



St. Augustine Orchid Society

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Orchid Myths – Foliar Feeding

by Sue Bottom, sbottom15@hotmail.com

Leave it to Alan Koch to debunk another orchid myth, this time foliar feeding, I have heard people laughingly say that the way foliar feeding works is the next time you water after foliar feeding, the nutrients are washed from the leaves into the root zone where they can be absorbed by the roots. Fertilizer drenches applied to the root system are the most efficient way of supplying most mineral nutrients to your orchids but when plants are stressed, have root damage or nutrient deficiencies, foliar feeding can provide a quick fix. It is also a way of supplying mineral nutrition to your plants without causing a buildup of salts around the roots.



The argument against foliar feeding usually centers on the waxy leaf cuticle and low density of stomata on orchid leaves. Plant leaves are specialized organs for capturing light and carbon dioxide. Leaf surfaces are covered by a cuticle, a hydrophobic skin with low permeability for water, gases and dissolved substances. The purpose of the cuticle is to minimize both the leaching of substances out of the leaf and the uncontrolled entry of substances into the leaf. Leaves also have stomata, adjustable pores on the leaf surface that facilitate the entry of carbon dioxide gas for photosynthesis into the leaf and the exit of water vapor for the transpiration process out of the leaf. The stomata, located on the undersides of orchid leaves, are formed by pairs of guard cells that regulate the opening



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and closing of the pores. Depending on the photosynthetic pathway, the stomata are open during the day in some orchids and others are open only at night.

- ★ *C3 Pathway.* Thin leaved orchids like many of the oncidiniiae tend to photosynthesize using the C3 pathway. The stomata are open during the day so carbon dioxide can be absorbed during daylight hours while photosynthesis is underway. C3 orchids tend to have a thinner cuticle and higher density of stomata than CAM orchids.
- ★ *CAM Pathway.* Thick leaved orchids like many in the cattleya alliance convert light energy to chemical energy using the CAM (an acronym for crassulacean acid metabolism, if you really want to know) pathway. These epiphytes have adapted to a dry xerophytic environment by keeping their stomata closed during the day to prevent water loss. Carbon dioxide is only absorbed at night when the stomata are open so it must be stored chemically in the thick leaf for subsequent use during the day light hours when photosynthesis occurs. This adaptation is also used by succulents. CAM orchids tend to have a thicker cuticle and lower density of stomata than C3 orchids.

There are many postulated pathways by which foliar applied nutrients enter the leaf surface, including selective ion channels, aqueous pores, open stomata, guard cells and macropores on the closed stomata. In general, the primary nutrients (nitrogen, phosphorus, potassium) and calcium are best absorbed through the roots and the micronutrients (zinc, manganese, iron, copper, boron, and molybdenum) that are generally immobile in the phloem are best absorbed through the foliar applications. The secondary macronutrients magnesium and sulfur can be absorbed through the roots as well as through foliar applications.

There is an abundance of literature for foliar fertilization of crops and grasses but very little has been written about foliar feeding of orchids. Notwithstanding those who believe the very thick waxy cuticle and low stomata density of many orchids make foliar feeding a “Spray and Pray” proposition, Alan has incorporated foliar fertilization into his overall plant nutrition program. Alan uses a 5 week rotation cycle. In the first week, a balanced fertilizer is applied as a drench to the root zone. In week two, a micronutrient package with a balanced fertilizer is sprayed onto leaves. In the third week, the balanced macronutrient fertilizer application to the root zone is repeated. In week four, the foliar micronutrient and balanced fertilizer application is repeated with the addition of seaweed or kelp. In the fifth week of the rotation, the pots are thoroughly leached with water to flush accumulated salts from the root zone.

The smaller the droplet, the more effective the foliar application will be. The most efficient way of delivering the micronutrients to the leaves is a fogger because the fogger atomizes the spray producing aerosol size droplets that will easily reach the plant undersides so less of the micronutrient solution is consumed with each feeding. Using a fogger with or without the addition of fungicides or pesticides requires that you wear full personal protective gear including an organic vapor respirator. A much easier alternative is using a water breaker like the red Dramm head that produces a fine spray. A good adjuvant will



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also dramatically improve the absorption of the foliar feed because it breaks the surface tension of the droplet on the leaf. You can use the generally available orange oil or some of the specialty nursery products containing organosilicates like SilWet or CapSil.

Foliar application rates are generally lower than the rates you would apply for root uptake. Products should be labeled for foliar applications and all label instructions should be followed to prevent leaf burn and phytotoxicity. Foliar spraying should be done in the cool morning hours, adjuvants and nitrogen should be added to the mix and care should be taken to direct the spray to the leaf undersides. Some nutrients and supplements, many available at hydroponic stores, that are effective when used as foliar applications include:

- ★ *Urea*. Urea is the most suitable nitrogen source for foliar applications because it is a nonpolar compound with a low salt index that is readily absorbed through the under-leaf. Urea also helps stimulate absorption of other nutrients by increasing the permeability of leaf tissue.
- ★ *Micronutrients*. The micronutrients zinc, manganese, iron, copper boron and molybdenum are required in small concentrations for plant growth. The FloraMicro formulations are available from hydroponic stores for the hobbyist and soluble trace element formulations are offered by fertilizer manufacturers.
- ★ *Calcium*. Calcium is best absorbed through the roots and carried in the xylem to the growing part of the plant where it is used in building cell walls. It is mostly immobile in the phloem so calcium cannot be translocated from older to newer growths. Foliar applications of calcium during periods of rapid growth are a way of supplying the calcium your orchid needs directly to the expanding tissue where it can be used in building cell walls. Many of the calcium foliar supplements contain calcium acetate, calcium nitrate or calcium chloride.
- ★ *Magnesium*. Magnesium is an essential building block for chlorophyll. It is easily absorbed through the roots and is mobile in both the xylem and the phloem. If your plant does not have enough magnesium when forming new growths, it will rob it from the older leaves that will then yellow and senesce. Epsom salts can be added to a foliar spray solution and Cal Mag solutions containing both calcium and magnesium are available for foliar feeding.
- ★ *Seaweed and Kelp*. Seaweed extract and kelp assist in the absorption of nutrients and contain beneficial vitamins and hormones. Seaweed extract is a generally available organic product derived from harvested brown seaweed that contains major and minor nutrients, amino acids and growth promoting substances like auxins, cytokinins and gibberellins. The product KelpPak is a specialty kelp product that can be ordered as KelpMax from First Rays.



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- ★ *Mega Thrive*. Mega Thrive is a 3-0-3 foliar fertilizer (mostly urea-based nitrogen) that contains the trace elements boron and molybdenum in higher levels than most other fertilizers. The boron and molybdenum stimulate the circulation of plant hormones auxin and cytokinin to increase the plant growth rate. It is intended to be used in conjunction with but separately from a regular root based fertilizer program

The majority of your orchids' nutritional needs should be satisfied by your regular fertilization program in which nutrients are delivered to the root zone for uptake. Foliar feeding is an enhancement to rather than a replacement of your regular fertilization program, and may be best suited for micronutrients and supplements. Once you have mastered all the other aspects of orchid growing by providing the proper light, air, water, nutrition, etc., foliar applications of specialty products may be a way for you to flower boost your orchids. As Alan says, with proper nutrition you can make the leap from being a great grower to being an exceptional grower.

Iron for rupicolous laelias

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