FEEDING YOUR ORCHIDS

Part One - What Orchids Eat for Breakfast

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In your orchid collection, you have some beautiful plants. They want to grow vigorously and flower, and depend on you to provide the proper conditions for them to do so.

You're aware that they need water, sun light (with varying degrees of shade, depending on the plant), and an occasional shot of mineral nutrients in the water. But what are we talking about?

Almost all orchids are epiphytes, which grow on trees, or lithophytes, growing attached to rocks, but without contacting soil. Even the terrestrial types that grow on the shaded leafy surfaces of their native environment of forest floors seldom have roots that grow into soil or 'dirt' as it's called here in Texas. So the term 'fertility' used to describe the minerals and elements contained in soil does not apply here.

An orchid growing on the bark of a tree has no soil to supply minerals. Instead, it depends on a very dilute source of nutrients washed down to it by rainwater. Deposits from birds, stuff leached from decaying leaves caught on limbs above, these are its source of mineral foodstuffs. It's lucky to see a solution of 5 to 15 parts per million of nutrients dissolved in the rain dripping down to its roots.

Some orchids grow in mosses covering rock escarpments, sending roots through the moss to that interface between the rocks and the lower portion of the moss which is the drainage area of rain flowing down the escarpment, thus sharing the nutrients with the mosses in which the roots grow.

But in our pots, or baskets, even those on the mounted cork, our orchids are waiting for us to supply the nutrients. The question to be addressed here then: how much and how often should we supply these minerals and elements necessary for the orchids to thrive and bloom for us?

Before delving into this, let's consider what we're to feed them. Almost any fertilizer contains some basic components, and some others involve the addition of trace components which can be either required for good plant growth, or at least offer some benefit to help the plants.

Orchids, like other plants, utilize the sunlight to convert carbon dioxide and hydrogen into food for plant energy. The carbon dioxide is extracted from the air around the plant, and most of the hydrogen is obtained from water. Through the process of photosynthesis, these two ingredients become starches and sugars which the plant uses for its 'grow power'. To study the photosynthesis process in plants is a subject in itself, so we'll leave that subject for the future by other folks to write about.

However, to accomplish photosynthesis, a plant requires some other ingredients to form its mechanisms used in synthesis of its 'food'. Herewith, we start a list:

Nitrogen (N) This is the first element you'll see on the list of primary component formulation (expressed in order of major elements involved, i. e., N-P-K) on your fertilizer container. Nitrogen is a major component of proteins, hormones, chlorophyll, vitamins and enzymes essential for plant life. Nitrogen metabolism is a major factor in stem and leaf growth (vegetative growth). Too much can delay flowering and seed formation. Too much often is indicated by 'soft' growth and dark green coloration in leaves. Deficiencies can reduce yields, cause yellowing of the leaves and stunt growth.

Phosphorus (P) Plants use phosphorus in their production of proteins and certain nucleic acids. Phosphorus is necessary for seed germination, photosynthesis, protein formation and almost all aspects of growth and metabolism in plants. It is essential for flower formation. It is present in several steps of photosynthesis and respiration in plant cells. Too little causes stunting; excess can cause collapse of plant tissues by showing limp plant leaves without them being wilted. If your fertilizer solution is alkaline (pH more than 8.0), plants will be impaired in their ability to take phosphorus into their roots. Phosphorus must be applied close to the plant's roots in order for the plant to utilize it. Large applications of phosphorus without adequate levels of zinc can cause a zinc deficiency. The phosphorus content in fertilizers is expressed as its phosphoric acid form, i. e., P_2O_5, and the percent involves the weight of the compound in the fertilizer. The actual amount of phosphorus is only about 43% of the phosphoric acid by weight.

Potassium (K) Potassium is necessary for formation of sugars, starches, carbo-hydrates, protein synthesis and cell division in roots and other parts of the plant. It helps to adjust water balance, improves stem rigidity and cold hardiness. Potassium use in plants is not totally understood, since it must be present during the formation of many organic compounds in plants, but the potassium is not always found in the compounds. It seems to be a required catalyst for their formation, acting like an enzyme activator. The form of potassium in the fertilizer percentage is expressed as the chemical compound K_2O, referred to as 'kallium' or potassium oxide. The potassium represents roughly 83% of the compound.

In formulating a fertilizer, the ratios in the N-P-K sequence are expressed as the percentage of each element or compound as part of the total weight. While looking at one bag, you might see 10-10-10, indicating that the three parts or minerals involved represents 10% each by weight of the total weight in the container. However, the second and third percentages are the percent of P_2O_5 (phosphoric acid) and K_2O (potassium oxide) which are chemical compounds, with each being 10%, leaving 70% of other things in the bag. We'll skip over what else is in there for now.

Together with carbon obtained from carbon dioxide, hydrogen and oxygen, these three items are called 'macro-nutrients', used in large amounts by plants for food synthesis and growth. But there are three other elements or minerals considered as secondary macro-nutrients:

Sulfur is a structural component of amino acids, proteins, vitamins and enzymes and is essential to produce chlorophyll. Deficiencies show up as light green leaves. Sulfur should be applied with a nutrient formula. Some water supplies may contain sulfur. Restrict use during times of high temperatures, since the sulfur can burn orchid plants exposed to sunlight under these conditions. See number 5 below for a good source.

Magnesium is a critical structural component of the chlorophyll molecule and is necessary for functioning of plant enzymes to produce carbohydrates, sugars and fats. It is essential for germination of seeds. Deficient plants appear chlorotic, show yellowing between veins of older leaves, and leaves may droop. Magnesium is leached by watering and must be supplied when feeding. It can be applied as a foliar spray to correct deficiencies. It is readily available as magnesium sulphate, commonly called Epsom Salts.

See Bob Gordon's excellent book for a good explanation on use of magnesium sulphate. The caution about applying sulfur in hot weather applies to using Epsom salts as a supplement too.

Calcium activates enzymes, is a structural component of cell walls, influences water movement in cells and is necessary for cell growth and division. Some plants must have calcium to take up nitrogen and other minerals. Calcium, once deposited in plant tissue, is immobile (non-translocatable) so there must be a constant supply for growth. Deficiency causes stunting of new growth in stems, flowers and roots. Symptoms range from distorted new growth to black spots on leaves and fruit. Yellow leaf margins may also appear. Supplementing calcium is not usually required in Houston and the Gulf Coast since there tends to be enough dissolved in our water; however, use of rainwater, distilled water or water from a Reverse Osmosis process will not have calcium in them.

These six items comprise the macro-nutrients required by all orchids in various amounts.

Then there are some minerals or elements which are not considered as major necessities, but which contribute to plant growth and flowering by affecting certain plant health factors, much as are the vitamins to us humans. Small traces of these 'micro-nutrients' act as catalysts to cause certain beneficial activities in the plants, serving to initiate or enhance chemical reactions. To differentiate these trace elements from those considered as macro-nutrients, our listing will index using small letters:

a. Iron (Fe) Available through use of ferrous sulfate (copperas), or through chelated forms enabling plants to absorb though its roots. Iron is essential for the production of chlorophyll. Deficiencies are shown by pale leaf color of young leaves followed by yellowing of leaves and large veins.

b. Zinc (Zn) Zinc is a component of enzymes or a functional cofactor of a large number of enzymes including auxins (plant growth hormones). It is essential to carbohydrate metabolism, protein synthesis and internodal elongation (stem growth). Particularly important in the synthesis of indole acetic acid, a growth regulator. Sources are as simple as mixing your fertilizer solution in a galvanized bucket, which provides plenty of zinc, or use of a fungicide containing zinc compounds! Orchids do not seem to require a lot of zinc, unlike pecans, another favorite thing grown down here on the coastal area.

c. Boron, cobalt, molybdenum, manganese, silicon and other micro-micro-nutrients that get involved: Arguments abound on whether these barely required elements are ever required to be added as a supplement, since most or all are present as impurities in the compounds used to formulate fertilizers anyway. That these items are listed on the chemical analysis may represent the fertilizer company's efforts to present a full disclosure, or else, as I've heard somewhere, a mechanism that allows charging more for their product.

In the next article in the series, we will address how to go about figuring the concentration in a solution, and lead into what concentrations are commonly used to fertilize orchids.

References:
1. Dorothy Morgan, extractions from a presentation for the Dyna-Gro Corp. Used with permission.