

## Understanding Plants: Part 3

Editor's Note: This is the third in a three-part series.

In the last two issues of the *OFA Bulletin*, I attempted to discuss various aspects of plant physiology and how plants function. My intended purpose was not only to explain portions of this very complicated field in simple terms, but also to provide tips to the understanding of plants that can make you a better grower. With a better understanding of how plants operate, you can walk into a greenhouse and see things that you might have missed before.

A lot of growers seem to believe that mildly drought stressing their plants will cause the crop to grow more roots. With very few exceptions, this is simply not true. Plants like to grow roots, stems, leaves, flowers, and fruit when they are happy and content with their surroundings. Conditions are rarely perfect for plant growth, but the closer to perfect they are, the more the plant can perform, within certain physical and genetic limits. When plants are drought stressed, they must close the stomates to conserve moisture. When the stomates are closed, the plant cannot absorb carbon dioxide, which they use as the building block for proteins, sugars, starches, fats, etc. Carbon is frequently a limiting factor in plant growth, and closed stomates will usually limit a plant's ability to grow, both above and below the soil line.

One thing that does encourage root growth is a relatively low nitrogen fertilizer regime. When nitrogen is only applied sparingly (or not at all), the plant tends not to grow as much vegetatively, and the shoot-to-root ratio will increase in favor of the roots. Unfortunately, in a production greenhouse, this is usually not a practical option for increasing root growth. Among the nutrients that can positively influence plant root growth are calcium and phosphorus. In regards to calcium, root growth is one of the many reasons why it is important to lime the media adequately.

In field soils, liming can also reduce the availability of aluminum, an element which is frequently toxic to root tip growth. Most potting media ingredients are naturally low in available phosphorus. Supplying phosphorus early in potted plant development will greatly help with rooting of a seedling or liner. You may be in the flower or foliage business, but one of the first things you should be trying to grow is a good root system. Some growers prefer to limit phosphorus applications for fear of plant stretch. While there are merits to that argument, restricting phosphorus applications too much can result in a reduction of quality and quantity of the root system.

### Nutrients

Plants are great concentrators of nutrients. One percent equals 10,000 parts per million. A typical potting media on a

greenhouse bench will usually contain a minimum of 25 ppm nitrogen for good plant growth. The most recent fully-matured leaf of an average ornamental plant may contain 2.5 to 4.5 percent nitrogen, and often up to 6 percent or more for heavy feeders like chrysanthemums and poinsettias. A 2.5 percent nitrogen value is equivalent to 25,000 ppm, fully a thousand times higher than you will often find in the media. A similar 1,000-to-1 ratio often exists for potassium between the foliage and the soil. The ratios are somewhat less for the other nutrients, but still very substantial. This is why things like compost, manure, and food waste are so rich in nutrients.

It is well known that under an abundant fertility regime, plants will engage in luxury consumption of nutrients, wherein they take up more nutrients than they normally would. What is less commonly known is that some plants may actually temporarily put nutrients back into the soil. Sometimes the plant will secrete nutrients through the roots back into the media. These nutrients will, therefore, be present and largely available for later in the immediate root zone. The plants are, in effect, packing a lunch. They also store nutrients for later use in little bags within the cells called vacuoles, the cellular equivalent of a lunchbox.

As I discussed earlier plants usually absorb, in the daytime, carbon dioxide through open stomates. Some plants that grow in harsh environments, such as cacti and succulents, may have a little different way of doing things. These plants, known as CAM or C4 plants, normally keep their stomates closed during the day because of excessive heat, drought, or low humidity. These plants will open their stomates and fix carbon dioxide at night. These so-called dark respiration plants include certain Amaranths, Alternantheras, Heliotropes, Euphorbias, Bromeliads, Lilies, and Gesneriads. They can often photosynthesize better under drought stress than traditional C3 plants.

### Cold Injury

Since it is now the dead of winter, let's briefly discuss the physiology of cold injury. Plants are poikilotherms, which means they take on the temperature of their environment. On a cold night, the plants are not much warmer than the air. If temperatures are low enough for long enough, cell membrane systems are disorganized and cells start to die. These cells may break and form water-soaked lesions in the foliage. In some plants, such as Aglaonemas and Orchids, the foliage will undergo mesophyll collapse. The interior leaf cells simply break down and fall apart, resulting in sunken, necrotic foliage. I have often seen Aglaonema Silver Queen develop cold damage at 58°F.



Most greenhouse ornamentals will suffer cold injury at temperatures above the freezing point. What happens when plant tissue is subjected to freezing is a little bit complicated. Water both in the cells and between the cells may super cool. This can cause various physical and chemical disruptions within the plants, even if the plant cells don't actually freeze. The cell membranes and certain enzyme systems are disrupted. Injury often becomes apparent only upon thawing. Some of the plant injury is actually the result of the thawing process.

So, how do some plants manage to be so much more cold tolerant than others? The differences may be both physical and chemical, depending on species. Some cold-tolerant plants have a higher proportion of fat-like compounds in their cells. Plants with more unsaturated fats will often take the cold better than plants higher in saturated fats. Some plants can make certain soluble carbohydrates and proteins that enable them to tolerate freezing and frost. Still other plants thicken their membranes to

help cells retain heat on a cold night. Others transfer water from within the cells to the area between the cells, thus making the salt content of the cytoplasm higher and, therefore, the freezing temperature lower. It is as if plants sprinkle salt on their own cellular sidewalks.

Time and space have allowed us to take only a summary look at plant function and physiology. But with this basic understanding it is hoped that you can better understand the logic supporting your cultural practices, and to anticipate and avoid issues in the future.

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**GIANT PUMPKIN  
GROWERS**

## Phosphites in the Patch, by Russ Landry, GVGO Science News.....

During the last few years we have witnessed the use of many new products called phosphites. These products are now being widely applied to Atlantic Giant Pumpkin (AGP) plants. They are offering an ever increasing potential for growers holding promise for healthier, disease free plants. Phosphites have been demonstrated to control disease while eliciting or enhancing systemic growth properties. They are also thought to be raising plant vigour and vitality while hiking pumpkin weights to loftier levels.

You may recognize them as Aliette, TKO Phosphite, pHortress PHP and recently Quad-9 with N, K and Ca. They are but a few of the many branded and several differing types of phosphite formulations. Often referred to as, phosphonates and or phosphoric acids, they are truly marvellous products in the patch. However in name, they do not tell the whole story of nursing larger fruit in an optimistic, growers patch. Phosphites are proving to be very beneficial controlling Powdery Mildew (PM). Rapidly they have become the weapon of choice in combating many common injurious plant afflictions.

Not to be confused with phosphates (P) which contain an extra cation of oxygen. Phosphites differ from common P forms, being highly soluble and generally unstable in the rhizosphere. They are easily up taken by plant roots and leaves; moving up through the xylem and into the phloem. Phosphites distribute macro mineral elements to all parts of plants vascular system we often call the "Calcium High-Way".

Phosphites are known to be relatively benign to fungi, bacteria and other soil fauna. Molecules of phosphites are eventually transformed by microbes into phosphates within the soil and plants by accumulating an extra oxygen atom. In doing so they are slowly transformed into traditional P over a longer term, similar to a slow release fertilizer. The result is often higher concentrations of root building, highly soluble available P and the accompanying piggy backed cations. When combined with positive cation formulations of N, K, Ca or Mg, phosphites un-stability and solubility help to release extra cations of these very important elements into the soil solution. While the delivery mechanism and uptake are two valid property's phosphites are also known to control soil borne disease such as phytophthora through a systemic acquired response (SAR) within the plant.

Grower attention is building as the current trend to use products that elicit growth and promote disease fighting capabilities continues. Phosphites key power maybe in reducing and or eliminating PM entirely. This demands a closer investigation in the pumpkin patch. Periodic foliar sprays of pHortress on AGP have boasted exceptional reductions of PM on plants during a documented trail the past two seasons in Ontario. Infection is controlled by inhibiting spore germination. This may hold the greatest promise for growers as pesticide and fungicide bans have growers in search of many new environmentally safe products.

Today a grower's tool shed might include various forms of phosphites used either as soil applied or foliar sprays. A pre-season soil applied mix would provide traditional P during the course of the active growing period lowering concerns of mycorrhizal toxicity caused by traditional P. Then seasonal foliar sprays perhaps beginning with an early N component to promote healthy vigorous canopy's just ahead of blossom development. Following this are sprays of Ca and K supplemented with Mg to foster fruit development, finishing maturity and weight gain.

The many valuable properties of Phosphites are indeed leading the charge to Y2K. Promoting health and vigour are two certain factors.

"Helping you to grow bigger Pumpkins".

## A Growers Life: skills to grow a big one

By Russ Landry, February, 2011

Ushering in another bright new pumpkin growing season, I have formed a roadmap for growers listing several aspirations to achieve this orange filled year. With that in mind, I've decided to offer an extended list of what I think every grower new and seasoned alike should know -- but might not.

### Pumpkin Growing 101

There is no soil test to analyze and no water test to review, but I believe determination and following these simple guidelines will undoubtedly make you a heavy hitter. In my experience, these simple lessons aren't learned in school, or in college, on BP.com, or on your clubs web site. Rather these are tiny tidbits of information gathered together over several years observing these remarkable plants we call Dill's Atlantic Giant Pumpkin.

Here are the lessons every grower should know and hold close to them. I hope they'll eventually help you to grow bigger and better pumpkins.

#### **1. Spend more time than you think working the patch.**

I could say it many different ways. "Be a prolific grower". "Avoid in season couch potatoitis." All the points are the same. Everyone needs to learn this as soon as possible! It's extremely important to do the time and invest your skills and knowledge in the patch all season long. Unfortunately, you can't turn to a web site, your friends, or clubs to get this lesson accomplished. Those groups teach us to how to grow by providing a knowledge base. No one will do the backbreaking hard work for you. Growing giants is difficult hard work. Giant growing is definitely not your plain old-fashioned flower or vegetable gardening your parents did in days gone by.

Here are three ways to impart this lesson into the patch:

- **Match your skills level with desire** Each year newer growers set lofty goals their skill set cannot match. An hour spent in the patch in April is often worth two more extra pounds in September. Strive to improve your skills and efforts with determination. Building a better hoop house or providing a stress free environment is a better influence on your plants.
- **You must earn it.** If you want grow something large work at it. Due diligence in the patch works wonders, your knowledge will build with each passing day. If you're a newer grower and want a big pumpkin tell yourself you must pay with the price of time and experiences.
- **Tend fewer plants in adequately sized areas.** The two biggest mistakes most growers make in growing are too many plants within areas that are too small. Most grower's rookie and seasoned

veterans are tricked into thinking their patches are a Garden of EDEN. On thousand square feet is still the standard per plant. Growers often spend more efforts or more chores on too many plants diluting care. To make sure you don't end up "time growing poor," consider these guidelines:

- Don't become over exuberant and do not plant a pumpkin unless you plan to devote an hour each day per plant for at least the entire growing season. I also include in this off season research of 1 hour per day, per plant. Or 365 hours per plant per year.
- Don't spend time wasting your gross resources on too many plants. The pumpkins will only be smaller and the plants more unruly to control.
- Don't over extending yourself purchasing every supplement know to mankind. Resources are better spent on equipment then chasing every new fangled thingy.

## 2. You are your own best resource.

These days, many people ask, "What can I do to become a Heavy Hitter" The short and quick answer: Become focused at what you do best. If want to the best grower, the key here is to become an enthusiastic pumpkin learner. Two ways to apply this instill this.

- **Read about and research pumpkin stuff.** It could be seeds or soil or whatever. Become devoted, to the many different aspects of this very unique hobby by reading! The best way to light a fire is to actually experience it and tend it. The best gift you can give yourself is the love of learning. That curiosity can lay the foundation to a world-class pumpkin is no secret.
- **Learn to love growing for the long haul.** The most difficult patch problems tend to be multidisciplinary, and they typically are not solved quickly. Soil issues quickly come to mind as being difficult to grasp and slow to resolve. It takes time to learn all of the new soil management and growing techniques. Atlantic Giant Pumpkin growing teaches us to be patient, organize your thoughts on paper and think logically while recording everything you do for future reference.

## 3. Become dedicated to the chores.

Growers don't come predisposed to be great growers. We have all kinds of psychological baggage that prevents us from propagating the great big pumpkin. In short, we form conclusions prematurely, and we're overconfident in our own abilities, prone to action in times of stress and fear, we often forget the past and become More-ons. You must learn from your mistakes so they are not repeated.

To counteract these flaws, here are my simple rules to guide your growing decisions:

- **Be patient.** Don't buy any supplement either foliar or soil and apply it spontaneously. Wait a least a few days before applying questionable new products. Go light on the App while testing products and experimenting. This allows you to introduce new untested products in a safe manner. It also nullifies your emotional "more-on impulses".

- **Be committed.** Tend every seed you plant until the end of season. This commitment will likely assist you to carefully consider and research the myriad of growing problems you will encounter. Gaining valuable experience over time pays dividends in growing larger fruit.
- **Seed Portfolio.** Build a modest collection. Growers need not enter the poor house chasing the latest and greatest seed. You should also know something about every seed you fling earthward. Each seed holds its own story, as the pedigree unfolds your plants may need special care.
- **Network.** Don't be timid. A great place to start looking for other growers is obviously the internet. It doesn't stop there! Networking and mentoring are great ways to analyze plant skills and problems. Plan to attend conventions, seminars and patch tours and above all learn from others.

#### **4. Learn the lingo, join in and master it**

A common adage holds that it takes four hours a day, seven days a week, for 10 years to achieve mastery – this however assumes you actually spend those hours wisely, get feedback, and track your performance. If you are doing something you don't find productive, you're swimming against the tide. Work for the best outcome, and do not settle for anything less while leaving no stone unturned. If you want to be a Heavy Hitter, become involved. Join a club; contribute to the collective of growers in your area. Go to message boards and chat while soaking it all in. The most important part is that you surround yourself with those who are the best at what you want to become great at. As they say, it is hard to soar like an eagle when you hang with a bunch of turkeys.

#### **5. Invest in experiences and equipment.**

As growers, our goal shouldn't be to die with the biggest pumpkin. Life is precious, and we want to live it, and live it well while displaying the fruits of our labor. That doesn't mean having the biggest or thickest pumpkin. He who dies with the most seeds doesn't win -- he who dies with the most meaningful experiences and the communities respect does. The feel of that new bulky 1810 seed does feel good but in the hands of rookie, they often fail to thrive. However, that once-in-a-lifetime seed opportunity will come along someday when you're ready.

Time and equipment are much more valuable than money and seeds. Although any De-Lorean will diminish with age, growing equipment saves time allowing the grower to grasp finer details. Do not delude yourself into thinking that you're expensive seed will grow to magical proportions. No matter how good the seed quality, most experienced growers intuitively know that time spent in the patch is more valuable than seeds. An hour spent tending a plant, is not only free -- it's priceless at the end of the season.

#### **One final piece of advice from a master**

# OHIO VALLEY

Al Eaton is famous for pumpkin quotes. Here's one of my favorites: "There is no silver bullet in growing these things." By following the steps above, you'll be well down the garden path of a well deserved and hard earn giant pumpkin.

So what are you waiting for? Go get it done! And if you find this advice at all valuable, pass it along on the message boards, link to it on the web, bookmark it and share it with those who you believe will become tomorrow's future heavy hitter. The hobby needs a few good folks because just like the plants we tend we will all thrive together in this collective of like minded pumpkin folks.

**OVGPG**

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## 2008 Steffing OTT Chart

Updated by Russ Landry 2008