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FERTILIZER BASICS

by Herb Plever

The esthetic goal of every grower is to grow healthy, beautiful plants with compact conformations and crisp leaves - and to bloom them. It is in this context that we can discuss fertilizing bromeliads.

In discussions about chemical fertilizers for bromeliads, it is frequently said that we are "feeding" our plants. This is a popular misconception and a misuse of the term. In fact, green plants such as bromeliads can and do "feed" themselves - even without our help. (The proper verb for what we do is "fertilize"; we provide the nutrients that our plants can feed with.)

They do this using the almost magical process of photosynthesis and carbon fixation, a process that I will briefly summarize in the next three parts of this article (with information gleaned from "The Biology of the Bromeliads" by Dr. David Benzing). If you find this information too technical or boring, just skip to Part 4. where the growing stuff begins.

1. Photosynthesis and Carbon Fixation - The green pigment (chlorophyll) in the leaves captures and harvests the radiant energy from a narrow bandwidth of photon light emanating from the sun, with help from the plant's enzymes. This process enables our plants to manufacture ("fix") organic carbon food such as sugar from a combination of radiant light energy, inorganic CO_2 (carbon dioxide), inorganic H_2O (water) and an array of inorganic minerals - all found in the air or in the medium the plant is growing in.

There are two chemical routines that different bromeliads use when they make food. Mesophytic, soft-leaved plants from water sufficient habitats use the simple C_3 metabolic pathway in which, with leaf pores open during the day, they take in and store CO_2 to be fixed during the night when the pores are closed.

After the cataclysmic uplifting of their habitats millions of years ago, some tillandsias survived and adapted to the cooler, drier, higher altitude atmosphere. In their drier conditions, "atmospheric" tillandsias could not afford to lose moisture through the transpiration that would occur if they kept their leaf pores open during the day, so they adapted by evolving a different method of making food. They keep their leaf pores closed during the day, and open them at night when there would be less water loss. At night they take in CO_2 and convert it to malic acid. After sunrise the malic acid is deacidified by enzymes to release CO_2 that is trapped below the leaf surface, and when the leaf is exposed to sunlight photosynthesis occurs - fed by the regenerated CO_2 and food sugar results. This process is called CAM or Crassulacean Acid Metabolism.

Almost all of the species of the genera of subfamily *Bromelioideae* (*Aechmea, Billbergia etc.*) also use CAM metabolism. But the reasons for this adaptation are not yet understood.

2. Why We Give Our Plants Fertilizer - If

NEXT MEETING - **Thursday, November 7th** , 2013 promptly at 7:00 P.M. at the Ripley-Grier Studios 520 8th Ave. (between 36th & 37th St) Room 16M
(**Note meeting date change because the 1st Tuesday falls on Election Day**.)

CRYPTANTHUS - We'll show a brief video of some old favorites and many new hybrids (plants that will be available on our Spring order). Then we'll have a round robin discussion about how to grow crypts: sizes and types of pots, mix, watering methods, fertilizing, and how to start pups so they root quickly. Bring in plants for sale, for Show and Tell, and especially a

our plants can feed themselves, why should we provide them with fertilizer? In their habitats terrestrial broms take up nutrients from their soil substrate. Epiphytes get nutrients from the animals which live in their cups and leaf axils in the form of droppings, decomposed dead animals and decayed leaves. Ants which colonize the inflated bases (the lower leaf axils) of tillandsias like *T. bulbosa, T. caput medusae* and *T, seleriana* provide various forms of nutrients. Also, the air is loaded with molecules of water and minerals that the scurfy epiphytic tillandsias can absorb through their trichome scales.

Tillandsia bulbosa with inflated leaf sheaths

But indoor grown bromeliads don't have a reasonable supply of any of the above sources of nutrients, and greenhouse grown broms fare only a little better in this regard. If we want to produce strong and healthy plants, we must provide them with chemical nutrients that they can use to manufacture food - nutrients that would otherwise be unavailable to them.

3. What Mineral Nutrients Do Bromeliads Need? - About 80% of the tissue of a bromeliad is water. The bulk of the rest of the mass is composed of compounds of carbon (C), hydrogen (H) and oxygen(O). In the remainder, there are relatively high concentrations of calcium (Ca), magnesium (Mg), nitrogen (N), phosphorus (P), potassium (K) and sulphur (S). These are called macronutrients. There are also very small amounts of other essential minerals: boron (B), chlorine (Cl), copper (Cu), iron (Fe) manganese (Mn), molybdenun (Mn) and zinc (Zn). These are called micronutients or trace elements.

Each of these nutrients performs multiple functions that are essential for the cellular growth of healthy plants. (Molybdenum only has one function).

4. Fertilizer formulas - Every commercial fertilizer has a formula for the amounts of nitrogen, phosphorus and potassium it contains - set out as **N-P-K** in that order. Except for magnesium, all of the good ones have safe amounts of the macronutrients and the trace micronutrients. Only a few such as the new Peter's Peat Lite Special contain the essential mineral,
magnesium. (See further discussion on this below.)

There are many commercial fertilizers on the market with widely different balances in the formulas for N-P-K There is an even greater disparity among the "experts" about what formula to use, and more importantly, at what strength and how frequently we should fertilize. Based on what I read in newsletter and Journal articles on fertilizing, I think most experts and amateur growers are overcautious.

5. Fertilizer Regimens - I have been experimenting with the use of fertilizer for different bromeliads, in different seasons and under diverse light conditions for about 45 years. I also try to keep track on the fertilizer practices of the good commercial growers. My conclusions are never fixed, because, by trial an error, I am constantly adjusting and changing my fertilizer practice in which each plant and microenvironment is unique. In other words, one size doesn't fit all.

Of course, when you grow many plants and still want to have time for a life outside your hobby it is necessary and expedient to generalize your regimens for groups of plants so long as you watch for anomalies and unexpected results. If your collection contains plants from a wide cultural range of habitats as mine does, you may have to use 2 or 3 different general regimens to get good growing results. In addition to my trial and error observations, there are good scientific reasons behind the practices I present below, but these are highly technical and go beyond the purview of this article.

a. Light - As noted in the section on photosynthesis, light is a key factor in both the rate and quality of cellular growth. The amount, strength and length of available light must be taken into account in your fertilizer routines. It is strange that outdoor growers in warm climes tend use minimal fertilizer, if at all; they like to grow their broms very slowly and hard in high light to get tight conformations with short, wide leaves. In contrast I having been giving my indoor grown plants relatively strong and frequent applications of fertilizer (depending on the season and the needs of particular genera and individual species and cultivars). I am fortunate in having decent light in my 8th floor apartment with east-south-east and south-south-west unobstructed window exposures.

With a northern sun and sooty window panes, we give our indoor plants the maximum light avail-

able. So long as they are kept wet, they won't burn even if exposed to wet sun, though you should avoid letting soft leaves touch hot windows in the summer.

b. My Fertilizer Formulas - I use two different formulas for fertilizing my plants: 11-8-22 and 5-12-26 hydroponic (called Jack's Professional and made by Peter's.) I made the 11-8-22 by mixing Peter's Peat Lite Special (18-8-17) and 5-12-26. Peter's Peat Lite Special is an all-purpose fertilizer adequate for most types of plants, but it is barely adequate for bromeliads. It has too much nitrogen and not nearly enough potassium. Potassium is a vital, multi-functional element. Too much nitrogen (especially in lower indoor light) will result in elongation of the leaves. I note that potassium nitrate (12-0-44) once again is available on line. I plan to add some my current formula (11-8-22) to raise the potassium to 2½ to 3 times the amount of nitrogen.

I have also used slow release fertilizer pellets placed in the medium; growers find them easiest to use. I don't use Osmocote pellets as their shells are brittle and tend to break apart and release all of the fertilizer. I've used Nutricote pellets (13-13-13) which are good for 9 months, but I prefer a Nutricote type called Dynamite pellets (10-10-17), made by Florikan and sold on line. The pellets should be placed well below the top of the mix so they stay moist. If placed on top, they will dry and harden and they won't release fertilizer when the mix is watered.

c. Epsom Salts - If you are using a fertilizer that does not have magnesium in its formula, you should add a scant 1/4 tsp. of Epsom Salts (magnesium sulfate) to a gallon of water to provide the missing magnesium which also is a vital multi-functional element. Epsom Salts is easily and cheaply obtainable in any drugstore. Both Peter's Peat Lite Special and the hydroponic 5-12-26 have some magnesium in their formulas.

d. Strength and Frequency of Applications - I mix 1/4 tsp. of fertilizer to 2 quarts of water. (½ tsp. per gallon.) I have two 2-quart pitchers and I put 11-8 -22 in one and 5-12-26 in the other. I begin by putting some very hot tap water in the container, and then add the fertilizer. I shake the pitcher to encourage the fertilizer to go into solution and then add warm to luke cool water from the tap to fill the pitchers. (I am fortunate in being able to use New York City tap water which is piped in from the Croton Reservoir upstate and has a pH of 6 - 6.2.)

I fertilize in the morning every 7-10 days except for the cooler, darker days in late fall and winter when I cut down on frequency and strength or cut out alternate weeks. When it is freezing outside my window sills get very cold; we rarely put on the heat. I pour the fertilizer into the cups of those plants that have them. I foliar feed my cryptanthus.which I grow wick-watered. This makes it inconvenient to bottom water them. My crypts do very well with this regimen, growing close under fluorescent lights. I fertilize tillandsias by soaking them in the bathtub for an hour with 4 tbsp. of 11-8-22 fertilizer. I've started to grow tillandsias in pots and I foliar spray them.

Spectroscopic analysis of samplings of the leaves taken before and after fertilizing shows that broms take up (feed) as much fertilizer as they need, and not any more After 1 hour they will have taken up 70% of what fertilizer they need.

Later in the day or during the next day after fertilizing, I flush out the fertilizer from the cups and leaf axils with fresh water. If fertilizer is permitted to stay in the axils, when the water evaporates, the remaining fertilizer salts will burn the sheath margins of the soft leaved guzmanias and vrieseas.

This regimen is specifically adapted to our conditions. Clearly the best way to fertilize is by frequent applications of very small amounts of fertilizer. Commercial brom growers do this with overhead watering every 1 or 2 days (more often if it is very hot and their greenhouses are not highly air conditioned). The water contains very small amounts of fertilizer controlled by the water proportioners. The total amount of fertilizer delivered to their plants in one week, exceeds my fertilizer strength of ½ tsp. per gallon of water.

e. Specific Adjustments of the Regimen:

1. Aechmeas - I use 11-8-22 for small aechmeas like *A. farinosa, A. recurvata, etc.* I also use it for *A.* 'Morgana', which grows compactly with wide leaves. Indoors, larger aechmeas can get leggy, so I use 11-8-22 in the spring and when they are on the terrace in summer, and 5-12-26 the rest of the year.

. 2. Billbergias and Neoregelias - The accepted wisdom about these genera was "don't fertilize them because it will wash out their color and markings". However I have found out that the good commercial growers do in fact discretely fertilize them. I have occasionally added 5-12-26 fertilizer to the pot media of my billbergias and neoregelias during our high light season without any loss of color or markings. I think the fertilizer gives them a small boost in growth and vigor.

3. Cryptanthus, Dyckia and Orthophytums - 11-8-22 foliar spray and I sometimes add it to the mix.

4 Guzmanias feed glutinously and tend to grow to be lush and large plants, which is o.k. if you have lots of space. When mini guzmania tissue cultures are fed 11-8-22 they grow larger than mini size. I moderate the blooming size of all guzmanias by using low nitrogen 5-12-26 fertilizer exclusively.

5. Vrieseas - They also are heavy feeders, but they don't tend to get enlarged growth as do guzmnias. I use the 11-8-22 fertilizer for vrieseas in late spring, summer and early fall. The rest of the year I use 5-12-26.

f. Blooming - Fertilizer will bring your plants into bloom more quickly than without it. Years ago members complained that their 4 or 5 year old *Aechmea fasciata* never bloomed. They started to flower them when they began to use fertilizer. When a mature plant seems ready to bloom, I fertilize it weekly only with 5-11-26; I think the added phosphorus will produce larger inflorescences. After a bromeliad blooms and the color fades, I sharply cut back the leaves to provide more light for pups coming up and to give space for other plants.

To sum up some fertilizing benefits:

- Leaves will be more vibrant and crisp.
- Plants will grow and flower more quickly.
- Inflorescences will be larger.

The inflorescence of the *A. fasciata* cultivar *Aechmea* 'Morgana' in the photo below measured a full **six inches across**. The plant was treated with weekly high strength fertilizer and it flowered in 19-20 months from the time it was potted as a pup. Also, note the 4"+ wide leaves.

Aechmea 'Morgana' inflorescence

Tissue cultured *Guzmania* mini 'Lois' has received weekly 5-12-26 fertilizer since I bought it in April. Six months later it has more than doubled in size, 12" wide and 8" high with 19 leaves - a strong response to a low nitrogen fertilizer. To keep it to mini size, I'll reduce the frequency of fertilizing in the coming fall and winter months. See photo below.

mini *Guzmania* 'Lois at 6 months

A few years ago I bought a small piece of the small form of *Vriesea phillippo-copurgii* and potted in a 5" azalea pot. Its lower leaves were slightly brown and they fully dried out although I was finally able to establish it in the medium. This tendency has continued, but the plant has grown much faster than its die-back of the lower leaves. I suspect that this condition is primarily due to lack of humidity as the mix was wick-watered and was always kept damp. After about 1 year of fertilizing with 11-8-22, I switched to 5-12-26 to moderate growth. The plant is now mature, strongly colored and is putting up a pup. I think it is ready to bloom. See photo below.

Vriesea phillippo-copurgii small form

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