THE APTUS BIBLE

The definitive guide to everything Aptus

INTRODUCTION

SUMMARY & OVERVIEW

The Aptus Bible is designed to educate and inform retail store staff how to effectively sell and support Aptus products. It is intended as a robust, behind-the-counter reference guide when customers ask tough questions, or for continuing staff education.

This is no replacement for our live support though. You are always encouraged to call Product Tech Support or schedule a Skype session with one of our Educators.

USING THIS GUIDE

The Aptus Bible is intended as an ongoing reference tool for store staff and educators. You can find information for each product and core concept in each major section. Each of these sections is divided into sub-sections based on the level of knowledge. This color-colding layout makes it easy to get just the level of information you want.

BASIC KNOWLEDGE

These are the bullet points. They are deep enough to have a grasp of the 'what' of Aptus. WHAT is different about Aptus? WHAT Aptus contains. WHAT it can do for growers. Understanding these points gives you enough to talk intelligently with most customers. It is the bare-minimum for all staff to know.

ADVANCED UNDERSTANDING

There is a portion of the population that asks the tough questions. These points go deeper into the understandings of HOW things work. In these sections the guide gets into more specifics about HOW the components work together. HOW plants respond to Aptus technologies. HOW Aptus was put together. At least one staff in each store should become well versed in these deeper concepts.

EXTREME EDUCATION

Only for the hard-core knowledge seeker. Most of these concepts will never be addressed in a typical store setting. But for those who want to truly understand the WHY of Aptus and many plant science concepts in general, these are the sections to understand. WHY do plants behave certain ways? WHY did we make certain decisions when formulating Aptus?

MAJOR COMPONENTS

INTRODUCTION

Aptus Plant Tech is different. And not because a flashy marketing campaign says so. The Aptus story is unique and exciting. The future of Aptus is greater because the beginnings were great. This section tells the Aptus Story, Philosophy, and Approach. Understanding our story and values sets a basis for understanding all the science, research, and product formulations.

APTUS SCIENCE

The research that went into Aptus products came from the top agriculture researchers and universities. The science is highly refined and based fully on the ideal of following the biological rules of nature. This section explains the specific science that inspired Aptus.

CORE PRODUCT TECHNOLOGIES

With a basic understanding of plant nutrition, product selection is easier. It's important to fully understand what goes into the products that go into your plants that, in turn, go into you. This section lays out the ingredients and formulation of the Aptus Plant Tech product line. We'll also discuss why we chose each ingredient in the technologies we use.

PRODUCTS

This section details specific product formulation, usage, and education. You'll find Frequently Asked Questions about specific products as well as general Aptus FAQ. This section is most important for understanding how to sell which products for specific needs and circumstances.

SELLING APTUS

Our goal is to build each store into a successful retailer and education center. We've found that stores with the most knowledgeable and passionate staff move the most product and develop a loyal following. There are nuances of Aptus sales that go beyond typical plant nutrition. This section provides tips and tricks for maximizing your sales.

THE STORY OF APTUS

"Big Ag" across the globe is experiencing the negative effects of decades of synthetic fertilizer and pesticide usage. Cropland is becoming toxic and barren, soil micro-life is dead, and many minerals have been completely depleted. Salt buildup creates harmful runoff into our groundwater, pesticide residue is on much of our produce, and our food lacks the nutritional value it contained only a few decades ago.

Aptus technologies were developed in an effort to fix these problems short term and long term. By creating highly bioavailable forms of nutrients and natural stimulators, Aptus works immediately on plant growth but also helps to remediate soil and bring life back to the earth. Truly, if nature is working as designed, there is no need for Aptus or any other human inputs!

After six strong years in the professional agriculture sector, Aptus moved to the hobby/hydroponics industry. Six years later, Aptus has become a dominant hydroponics nutrient in Holland and is growing quickly in multiple European markets. From this success we are expanding quickly in North and South America. This rise to prominence is not from million dollar marketing campaigns or aggressive sales tactics. Rather, Aptus is built on True Plant Science so growers experience quality, efficiency, and cost-savings alike.

Our companies in Europe and in North America are built on the idea that people are most important. The rapid growth is fueled by focusing on educating stores and end-users with real science and providing reliable, proven formulations.

THE APTUS PHILOSOPHY

We strive for excellence in everything we do. This applies to nutrients, client service and quality of our public image and beliefs. Our three core brand pillars are:

Education – Everything we do begins with proper education. We teach maximizing plant genetic potential through natural, science-based nutrition technologies. Our chief desire is to create a community of growers who understand why they achieve success.

Quality – We are vigilant of the quality of our ingredients, distribution channels, and staff. Growers can be confident that their plants receive no synthetic or harmful materials from Aptus products—only natural nutrition.

Value – All our products are designed to maximize the end user's value experience. The high concentrations of our nutrient formulas mean low cost-per-use and minimal waste. Growers typically achieve superior quality and increased yields for far less cost.

THE APTUS APPROACH

The Aptus Approach is to provide quality uniform products and education that enhance growers' production and cultivation. The Aptus Approach is based on a preventive methodology for host (plant), pest and environmental problems. Simply put, **to avoid problems before they become problems**.

The Aptus Approach is natural; it respects fully the rules of nature and is a guideline to get back to ancient natural mechanisms: soil care and plant care. Aptus is the combination of soil bioremediation, plant stimulation, and proper nutrition.

GROWER GOALS

All growers, regardless of plant type, background, location, etc, have four primary goals for their operation.

1) Larger yields
2) Increased quality
3) Cost savings
4) Less work

Growers can spend their entire career purusing the fulfillment of these goals. And because of slick marketing campaigns and snake-oil salesmen, many are duped time and again into trying magic potions that promise all of the above. The truth is far different, and much simpler.

Aptus believes that these goals can be reached by aligning our operations with principles that obey the rules of nature. Plants want to be healthy, to be robust and nutritious, to produce flavors, aromas, and oils, to grow and reproduce. Too often, growers hinder these natural desires by trying to manipulate plants in unnatural ways.

If natural balance is returned to the growing environment, plants respond positively. They create natural immunity to pest and fungal attacks; they increase production of quality affecting components; they grow larger and faster. Growers ultimately also get what they want.

MODERN AGRICULTURE, HOW DID WE GET INTO THIS MESS?

The market certainly doesn't need another plant nutrient. It seems there is a new nutrient line every month. And for the most part, they are all the same. They continue to create the same problems as the brand before them. That's because they are all based on the flawed mentality that drives modern agriculture.

Look where that mindset has gotten us:

- Exhaustion of carbon from the soil
- Disappearance of micro-organisms from the soil
- Disappearance of essential micro-elements (silicon, selenium)
- Soil acidification (unfriendly to most plants)
- Weak plants with low mineral content and little natural resistance

These problems are just the beginning. And unfortunately most of the 'solutions' offered for these problems, can create even greater problems. Some of them include:

- Toxic chemical runoff into water sources (pesticides, herbicides, fungicides)
- Poisoned soil and air
- Vast wastelands of industrial manufacturing byproducts
- Massive carbon footprints for food production
- Crop failure on massive scale
- Poor food nutrition, which leads to health problems
- Etc., etc., etc.

Aside from these issues, there are specific problems created and propagated in our food crops when grown with these modern methods:

- Excessive residues in vegetables and fruit
- Poor shelf life of vegetables and fruit
- Poor nutritional values of vegetables and fruit
- Soil and groundwater contamination
- Resistance amongst fungi, bacteria and viruses

The only conclusion one can draw when looking at all these problems is that chemical NPK fertilizers and pesticides are not enough to solve existing problems. There will simply be more and more new problems created. Something must change.

The current situation

- Most growers buy products because of marketing feeling (nice labels, free samples, flashy advertisements).
- Most nutrition manufacturers do not educate their clients (miracle ingredients, secret formulas, etc.).
- Most products on the market are heavily diluted and are not complete (provide base essentials and require huge quantities).
- Most problems in cultivation come from bad nutrition and poor plant stimulation (people give too many nutrients, unbalanced nutrition, and/or unnatural stimulants).

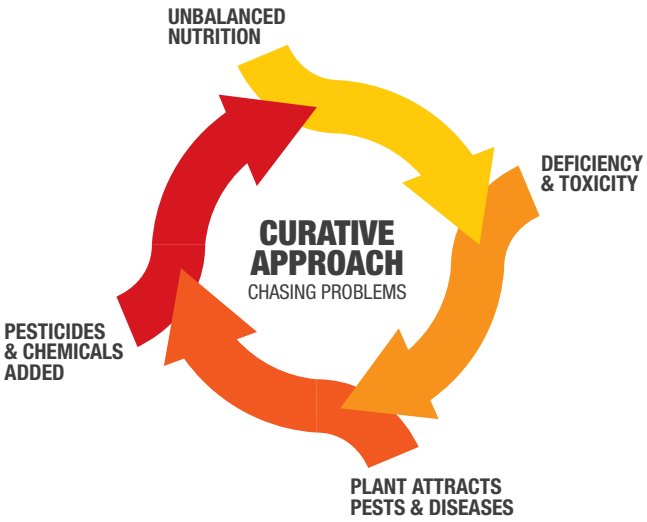
How Aptus believes we can fix these challenges

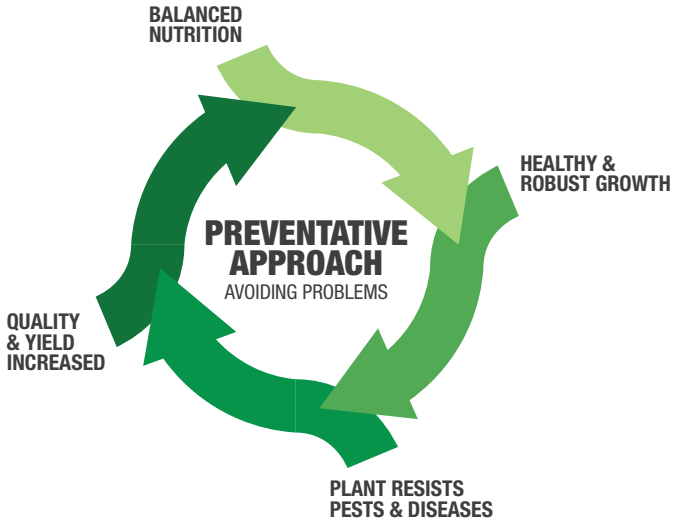
- Preventing problems instead of curing / combating them
- Looking at the complete picture
- Get to know your plants
- Restoring soil micro-life
- Restoring the structure of the soil
- Introducing plant/bio-stimulation
- Improving natural resistance
- Optimizing fertilization

CURATIVE VS. PREVENTATIVE

This is a cornerstone of the Aptus Approach. We believe strongly that to achieve the best results with our crops we need to prevent problems before they occur. Much like in humans, when you see an external symptom, such as leaf yellowing, it means there has been an internal problem for some time.

Most growers identify a problem, buy a bottle, pour it on and hope the problem goes away. Sometimes it does. More often it goes away then causes another problem. So the grower repeats the process. And repeats. And repeats. The grower is chasing problems throughout the crop cycle just hoping to make it to the end. This is the curative approach and it simply does not work.





NOTES

APTUS SCIENCE

KEY PRINCIPLES TO UNDERSTAND

1) Plants are People Too
2) Stages in Plant Development
3) Biochemical Sequencing of Nutrients
4) Proper Diagnosing of Problems
5) Nutrient Antagonism
6) Insect and Fungal Attacks

TRUE NUTRITION – THE MISSING LINK TO GROWING SUCCESS

The way plants assimilate nutrients, the interactions between nutrients, and the bio-availability of nutrients are widely misunderstood. Modern plant nutrition systems are managed as if they were a chemistry experiment. All kinds of chemical compounds for nutrition (especially N, P, K) and protection (pesticides, fungicides and herbicides) are released in the plant's environment. Results are expected simply because all the proper chemicals are present.

However, nature teaches us that the use of chemical-based nutrients and pesticides is not enough to solve existing plant problems. Typically, as more chemicals are added, more and more problems are created. This is because chemical-based nutrients typically create imbalance in the plant's nutritional uptake.

Chemical fertilizers tend to decrease pH in plants, which induces plant weakness. Weak plants attract pests and fungal diseases. Chemical fertilizers and pesticides also significantly decrease micro-life populations and diversity in the growing medium. This results in poor mediums, poor mineralization and minimal plant stimulation.

To fix these problems, better understanding of nutrient uptake sequencing, nutrient interactions, and bioavailability of nutrients is essential.

Over the next few sections, this guide will dig into the specifics of each major component of Aptus science. Remember that each section contains multiple levels of knowledge. Start with BASIC and move to the others once you understand the principles.

PLANTS ARE PEOPLE TOO

We've been taught to view plants as machines, systems that can be manipulated and bent to our will. This is what the last 70 years of science and agriculture has shown us. While many amazing advances have been made, the cost is unbearable.

Our soils are dead. Our crops lack nutrition and quality. Toxic chemicals are almost a necessity. We expend massive amounts of energy to grow. Just 50 years ago, it took only 1 calorie of fossil fuel energy to produce 2.3 calories of food energy. Today we expend 10 calories of fossil fuel energy to produce 1 calorie of food energy! [1]

This is because we've lost the relationship with plants as living creatures. Plants are amazing biological systems as complex and intricate as us. And like humans, plants have goals. Thankfully, in most cases, the plant's goals actually align with our goals.

1) Plants want larger fruits to carry more seeds and pass on their genetics.
2) Plants want larger and more vibrant, aromatic flowers to attract pollinators.
3) Plants want higher quality factors like oils, resins, and flavors to attract good bugs and repel bad bugs.
4) Plants want firm, sturdy stems to support great growth to support heavier yields.
5) Plants want more minerals and stimulants to resist pests and disease.
6) Plants want ease and speed of growth; less energy spent means more can be accomplished.

When you look at the list above, these are all goals focused on living strong, greater production, and furthering the healthy genetics of the plant. This is nature at work. And more importantly, all these goals align with what we seek to achieve in our gardens.

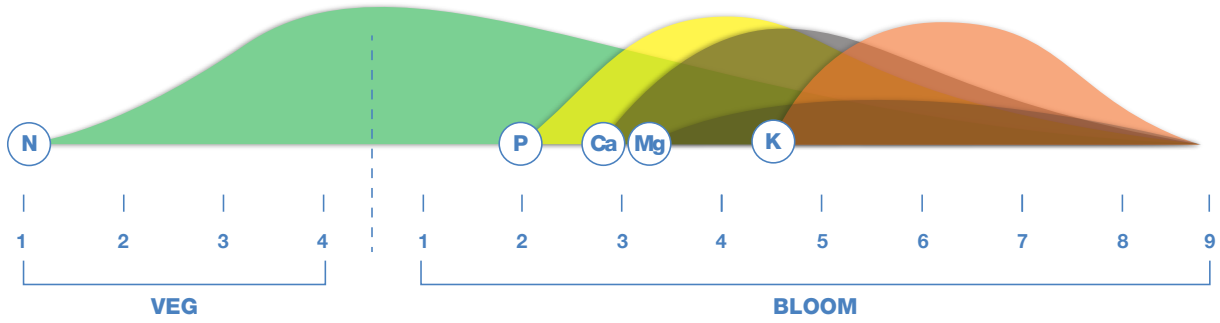
We need to look at plants as partners, rather than tools. This may sound a bit "out there" but truly when we view plants this way it allows us greater insight into how they function, how to diagnose problems, and how to optimize our growing environment. Do this and you will experience consistent and tremendous results.

When we ignore this relationship, we are quick to spray chemicals, use cheap synthetic fertilizers, and respond with a curative approach rather than preventative. The better option is always optimal and balanced health, as with people.

1 Michael Pollan, The Omnivore's Dilemna (The Penguin Press, 2006)

STAGES IN PLANT DEVELOPMENT

Plants have different and distinct development stages. The primary stages are rooting, vegetative, and flowering. These can be broken into more specific stages: rooting, growing, shooting, blooming, fruit or flower development and maturation. Each stage requires a specific balance of nutrition and mineral uptake for maximum production.



Many growers supplement with growth 'boosters' at the wrong development stage when the plant cannot utilize the nutrient. These unused minerals precipitate in the growing medium interacting with micro-life and other minerals, many times causing deficiencies and lockout.

Every plant is slightly different as well. The nutritional needs of a leafy green plant like spinach is far different than an apple tree. Often growers look for a 'silver bullet' product that will solve all their problems. In nature, there IS NO SILVER BULLET. Nature desires balance and moderation.

A COMMON MISTAKE THAT CAN HURT YIELD AND QUALITY

Many growers add a Phosphorus and Potassium (P/K) booster during all or most of the bloom phase. This can create significant problems with nutrient uptake that decrease yield and quality. Most plants only need small amounts of Potassium during initial growth and early bloom. Potassium is mostly needed during the ripening and maturation stages (late bloom).

Excess unused Potassium in the growing medium during the early stages can 'push' away nitrogen, calcium, and magnesium. These are some of the most common deficiencies. Growers can avoid these issues by respecting natural laws and providing the right balance of nutrients at the proper development stage.

A common thought is if some is good, more is better. Imagine eating at a Vegas buffet every meal of every day. You may enjoy at first, but you will quickly become unhealthy. Plants, like humans, can easily become malnourished or obese. Biological systems always perform better with moderation and balance.

In addition, nutrients that are not immediately used by plants remain in the growing medium and cause unwanted (and unpredictable) antagonism with other nutrients and micro-life. When plants are stressed improperly, they focus energy on basic functions (survive) rather than higher-level functions (thrive) such as immune response, flavor, aroma, and essential oil production.

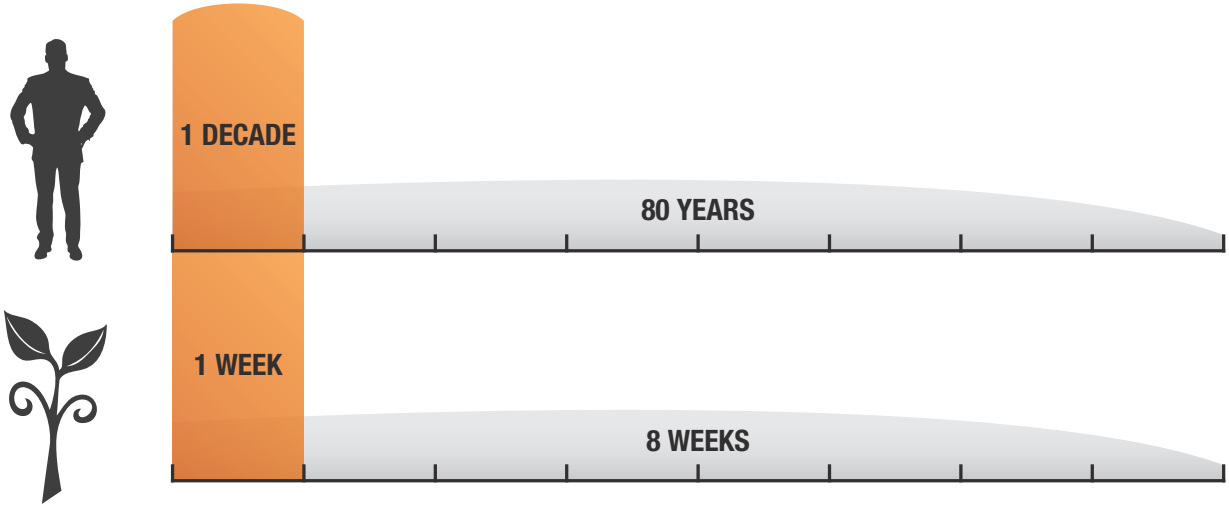
Most important to understand is that problems in plants are not always immediately visible. Much like a person may have cancer months or years before finding out, plants may appear healthy but still be sick. We need to learn to properly identify and diagnose these hidden problems to achieve optimal results.

UNDERSTANDING THE LIFE OF A PLANT

Plants are living creatures. They possess all the fundamental biological systems as humans and animals: nervous, circulatory, reproduction, skeletal, immune, etc., etc. If we are to achieve common agricultural goals (yields, quality, cost, effort), then we need to understand that plants are not machines but delicate natural systems designed to work and behave in specific measurable and predictable ways.

Let's look at food producing types of plants. In general, this section focuses on terminal life (annual) crops that grow, flower, mature, and then die. But the principle is the same for all plants. Most plants of this type have a definitive vegetative and a blooming season.

For the sake of this example, let's look at an annual that blooms for about 2 months.



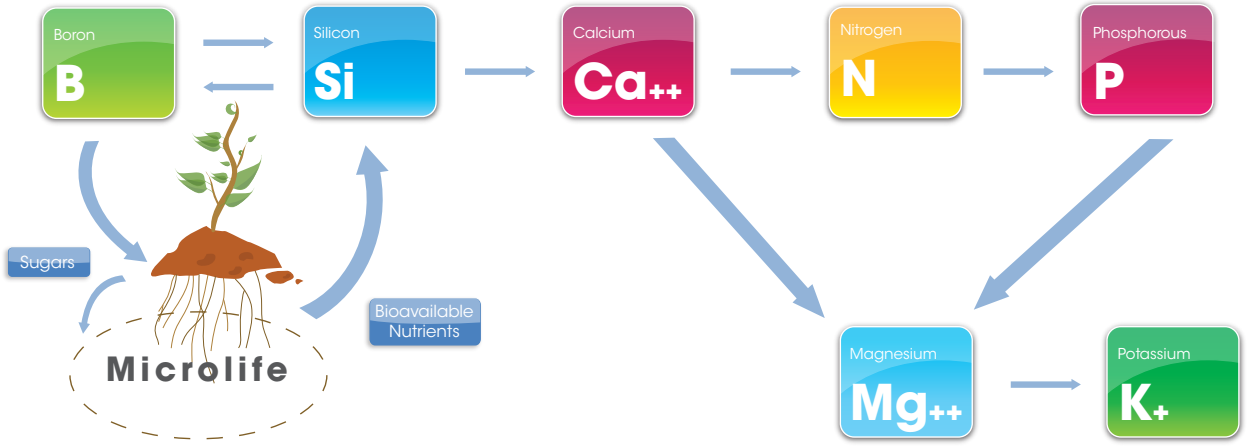
This plant has a very short life compared to humans. That means that causing undue stress for even a week in the plant is the same as stressing your body for a decade! This is what happens when unnatural stimulants (eg. plant growth regulators (PGRs)) and synthetic fertilizers are given to a plant.

Imagine if you take steroids for an entire decade. Sure you'll be strong and bulky, but at what cost? Muscle failure later in life, infertility, heart disease, and other health issues. When a plant is given a PGR or other chemical stimulant (like paclobutrazol) even for a week, there are other negative consequences in the plant. To maximize a plant's genetic potential, natural laws must be observed. Otherwise we may increase one specific aspect (yield) but decrease another (quality).

BIOCHEMICAL SEQUENCING OF NUTRIENTS

It is important to understand that plants have a defined biological sequence of nutrient uptake. This starts with Boron, which stimulates the root system to leach sugars into the medium. These sugars feed the microbes, which transform silicates (Si) into silicic acid through a process called silicification. Silicic acid enhances Calcium uptake, followed by Organic Nitrogen (from L-Amino Acids), Magnesium, Phosphorus and Potassium.

These elements should be present in a bioavailable form to plants. If one nutrient in this sequence is not available (or less available), the uptake of all other elements in the sequence is more difficult or missed. It is very important to respect this sequence in order to avoid mineral deficiencies and/or nutrient uptake problems.



A common nutrient problem in indoor gardening is Calcium deficiency. This is because Calcium is immobile, meaning it doesn't naturally move into and throughout plant tissue. Also, Calcium is pushed away by other minerals that are often added in large quantities, such as Nitrogen (as Nitrates) and Potassium.

Looking at the chart above we can see that Calcium is near the beginning of the sequence. And if Calcium uptake is limited in any way then all other nutrients uptake and availability will be affected. There are many other problems with Calcium deficiency that will be discussed later.

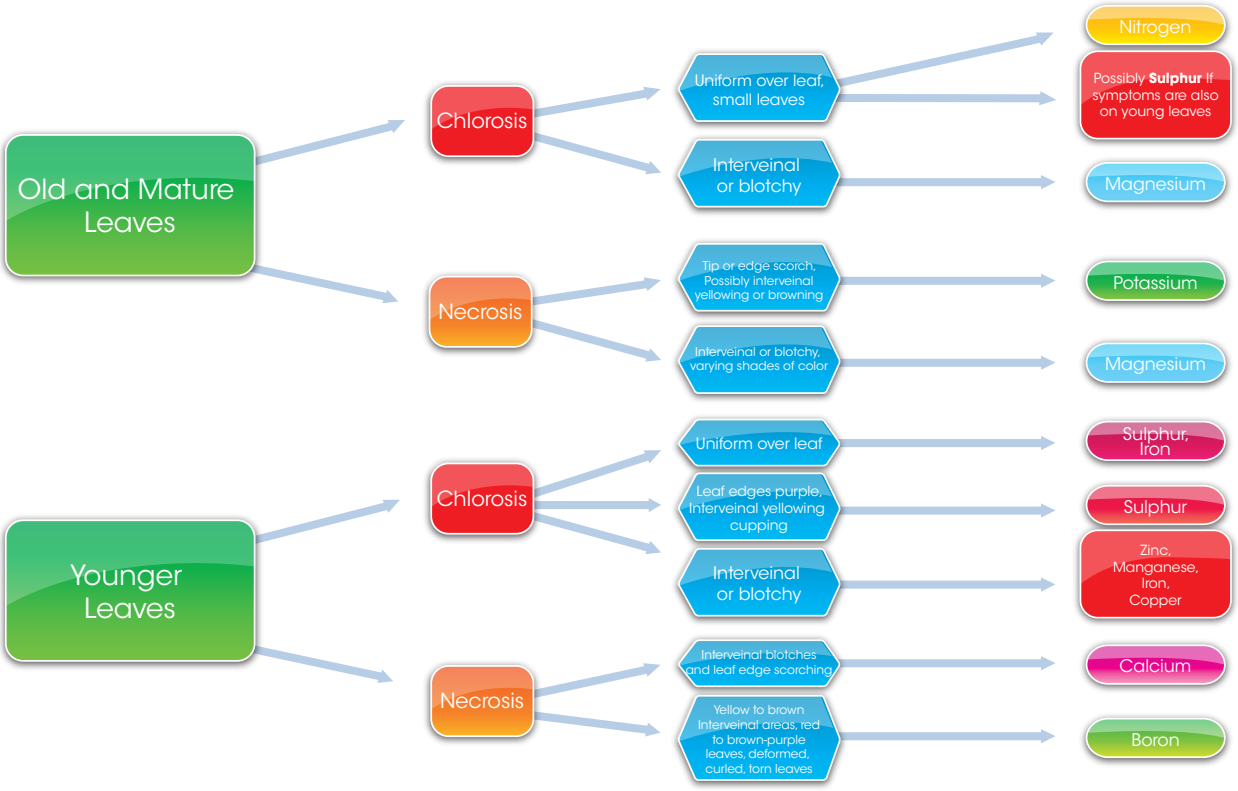
One of the best ways to increase Calcium availability and uptake (other than chelating with amino acids) is to optimize Silicon levels in the form of Silicic Acid. This is the beginning part of the biochemical sequence. In most indoor applications, silicic acid is rarely available because of the time it takes soil micro-life to naturally convert silicon

into silicic acid. Even if a grower is adding a silica supplement (not in silicic acid form), virtually all of the silica remains in the growing medium until it is converted, which can take many weeks to months for any meaningful conversion.

Adding bioavailable silicic acid, as in FaSilitor, helps to increase the uptake and availability of Calcium and thus, all other nutrients. This is the natural mechanism and is far more efficient than any synthetic method.

DIAGNOSING PLANT PROBLEMS

It's good to know how to identify and fix problems in plants. Ultimately, it's better to prevent problems by understanding the underlying cause. The chart below breaks down common symptoms seen in plants, and their likely cause.



By providing proper nutrition in proper sequence and amounts to your plants from the beginning, many of these problems can be avoided. It is always better to maintain a preventative methodology versus curative.

Most times when a plant appears sick, the growers quickly goes to the internet or a book to reference the leaf discoloration or other symptom. This may give them a variety of answers. The grower picks the most common and logical, purchases a 'remedy', and tries to fix the plant. This usually doesn't work because the grower is asking the wrong question.

Typical question:
Why is my plant having this symptom and how do I fix it?

Better question:
Why is my plant having this symptom and how do I prevent it?

Unfortunately diagnosing plant problems is usually not as simple as observing leaf discoloration or growth patterns. Really these symptoms are just clues, not answers. Most of the time growers need to look deeper to assure proper diagnosis, treatment, and later prevention.

CALCIUM DEFICIENCY

A common 'deficiency' growers experience is calcium. Calcium is immobile and is difficult for plants to uptake and transport. The grower sees a sign of calcium deficiency and immediately adds additional Ca/Mg supplementation. However, most times there is plenty of calcium already in the growing medium. The issue is not deficiency; the issue is bioavailability.

The root cause is the broken biochemical sequence. Perhaps boron or silicic acid is unavailable or locked out. By understanding this sequence growers can provide the correct solution that truly solves the problem and not just a temporary fix.

Combining the skill of diagnosing problems with the understanding of biochemical sequencing is the most effective way to accurately solve problems.

NITROGEN DEFICIENCY

Another often misdiagnosed deficiency is Nitrogen. This usually appears as a even yellowing of leaves, indicating slowed photosynthesis. A grower will quickly add more Nitrogen as an attempt to fix the problem. Sometimes this works but doesn't always solve the real issue.

Nitrogen moves from the roots to the lower leaves. Then with the help of the enzyme nitrogenase, Nitrogen moves from the lower leaves to the upper leaves (new growth). Nitrogenase is stimulated by the presence of Molybdenum (Mo). If Molybdenum is deficient, this process is slowed and deficiencies may appear in the upper leaves.

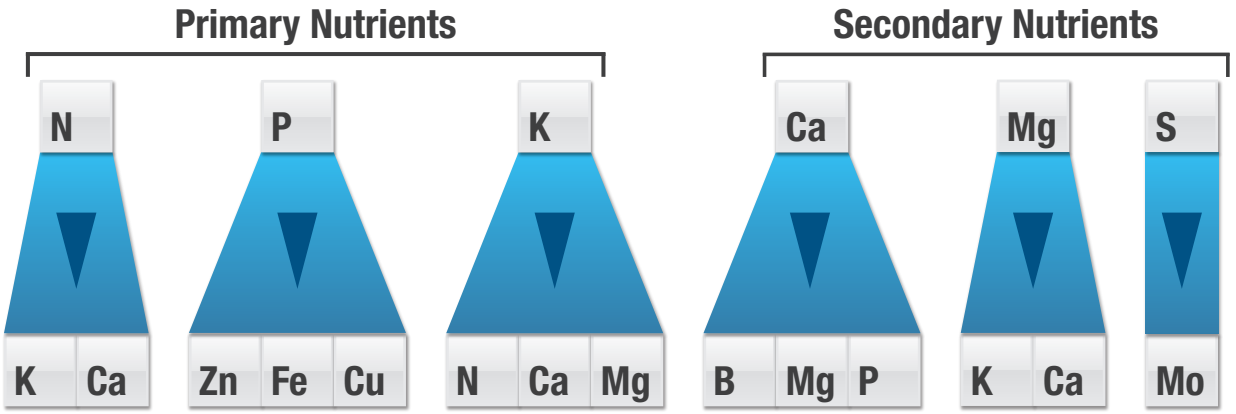
If upper leaves are yellowing and lower mature leaves are still properly green (has proper N levels), then more likely there is a Molybdenum problem. In this case, adding more N may cause unwanted problems in the growing medium.

ANTAGONISTIC ACTION OF NUTRIENTS

It is very important to understand how certain nutrients react with each other. If you don't understand these interactions, you may over-supplement with a specific nutrient in attempt to correct a deficiency.

Not all deficiencies are caused by a lack of nutrients! For example, Calcium deficiency may be diagnosed due to low Calcium levels OR because there are high levels of Nitrates (NO_3). Nitrates 'push' Calcium away and can block absorption.

So you should use organic Nitrogen instead of inorganic Nitrogen, which is high in Nitrates. Many modern synthetic fertilizers contain primary Nitrates or other salt-based forms of nitrogen. The salts are the most common cause of tip burn, nutrient antagonism, and weak plant growth (more on that later).



The antagonistic action of nutrients shows how overdoses of certain elements can lock out or displace another element. This list shows which elements react with each other. Understanding nutrient antagonism makes diagnosing deficiencies and excess more difficult, but ultimately more accurate.

Most nutrients usually work together. But this is not always the case. If Phosphorus is in excess it brings in more Nitrogen to the plant, unbalancing the nutrition. At the same time it also limits Zinc, Iron and Copper. Optimum nutrition is achieved by balancing the nutrients in the medium.

ELEMENTS IN EXCESS	NUTRIENTS USUALLY AFFECTED
Nitrogen	Potassium, Calcium
Potassium	Nitrogen, Calcium, Magnesium
Phosphorus	Zinc, Iron, Copper
Calcium	Boron, Magnesium, Phosphorus
Magnesium	Calcium, Potassium
Iron	Manganese
Manganese	Iron, Molybdenum, Magnesium
Copper	Molybdenum, Iron, Manganese, Zinc
Zinc	Iron, Manganese
Molybdenum	Copper, Iron
Sodium	Potassium, Calcium, Magnesium
Aluminum	Phosphorus
Ammonium Ion	Calcium, Copper
Sulfur	Molybdenum

These problems arise often when growers attempt to create their own 'custom' nutrient recipe from multiple product lines from different companies. Unless a grower is highly scientific, this practice results in overdose and deficiency of specific nutrients.

The plants get into wild swings of deficiencies and lockout that result in decreased yield and quality. By using a balanced, high-quality, specifically formulated nutrition system, plants can maximize their genetic potential.

WHY MODERN PLANT NUTRITION CREATES ANTAGONISM

Perhaps you've noticed that each of these core concepts touches all the others. Plants are systems—intricate, delicate, and intertwined systems of biochemical reactions happening constantly within and around the plant.

Modern plant nutrition, often called 'NPK agriculture' is based on the idea that if we add the major nutrients needed, plants will grow. Nature will always find a way to survive despite mistakes we may make. But that doesn't mean that our plants are optimal.

NPK agriculture has shown us that this simplistic approach is not effective. Our crops are less nutritious, more susceptible to pests and disease, our soil is dead and infertile, and crop yields are actually decreasing around the world.

Perhaps the most important concepts that can begin to fix this issue is the principle of nutrient antagonism. In a growing medium, nutrient molecules are constantly pushing and pulling at each other based up form and electrical charge. This 'dance' is fundamentally important to how well plants are able to uptake and assimilate nutrients.

NPK agriculture doesn't do a very good job of looking at balance of soil mineral contents and fertilizer inputs. Properly structured soil and balanced fertilizer programs helps to balance the activity of nutrients and simulate natural environments.

Consider this…visit a virgin rainforest. The vastness and density of the vegetation is mind-boggling. The fruits and flowers are massive and instantly flavored. They are also the most nutritious food found anywhere. How is this possible without human interaction? It's because nature has found ways to balance nutrients through microbial activity, natural soil remediation, and biological systems.

It is impossible to fully replicate these intricate systems in isolated indoor (and many outdoor) environments. But we can learn from the biological rules and see many of the same benefits.

P/K BOOSTERS

Many growers supplement with Phosphorus and Potassium boosters at various stages of flowering to increase the weight and yield of their crop. True these primary nutrients are essential for plant growth, especially in fruit development and maturation. If we want to maximize our yields and quality of harvest, most situations require phosphorus and potassium supplementation.

As with other nutrients, phosphorus can easily become locked up in the soil by combining with other minerals and potassium tends to wash away fairly readily in from the growing area. So both are needed in higher quantities and at the right time for the plant to use.

Indoor gardeners often provide both P and K at the same time in large doses in an effort to boost yields. But this can come at a cost. In the early stages of flower and

fruit development a plant needs more phosphorus and less potassium. So if a grower adds a lot of potassium in the early stages, it remains unused in the medium, but not inactive. In fact, the potassium begins to interact and antagonize other key nutrients (calcium, magnesium, nitrogen). This is probably why growers experience calcium and magnesium deficiencies in early bloom stages.

The same grower may continue to use the P/K booster later in bloom when the plant needs far less P and more K. So the phosphorus remains unused in the medium, but not inactive. Unused phosphorus is notorious for binding with other minerals, making them unavailable (such as calcium and several micro-elements).

The point of all this discussion is to optimize plant growth and production we need to work like a military sniper, providing nutrition as close to the point of need. This is how nature prefers and this is how we reach our goals.

FINAL THOUGHTS ON NUTRIENT INTERACTION

Most growers focus on their feed water mix. They are sometimes very scientific about what and how they apply their fertilizer. And this is good. What goes in affects what comes out.

But there is a deeper and more important consideration. We've got to start looking more closely at the growing medium and the root zone. This is where the magic happens. This is where we achieve success or experience failure.

There is a common saying amongst organic farmers, "Feed the soil, not the plants." The plant is only part of the equation. There are extremely complex and somewhat mysterious activities occurring constantly between mineral ions, microbes, plant tissue, water, and gases.

Ultimately every situation, every plant, every medium, every growing environment is slightly different. To achieve the greatest results consistently, growers need to become intimately aware of the specific demands of their garden. Without this understanding, it's easy to cause unseen problems that have drastic, negative effects.

INSECT AND FUNGAL ATTACKS

Most growers have been raised and educated with the idea that pests and disease are simply a part of life. They plant their garden, fertilize, spider mites show up, they spray with pesticides (even organic), and hope for the best.

This is horrible thinking and extremely destructive to yields, quality, and even the planet. If we are to increase our production and quality of crop then we need to appreciate the rules nature established to deal with these invaders.

> *"Insects and disease are the symptoms of a failing crop, not the cause of it. It's not the overpowering invader we must fear but the weakened condition of the victim."* - William Albrecht

WHEN PESTS ATTACK!

The first rule to understand is that nature uses insects, fungi, and other pathogens as decomposers and recyclers. The big pests cut up and break down big chunks into small bits that the small pests decompose further and convert back into base level compounds (like nutrients, sugars, etc.). This process serves an important function in nature: getting rid of what's bad and recycling it into something useful. In other words, these so called "pests" are actually our friends!

Of course, when they invade your precious garden, they don't quite seem like friends. Instead they are ruthless enemies bent on your destruction (or at least your plants). Because these attacks threaten to damage a grower's livelyhood, the first response is retaliation, usually in the form of chemicals.

So, the question begging to be asked is, why are these decomposers attacking your healthy garden? The answer comes from the second important rule of garden pests: plants request the attack.

Go back to the days when you learned about natural selection. And think about the videos of lions attacking an antelope. Nature demonstrates that predators attack the weakest in the herd. This is a natural and important process to ensure that the healthy strong members (i.e. healthiest, smartest, best genetics) survive and can reproduce to carry on the species.

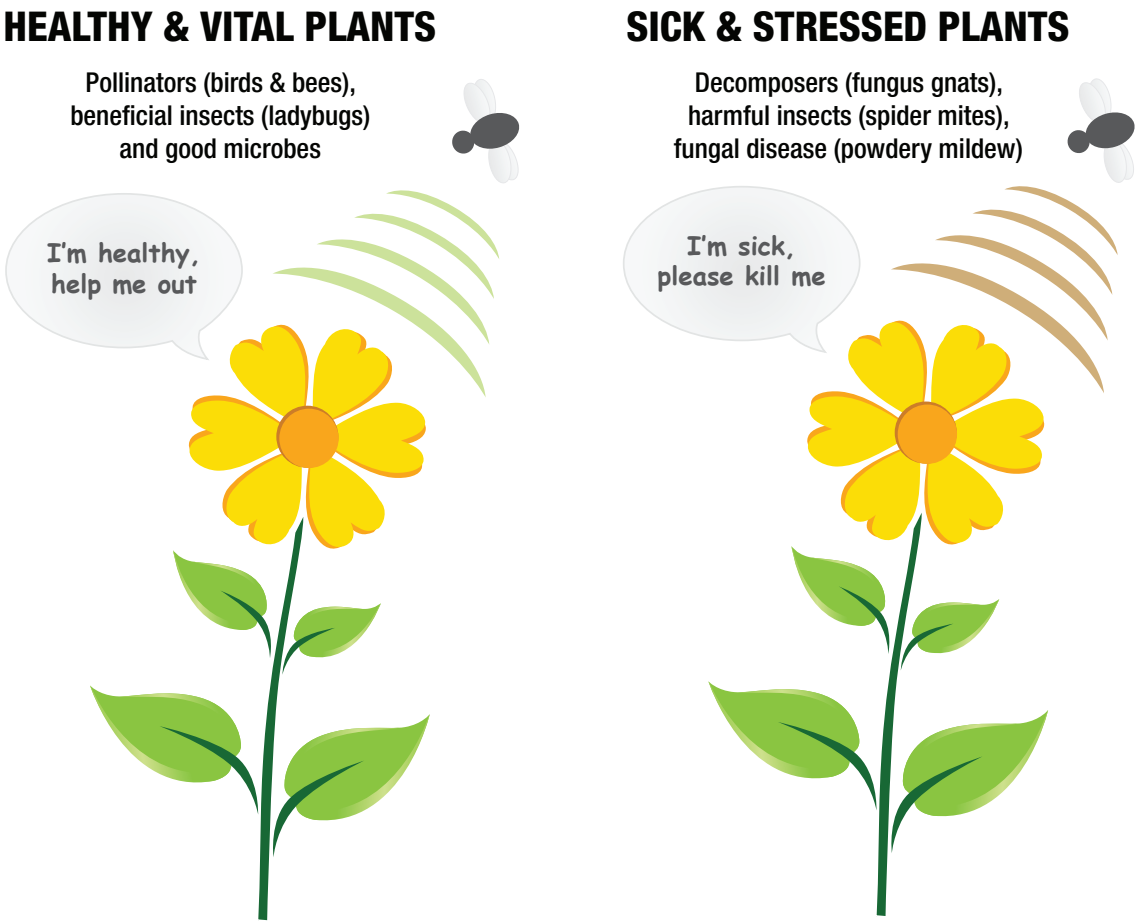
This is the same process in your garden; the main difference is that plants are stationary. So they have built mechanisms to signal their natural predators (insects, fungi, bacteria) to attack and destroy them when they are weak.

Plants have all sorts of different signaling mechanisms. Some are for their individual benefit (pollination, attack prevention, food sources, attracting fungus to protect roots, etc.); some are for group or species benefit (as in, “kill me so my healthy sister can survive”).

These signals come in all forms, such as colors and aromas to attract pollinators, through hormones and chemical release, and some simply by emitting specific frequencies that attract specific insects. This is a broad area of plant science and varies greatly between plants so we won’t get into specifics here. The important discussion is how to get the plant to send the good signals and not the bad.

HEALTHY PLANT, HEALTHY SIGNALS

Healthy plants are able to focus their energy on higher-level functions like producing chemicals, oils, resins, and aroma compounds that are usually intended to perform a function of attraction or defense. For example, some plants produce oils that are toxic to their natural predators. If the plant is healthy, the predator may attack but be killed by the toxin (research the neem tree), thus the plant is able to survive and reproduce.



If that same plant is sick and is lacking the tools to produce the oil, when the same predator attacks, it lives and is able to consume the plant.

ALL plants have these systems built into them; otherwise, their species would be destroyed within a few generations. In a healthy growing environment the occasional plant may lack the nutrition to produce it's defensive mechanism and be removed, but mostly the plants have healthy nutrition, and are able to naturally resist any attacks.

How do we raise the health of a plant then and keep it healthy in a controlled agricultural environment? There are two indicators that have a tremendous influence on the overall health of a plant. Both can be measured relatively easily with some specialized instruments. But that's not always practical. Fortunately, even without testing there are specific techniques that will help your plants get healthier.

The Quality Factor: Brix

The most common agricultural understanding of Brix measurement is the level of sugars within the plant tissue. The guy that created the Brix scale (Adolf Brix) defined it as the sugar content of an aqueous solution. This measure has been used for long time to test fruit like grapes and apples for ripeness. The higher the Brix level, the riper, more flavorful, or more ready the crop is for specific applications like winemaking.

However, there's not just sugar (specifically sucrose) in plant tissue. There are many other compounds floating around in healthy plants like amino acids, vitamins, phytohormones, minerals, etc. These all have an effect on the Brix reading. Because of this effect, more and more researchers are expanding (or loosening) this reading to the total dissolved solids in a solution. Even though Brix was originally designed to test only sugar levels, it is quickly becoming accepted as a key measure of overall quality and health.

FRUITS	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Apples	6	10	14	18	16
Avocados	4	6	8	10	
Bananas	8	10	12	14	
Cantaloupe	8	12	14	16	16
Casaba	8	10	12	14	16

FRUITS	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Cherries	6	8	14	16	16
Coconut	8	10	12	14	
Grapes	8	12	16	20	
Grapefruit	6	10	14	18	
Honeydew	8	10	12	14	16
Kumquat	4	6	8	10	
Lemons	4	6	8	12	
Limes	4	6	10	12	
Mangos	4	6	10	14	
Oranges	6	10	16	20	
Papayas	6	10	18	22	
Peaches	6	10	14	18	
Pears	6	10	12	14	
Pineapple	12	14	20	22	
Raspberries	6	8	12	14	15
Strawberries	6	10	14	16	16
Tomatoes	4	6	8	12	18
Watermelon	8	12	14	16	

GRASSES	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Alfalfa	4	8	16	22	14
Corn, Sweet	6	10	18	24	24

GRASSES	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Corn, Young	6	10	18	24	
Grains	6	10	14	18	
Sorghum	6	10	22	30	

VEGETABLES	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Asparagus	2	4	6	8	
Beets	6	8	10	12	
Bell Peppers	4	6	8	12	
Broccoli	6	8	10	12	
Cabbage	6	8	10	12	
Carrots	4	6	12	18	
Cauliflower	4	6	8	10	
Celery	4	6	10	12	15
Cow Peas	4	6	10	12	
Endive	4	6	8	10	
English Peas	8	10	12	14	14
Escarole	4	6	8	10	
Field Peas	4	6	10	12	
Green Beans	4	6	8	10	14
Hot Peppers	4	6	8	12	12
Kohlrabi	6	8	10	12	
Lettuce	4	6	8	10	12

VEGETABLES	POOR	AVERAGE	GOOD	EXCELLENT	DISEASE FREE
Onions	4	6	8	10	13
Parsley	4	6	8	10	
Peanuts	4	6	8	10	
Potatoes, Irish	3	5	7	8	13
Potatoes, Red	3	5	7	8	
Potatoes, Sweet	6	8	10	14	
Romaine	4	6	8	10	
Rutabagas	4	6	10	12	
Squash	6	8	12	14	15
Turnips	4	6	8	10	

These Brix level charts are generally credited to Dr. Carey A. Reams.

Most important to understand about Brix is the affect on the plant. First, if there are more sugars and other beneficial components like minerals and amino acids (building blocks), the plant is able to build more good stuff (oils, flavors, resins, etc.). This makes the plant tastier and healthier to us. At the same time, decomposing insects and pathogens don't like these compounds.

If you have a healthy plant reading a high Brix level, a spider mite for example, will not be attracted by the plant. The high mineral content makes the plant repulsive to the mite so it leaves. Natural resistance with no artificial and toxic chemicals used.

Every plant has different ideal Brix levels and many can be found online. Most important to understand is that raising the Brix is a good thing and should be a primary goal of growers. So how can you raise the Brix level in your plants?

Proper mineralization. This is the key to everything. One of the main reasons why plants get sick (low Brix) is lack of the tools to create the good stuff. Getting more minerals (in proper form) into your plants is going to raise the Brix level and provide the tools that the plant needs to produce other natural immune compounds.

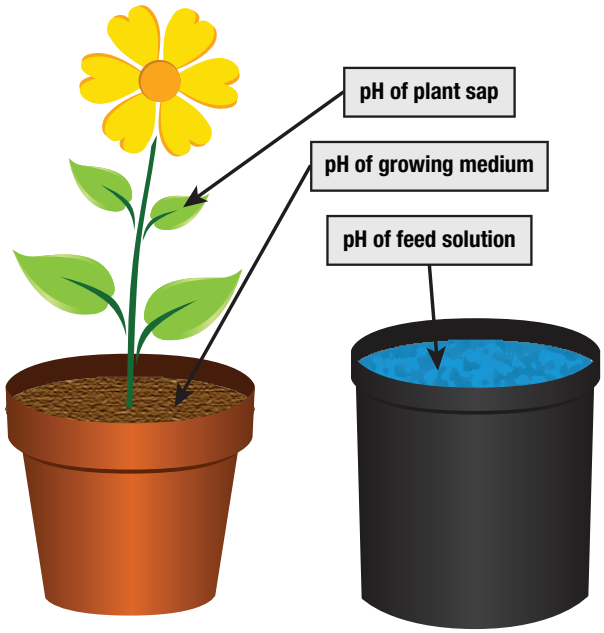
A key to this is silicic acid and L-amino acids. Both of these compounds help to increase the bioavailability (absorption and transport) of minerals into and throughout the plant. The less the plant must work to bring in food, the more it is able to bring in. More minerals equal higher Brix.

Calcium plays a key role in increasing Brix level. Since calcium is immobile AND near the beginning of the biochemical sequence of uptake, it's absorption affects most of the rest of the minerals. If calcium availability and uptake is optimized, then all other mineral uptake will be more balanced and effective.

Also, mineral salts (from cheap chemical fertilizers) can be detrimental to mineralization. Excessive salts cause imbalance and are toxic to living tissue and cause stress that further weakens the plant. IN a truly diverse organic environment where soil micro-life and plants are working fully in their place, pest problems are isolated or non-existent.

The Health Factor: pH

Every grower knows pH is an important measurement for any fertilizer input. And most growers have instruments to measure their feed solution. Most also know that the pH of the medium is a big factor in the availability and absorption of nutrients. What fewer growers understand is the importance of the pH of the plant itself.



When a homeopathic doctor takes a blood sample, one of the first items they test is your pH. You can also check your pH (urine or saliva) with litmus paper. Your body's pH level is a key indicator of your overall health. Low pH (acid) is a direct invitation for diseases like cancer and pathogens. Higher pH allows your body to naturally resist these attacks. Generally speaking, bad things like acid, good things like alkaline.

Plants are living biological systems just like us. And the same rules apply. For example, if you have a plant infected with powdery mildew (a systemic fungal disease), you are guaranteed to have a low plant sap pH (under about 5.5). The good news is if the pH is raised, powdery mildew will not appear, because the plant will send a different frequency signal that will NOT attract fungus.

There are many topical application products like potassium bicarbonate and sulfur burners that treat mold problems. All they are doing is raising the pH of the leaf surface which kills and prevents the fungal spore from surviving. Unfortunately, these are topical treatments. Some pathogens like powder mildew get inside the plant and resist these treatments. The only way to combat a systemic disease is a toxic chemical treatment OR fix the plant's insides. pH is the tool for this.

One important note: it's much more difficult to raise a plant's pH if it is already infected. Most bad infections and pathogens exude acidic compounds that continually lower the pH. The best approach is to keep a plant healthy from the beginning. This creates an environment that naturally resists the attacks from the beginning.

A side benefit of increasing your plant's pH is that it becomes healthier for you as well if your goal is consumption. Since our health is a result of pH balance, by eating more alkaline foods increases our body's natural resistance to disease. In fact, there is a growing body of research and stories of destroying established cancer and other diseases simply by raising the alkalinity of the body!

Raising a plant's pH level is more difficult, especially with short term crops. Once a plant is sick or under attack with only a few weeks left till harvest, you probably won't cure the problem, only treat the symptom. At this point topical treatments may be required. But remember that chemical applications further stress the plant and invite more problems.

Calcium and magnesium have alkaline effects on a solution (raising pH). Because Calcium is immobile and tends to lock up in the soil, deficiencies are common. Magnesium is often deficient because of the antagonistic effect of potassium. If you can optimize calcium and magnesium uptake with L-amino acids and silicic acid, the pH will increase and stabilize.

SOLUTIONS TO INFECTIONS AND ATTACKS

Remember that these fungi and pests are attracted to plants with a low pH and Brix, or unhealthy in some other way. If growers can raise these two important factors most of their problems with pests and disease will be eliminated. Plus, the healthier plants will produce more at higher quality.

Proper mineralization is the key. Getting more proper form of nutrients into the plant tissue from the very early stages of growth, ensure overall health. The Aptus Approach is to increase health of the plant from early stages through proper balanced nutrition and increased bioavailability.

Understand this doesn't mean feed more and more of certain 'good things'. Proper form, bioavailability, and timing are more important than quantity.

Remember that the rainforest doesn't use chemicals and treatments to fight off pests. And yet it continues to thrive without our help. That's because the occasional sick plant is removed with the help of the decomposing pests while the strong naturally resist. Apply this mindset to your growing environment and many of your pest problems will go away.

ELIMINATING PEST AND DISEASE

1) Increase mineral uptake and balance with silicic acid (found in FaSilitor).
2) Raise the internal pH of the plant by providing more bioavailable forms of Calcium (MassBoost) and Potassium (FinaleBoost).
3) Increase the Brix level by providing absorbable L-amino acids, and increasing mineralization within the plant.

NOTES

CORE PRODUCT TECHNOLOGIES

THREE CORE NUTRITION TECHNOLOGIES

Scientists from around the world are working to discover how to fix the major problems with modern agriculture. In that pursuit they found that there are three key technologies that plants use to achieve their goals of growth.

1) Silicic acid combined with synergistic micro-elements
2) L-amino acids combined with minerals
3) Specific micro-life combined with bio-stimulants

In nature when these three technologies are in full-force and properly functioning, plants are strong and robust, soil is fertile and alive, and the work to maintain both become much easier.

The good news is we can use these same technologies in any environment, whether indoor or outdoor. Nature behaves in specific predictable ways. We've found that by aligning with these biological rules, we increase plant health and thus yields, as well as quality.

The following section covers, in depth, these three technologies and how they work together. Remember to use the color coding as a guide to gauge the level of education and explanation you desire.

SILICIC ACID
WITH SYNERGISTIC MICRO-ELEMENTS

Silicic acid is a naturally occurring compound found in healthy soil environments. While silicon is the second most abundant mineral in the earth's crust, it is not readily absorbed into biologic tissues in common forms (potassium silicate, calcium silicate, silica, etc.). Silicon is often found in larger molecules that cannot penetrate cell walls.

The most common agriculture input forms of silicon are potassium silicate (K_2SiO_3) and calcium silicate (Ca_2SiO_4). Much of the naturally occurring silicon is in the form of silica (SiO_2). These forms when unprocessed are not bioavailable to plants.

Before the silicon can be taken up into the roots and throughout the tissue it must first be converted by microbes into silicic acid by a process called silicification. This natural process is slow and can take weeks or months to occur in any meaningful amounts.

For indoor applications, speed and bioavailability are critical. Many times crops are grown and harvested in a matter of weeks or a couple months. Growing medium is frequently discarded or sterilized before reuse. This destroys the micro-life populations and minimizes the process of silicification.

WHY HAS THIS NOT BEEN DISCUSSED IN MODERN AGRICULTURE?

Because of this, true scientific studies are difficult due to the fact it is nearly impossible to have a control group during research. In addition, silicon is not considered 'essential' for plant growth. Only recently has it even been classified as a beneficial nutrient. It seems because of its pervasiveness, silicon has simply been taken for granted.

silicon
14
Si
28.086

While silicon is not considered essential to plant development, the effects of silicon in plants are remarkable. And without bioavailable silicon, plants don't achieve their greatest potential. It's easy to see why many growers have problems in their garden when bioavailable silicon is not present. Silicon is responsible for increasing dry weight, strengthening plant tissue, balancing and increasing nutritional uptake and assimilation, immunity, and resistance to all forms of biotic and abiotic stress.

With these kinds of benefits, it is critical for growers of all types to understand the power of silicic acid and make it a regular part of their fertilizer program.

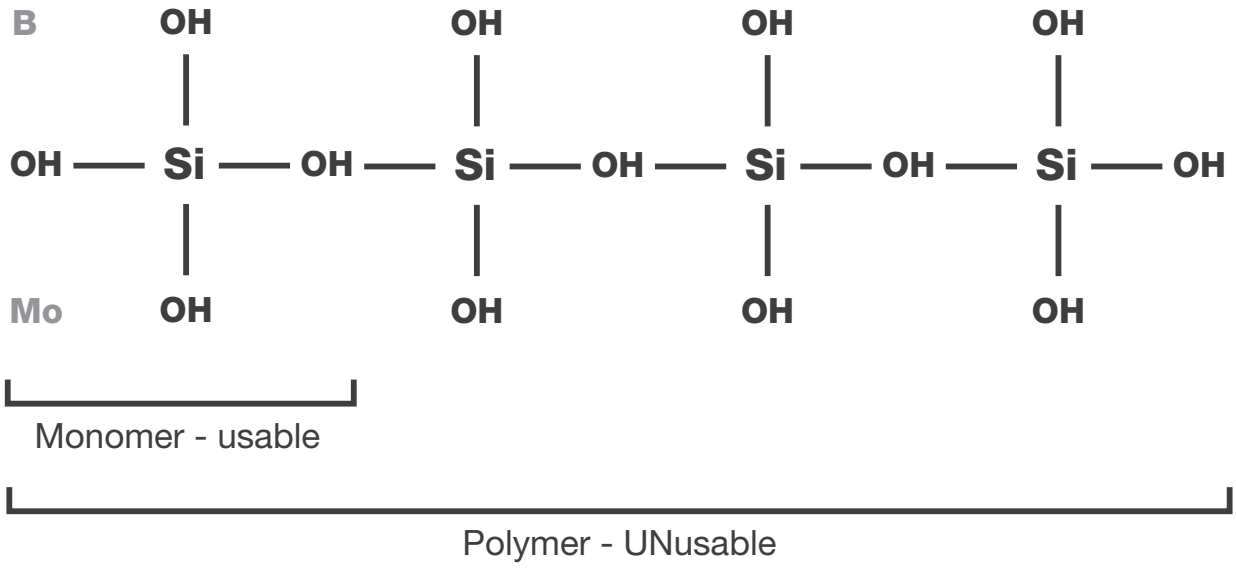
THREE PRIMARY EFFECTS OF SILICIC ACID IN PLANTS

1. **Mechanical** – Builds structure and resistance against stress
   Deposits silicon directly into the out layer of the cell creating a rigid barrier and more solid structure.

2. **Nutritional** - Increased and balanced uptake of nutrients
   Pressurizes the plant sap to allow better and more even flow of nutrients throughout the plant circulatory system.

3. **Immunity** - Stimulates plant's immune system
   Triggers the production of immunity compounds as well as pulling silicon to the point of attack to rebuild and strengthen tissue.

In nature, silica exists in polymer form because it is stable. These are long chains of molecules. In order for plants to use silicic acid it must be in monomer form (single molecule. Pure silicic acid, when stabilized as in FaSilitor, is 'packed' in polymer form. It 'unpacks' into monomer form when added to clean water, which allows it to enter the plant and carry nutrients along with it (like boron and molybdenum). Over time silicic acid will repolymerize, which is why it's important to mix fresh nutrients and feed immediately.



Study: Silicon Bio-Availability (The Netherlands)

Many growers are familiar with the benefits of including silicon in their feeding regimen. However, it must be understood that no matter how much silica product is added, if it is not in bioavailable form, then it's a waste of money and resources.

In 2008, a multi-national fertilizer company worked with Aptus Holland to perform a controlled study on the uptake of various forms of silicon. The goal was to determine the actual silicon content within plant tissue and surrounding soil after the trial period. This test would show which form of silicon amendment was most effective.

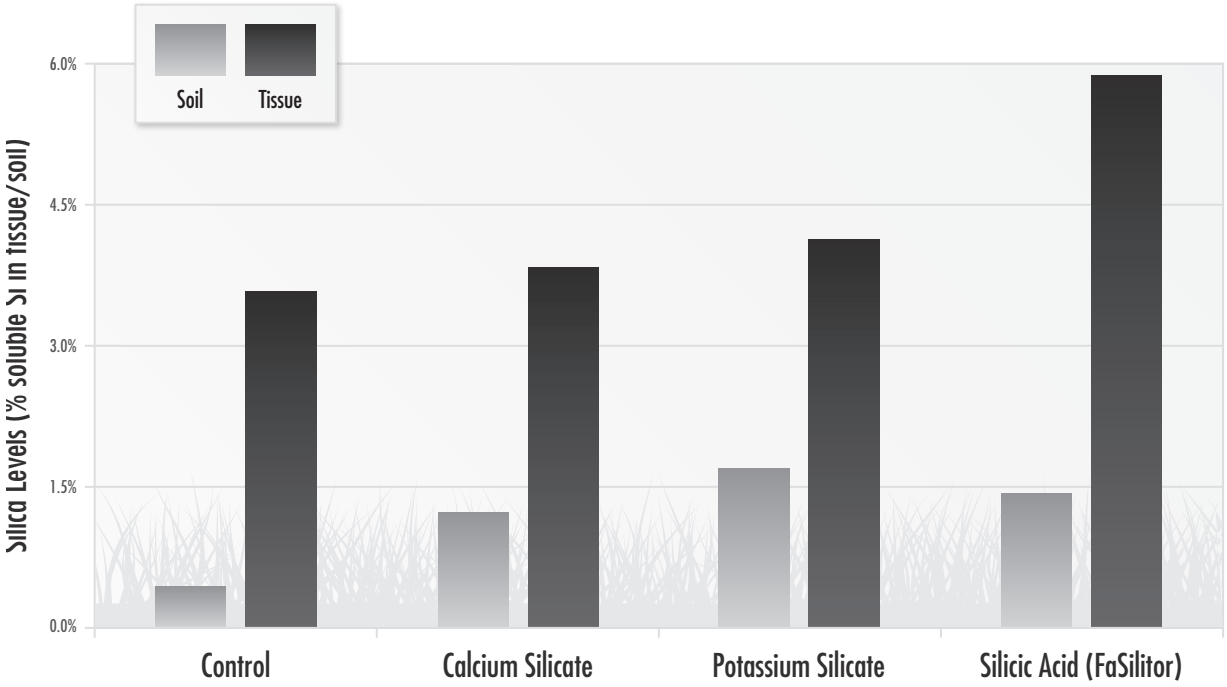
This particular study did not look at other effects such as pest resistance, plant health, plant growth and size, or soil health. The test was simple. Four one-hectare plots of land planted with turf. The trial lasted for only six weeks and all fertilizer and soils were identical.

Plot 1 – Control, no silicon amendment
Plot 2 – Calcium Silicate – 2,000 kg
Plot 3 – Potassium Silicate – 5,000 kg
Plot 4 – Silicic Acid (from FaSilitor) – 1.5 kg

PLOT 1	PLOT 2
Control No Silicon ammendments added	2,000 kg **Calcium Silicate** Ca_2SiO_4 Actual Silicon (Si) Content 2,000 kg x 65% Si = **1,250 kg Si**
PLOT 3	**PLOT 4**
5,000 kg **Potassium Silicate** K_2O_3Si Actual Silicon (Si) Content 5,000 kg x 25% Si = **1,250 kg Si**	1.5 kg **Silicic Acid** $Si(OH)_4$ Actual Silicon (Si) Content 1.5 kg x 1.6% Si = **24 grams Si**

At the end of the six-week trial, tissue samples were taken from multiple points in each plot and analyzed for silicon content. The results are incredible.

Most plants are roughly 80% water and 20% plant material. This means that if there is 6% silicon content in the plant tissue, when dried, silicon makes up to 30% of the dry weight of grass. Grass is particularly heavy on silicon usage but many other plants can contain silicon at around 8-15% of total dry weight if grown properly.



Notice also that the difference of uptake between the control (untreated) and the typical agricultural silicon amendments is marginal. This is because of the time required for the process of silicification. This is especially important to indoor gardening applications where cycles are short and often mediums are not reused.

WHAT SILICON DOES INSIDE PLANTS

Many growers are familiar with the benefits of including silicon in their feeding regimen. However, it must be understood that no matter how much silica product is added, if it is not in bioavailable form, then it's a waste of money and resources.

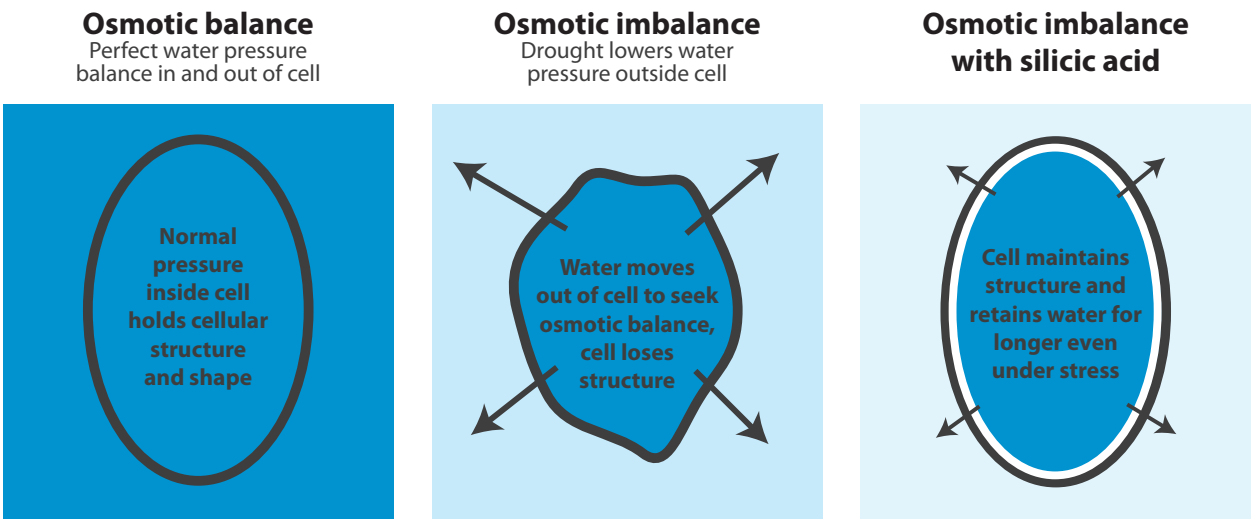
Most of the silicon in plants exists as an insoluble form of silica (SiO_2- nH_20) in leaf blades and leaf sheaths. Here it provides rigidity, and helps minimize water loss, as well as presenting a hard barrier to fungal pathogens and insect pests.

Below are brief explanations of how silicon (from silicic acid) works in plants:

Increases resistance to abiotic stress (environmental: temperature, wind, drought)

When silicon is deposited in cell walls, a rigid structure is created, much like a brick or stone wall cemented together. Cells are able to maintain their shape amid environmental attacks. When the wind blows and bends a stem in one direction, cells on the downwind side are compressed. Silicon makes firmer cells that compress less when bent.

In the case of drought, stronger cell walls are better at managing water balance inside the cells. Imagine filling a water balloon full—the balloon is firm and taught. Then as you deflate (letting water out), the skin of the balloon becomes soft and soggy. This is why dry plants droop. Stronger cells keep their structural integrity for longer.



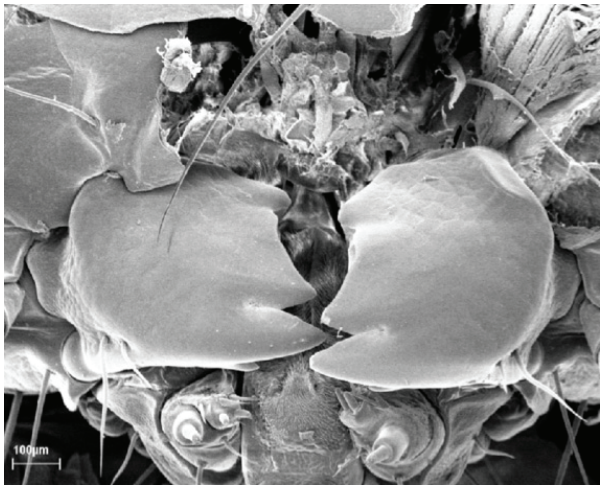
Increases resistance against biotic stress (pests and pathogens)

Attacking insects must somehow puncture the wall of the plant 'skin' in order to suck the fluid, eat the tissue, or burrow inside. By increasing the thickness of cell walls with silicon deposits, many of these tiny insects are unable to break the surface of the cell.

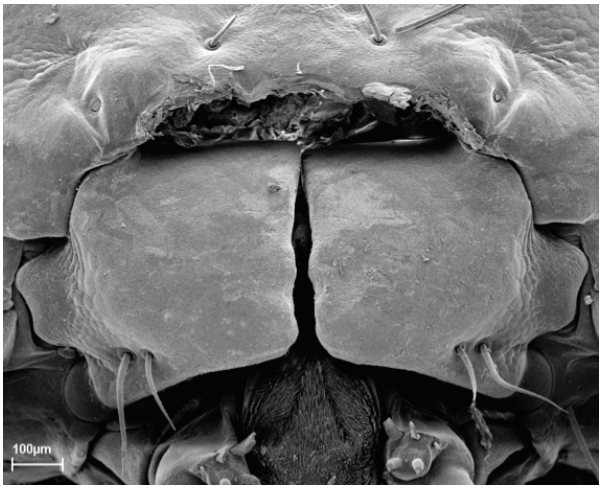
We have performed numerous studies on this effect. See the images below of the stalk borer larvae as tested on sugar cane.

Study: Sugar Cane Stalk Borer Larvae (South Africa)

It is easy to see the larvae attempting to bore into the treated sugar cane has its mouth parts dulled and rendered useless. This experiment has been performed with similar results on a variety of crops and biting, piercing, and boring pests.



Untreated



Treated with silicic acid

The above images come from a South African study on silicic acid. The findings from the study on sugar cane showed:

- Reduction in stalk length bored = max 63%
- Reduction in borer survival rate = max 59%
- Reduction in borer mass = max 62%
- 60% of the region's soils are deficient in silicon
- Losses of up to 30 tones a hectare
- Silicon is even more effective in case of water stress
- No Si impact on sugar quality has yet been observed

Overall the study found: "It is now estimated that applying silicon (from silicic acid) prevents the loss of 20% if not 30% of the sugar yield." Simply by increasing the plant's natural resistance.

Study: Silicon Versus Fungal Infections (Canada)

Silicon deposits in the epidermal cells of plants act as a barrier against penetration of invading fungi such as powdery mildew and Pythium. To penetrate the leaves, a pathogen must get through the wax (no problem), then penetrate this hard, rigid layer of silica mineral, before it even reaches the cell wall.

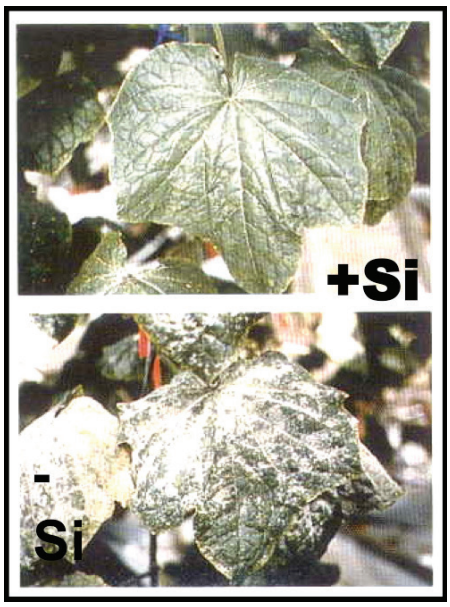


Figure 1: Cucumber leaf with and without silicon

Most important to understand is that the silica doesn't kill the pathogen, but rather makes the host plant inhospitable to the pathogen. By blocking the fungal spores from attaching, the plant maintains it's health and strength. This the best preventative approach, and how nature prefers. (Figure 1)

There are also compelling studies showing plants moving extra silicic acid to points of attack and stresses, such as insects, fungi, or breakage, in effort to resist and repair. This is much like when we get a cut and platelets in our blood rush to the cut to create a clot while the wound heals. The additional silicon deposits create even stronger tissue. (Figure 2)

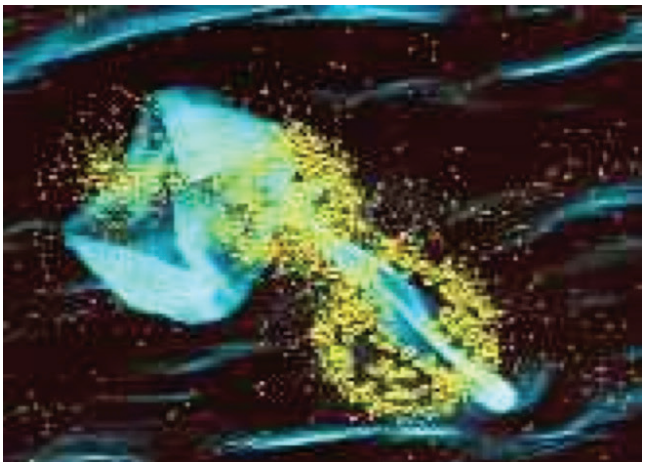


Figure 2: Increased soluble silicon (white) moved to point of fungal spores (yellow)

Silicon must be readily available in soluble form (silicic acid) at the point of infection/attack to be effective. This effect has been shown on many different plant species.

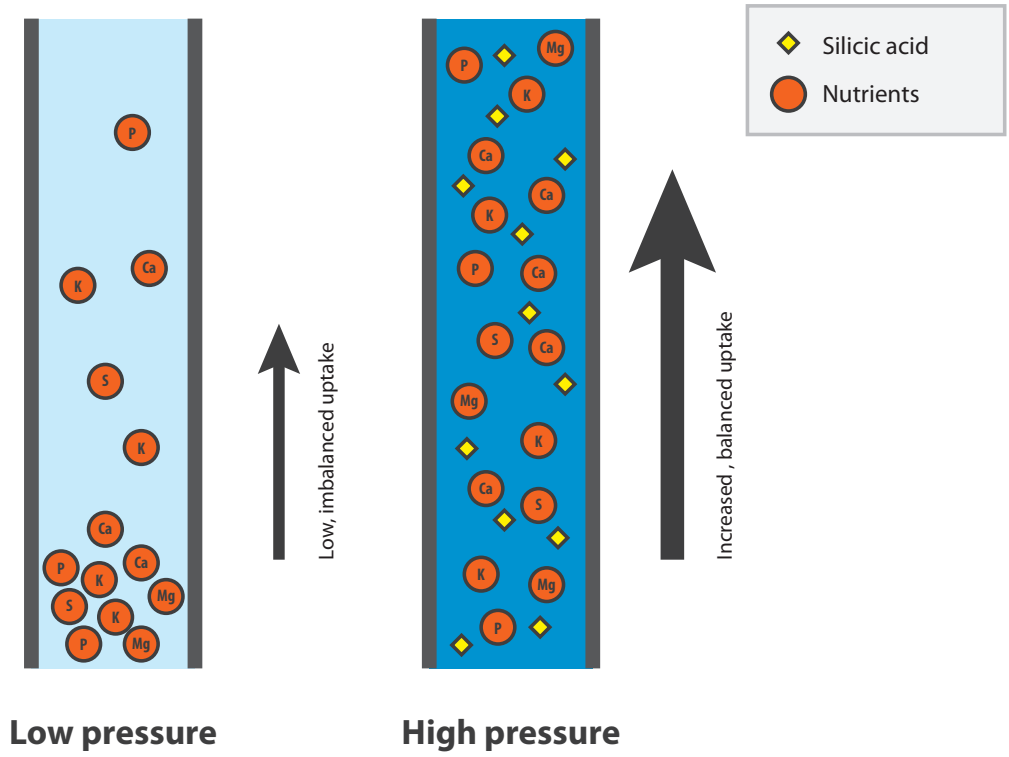
Since silicon is deposited into the cell walls within about 24 hours of uptake, it is crucial to maintain a constant supply from early stages until the end to achieve this immunity effect.

Improves uptake, absorption and utilization of nutrients

There is a remarkable effect silicic has on the uptake of other nutrients. Think of it as a train engine that helps pull other 'cars' throughout the plant sap. Silicic acid is particularly good at increasing the transport of heavy, immobile minerals like Calcium.

Silicic acid is a 'sticky' fluid molecule. When present, the pressure of the vascular system (like our circulatory system) increases. Imagine a hose filled with tiny particles of sand (nutrients). If a trickle of water (plant sap) moves through the hose, most of the particles stay put. If the water pressure is increased to a heavy flow, more of the sand particles are pushed through the hose.

Plants don't have muscles in the same way we do. Instead elements move around the plant by suction, pressure, and molecular interaction. Lower pressure created by synthetic fertilizers and overwatering makes heavier molecules less mobile. By increasing the pressure, minerals are more easily carried throughout the plant.



With higher pressure inside, all other minerals in various forms are more easily moved throughout the plant to where the plant needs them. This vascular pressure is especially important for larger plants with heavy branching as more energy is required to move nutrients along these complex and far-reaching pathways.

Stronger cell structures and epidermis layer creating stronger plants and thicker stems (increases dry weight)

Silicic acid is absorbed into the plant tissue and deposited into the epidermis layer of each cell within about 24 hours. This layer acts like the mortar in a brick or stone wall, holding the shape and structure of the cells.

With this added silicon, the plant is not only strong but it now contains a permanent additional layer of silicon that stays in place for the life of the cell. This is why it's important to provide silicic acid throughout the life of the plant so each new cell receives this treatment.

Study: Detection of Silicon with Electronic Micro-sensor

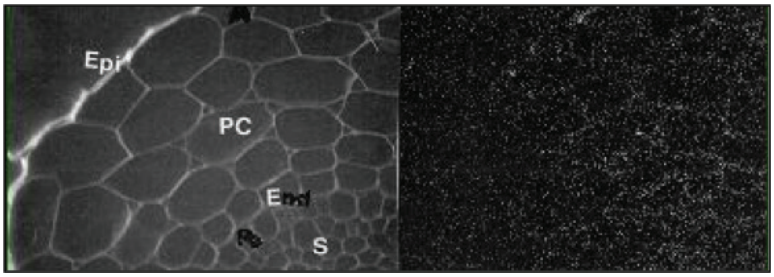


Figure 2-3 Untreated plant cells

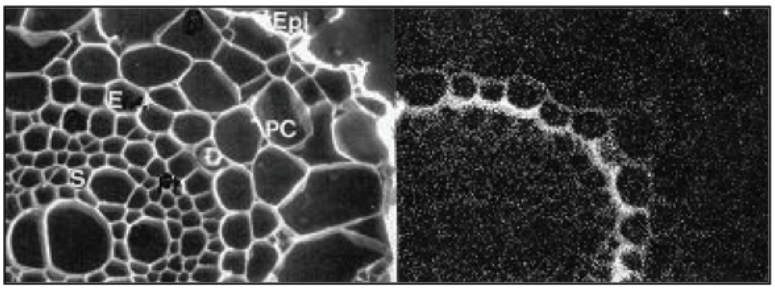


Figure 2-3 Plants treated with silicic acid have a visibly stronger cell wall

Reduces and controls the space between internodes caused by temperature stress and unbalanced nutrition

As discussed before, plants have specific goals. One of the goals is production and yield. Plants want to produce more flower sites because that means more fruit development, and thus, more chance of being fertilized and passing genetics on to the next

generation. So if environmental and nutritional conditions are ideal, the plant will create more nodes and shorten node spacing to allow for more potential flower sites.

Some of the reasons plants have longer internode space (less overall flower sites):

1) Temperature differential (DIF) between day and night
2) Improperly formed cell structure from high nitrate and other salt levels
3) Overdose and deficiency of specific nutrients
4) Heat and moisture stress

The mechanical and nutritional effects of silicic acid help to buffer against these types of stress and allow the plant to grow how it wants. By providing better structure and more natural growth patterns, the plant is ultimately healthier and able to produce higher yields and improve quality factors.

Increases resistance against salinity (nutrient salt buildup)

Too many salts is one of the biggest problems indoor and outdoor gardeners face. Mostly because modern nutrients are made up of mostly salts. And we've been taught that more is better! Silicic acid helps to increase and balance nutrition so less overall inputs are needed. This generally means non-salt nutrients become more available for uptake so they can balance out over-salinized growing mediums.

Reduces transpiration (loss of moisture from the leaves)

Transpiration is one of the main ways that plants pull nutrients from lower portions to upper portions. Depending on the ambient moisture (relative humidity), moisture from the plant (and oxygen) is released from stomata on the leaf surface. This action creates a vacuum in the vascular system of the plant, which then 'pulls' water and nutrients further into the plant.

When a plant craves more nutrients, it will increase the level of transpiration in effort to bring in more nutrient-rich water from the roots and lower plant parts. If the vascular system is functioning properly, the plant has sufficient nutrients, so less transpiration is required.

NOTES

L-AMINO ACIDS
WITH ESSENTIAL MINERALS

Amino acids are the building blocks of all life on earth. They participate in many of the critical functions of biological systems. Without amino acids, life would never have formed and would cease to exist. So, they are pretty important. We'll look at what specific role amino acids play in plant development but first let's look at what amino acids are.

There are around 500 known amino acids that are categorized in many different ways. For our purposes we'll keep it simple.

ESSENTIAL, STANDARD, NON-ESSENTIAL

Most scientists agree there are 20 (some say 21-23) standard amino acids needed for life. Other amino acids are used for industrial processes, flavorings and additives, etc. There are always exceptions and we are always learning more.

You'll often hear the term "essential amino acids". This is in reference to human needs because our bodies can't synthesize these amino acids and must obtain them from our diet. Most plants have the ability to synthesize all they need. However, these are energy-intensive processes so it's a good idea to provide ready-to-use L-amino acids either through foliar or root feeding.

These are the 'standard' amino acids (depending on whom you ask):

L-Alanine
L-Arginine
L-Asparagine
L-Aspartic acid
L-Cysteine
L-Glutamic acid
L-Glutamine
Glycine (non-chiral, only L- variety)
L-Histidine
L-Isoleucine
L-Leucine
L-Lysine
L-Methionine
L-Phenylalanine
L-Proline
L-Pyrrolysine *
L-Selenocysteine *
L-Serine
L-Threonine
L-Tryptophan
L-Tyrosine
L-Valin

* Some now consider these to be standard

LEFT VERSUS RIGHT

The most important concept of amino acids to understand is the difference between L-amino acids (left-handed) and D-amino acids (right-handed). This topic gets a bit technical and science still has a lot of unanswered questions. What we do know is that nature (life) has decided that the only type of amino acids it will (and can) use is the 'left-handed' variety, or L-amino acids (with very rare exceptions). This effect is known as chirality (mirror image).

"L" in this case actually stands for "laevo" not "left". The other variety is D-amino acids where "D" stands for "dextro". Both types amino acids have the exact same molecular structure yet they are actually mirror images. The best way to think about the difference is this: your hands may look identical—bones, veins, fingers—yet you can't put a left-handed glove on your right hand. In order for life to use amino acids, these molecules need to fit onto specifically shaped receptors. That's why a left-handed organism can't use right-handed amino acids.

Because of this L-amino acids only come from natural organic processes, such as enzymatic hydrolyzation (how nature breaks down proteins). Synthetically manufactured proteins produce D-amino acids which may be useful in other functions, but not for life.

Enzymatic hydrolyzation is a process where enzymes are combined organic matter and heated. The organic matter is decayed down to basic components (L-amino acids). This process is expensive and requires specialized equipment but is also guaranteed to produce pure, life-friendly L-amino acids. It also allows for separation by chain-length, which is another discussion point for later on.

L-AMINO ACIDS DO A LOT IN PLANTS

In natural soil environments with healthy and thriving ecosystems, plants obtain amino acids from decaying organic matter and, when necessary, synthesize what is needed. Unfortunately modern agriculture has destroyed healthy soil life so there may not be sufficient levels of naturally occurring amino acids. And if plants need to expend energy on amino acid production, they are not spending energy on more desirable functions.

Before amino acids can perform their essential functions within plants, they must be bioavailable. Simply applying amino acids to the plant is not enough. In order to be absorbed either through the roots or tissue, amino acids must be in free form or as

peptides. If they are combined into long-chains the molecules are too big to penetrate the plant tissue.

In general

The functions of amino acids in plants are near endless and science is constantly discovering more. Here are a few important effects:

- Increase chlorophyll production
- Provide rich source of organic nitrogen
- Stimulate synthesis of vitamins
- Influence various enzymatic systems
- Flowering is stimulated
- Better fruit setting
- Higher nutritional content, size, flavor, and coloration of fruits.
- Higher brix level (quality increase)
- Increased pest and pathogen resistance

Protein biosynthesis

Amino acids are the base structure for proteins. The standard amino acids combine in virtually infinite variations to produce countless different proteins. These proteins are essential to many structural components of plant tissue.

Proteins have many different functions: structural (supportive), metabolic (enzymes and stimulation), nutrient transport, amino acid reserves. In fact proteins are used in virtually every biological process!

Plants make their own proteins based upon the specific stage of growth, nutritional demands, stress, etc. They can only effectively build the needed proteins if the raw materials are present. And making amino acids is an energy intensive process. So, providing additional L-amino acids via the roots or leaf tissue ensures the plant has plenty of materials for building these important proteins.

Resistance to abiotic stress

Abiotic stress, such as high/low temperatures, drought, flooding, pest attacks, disease or phytotoxic effects from the application of chemical pesticides have negative effects on a plant metabolism. Of course this lowers crop quality and yield. Applying amino acid supplementation before, during and after stressful conditions gives plants the building blocks that directly provide prevention and repair effect.

When a plant is under stress, self-production of amino acids slows because it is an energy-expensive process. Instead the plant hydrolyzes (breaks down) existing proteins to gain the needed amino acids. This process requires less energy than synthesizing from scratch. It also means that the plant may cannibalize itself unless amino acids are provided as supplementation.

Plants increase L-Proline production during times of abiotic stress to help reduce effect and speed up recovery time. L-Proline primarily influences the cell wall's strength and resistance to various stresses, like poor weather conditions.

Photosynthesis

Photosynthesis is a plant's most important chemical process. A plant synthesizes sugars from carbon dioxide, water, and light energy. The sugars (carbohydrates) are then used by the plant as a source of energy for other metabolic processes. This critical function is influenced by amino acids.

L-Glycine and L-Glutamic acid are essential metabolites for chlorophyll synthesis and tissue formation. These amino acids raise the concentration of chlorophyll in plants. More chlorophyll means greater absorption of light energy, which increases photosynthesis.

Steady source of organic nitrogen

The most commonly discussed forms of nitrogen used by plants are nitrates (NO_3) and ammonium (NH_4). Nitrogen is difficult to provide as nutrition because it's naturally a gas and easily leaches from the soil. Most commercial fertilizers contain these two forms in high quantities. Plants readily use both forms, though different plants do have preference.

But there is another, less discussed source of nitrogen. Perhaps the lack of discussion is because there is still a lot of research needed on the topic. Organic materials (like

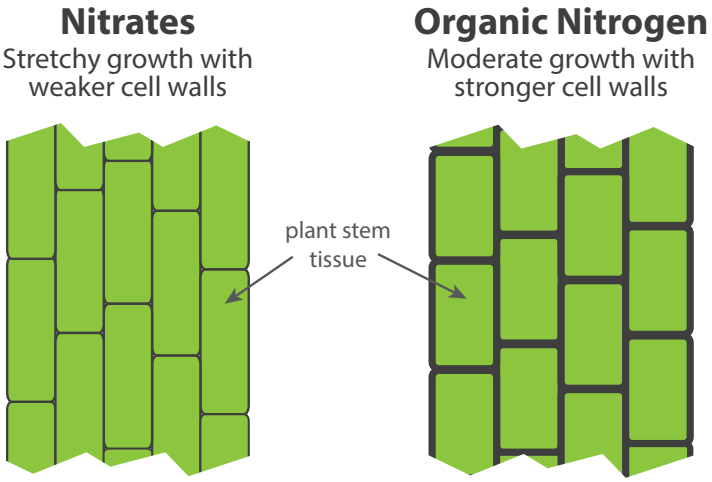
L-amino acids) contain organic nitrogen. Once inside the plant, the organic nitrogen is released and used by the plant.

Since a portion of the nitrogen taken into the plant is used for protein and amino acid synthesis, by providing in ready-to-use form, the plant requires less from nitrates and ammonium for these activities. Why does this matter? As with anything, overdoing any one aspect causes problems somewhere else.

Excessive nitrates especially tend to create accelerated growth and cell elongation. As the rapidly growing cells form, the cell wall is stretched and thinned. This weaker tissue makes a perfect target for invading pests. You can see this with many field crops like corn—fast growth but weak plants. Excess nitrates also cause antagonism against other important minerals like calcium, magnesium, and potassium.

When nitrates are in balance and nitrogen is also provided by organic sources, cells tend to grow with more natural and sturdy shape. This results in a stronger plant and healthy cells more resistant to stress and attack.

Organic nitrogen provided by L-amino acids also tends to stick around in the soil longer with less leaching. So less fertilizer input is required.



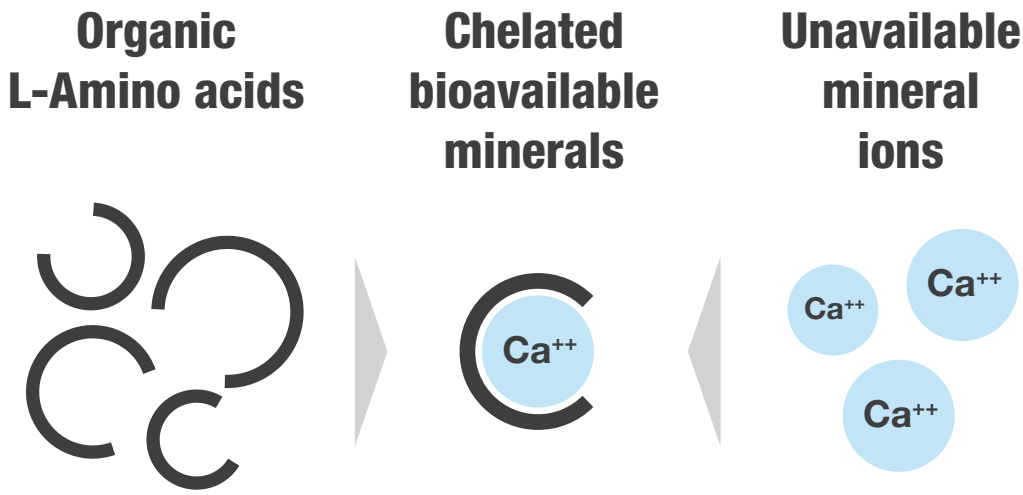
Stomata

Stomata are cellular structures that control a plant's water balance. They are also used during transpiration (breathing from the leaves), as well as the absorption macro and micronutrients. A stoma's openings are controlled by external factors (light, moisture, temperature and salt concentration) and by internal factors (amino acids, available potassium, etc.).

Stomata close during periods of low light and moisture and when salt concentration and temperatures are high. When stomata close, photosynthesis and transpiration are reduced and respiration is increased. This lowers the plant's metabolic balance and slows or stops growth. L-Glutamic acid works as an osmotic agent for the protective cells, which can increase the opening of stomata.

Mineral chelation

One of the most significant roles amino acids play is enhancing the bioavailability of nutrients. Certain nutrients are not absorbable by plants due to molecular structure, ionic charge, etc. L-amino acids (and some other organic acids) work to 'hide' these unavailable minerals so the plant can absorb and transport the minerals.



By chelating with amino acids, the overall amount of minerals existing in a nutrient solution and growing medium becomes available for uptake and transport throughout the plant. In addition, amino acids allow for more effective foliar feeding by transporting minerals into the stomata.

L-Glycine and L-Glutamic acid amino acids are known as very effective chelating agents primarily because of their small molecular weight. Their size allows them to easily move through cell membranes.

In addition to increasing the availability of good nutrients, amino acids are also shown to reduce metal toxicity in plants and soil by binding with excess metals. This helps to balance the levels of various elements in the medium.

Precursors to plant hormones and growth factors

Some amino acids are precursors of various plant hormones and other growth compounds.

- L-Methionine is a precursor of ethylene (important for fruit and flower ripening) and other growth factors such as Espermine and Espermidine.

- L-Tryptophan is a precursor of auxin synthesis (only available if produced through enzymatic hydrolyzation)
- Indole-3-Acetic acid (essential rooting growth hormone) requires L-Tryptophan
- L-Arginine is a precursor to cytokinin production
- Several amino acids influence gene expression (telling the plant what to do)

Pollination and fruit formation

Amino acids are used extensively during peak metabolic activities. Pollination and fruit formation are two of the most important times for plants, thus metabolic activity is heightened.

- L-Histidine helps ripen fruit
- L-Proline increases pollen fertility
- L-Lysine, L-Methionine, and L-Glutamic acid increase pollen germination and the length of the pollen tube
- L-Alanine, L-Valine, and L-Leucine improve the quality of fruit

Microbe activity in growing medium

Since all life is dependent upon amino acids, this includes all the little microbes living in and around the root area. These microbes utilize amino acids much like plants do.

Some amino acids are used as building blocks for structural components and protein synthesis. Others are used as stimulants for production of various hormonal and growth compounds. For example, L-methionine is a precursor of growth factors that stabilize cell membranes in microbes. Some microbes also consume amino acids as a source of organic nitrogen and proteins.

In addition, amino acids in the soil provide a rich source of organic material to help build soil structure, fertility, and water retention.

NOTES

SPECIFIC MICRO-LIFE
WITH NATURAL BIO-STIMULANTS

Before getting into the specifics of the Aptus philosophy and science of soil microbes, we need a basic understanding of what microbes are and what they do. Most important to understand is that good microbes in a healthy soil are essential to maximize crop potential.

FOUR PRIMARY MICROBES IN A HEALTHY FUNCTIONING SOIL

1) Bacteria
2) Fungi
3) Protozoa
4) Nematodes

This manual is not intended to provide complete education on soil micro-life. In fact, there are tremendous books and resources online if you want to go a lot deeper. For the purposes of this manual we are going to focus on bacteria and fungi as they are the base of the soil food web.

Protozoa and nematodes are both larger organisms that perform specific and important functions in a healthy soil, such as eating bacteria and fungi, as well as protecting the rhizosphere. But most terminal-crop indoor or outdoor growing environments don't make full use of these creatures since the cycles are short and often soil isn't reused. More important in these applications are bacteria and fungi.

In addition, there are always exceptions to these 'rules' of nature. So, in this manual we'll discuss generalities that apply to most situations. Depending on your specific circumstances and methodologies, different techniques may apply. What we'll cover here can apply to everyone.

It is important to understand that the soil food web is a complex and delicate ecosystem that needs to be properly cared for in order to perform at its peak. For example, you may be supplementing with a compost tea but if you are also using chemical fertilizers, you are negating the benefit. Inorganic fertilizers can actually suck the cytoplasm from fungal cells, destroying them.

Beneficial Bacteria

Bacteria are the smallest of the microbes. They tend to be the most diverse and resilient as well. Bacteria are the first to establish populations in a soil environment. In fact, they require little time and resources to begin functioning.

These microscopic creatures are the workhorses of the soil, each programmed to perform specific functions. Bacteria don't eat like we do. Instead they simply absorb small molecules through their cell wall. Since most compounds in soil are larger 'poly' molecules, bacteria produce enzymes and send them out to cut up large chunks into smaller absorbable molecules.

Most important to maintain a healthy bacterial population is plenty of carbon in the soil. Carbon acts as an anchor for bacteria. Without a solid platform, bacteria are easily washed away from the root area. Carbon can be introduced to soil with activated charcoal, organic acids (L-amino acid, Humic acid, etc.), or other organic matter.

Carbon also acts as a stimulator for bacterial activity. This is one of the reasons much of the arable farmland has little to no micro-life. Without organic matter (carbon-rich) microbe populations suffer.

Bacteria like to eat simple sugars as a primary food source. They are able to consume small sugar molecules quickly without enzymatic digestion. They can break down larger sugars with enzymes but it takes some time.

Some of the functions bacteria perform:

- Create a sticky slime that helps bind together soil particles and improve soil structure
- Produce hormones, vitamins, and other bio-stimulants
- Consume nutrients and store for later use, also prevents leaching from soil
- Convert nutrients into forms that plants can take up.
- Protect the rhizosphere (area immediately around roots—about 1/10") from invading bad pathogens and organisms.
- Release stored nitrogen as nitrates
- Some bacteria effectively pull gaseous nitrogen from the air and 'fix' into a form that plants can use

As they function, bacteria produce exudates (waste products) that are mostly alkaline. Thus, bacteria dominant soils tend to have a higher pH and contain more nitrates than ammonium. Annuals, flowers, grasses, and vegetables prefer more bacteria in the soil than fungi. These types of plants prefer nitrates as their nitrogen source.

Certain bacterial strains like to live on the leaf surface as well (the phylosphere). These bacteria can perform crucial functions like protecting the above ground plant parts from invading pathogens and pests. Some new bio-pesticides and bio-fungicides are actually bacteria that infect and kill the invaders.

Beneficial Fungi

Most growers know of mycorrhizal fungi. This term actually refers to the symbiotic relationship that certain fungal strains develop with plants. This relationship is complex and diverse. Basically, the fungi attach to the plant's root hairs forming a casing around the plant tissue. The plant exudes sugars, which feed and stimulate the fungi. In turn the fungi convert and transport nutrients and stimulants into the root tissue.

Most types of mycorrhizal fungi take several weeks to fully establish a colony on the roots and start performing their functions. Because of this fungi tend to perform better in environments where plants exist for longer periods and soil remains undisturbed (forests, perennials, shrubs, etc.).

Fungi are not as good at breaking down and consuming simple sugars, as are bacteria. Fungi tend to perform better with larger complex food sources. They are able to consume small sugar molecules quickly without enzymatic digestion. They can break down larger sugars with enzymes but it takes some time.

Some of the functions fungi perform

- Build networks of 'hyphae' – strands that help transport nutrients across distances to the rhizosphere
- Pull nutrients directly into the root hair
- Build a protective layer around root hairs
- Increase root surface area, which can enhance moisture and nutrient uptake (especially phosphorus)
- Decay complex organic matter into usable compounds

- Protect roots against bad pathogens and pests
- Some fungi grow inside plant tissue and protect against systemic attacks, like powdery mildew
- Release stored nitrogen as ammonium

As they function, fungi produce exudates (waste products) that are mostly acid. Thus, fungi dominant soils tend to have a lower pH and contain more ammonium than nitrates. This is one of the reasons established forests, trees, shrubs and other annuals have more fungi in their soils than bacteria. These types of plants prefer ammonium as a nitrogen source.

Two major philosophies of adding microbe supplementation

There are two departing philosophies of micro-life applications:

1) **Shotgun** – Provide many microbes and allow nature to find its balance
2) **Sniper** – Provide specific microbes based upon plant type and goals

Both methodologies have their benefits and drawbacks.

SHOTGUN METHOD	SNIPER METHOD
Pros • Compatible with a wide variety of crops • Broad spectrum of microbial activity	**Pros** • Custom microbial activity for specific plants • Guaranteed high populations • Faster effect
Cons • Microbes compete for food instead of feed the plant • Many unknowns as microbes compete and establish populations	**Cons** • Doesn't focus on wide diversity • Not complete enough for longer-term crops like trees, shrubs, and other perennials

When looking at microbial soil inoculation, Aptus chose the Sniper method (using specific bacteria) for a few key reasons:

1) By targeting the ideal blend of bacteria, we can guarantee immediate population establishment and activity

2) Even without detailed soil analysis we can know more precisely what's happening in the root zone which allows better troubleshooting

3) Bacteria work faster that fungi so are more suitable for terminal-crop cycles

The two most critical functions our research shows are:

1) **Rhizosphere protection/antagonism** (soldiers that keep out the bad guys)

2) **Nutrient conversion** (workers that turn unusable minerals into plant food)

We chose two specific strains of *bacillus subtilis* shown to be the most effective and used massive populations. The research shows that by overwhelming the soil with high populations of these strains, locked up nutrients are quickly made available and more resistant to leaching. Plus, any invading pathogens are quickly destroyed.

Another key function of bacteria – bio-stimulant production

It was already briefly mentioned that some bacteria produce bio-stimulants. Bio-stimulation is essential for plant growth. Going back to NPK agriculture that views plants as machines and feeding as a chemistry experiment, plants need much more than simply 16-17 essential elements. Bio-stimulants are the not nutritive substances that trigger specific growth in plants

For example, when the light period changes from long days (18 hours light) to short days (12 hours light), certain plant hormones tell the plant it's time to flower and reproduce. Or when a clone is taken, certain hormones trigger the plant to focus on root growth rather than leaf growth.

Some bio-stimulants are manufactured within the plant based upon environmental triggers. Others are provided to the plant from external sources (feeding from a grower, and the soil from microbial activity).

Synthetic versus natural bio-stimulants

There is a huge difference. Just like two amino acid molecules can look identical but only one is compatible with plants, hormones, vitamins, and other bio-stimulants are most effective in specific natural forms.

Nature has developed powerful mechanisms to identify and utilize preferred forms of all compounds. If desperate, plants (like animals) will adapt their biochemistry to eat

what's available and necessary for survival. But under ideal circumstances we would stimulate plants with naturally occurring forms of the various compounds.

Many hormone and vitamin products on the market contain important compounds necessary for plant growth. But the various ingredients are often synthesized from cheap chemicals in a laboratory. This is common in human nutrition as well. Which is better…vitamin C (ascorbic acid) made from chemicals, or made by an orange?

As growers, we are looking for ideal plant health and maximum production. The best way to achieve this is through natural bio-stimulation.

One of the powerful tools Aptus uses is naturally occurring plant bio-stimulants. Rather than 'make' these ingredients, we let nature build them for us. Yeah it is much more expensive and complex a process but the research shows that results are far better. We use a bioreactor to manufacture hormones like gibberellins and cytokinins. A bioreactor is essentially a soil simulator that lets specific bacteria produce these hormones and vitamins in the form and balance as would be in a healthy soil.

Cytokinins

This is a class of naturally occurring plant hormones essential for growth. Primarily they are responsible for promoting cellular division (the name comes from cytokinesis) and growth. They also are key to cell differentiation, which makes them important during high metabolic and transition stages of plant growth, such as budding and flowering.

Some research shows that cytokinins can release apical dominance (side shoots ignored while top shoot produces) when higher in concentration than auxins. This means that side shoot growth is increased in addition to the single top shoot. Cytokinins are found in most plants, which makes them diverse and readily accepted by all crops.

Gibberellins

This is another class of common naturally occurring plant hormones. Generally gibberellins are needed for stem elongation (vertical growth), flowering initiation, seed germination, and fruit aging/ripening.

There is quite a body of research in various commercial crops (grapes, apples, cherries) that shows gibberellins increasing the size and quantity of fruit. It is thought the gibberellins are responsible for increasing carbohydrate transport into the fruit.

As with cytokinins, gibberellins are found in most higher-level plants, which makes them diverse and readily accepted by all crops.

NOTES

PRODUCTS

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

FASiLITOR
NUTRITION MANAGER

This golden liquid is the flagship of the entire Aptus lineup. It is extremely concentrated, ultra-pure, and fast acting with visible effects. While it is a silicon-based solution, it is unlike any other silicon on the market. The patented formula works with natural plant mechanisms to provide the right nutrition in the right amounts at the right time.

FaSilitor aids in uptake of nutrients, strengthens plants structure and increases the plant's ability to handle various environmental stresses (abiotic and biotic). It increases the absorption and bioavailability of all other nutrients by acting as an efficient transporter for other elements. This increases general plant strength, health and nutrition.

Some of the effects seen with FaSilitor can appear like those of plant growth regulators (PGRs). Aptus products contain no synthetic or unnatural PGRs! The key thing to understand is that FaSilitor works with natural plant mechanisms rather than trying to manipulate in unnatural ways.

1) **Silicic acid** provides immediately bio-available silicon when and where the plant needs it. Read more on the specific effects of silicic acid under the product technologies section.
2) **Boron** stimulates the production of plant fibers (increases dry weight) and stimulates root hairs to leach sugars into the medium, which feeds micro-life.
3) **Molybdenum** acts as a nitrogen pump, helping move nitrogen from the lower leaves (old growth) to the higher leaves (new growth).

Why Use FaSilitor

- Resistance against abiotic (environmental: temperature, wind, drought).
- Resistance against biotic stress (living: pests and pathogens).
- Improves uptake, absorption and utilization of nutrients.
- Stronger cell structures and epidermis layer creating stronger plants and thicker stems (increases dry weight).
- Reduces and controls the space between internodes caused by temperature stress and unbalanced nutrition.

- Increases resistance against salinity (nutrient salt buildup).
- Reduces transpiration (loss of moisture from the leaves).

FaSilitor Key Ingredients

- Silicic Acid ($Si[OH_4]$) – Nutrient transporter, plant strengthener
- Boron (B) – A precursor to all other nutrient utilization
- Molybdenum (Mo) – Moves Nitrogen from lower to upper leaves

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Silicon (as silicic acid)	Potassium Silicate	1.4%
Soluble Potash (K_20)	Potassium Silicate	0.6%
Boron (B)	Boric Acid	0.1%
Molybdenum (Mo)	Sodium Molybdate	0.001%

Using FaSilitor

Add FaSilitor FIRST to your reservoir of clean water every feeding during all stages of plant growth. It's very important to add FaSilitor before any other nutrients and boosters to maximize effectiveness.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding	3ml per 5 gallons
Special (to slow vertical growth)	6ml per 5 gallons

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Foliar spray	1-2ml per liter, 4-8ml per gallon

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Silicic acid provides immediately bioavailable silicon when and where the plant needs it. Read more on the specific science of silicic acid under Core Product Technologies.
- Boron (B) is the basis for all other nutrient usage. Particularly, it enhances calcium (Ca) uptake and stimulates the production of plant fibers (better quality, more dry matter). Read more on this under Biochemical Sequencing.
- Molybdenum (Mo) is a key part in the activity of the nitrogenase enzyme. When Nitrogen (N) is missing, plants look for molybdenum in order to stimulate nitrogenase activity, which helps move Nitrogen from old leaves to new leafy growth. This is important to understand during diagnosis. If N is deficient in upper leaves but okay in lower leaves, you may have a Mo problem not and N problem!

Tips from the field

- Very important! FaSilitor is an ultra-pure liquid and should not be contaminated. Always mix FaSilitor first in your reservoir filled with clean water (reverse osmosis or dechlorinated). The precise chemistry of FaSilitor is negatively affected if water already contains added fertilizers (especially NPK).
- If during early bloom your plants continue to stretch too much, double the dose of FaSilitor for a couple feedings. This helps tighten node spacing and slow vertical stretching.
- FaSilitor makes plants more compact. Used from the beginning of vegetative growth tends to produce a wider plant with more branches and tighter internodes.
- If you are experiencing nutrient deficiencies, often FaSilitor helps correct these deficiencies within a few days by making existing nutrients more bioavailable. This

is a better option than adding more nutrients and potentially causing more antagonism.

FaSilitor Q&A

Why do I need to use it every feeding?

Once silicon is deposited in the cell membrane, it stays there for the life of the plant. So it's important to keep a continuous supply to strengthen all the newly formed cells.

I accidentally added too much, will it hurt my plants?

Not likely. If there is too much in the medium most likely it will degrade and mix with other minerals. Even at 3-4 times recommended dosage, no negative effects have been reported.

Why did my FaSilitor turn light blue?

If water or other contaminants get into the FaSilitor bottle, the liquid is activates and changes structure. It doesn't mean your bottle is ruined, just loses a bit of effectiveness. NEVER allow any contaminants in your FaSilitor. Use clean and dry instruments when measuring.

Can I use FaSilitor as a foliar spray?

Yes. In fact, many commercial crops are fed by spraying the leaves. Silicic acid absorbs readily into leaf tissue. Use it at 1ml per liter (4ml per gallon). Best to spray in early morning or at night (lights off).

Why is FaSilitor so expensive?

Some try to compare FaSilitor with other silicate supplements and it certainly appears expensive! Read more about silicic acid to understand the differences. Stabilized silicic acid is extremely complex and expensive to manufacture. First of all it must be ultrapure to maintain its stability. Our silicic acid requires the highest grades available of boric acid, sodium molybdate, and silica (similar to microchip manufacturing) in order to remain stable for long periods.

It's a silica so I can use it as a pH up right?

No. Silicic acid is an ACID. And quite strong at that. Fortunately it is stabilized so it won't melt your skin off. But it does have a small pH down effect in your water. It drops the pH even more in RO water where there's no buffer. Just use a natural pH to adjust your solution after mixing everything.

NOTES

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

STARTBOOST
ROOT & GROWTH BOOSTER

Second in the Aptus Premium Collection is StartBoost, a dark smelly, concentrated liquid designed to stimulate root growth, vegetative growth, enhance soil micro-life, and increase soil structure and fertility. StartBoost is 100% organic with bioactive ingredients, which encourages the development of the root system and vegetative growth. Specific micro-life biomass works to enhance root development. It stimulates root hair development while conditioning the soil and providing bioavailable nutrition during vegetative growth.

Why Use StartBoost

- Powerful root and growth stimulator (more roots and plant growth)
- Improved development of stems, root system, and plant tissue (vegetative)
- Improves micro-life populations and strength
- Improves cellular development of stems (up to 2x thicker)

StartBoost Key Ingredients

- L-amino acids, which provides organic nitrogen (N)
- Micro-life biomass from controlled fermentation of selected strains
- Humic acid from the Leonardite layer
- High-grade, low molecular weight Fulvic acid

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Humic acid	Leonardite	1.2%

Using StartBoost

Add StartBoost to your reservoir every feeding during the complete vegetative phase and first week of the flowering stage.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding	5ml per 5 gallons
Seedlings/clones (rooted)	4ml per gallon
Transplant root dip	40ml per gallon (1:100)

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.
- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Humic acid improves water retention by increasing the structure of the growing medium. Beneficial bacteria use the carbon from Humic acid for anchorage and stimulation. Humic acid is an effective soil conditioner, which improves cation/anion exchange (helps with nutrient availability).
- Fulvic acid acts as an efficient chelator. It's especially effective if there are excess unchelated nutrients in the growing medium.
- The specifically chosen micro-life biomass (beneficial bacteria) converts unusable minerals into bioavailable nutrients and enhances antagonistic action against pathogens (rhizosphere protection).

Tips from the field

- Begin feeding with StartBoost (plus FaSilitor) as soon as your plants develop initial roots and leaves. Continue feeding throughout the entire vegetative phase.
- Use a 1:1000 dilution to feed new clones or starts from seeds (4 ml per gallon). this is effective as a pre-soak for cloning or seed starting medium.
- During transplanting, dip the roots of the plants directly in a 1:100 mixture (40 ml per gallon).
- Do not keep StartBoost in your reservoir for more than 2-3 days in order to avoid organic biofilm buildup and blockage of irrigation drip lines.
- When using rockwool or similar medium, micro-life have a difficult time anchoring. It may be necessary to supplement more often in order to maintain a good micro-life.

StartBoost Q&A

Why can't I leave StartBoost in my reservoir for a week?

You can but you risk a lot of mess. StartBoost contains spore-form bacteria. When mixed in water they come alive and go to work. One thing bacteria do well is produce a biofilm, or slime, as a way of stabilizing the soil and providing protection. This is good in the soil but not so good in a recirculating nutrient tank. Plus, environmental factors such as water temperature, aeration, nutrients, and possible contaminants may start to degrade or affect your mix.

Is it possible to overdose StartBoost?

No. You can use StartBoost at multiple times the recommended dosage. StartBoost is 100% organic and contains nothing that will burn or harm your plant. Dump a full bottle and a plant and the worst that may happen is a temporary imbalance in your soil (excess organic acids may over-chelate and not release minerals as readily to the plant).

Can I use StartBoost during bloom?

If you have a soil issue and are forced to sterilize or flush your medium during bloom, you can re-inoculate with StartBoost and there are no negative effects.

What's the shelf life of StartBoost?

We guarantee about two years if stored properly. The bacteria are in stabilized spore form. They can become active if heated or contaminated. But as long as StartBoost is stored sealed in a cool, dry place it will last for a while.

Can I use StartBoost as a foliar spray?

Technically you can but it's most effective when used at the root. We have heard of some growers spraying clones with good results.

Can I add other microbe inoculants with StartBoost?

A lot of people like to use compost teas and other soil inoculants with their existing nutrient feed schedule. You can read a more lengthy discussion on our philosophy under Core Product Technologies. Generally, we recommend NOT adding anything additional. The risk of other inoculants is introducing unknown and uncontrollable factors into your growing environment. Our products and feed schedule is highly researched at universities across Europe and works excellently as is. Adding other micro-life adds a wildcard and isn't necessary.

Can I make a tea with StartBoost?

Not a good idea. And really not necessary. The purpose of brewing a tea is to increase microbe activity and populations. StartBoost contains two specific bacteria strains with programmed functions (nutrient recycling and pathogen antagonism) at very high populations (5E8 – that's 500 million spores per ml of each!).

StartBoost smells terrible...

Well, it's not really a question but yes it does! This is because StartBoost is not diluted in water. All you get is bioactive ingredients and they smell pretty bad.

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

BLOOMBOOST
BLOOM BOOSTER

BloomBoost is a bloom and maturation stimulator, as well as a rich microbial feed and stimulator. It is 100% organic with bioactive ingredients that stimulate plant flowering response and increase soil health.

Using BloomBoost throughout the flowering phase produces larger fruit with more fibers, resin and sugars, which increase the quality of the end product (higher Brix level). BloomBoost helps improve the natural flavors while enhancing the appearance of your product.

Why Use BloomBoost

- Improves transition between different metabolic stages in plant physiology (better plant development)
- Improves quality and end product by increasing fibers, resins and sugars (flavor, nutrition, appearance, and quality)
- Improves yield by stimulating more bud sites, particularly along the sides of main shoots (greater quantity of flowers and buds)
- Stimulates production of phytohormones, vitamins, and other important natural bio-stimulants.

BloomBoost Key Ingredients

- L-amino acids, which provides organic nitrogen
- Polysaccharides (simple sugars)
- Trace elements: boron (B), iron (Fe), molybdenum (Mo)
- Potassium (K) and sulfur (S)
- Bloom promoting natural plant stimulants
  - Cytokinins
  - Gibberellins
- Vitamin complexes produced by natural fermentation

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Soluble Potash (K_20)	Potassium Sulfate	1.0%
Boron (B)	Boric Acid	0.1%

Using BloomBoost

Add BloomBoost to your reservoir every feeding from the second week of the flowering stage the end. BloomBoost is effective used through harvest without negative affect on quality and flavor.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding	4-8ml per 5 gallons

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.
- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Potassium aids in sugar and nutrient transport, improves starch, carbohydrate and protein synthesis, regulates water usage, and is critical to fruit and flower maturation.
- Sulfur is an essential component of all cells, and many enzymes, vitamins, and amino acids. Also a part of flavor and aroma compounds.

- Iron, boron, and other micronutrients assist floral development, and plant fiber development, leading to greater dry weight.
- Vitamin complexes and phytohormones are produced through controlled fermentation of specific bacteria in a bioreactor. These natural-form stimulants provide building blocks for other needed hormones, immune compounds, and metabolic triggers.
  - Gibberellins for enhancing shooting (increasing bud sites and production of side branches)
  - Cytokinins for increasing cellular division and tissue growth
- Polysaccharides (simple sugars) are consumed by beneficial microbes as food energy. This stimulates the soil micro-life activity, which increases the availability and uptake of bloom-promoting nutrients.

Tips from the field

- BloomBoost may be used at a slightly higher dose for even better results. Some growers have reported good results from double recommended dosage through the bloom cycle.
- Do not keep BloomBoost in your reservoir for more than 2-3 days in order to avoid biofilm buildup and blockage of irrigation drip lines.

BloomBoost Q&A

Why can't I leave BloomBoost in my reservoir for a week?

You can but you risk a lot of mess. BloomBoost contains organic material that stimulates micro-life activity. In recirculating systems, these microbes become highly. One thing bacteria do well is produce a biofilm, or slime, as a way of stabilizing the soil and providing protection. This is good in the soil but not so good in a recirculating nutrient tank. Plus, environmental factors such as water temperature, aeration, nutrients, and possible contaminants may start to degrade or affect your mix.

Is it possible to overdose BloomBoost?

Perhaps in very high doses, some of the minerals may create antagonism. And the hormones could over stimulate a single aspect and create imbalance. But you can use BloomBoost at multiple times recommended dosage with no problems. BloomBoost is 100% organic and has a natural effect on plants and growing medium.

What's the shelf life of BloomBoost?

We guarantee about two years if stored properly. The organic material can breakdown and react of heated or contaminated. But as long as BloomBoost is stored sealed in a cool, dry place it will last for a while.

Can I use BloomBoost as a foliar spray?

Technically you can but it's most effective when used at the root. Some of the ingredients have benefits applied as a foliar but it's not our primary recommendation.

The NPK is quite low, how is this a bloom booster?

Many products labeled "bloom boosters" are really just phosphorus and potassium supplements. While both minerals are important to good floral development, BloomBoost focuses on plant and microbial bio-stimulation. If you need P and K supplementation, use PeakBoost and FinaleBoost.

NOTES

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

PEAKBOOST
PHOSPHORUS BOOSTER

PeakBoost is organo-mineral phosphorus booster that improves blooming processes and stimulates the production or proteins, plant hormones and vitamins. Phosphorus is needed in higher quantities during the initial stages of fruit and flower development.

Phosphorus tends to get locked up in the growing medium and become unavailable to plants. This results in deficiencies and mineral antagonism in the medium. By combining with organic L-amino acids, the phosphorus is buffered and protected from these mineral interactions. This ultimately means you can use far less fertilizer input and achieve the same or better results.

PeakBoost is a better option than many combined P/K boosters because it allows the targeted application of phosphorus when and where the plant needs. Often when P and K are added in high quantities at the same time, one or the other remains unused in the medium. This can cause antagonism, chemical binding, and nutrient lockout.

PeakBoost contains organic acids that can help to adjust pH-down for your nutrient mixture. PeakBoost is 100% soluble in water and doesn't leave residue in reservoirs and irrigation systems.

Why Use PeakBoost

- Provides high levels of natural bioavailable phosphorus during the early generative and bloom stages
- Minimizes antagonism and lockout of phosphorus with other nutrients
- Powerful stimulating effect on the blooming process
- 100% water soluble and organo-mineral leaving no residue

PeakBoost Key Ingredients

- L-amino acids, which provides organic nitrogen (N)
- High concentrations of natural phosphorus (P)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Available Phosphate (P_2O_5)	Phosphoric Acid	14%
Urea Nitrogen (N)	Urea	1.0%

Using PeakBoost

Add PeakBoost to your reservoir every feeding from the second week to the sixth week of the flowering stage. It's okay to extend or shorten the usage of PeakBoost based upon the total flowering time of your specific plant.

When mixing with any calcium supplements (like MassBoost), be sure to allow one to mix in the solution before adding the other to minimize the formation of calcium-phosphate bonds, which renders both unavailable to the plant.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding	6-16ml per 5 gallons

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.
- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Phosphorus stimulates the production of hormones, vitamins, L-amino acids, and enhances protein synthesis in the plant

- Phosphorus stimulates bud formation, bud set, fructification and bud development
- Phosphorus is an essential part of the photosynthesis and respiration processes
- Nutrients are chelated using organic L-amino acids

Tips from the field

- Increase PeakBoost dosages throughout the bloom cycle for even better results (see Extreme Feed Schedule)
- PeakBoost has acidifying characteristics and can be used as a natural pH-down
- Extend or shorten the usage of PeakBoost based upon the total flowering time of your specific plant

PeakBoost Q&A

What is organo-mineral?

Technically, pure minerals are not organic because they don't contain a carbon atom (scientific requirement of organic). But minerals mined from the earth and processed with specific natural methods, may be approved and accepted for organic farming. When processed this way and chelated in organic L-amino acids, we call this organo-mineral—the combination of organic and natural mineral components.

Why is the P separate from the K?

There is a lot of research to show that adding a powerful P/K booster increases the chance of mineral antagonism and lockout. Since plants don't need high quantities of both minerals at the same stage of growth, the unused minerals sit in the growing medium. But they are far from inactive. When unused, these minerals are chemically very active and combine and repel other minerals. In even a short time this can cause problems of deficiencies and lockout. A better way is to provide the plant precisely the nutrients it needs at the right time.

Can I add another P/K booster to increase yield?

No. Adding another chemical (or natural) P/K booster on top of the base Aptus feed schedule is almost guaranteed to cause antagonism, deficiency, or overdose of these minerals. There is such thing as too much. In this case less is better.

Seems like the phosphorus levels are low compared to other P/K boosters?

True PeakBoost numbers are lower than many products on the market. When the minerals are organically chelated, they are 100% bioavailable and resistant to antagonism and lockout. This means you ultimately need far less input, which saves money and the environment.

Why is there urea in PeakBoost?

Urea is a byproduct of our natural processing of phosphoric acid and is important to stabilize the solution. The urea is a source of direct available nitrogen and completes the formulation of PeakBoost.

NOTES

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

MASSBOOST
BUD BOOSTER

MassBoost is an organo-mineral plant booster that prevents Calcium (Ca) and Magnesium (Mg) deficiencies while stimulating powerful fruit set and development.

Calcium and magnesium are very active molecularly and are easily locked up or combined with other minerals in the growing medium. Both minerals are extremely important for floral and fruit set and development. MassBoost provides both minerals in a highly bioavailable form by chelating in L-amino acids. The L-amino acids also help to minimize antagonism with other minerals in the growing medium.

MassBoost is effective when applied to the roots in a feed solution. It is also very effective as a foliar treatment either as maintenance or to treat deficiencies. The L-amino acids help make the minerals easily absorbed into the leaf tissue.

Why Use MassBoost

- Provides organic Nitrogen combined with Calcium and Magnesium and L-Amino Acids that stimulate plant development
- 100% water soluble and leaves no residue
- Combines Calcium (Ca) and Magnesium (Mg) with L-Amino Acids to eliminate deficiencies
- High bioavailability
- Improves structure and firmness of the flower and fruit
- Provides the extra boost plants need during certain plant development phases

MassBoost Key Ingredients

- L-amino acids, which provides organic nitrogen (N)
- Calcium (Ca)
- Magnesium (Mg)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Calcium (Ca)	Calcium Nitrate	7%
Magnesium (Mg)	Magnesium Nitrate	1%
Nitrate Nitrogen (NO_3)	Calcium Nitrate Magnesium Nitrate	5%

Using MassBoost

At minimum add MassBoost to your reservoir during weeks 3, 5, 7, 8 of the flowering stage. Sometimes additional calcium/magnesium supplementation is necessary during vegetative and early bloom stages. If needed MassBoost should be used at a lower dosage or as a foliar spray.

When mixing with any phosphorus supplements (like PeakBoost), be sure to allow one to mix in the solution before adding the other to minimize the formation of calcium-phosphate bonds, which renders both unavailable to the plant.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding (vegetative)*	2.5-5ml per 5 gallons
Regular feeding (flowering)	5-10ml per 5 gallons
Foliar spray (maintenance)	2.5ml per liter, 10ml per gallon
Foliar spray (repair)	5ml per liter, 20ml per gallon

*Take care when using MassBoost on young plants because the nitrates (along with other nitrates from your base fertilizer) can cause tip burn and stress. If this is the case use a CaMg supplement without nitrates to buffer RO water.

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.
- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Both minerals are important to photosynthesis, especially when combined with L-amino acids
- Calcium is deposited in cell walls to improve structure, dry weight, and firmness of fruits and flowers
- Calcium is responsible for fruit set and floral development. Many fruiting and flowering crops drop their blossoms when calcium is deficient or unavailable.
- Calcium activates various enzymatic activities which are precursors to many other plant processes
- Higher levels of Ca and Mg help raise internal plant pH to resist fungal attacks

Tips from the field

- Use MassBoost in combination with PeakBoost & FinaleBoost in the last weeks to get maximum weight, firmness, and quality.
- Pay attention when you mix PeakBoost and MassBoost as they can react together. Always add one, dilute and mix then the other. In case you use a lot of Phosphorus based products, then take care when adding MassBoost as Phosphorus and Calcium mixed together in high concentrations may cause deposits and residues.
- MassBoost contains low levels of nitrates that can sometimes cause tip burn if fed at too high of rates on young or weak plants. If you use MassBoost during early growth, start with a lower dosage and work up to full dosage based on your plant's response.

MassBoost Q&A

My base nutrient has a lot of calcium already, do I need MassBoost?

Most bases with high Ca and Mg are in salt form and are usually enough for early stages. We still recommend MassBoost in bloom as this is effective at increasing mass, firmness and quality factors. MassBoost is also in a 'softer' form because the calcium and magnesium are combined with L-amino acids which makes them more bioavailable and less likely to combine with other minerals in the soil. The L-amino acids help plants assimilate and transport the minerals more easily.

If you need additional calcium or magnesium because of a deficiency or lock up, MassBoost is a highly effective foliar spray. This method of delivery is faster than by the roots.

I'm using reverse osmosis water, should I still add my regular CaMg at the beginning?

When using RO water, you can add some Ca and Mg in order to create a buffer. Adding bioavailable Ca and Mg with MassBoost, will avoid antagonism with potassium and balance the nutrition in critical stages of plant development. In early stages of growth the nitrates in MassBosot can burn tender plants. It may be a good idea to use another CaMg booster as a buffer--one with minimal or no nitrates.

Why foliar feed with MassBoost?

MassBoost is used effectively as a foliar feed on many crops like strawberries and apple trees. Some Ca and Mg products are too harsh to use as a foliar feed. But this can be a very effective way of correctly a deficiency more quickly than feeding by the roots. Always test on a single plant before treating a full garden though.

I'm using coco, do I need extra MassBoost?

Probably not extra, though every situation is a bit different. Most growers using coco have good results at the recommended dosage. And depending on your base fertilizer, you may want to supplement with another CaMg earlier in the vegetative phase.

I thought nitrates are bad, why does MassBoost have them?

Some nitrates are okay. It's one of the main ways plants absorb nitrogen! Where we get in trouble with nitrates is applying too much. Nitrates are salts and in higher doses can cause tip burn in young plants, stress in older plants, fast and weak vegetative growth, and nutrient antagonism. Typically the dosage of MassBoost is so small that the nitrates do not cause imbalance.

With MassBoost it is especially important to watch the dosage. Full dose (2ml per gallon) should only be applied to large healthy plants. Tender young plants can burn with too high of nitrate application. Use only 0.5-1 ml per gallon on younger plants. And once per week application is usually plenty.

Do I need MassBoost with dechlorinated tap water?

You may. Some tap water has sufficient levels of calcium and magnesium already but may not be in available form. If in doubt use a lower than recommended dose and read the plant. This also depends on the Calcium levels in your base fertilizer.

Why isn't MassBoost used every feeding?

As mentioned before, the nitrates in MassBoost may cause tip burn in younger plants, so we caution against its use early in growth. During the bloom phase, we recommend skipping weeks 4 and 6. This is to temporarily 'starve' the plant as a positive stress technique. Some growers report seeing yellowing in the leaves during these weeks. In most cases it will correct once fed with MassBoost. You may still feed during these 'off' weeks if the yellowing is a concern.

NOTES

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

FINALEBOOST
MATURATION BOOSTER

FinaleBoost is an organo-mineral maturation and finishing booster. FinaleBoost is an essential component to finishing a crop with firm and high quality end product. It contains organic L-amino acids combined with natural potassium and sulfur. Potassium is needed in higher quantities toward the end of the blooming stage.

Potassium tends to combine with other minerals and become unavailable to plants. This results in deficiencies and mineral antagonism in the medium. By combining with organic L-amino acids, the potassium is buffered and protected from these mineral interactions. This ultimately means you can use far less fertilizer input and achieve the same or better results. Sulfur is an essential element in all plant cells, amino acids, and many flavors and quality compounds.

FinaleBoost is a better option than many combined P/K boosters because it allows the targeted application of potassium when and where the plant needs. Often when P and K are added in high quantities at the same time, one or the other remains unused in the medium. This can cause antagonism, chemical binding, and nutrient lockout.

FinaleBoost can be viewed as a finishing product that is used in the final stages of flowering. FinaleBoost is 100% soluble in water and doesn't leave residue in reservoirs and irrigation systems.

Why Use FinaleBoost

- Stimulates fruit and bud maturation
- Firmer and more nutritious end product
- Improves crop quality by increasing production of sugars and amino acids
- Minimizes antagonism and lockout of potassium with other nutrients
- Powerful stimulating effect on the blooming and finishing process
- 100% water soluble and organo-mineral leaving no residue

FinaleBoost Key Ingredients

- L-amino acids, which provides organic nitrogen (N)

- Potassium (K)
- Sulfur (S)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Soluble Potash (K_20)	Potassium Thiosulfate	16%
Sulfur (S)	Potassium Thiosulfate	10%
Urea Nitrogen (N)	Urea	3%

Using FinaleBoost

At minimum add FinaleBoost to your reservoir weeks five through eight of the flowering stage. With some plants you may be able to use FinaleBoost at rates 2-3x higher than recommended to increase weight and quality during finishing. Always test on a few plants before applying at these rates.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Regular feeding	6-20ml per 5 gallons
Foliar spray (maintenance)	2.5ml per liter, 10ml per gallon
Foliar spray (repair)	5ml per liter, 20ml per gallon

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.

- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Potassium improves the water management in plants (osmoregulation). When Potassium is deficient, stomata don't work properly and the plant loses water.
- Potassium also improves starch and protein synthesis.
- Potassium regulates opening of the stomata and enzyme activity.
- Sulfur is used in the maturation process and increase weight.
- Nutrients are organically chelated using L-amino acids.

Tips from the field

- Use higher dosages of FinaleBoost during the last 3-4 weeks of flowering to enhance yield and firmness of end product.
- FinaleBoost may be used as a foliar to provide direct fertilization by leaf.
- Use in combination with MassBoost to bulk up weight and firmness and to help avoid antagonistic action between K and Mg.
- Extend or shorten the usage of PeakBoost based upon the total flowering time of your specific plant

FinaleBoost Q&A

What is organo-mineral?

Technically, pure minerals are not organic because they don't contain a carbon atom (scientific requirement of organic). But minerals mined from the earth and processed with specific natural methods, may be approved and accepted for organic farming. When processed this way and chelated in organic L-amino acids, we call this organo-mineral—the combination of organic and natural mineral components.

Why so much sulfur?

Sulfur is a secondary element needed for almost all biological processes within a plant. In healthy soils, sulfur is usually available in high amounts and is not needed as supplementation. You may see only minimal or moderate levels in other boosters. AS

with other minerals, we want to assure that sulfur is bioavailable and ready for immediate uptake when the plant needs it.

Why is the K separate from the P?

There is a lot of research to show that adding a powerful P/K booster increases the chance of mineral antagonism and lockout. Since plants don't need high quantities of both minerals at the same stage of growth, the unused minerals sit in the growing medium. But they are far from inactive. When unused, these minerals are chemically very active and combine and repel other minerals. In even a short time this can cause problems of deficiencies and lockout. A better way is to provide the plant precisely the nutrients it needs at the right time.

Can I add another P/K booster to increase yield?

No. Adding another chemical (or natural) P/K booster on top of the base Aptus feed schedule is almost guaranteed to cause antagonism, deficiency, or overdose of these minerals. There is such thing as too much. In this case less is better.

Seems like the potassium levels are low compared to other P/K boosters?

True FinaleBoost numbers are lower than other products on the market. When the minerals are organically chelated, they are 100% bioavailable and resistant to antagonism and lockout. This means you ultimately need far less input which saves money and the environment.

Why is there urea in FinaleBoost?

Urea is a byproduct of our natural processing of potassium thiosulfate and is important to stabilize the solution. The urea is a source of direct available nitrogen and completes the formulation of FinaleBoost.

NOTES

PACK SIZES AVAILABLE
250 ml, 500 ml, 1 liter, 5 liter

ECOZEN

ENZYME AND MICRO-LIFE BOOSTER

Ecozen is a powerful blend of enzymes that have different functions. Like Ecozen, most enzyme products contain enzymes that keep the root surface clean, remove dead organic matter and root residues. This is an important function to healthy soil, rhizosphere, and maintaining active nutrient uptake.

Ecozen also contains enzyme complexes that transform accumulated or precipitated salts into usable plant nutrients. This helps to stabilize EC in the medium and improves the plant's natural ability to absorb more nutrients while avoiding nutrient build up that can cause antagonism, lock up and pathogen problems in the root system.

Overall Ecozen is an effective root and soil conditioner that works in conjunction with microbial life and bioavailable nutrition. Ecozen also contains a small amount of manganese, which stimulates micro-life, which in turn help further breakdown and recycle the material broken down by the enzymes.

Why Use Ecozen

- Grow mediums can be used longer and for multiple cycles (less medium replacement saves cost and work)
- Stabilizes EC in mediums and prevents salts accumulation and excess of nutrient salts (decreases nutrient lock up)
- Can fertilize later in the cycle without risk of built up salts affecting flavor and quality
- Keeps root system and medium clean (improves absorption, reduces residues)

Ecozen Key Ingredients

- Cellulase and beta-glucanase enzyme complexes
- Blend of sugar complexes (polysaccharides)
- Manganese (Mn)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Nitrate Nitrogen (NO_3)	Potassium Nitrate	0.05%
Soluble Potash (K_20)	Potassium Nitrate	0.02%

Using Ecozen

Add Ecozen to your nutrient mixture every feeding during all stages of plant growth to keep the medium clean and healthy. Ecozen may also be applied at double strength once per week if desired. Do not allow Ecozen to sit in a reservoir with nutrients for more than a few hours—always add just before feeding.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
With every feeding	5ml per 5 gallon
Once weekly application	10ml per 5 gallons

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- As roots grow, some die off to make room for new growth. This forms cellulose (starchy plant matter) around the roots, which inhibits nutrient absorption and microbial development. The cellulase in Ecozen breaks down cellulose and keeps the roots clean.
- Beta-glucanase enzymes transforms precipitated nutrient salts into plant available nutrients helping to minimize build up and increase uptake.
- Manganese (Mn) stimulates micro-life and stabilizes the solution.

Tips from the field

- Reuse your grow medium for multiple cycles. Flush medium between cycles with a higher dosage of Ecozen to clean out dead plant material and accumulated nutrient salts.
- Do not leave a reservoir with nutrients and Ecozen for more than 2 days to avoid nutrient degradation. Ideally, Ecozen is added last to the nutrient solution, just before feeding.
- Enzymes start to work instantly, especially at temperatures higher than 68° Fahrenheit.
- Use Ecozen at least once a week to keep the root area clean and nutrient assimilation optimized.

Ecozen Q&A

Why can't I leave Ecozen in my reservoir?

Those enzymes that breakdown salts are even faster acting in a solution than in soil. If you leave Ecozen with nutrients for too long, there are complex chemical interactions that can degrade your nutrient solution and affect availability of the nutrients.

Is it better to use every feeding or only once per week?

This depends a lot on your personal situation and feeding habits. Most important is that you regularly apply Ecozen. Some growers work on a feed-feed-water schedule and use Ecozen during their 'water' application. Some prefer the simplicity and consistency of adding every feeding. Both methods are effective if done consistently.

How do I know Ecozen is working?

Sometimes you may not see a visible effect in your plants when using Ecozen. You should notice less salt build up in the medium and healthier roots. You can run a simple test to see Ecozen working. Fill a clear glass with clean water and add Ecozen. Drop in a piece of paper, apple, or cat food. Within a couple hours most of the added material should be dissolved and settled to the bottom of the glass.

NOTES

PACK SIZES AVAILABLE
1 kg, 10 kg

BASEBOOST

COMPLETE TIME-RELEASE FERTILIZER PELLET

BaseBoost is a time-release 100% organic pellet fertilizer that provides complete nutrition for plant development for up to 3 months. Each application lasts 2-3 months and can be reapplied for longer cycles. It is special formulated with macro-nutrients and micro-nutrients, L-amino acids and bio-stimulants to enhance plant development over a period of time.

BaseBoost is effective standalone as a complete fertilizer for the grower with little time or trying to simplify the work of growing. For advanced growers looking to maximize yields, BaseBoost is an effective replacement for a typical base NPK nutrient in combination with the rest of the Premium Collection boosters.

You can apply BaseBoost during transplanting by mixing into the growing medium or as a top dressing to extend the growing cycle (especially outdoor applications).

Why Use BaseBoost

- Simple and complete 100% organic plant nutrition – nothing else but water is required for a 3 month cycle, vegetative and flowering
- Complete formulation reduces fertilizer input and work
- Easy to use – application is once every 2 to 3 months simply by mixing in the pellets or topdressing and watering in.
- Perfect for remote locations and long lasting crop cycles
- Provides organic nitrogen and L-amino acids that stimulate plant development
- Helps condition soil, improves plant development, and stimulates micro-life
- Long shelf-life if properly stored

BaseBoost Key Ingredients

- L-amino acids, which provides organic nitrogen (N)
- Primary macro-nutrients: nitrogen (N), phosphorus (P), potassium (K)
- Secondary macro-nutrients: Calcium (Ca), Magnesium (Mg) and Sulfur (S)

- Organically chelated micro-nutrients such as, Boron (B), Iron (Fe), Manganese (Mn), Zinc (Zn)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Nitrogen (organic)	Protein Hydrolysate	6%
Available Phosphate (P_2O_5)	Bone Meal	3%
Soluble Potash (K_20)	Potassium Sulfate	14%
Calcium (Ca)	Dolomite Lime	8%
Magnesium (Mg)	Dolomite Lime	1%
Sulfur (S)	Potassium Sulfate	4%

Using BaseBoost

Application is incredibly simply. You can either mix in to your soil or planting hole prior to transplanting. Apply with water only or add boosters for greater effect. Base-Boost is effective and safe even for young plants. BaseBoost can take a week or two to fully kick in so it's a good idea to use FaSilitor and StartBoost at the beginning to a faster start.

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Short crop cycle (1-3 months)	100 gm (1/3 cup) per plant
Long crop cycle (3-6 months)	200-300 gm per plant

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Organic Nitrogen provided by L-amino acids promotes robust vegetative growth and photosynthesis without risk of burning or overdose. Read more on L-amino acids under Core Product Technologies.
- Full spectrum organic L-amino acids provide growth materials, plant and microbe bio-stimulation, and boost beneficial bacteria populations.
- Complete time-released nutrition feeds plants as they require the nutrients rather than force feeding with chemical salts
- L-Amino Acids stimulate natural plant processes and growth, including stimulating soil micro-life.
- Complete nutrient profile minimizes plant stress due to environment, pests, and pathogens. Healthier plants means greater yield and quality.

Tips from the field

- Use more pellets for sandy soil (200 grams per plant) than for clay or heavy soil (100 grams per plant), per cycle (2-3 months).
- If your cycle is longer than 3 months, apply a second treatment as topdressing and water from the top, or mix pellets into the top couple inches of soil.
- In case of deficiencies, simply add more pellets as topdressing and water from the top. The pellets will be solubilized and the nutrients assimilated by the plant.
- Mix into the ground during soil preparation or simply place at the bottom of each planting hole.
- For better results outdoors, use with FaSilitor, StartBoost, and NutriSpray.
- For better effect indoor in pots, use with all Boosters (StartBoost, BloomBoost, Peak-Boost, FinaleBoost).

BaseBoost Q&A

How do I know how much to use?

How much is needed depends on plant size more than anything. The base dosage recommendation is 100 grams to feed a 3-4 foot tall plant in a 5-7 gallon pot. Use this as a guide and scale up or down based upon your specific situation.

Large outdoor plants may need 300-500 grams per cycle (two feedings on longer cycle) depending on the finished size.

Does it really last three months?

Yes. Many time-release fertilizers are salt based and flush away or become unavailable within only few weeks. BaseBoost uses L-amino acids to minimize this antagonism and adverse chemical reactions. That means the nutrients stick around for longer in bio-available form. For cycles longer than three months we recommend a second dose at about month 2.5.

Is it better to pre-mix in the soil or top dress?

If you are transplanting we recommend mixing in. This assures even distribution of the nutrients. Top dressing is still effective but may take a bit longer to start working fully. Most tests we've performed show about a 2 week lag when top-dressing.

What kind of growing medium should I use?

It's usually best to use the medium you already use. Or pretty much any pre-mixed soil or coco is good. For large outdoor crops, some like to add in soil amendments like activated charcoal, worm castings, peat, etc. Healthy soil is an important starting point for any application so generally these are good practices. Where problems can occur is when using high nutrition amendments like guanos and other fertilizers. These potentially cause overdose or lock up of certain elements.

Can I dissolve the nutrients in water and then feed?

Not a good idea. BaseBoost is not 100% soluble in water and wouldn't mix well. Some plants would get too little and others too much. It would be messy and affect the time-release effect.

Will BaseBoost burn young plants?

No. It's 100% organic and safe for all size plants! In Europe some nurseries press 2-3 pellets into a starting cube along with a seed. The seed sprouts and has immediately available nutrition and stimulation.

Can I use BaseBoost in my indoor garden?

BaseBoost is ideal for outdoor applications, though it can be used as a simple feeding method for the busy or inexperienced grower indoors. You will have healthy plants, but on its own, BaseBoost will not achieve massive yields. We recommend supplementing with other boosters and additives to achieve desired yield.

For an outdoor application, how often should I use other boosters?

Many outdoor farms are quite large and using the boosters with every feeding can be costly. Plus there are a lot of variables that drive water usage and nutrient persistence, like temperature, humidity, soil structure, and plant type. Generally speaking if you are using BaseBoost mixed in your soil or top dress throughout the entire cycle, applying the boosters once per week should be sufficient. Or use the boosters as a foliar.

What other products can I add with BaseBoost?

You usually won't need any additional NPK fertilizer since BaseBoost provides sufficient base nutrition. You can effectively use all the Aptus boosters as well. The great part about BaseBoost is its effectiveness completely on its own. Adding the boosters in addition will help to increase bulk and yield.

NOTES

NOTES

PACK SIZES AVAILABLE
250 ml

NUTRISPRAY

MICRO-ELEMENT FOLIAR FERTILIZER

NutriSpray is an organic micro-element foliar fertilizer. It is used to provide essential micro-elements during the complete growing cycle. NutriSpray can be used for general nutrition or for deficiency correction.

Many outdoor growers use NutriSpray through the vegetative and blooming cycle to correct common deficiencies in outdoor growing environments. NutriSpray is needed infrequently, which makes its application simple and cost effective.

While some foliar sprays are designed to show an immediate change like 'greening up' of the leaves. NutriSpray is intended more as a micro-element prevention and corrective solution. If your plants are already healthy, you may not see dramatic physical changes, but NutriSpray is still working to prevent—think vitamins versus drugs.

Why Use NutriSpray

- Leaves an active layer containing micro-elements on leaf surface
- Layer fully biodegrades within 10-15 days
- Fast-acting nutrient absorption
- Quickly treat common micro-element deficiencies

NutriSpray Key Ingredients

- Organic surfactant
- Horse chestnut extract
- Sulfur (S)
- Micro-elements
  - Manganese (Mn)
  - Zinc (Zn)
  - Iron (Fe)
  - Molybdenum (Mo)

GUARANTEED ANALYSIS		
Nutrient	**Source**	**Amount**
Sulfur (S)	Ferrous Sulfate Manganese Sulfate Zinc Sulfate	1.0%
Manganese (Mn)	Manganese Sulfate	0.4%
Zinc (Zn)	Zinc Sulfate	0.4%
Iron (Fe)	Ferrous Sulfate	0.4%
Molybdenum (Mo)	Sodium Molybdate	0.4%

Using NutriSpray

Mix NutriSpray alone in clean water. No addition surfactant is needed. Never use at full strength. Spray lightly on leaf surface (top and bottom). Best to spray at night, early morning, or with lights off. It's a good idea to treat a small area first to make sure your plants respond properly.

Indoor: Spray during weeks 1, 3, 5 of flowering

Outdoor: Spray 1 week after transplanting and repeat once per month until finish

DOSAGE INSTRUCTIONS	
Feeding Type	**Amount**
Foliar application	1.5-2ml per liter, 6-8ml per gallon

Use the online nutrient calculator for weekly feeding recommendations at: www.aptus-usa.com/nc

Education

- Horse chestnut extract binds to the micro-elements to make them more available for transport into the stomata. It also thins the vascular fluid (plant sap) to help nutrients transport through the tissue faster.
- The organic surfactant creates a protective shield so nutrients stay on leafs up to two weeks

Tips from the field

- Use primarily as a preventative against micro-nutrient deficiencies
- Spray three to four times per cycle for general nutrition (weeks 1, 3, 5 of bloom)
- Spraying too often can have a negative effective because NutriSpray stays on the leaf surface for up to two weeks
- If micro-element deficiencies appear, apply for faster correction than root feeding
- Spray mother plants one week before cutting clones for healthier cuttings
- Spray cuttings once per week to provide a protective shield and available nutrients

NutriSpray Q&A

Why don't I see any visible effect after spraying?

Some foliar sprays have hormones and other stimulants that create an immediate visible effect. When used as a preventative, you may not see a visible change. That's good though because it means your plant is healthy! Think of it like taking vitamins: if you're already healthy, you may not feel a lift from the vitamins. You are more likely to see a result if there is a visible deficiency occurring. What you should see is the protective layer on the leaf that allows better and longer uptake availability of the micro-elements.

Should I spray every day when misting my clones?

No. This can actually cause problems because NutriSpray stays active on the leaf surface for up to two weeks. Spraying too often can create an overdose of micronutrients.

If I spray later in flower will NutriSpray affect the flavor of my crop?

Not likely. And you probably won't see any benefits from spraying after weeks 5 or 6 if you've already been using NutriSpray through the cycle.

Can I still spray with other foliar product like sea kelp?

Sea kelp and other foliar feeds usually serve a different purpose than NutriSpray. Often they contain natural or artificial hormones and stimulants. Sometimes, especially with artificial compounds, these stimulants can work against good things added by Aptus. Always be cautious and try not to overdo foliar feeding. Since NutriSpray persists on the leaf, if you spray something else you may wash off the NutriSpray.

NOTES

QUESTIONS & ANSWERS

What makes Aptus different than all the other nutrient brands?

Aptus plant nutrition began in the large-scale commercial agriculture market where results and pennies matter. Crop farmers have a lot to lose if something doesn't work. Changing methods is also a very costly endeavor because of equipment, time, and investment. Most farmers will only change their methods when they see drastic difference in results.

We looked at natural soil and plant processes and replicated the form and quantities of minerals. Top universities and researchers took thousands of plant tissue and soil samples to find the proper balance of nutrients that maximizes the uptake, internal transport, and usage of those minerals.

Proper nutrition is not just having the necessary minerals mixed together. Most important to healthy, vital, and productive plants is the balance and bioavailability of nutrients. With Aptus you are able to use far less fertilizer because all the minerals are chelated in L-amino acids rather than synthetic chelates the plant can't recognize.

Several of the technologies used in Aptus nutrients are unique and patented. We didn't invent the technologies; nature invented them millions of years ago. Our research simply identified the natural processes and how to practically apply them more quickly.

Why should I switch if I'm already getting great yield and quality?

Aptus is not for everyone. If you truly have no issues in your garden and consistently get incredible yields using minimal cost fertilizers, perhaps you should stay the course.

But in our experience, every grower has some sort of issue they deal with regularly—perhaps pests, mildew, pathogens, deficiencies, or simply the cost of their nutrients.

Every grower has different goals, skills, and challenges. If expensive nutrients are lowering your profitability, Aptus can likely save you money due to product concentrations. If you experience occasional deficiencies or plant health issues, the balanced nutrition of Aptus Boosters will maintain plant health throughout the cycle. If you face regular pest and disease attacks, Aptus helps increase internal Brix and pH levels, which naturally aid in pest and disease resistance.

Most important, is testing. Every great grower knows they don't know everything. Aptus is new nutrition technology to most people. Belief comes from experience. If you are good enough to consistently get amazing results, there's still a good chance Aptus will help you improve something, whether yield, quality, or cost. Try it; test it; tell us what you see.

What base NPK nutrient do you recommend?

We don't. Aptus boosters are compatible with any base fertilizer so it's better to use what you are accustomed to using. If you switch to an unknown fertilizer (from 2-part to 3-part), you'll run more risk of issues. It's better to stick with what you know.

We have good reports from virtually all the brands on the market. The choice comes down to preference: organic versus synthetic; 1-part, 2-part, 3-part; etc.

Most important consideration is the dosage used. Most growers are accustomed to mixing at specific PPM/EC each week. Because Aptus boosters register very low (minimal salts) your PPM/EC is going to be much lower than usual.

We recommend following the manufacturers recommended dosage for the base fertilizer but cut by 30-50%.

I'm seeing a little tip burn; why is that happening?

Tip burn most often comes from chemical fertilizer salts dehydrating cells in the growing tips of plant leaves. This is a sign of stress and overdose. If you are using Aptus according the feed schedule combined with your base NPK fertilizer of chose, burning is not likely. But there are a couple situations that may cause tip burn.

1) Too high levels of your base nutrient. Most Aptus boosters have a minimal effect on EC/PPM so usually the base nutrient levels are too high. FaSilitor increases the uptake and availability of other nutrients. And if you are using a base NPK fertilizer at too high of levels (particularly salt-based), you may see burning because of the enhanced uptake. Lower your EC/PPM levels and it should stop.
2) MassBoost contains some nitrates and has been reported to cause tip burn in younger plants. If you use MassBoost during veg or your plants are sensitive to salts, use a lower dose of MassBoost. 0.5 – 1 ml per gallon should stop any tip burn issues. This is especially likely if your base nutrient also contains nitrates and other salts.

What if I just use one or two of the products with my current recipe?

This is NOT recommended. And this is true of any well-researched complete nutrition line. Most manufacturers have created their nutrients to work together in a synergistic way. Mixing and matching breaks this synergistic effect.

Aptus has invested millions of dollars with top agriculture universities and research facilities to find the precise balance and format of nutrients and beneficial microbes. If you start mixing and matching nutrients from other manufacturers, you are guaranteed to create imbalance through overdose and deficiencies of certain ingredients. Imbalance stunts plant growth, invites pest and disease attacks, and lowers quality of end product.

Which products are good to try standalone with other nutrient lines?

FaSilitor increases the availability, mobility, and uptake of nutrients. It also benefits plants by depositing silicon in cell walls, increasing stress resistance, stimulating immune response and creating more dry weight. The silicic acid in FaSilitor is the only form of silicon that is bioavailable and is effective independently of the other Aptus boosters. FaSilitor will increase the effectiveness of any existing nutrient program.

StartBoost is a superior replacement for any root and growth enhancing product. It is part soil conditioner, root and growth stimulant, and microlife innoculant. It is highly concentrated and very bioactive. Visible effects are seen in early vegetative growth. There is nothing artificial or harmful like many synthetic products.

MassBoost is our calcium/magnesium booster. CaMg is a common deficiency in gardens so usually growers already use a CaMg product. MassBoost is an excellent replacement for any other CaMg supplementation. Because the minerals are chelated in L-amino acids, they are much more bioavailable and less harsh than many of the chemical salt products available. Try as a foliar to quickly correct deficiencies.

Ecozen contains mutiple enzyme complexes to break down dead plant tissues (cellulase digests cellulose) and break down mineral salts (beta-glucanase). If you have high levels of residual salts Ecozen will work to help clean your growing medium. Ecozen also contains polysaccharides to feed and stimulate your soil micro-life. This can be used as a straight ***replacement*** of any other enzyme product.

Can I switch to Aptus mid-bloom cycle?

This is NOT recommended. It's impossible to know exactly what minerals and micro-life already exists in your growing medium without soil testing. Changing nutrients mid-cycle may create unexpected problems. It's better to stick with your current recipe and finish out a cycle before switching. In fact, introducing new nutrients of any kind mid-cycle is often the cause of new problems.

Aptus nutrition is designed to build healthy plants from the beginning to prevent problems from ever occurring. If you are already experiencing major issues in your garden, Aptus may help correct them. If you are later in your cycle with major problems, it's difficult to correct with any nutrient. It's always easier to keep a plant healthy than make a sick plant healthier.

The only exceptions are FaSilitor, MassBoost and Ecozen since they may be used effectively to address specific problems or needs. FaSilitor can help correct nutrient imbalance and deficiencies in plants by creating a more effective transport mechanism. Ecozen is a more effective and diverse enzyme booster. MassBoost is an excellent direct replacement for chemical CaMg supplements, especially as a foliar.

The best approach to assure optimal plant health and results is to start new plants with Aptus and use it through the entire cycle. Even better, perform a side-by-side test with your current recipe and Aptus to see the actual difference. If you really want to see the powerful change Aptus can bring, you need to start early and follow the feed schedule.

How will Aptus nutrients affect my pH?

It's always important to insure your feed water's pH is at the proper level for your growing medium. Some of the boosters will raise and lower your pH slightly due to the organic compounds and other ingredients.

PeakBoost contains organic acids and can be used as a pH down solution that also adds bioavailable phosphorus and L-amino acids. FaSilitor has a down effect, especially in RO water. MassBoost and FinaleBoost have a slight pH up effect.

If your pH lies outside of the desired range after completely mixing your feed water, it's best to use a mild pH up or down since harsh acids and bases can affect micro-life in the mix.

What kind of water is best to use with Aptus?

Bare minimum you should use dechlorinated water since the levels of chlorine in tap water will kill micro-life. You may also use reverse osmosis water. Aptus growers using both types of water report good results.

If I'm using RO water do I need to add a CaMg supplement?

Depends. Most soil products contain adequate levels of calcium and Aptus FaSilitor helps unlock and transport available calcium. MassBoost is a CaMg booster but is generally only needed to aid fruit and flower development. Many quality base NPK nutrients also contain sufficient levels of calcium and magnesium for earlier growth.

If you are using an inert medium such as rockwool or coco coir, you won't have any existing Ca or Mg in the medium. Dechlorinated tap water often contains enough to satisfy young plant growth (levels higher than 300 PPMs should be further purified). If using reverse osmosis water in inert mediums, you may want to include a mild dose of MassBoost once per week during veg (unless your base contains Ca/Mg). You can also use another CaMg product to buffer your RO water.

As always, monitor your plant's health before adding anything not on the main feed schedule.

What should be my PPM/EC levels?

This is a difficult question to answer because there are many factors at play: growing medium, plant strain, light levels, growing method, temperatures, water usage/source, etc.

Generally, you will need much lower PPM/EC levels than you usually use. Most Aptus boosters have minimal effect on PPM/EC levels due to the organic ingredients. Many Aptus growers report PPM/EC levels 30-50% less than with previous recipes.

Most of your PPMs will come from your base NPK fertilizer. We recommend following the usage instructions on the bottle or feed schedule from the base NPK manufacturer. And when starting young plants for the first time, cut the base NPK recommendations by 30-50% and see how the plant responds.

Remember that balance is more important than quantity. High PPMs are usually necessary if the nutrients are not bioavailable. When nutrients are properly and naturally chelated, plants better utilize and thus, need less. Also if you have salt build up, you probably are feeding too much.

When using a pure synthetic base fertilizer your **PPMs should not go over 1100** in peak bloom. This will be much lower if using an organic base fertilizer.

Why do I use so little Aptus in my mix?

Aptus boosters contain active ingredients and no added water. This means you need smaller doses than other products. Also, all the minerals in Aptus products are naturally chelated and fully bioavailable. Plants are able to uptake and utilize more of the nutrient material you add, so you need far less to feed your plants the same.

Why does it cost so much for a small bottle?

All Aptus nutrients are extremely concentrated. We don't add any water to dilute the active ingredients. Instead we use plant available L-amino acids. This means every drop is active material the plant uses to build itself. It also means that you only pay for beneficial ingredients rather than very expensive water.

All of our ingredients are pharmaceutical or food grade and manufactured under Good Manufacturing Processes (GMP) to assure purity and consistency. We always choose the most pure sources of ingredients (minimal contaminants), which contain properly structured minerals for the best compatibility with plants.

For example, our source of L-amino acids is natural, organic and approved for food production (and human consumption). They are produced through enzymatic hydrolyzation, which is a natural process that creates a complete profile of all essential amino acids. More importantly, the amino acids produced are left-turning, which is the only form that is recognized and used by nature.

These manufacturing methods are not cheap. But they are the best and most reliable.

Can I add a sweetener product or a sugar like molasses?

Many growers like to add lots of "sweeteners" to their mix because it is reputed to increase sugar production and flavor profiles in the plant. This is not really true. Plants rarely absorb sugars from outside sources. Plants produce their own sugars via photosynthesis. These sugars are used for energy and other processes within the plant tissue. Leftover sugars are secreted through the roots to feed microbes…this is the primary benefit of adding additional sugars to your feed mix. If a plant is healthy and properly mineralized, more sugars are not needed.

Adding sugars is only beneficial to the micro-life. Improved micro-life enhances mineralization and thus higher brix and better flavor. So it is an indirect effect and not what many sugar-based products claim: that it improves taste and flavor directly, as sweeteners are not assimilated by plants.. Also, some sweetener products contain hormones, PGRs and other unlisted synthetic stimulants that can create more imbalances in plant health.

BloomBoost and Ecozen contain high-quality polysaccharides, which are ideal food for your beneficial microbes so additional sugars are not needed.

Can I use a P/K bloom booster to increase yields?

These so-called “bloom boosters” are nearly always highly processed chemical salts that are not how nature prefers minerals. The high quantities of P and K are nearly certain to create imbalance and antagonism with other important bloom nutrients like Calcium and Iron.

Your plants will not suffer or see a decrease in yields without these “boosters”. Modern agriculture has taught us that we need high levels of certain nutrients to boost the plant growth. This has resulted in sick crops, depleted soil, pest and disease vulnerability, low nutritional content, and lack of flavor. Nature teaches us that balanced levels and bioavailability of nutrients is what truly helps the plant maximize genetic potential.

PeakBoost (P) and FinaleBoost (K and S) contain ideal levels of bloom enhancing minerals that are chelated in L-amino acids to make them immediately bioavailable to plants. We have split P and K into two products since plants require different levels of these minerals at different stages. This allows more targeted feeding for different plants.

Can I use compost teas?

Our recommendation is NO for most situations. Not because we don’t like compost teas. Rather, this practice introduces unknowns into the growing environment. It makes troubleshooting quite difficult. This is probably okay, though Aptus is formulated to be 100% complete nutrients and necessary micro-life. You don’t need to spend the extra money and effort on compost since Aptus boosters already perform the same functions.

If you are going to supplement with a compost tea, make sure it does NOT contain nutrients, such as guanos and other fertilizers. If there are minerals in your tea, you run the risk of creating imbalance and mineral antagonism within your growing medium.

Rather, use straight compost teas, preferably from a reputable source to minimize risk of bad pathogens. These compost teas will have small amounts of natural fertilizer present but shouldn't cause any issue due to the low concentrations. The main goal of a compost tea should be to enhance the microbe life within your growing medium. This is most important in mediums that lack good microbe-friendly structure like rockwool.

Keep in mind introducing additional micro-life to a balanced system can have unwanted results. Micro-life competes for food and space. When they are focused on fighting for dominance, they ignore their more important functions like breaking down locked up minerals and organic matter to feed your plants. For example, during high activity, bacteria will use nitrogen for food rather than feeding to the plant, creating deficit in the medium.

Should I use an additional microbe product?

This should be no problem and can even benefit, depending on your plant and growing medium. Rockwool is notoriously bad at holding on to beneficial microbes. Re-inoculating is a good idea. StartBoost contains high populations of specific beneficial bacteria and BloomBoost feeds those microbes throughout the bloom cycle so you do not need supplements.

Also, sometimes these inoculants contain other ingredients (hormones, nutrients, etc.) that may cause negative or unexpected interactions in your medium. If you decide to supplement, choose a microbe product that is strictly microbes rather than a fertilizer supplement.

What is the best growing method to use with Aptus Boosters?

Drain-to-waste is hands down the most efficient and productive method. You'll use less water and see better yields and flavor. You should always mix fresh nutrients right before feeding. When nutrients are left standing for periods of time, there's increasing chance of minerals interacting, pathogens being introduced, and biofilm build up.

Fresh nutrients are always most effective. We prefer mix and feed immediately whenever possible. Using any kind of recirculating system with active biologicals can clog irrigation lines and develop biofilm build up unless you have a biofilter. You also run the risk of introducing pathogens to the system.

Flood-and-drain can work, but again, letting nutrients stand in a reservoir for longer than 3 days can get messy. This method tends to be wasteful as well.

Aeroponics and similar systems are not recommended since they can easily get clogged with the biological activity.

What is the best growing medium or system to use with Aptus boosters?

Ideal growing medium is a soil or soilless mix like coco. Use a high-quality mix from your local gardening center. If mixing your own, assure there is adequate drainage and aeration by mixing in perlite or clay pellets.

Aptus will work with any growing medium since the nutrients are properly chelated for immediate bioavailability. Some mediums like rockwool are not ideal since they don't retain and stimulate micro-life adequately.

Can I/should I reuse my growing medium?

Growers in Europe report that subsequent cycles with the same growing medium are more productive than the first. When Aptus has a chance to create a thriving and balanced ecosystem in the medium, it's a shame to throw it away after only one use.

Towards the end of your cycle, you'll want to introduce more carbon (usually from Humic and amino acids) to the medium. This will help enhance structure to hold on to micro-life. Also, use Ecozen to help break down any dead organic material (cellulose) and residual mineral salts. You can do it with soil, soilless mixes, perlite, and clay pellets. It's a good idea to lay the medium out, break up clumps, remove large root balls, and let it mostly dry out.

There is some risk. If you have issues with soil pests like aphids and fungus gnats, or pathogens, nematodes, etc. never reuse your medium. But if you have a healthy clean growing environment and medium, reusing you medium is a great way to cut costs and work. We've found that the use of the Aptus BaseBoost nutrient pellets can help a lot to maintain a good micro-life and nutrition balance in soil and coco. The pellets don't contain nutrient salts, but only organic NPK compounds combined with lots of L-amino acids. It is the best way to grow in an organic way and re-use your medium.

Should I flush my medium each week or at the end of my cycle?

Flushing is an interesting practice. It's intended to get rid of the built up salts which can negatively affect flavor and quality. More important to ask is, why are their built up salts? Perhaps the issue is over-fertilization with chemical salt-based fertilizers. If

there is proper balance of nutrients in bioavailable form, you shouldn't need to feed so much. Thus, lowering the need for any kind of flush.

Also, flushing washes out good stuff with the bad. You've spent a lot of time and money adding nutrients and micro-life to your soil, so why just flush it out? It is certainly okay to feed with just water occasionally to give the soil and plant a rest. But flushing is usually a wasteful practice and less necessary when using Aptus.

Some Aptus growers stop feeding with their base fertilizer 1-2 weeks prior to harvest but continue with the Aptus boosters through the end. Because there are none or a strict minimum of salts in Aptus products, this seems to enhance yield and quality without affecting flavor.

How often should I feed with Aptus?

Most successful growers feed Aptus with every watering. You should certainly use Aptus boosters every time you fertilize. Some growers prefer a weekly feed-feed-water schedule and this is fine also, though flushing is not necessary unless using a salty base fertilizer. It's very difficult to overdo with Aptus because the dosages are already low and the minerals are naturally chelated.

NOTES

APTUS 'EXTREME' FEED SCHEDULE

	PLANT GROWTH PHASE WEEK OF GROWTH	Vegetative All weeks	Bloom Week 1	Bloom Week 2	Bloom Week 3	Bloom Week 4	Bloom Week 5	Bloom Week 6	Bloom Week 7	Bloom Week 8	Bloom Final Week
1	Fill tank with fresh water	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
2	Add FaSilitor* - mix well	3ML/5G	3ML/5G	3ML/5G	3ML/5G	3ML/5G	3ML/5G	3ML/5G	3ML/5G	3ML/5G	
3	Add any base NPK nutrient and mix well	NPK BASE	NPK BASE	NPK BASE	NPK BASE	NPK BASE	NPK BASE	NPK BASE	NPK BASE	NPK BASE	
4	Check EC/PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	EC / PPM	
5	Add StartBoost* - mix well	5ML/5G	5ML/5G								
6	Add BloomBoost* - mix well			4ML/5G	4ML/5G	5ML/5G	6ML/5G	7ML/5G	8ML/5G	8ML/5G	
7	Add PeakBoost - mix well			6ML/5G	10ML/5G	12ML/5G	14ML/5G	16ML/5G			
8	Add MassBoost - mix well	2.5ML/5G	5ML/5G	5ML/5G	10ML/5G	10ML/5G	10ML/5G	10ML/5G	10ML/5G	10ML/5G	
9	Add FinaleBoost - mix well						6ML/5G	10ML/5G	15ML/5G	20ML/5G	
10	Add Ecozen** - mix well	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G	5ML/5G
11	Check pH (Hydro = 5.8, Soil = 6.2)	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
12	Nutrient mix is ready to use.	PREFERABLY USE NUTRIENT MIX IMMEDIATELY, BUT ALWAYS WITHIN 3 DAYS									

NOTE: ONLY USE THE "EXTREME" SCHEDULE ON HEALTHY AND VITAL PLANTS

* THESE PRODUCTS HAVE MINIMAL EFFECT ON EC/PPM READINGS

** ECOZEN MAY BE USED ONCE PER WEEK AT 10 ML PER 5 GALLONS. ALWAYS ADD ECOZEN JUST BEFORE WATERING.

CUSTOMIZE YOUR FEED SCHEDULE ONLINE: WWW.APTUS-USA.COM/CALC

PRODUCTS

RECIRCULATING HYDROPONICS SCHEDULE

HYDROPONICS WITH RECIRCULATING RESERVOIR

Aptus is not at its best when sitting in a reservoir for more than 3 days. Use these mixing instruction when running a 7 day reservoir. Our research shows that Aptus performs best in soil/ soilless media with freshly mixed nutrients. But creative growers are also getting excellent results in hydroponics. Use the weekly dosage recommendations on the Extreme Schedule.

MIXING & USAGE INSTRUCTIONS

Reservoir mixing

Follow the weekly dosage recommendations on the Aptus Extreme Schedule. Add boosters based on amount of water remaining in reservoir.

Foliar spray preparation

1. Add FaSilitor to clean water and mix well
2. Add other crop feeding or protection products and mix well
3. Adjust pH to about 5.8
4. Spray lightly with lights off

Mix base NPK fertilizer to desired strength in reservoir.

Foliar spray with FaSilitor at 1 ml per Liter, adjust to 5.8 pH. Use a sticker/ spreader for best results.

For reservoir changes longer than seven days, simply move Day 5 directions to the third from last day. For example, on a 10 day reservoir change, this would be done on Day 8.

Mix Aptus boosters into remaining reservoir water using weekly dosages on the Aptus Extreme Schedule (StartBoost, BloomBoost, PeakBoost, MassBoost, FinaleBoost).

Mix Ecozen into reservoir just before final feeding; use at double strength (2ml/gallon).

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7

LONG-CYCLE OUTDOOR CROP SCHEDULE

OUTDOOR CROPS (BASEBOOST + ADDITIVES)

Use this feeding schedule for outdoor fruiting and flowering crops with long growth and bloom cycles. This is strictly a baseline recommendation. Individual crops and varietals may require modifications to this schedule. This example is for 200 Gal pots.

Container Size	5 Gal	10 Gal	30 Gal	100 Gal	200 Gal
BaseBoost	100 gr	150 gr	300 gr	1 kg	2 kg

MIXING & USAGE INSTRUCTIONS

Reservoir mixing

1. Add FaSilitor first and mix well before adding other products
2. Add StartBoost and mix well
3. Adjust pH to about 6.2

Foliar spray

1. Add FaSilitor first and mix well before adding other products
2. Add PeakBoost, MassBoost or FinaleBoost and mix well
3. Add other crop feeding or protection product and mix well
4. Adjust pH to about 5.8
5. Spray lightly when sun is low in the sky