

Growing with ISP

Integrated Solutions for Improved Food Quality
with Environmental and Economic Sustainability

SUMMER 2016
Integrated Soil & Plant Technologies, Inc.

www.isptech.com



Summer
2016

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UPCOMING EVENTS

Aug 2, Twilight Tour,
PSU SE Research Farm,
Manheim, PA

Aug 4, Cushman Creek
Produce Walk
Middlefield, OH

Aug 10, 11, Garden Tours
Hutterite Colonies
Minnesota and S. Dakota

Aug 30, 31, Bejo Seed
Research Farm Tour
Geneva, New York

Summer has arrived, and fortunately the longer day length gives us almost enough time to get our daily tasks completed. Unfortunately the important word in the first sentence is "almost". Caring for our crops is a never ending task ... watering, ensuring nutrient is available at optimum levels, checking and preparing for potential disease and pest issues, harvesting produce crops.

At the end of the day, one can reflect that we completed most of our tasks, hopefully the important ones anyway. We go to bed tired, already thinking about what lies ahead tomorrow. The chores are endless ... but we embrace them with enthusiasm because we also have the opportunity to enjoy the feeling of accomplishment when we see the results of our labor. There is a very special feeling in agriculture; of being connected to our world in a manner that many people do not get to experience. And yes, it is worth all of the hours, the sweat, and the frustrations ... as we can see the results. The boxes of colorful and delicious produce, the bushels of corn, the bales of sweet hay. We know our work makes a difference, it's important and it's something that most simply won't do.

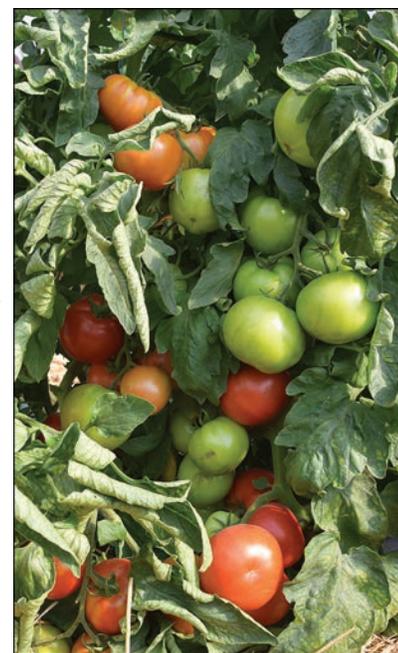
In growing produce we can also enjoy the smile on our customers faces, the light in their eyes as they tell us how much they enjoyed eating what we grew. So embrace the tasks, remain enthusiastic ... rest is only several months away.

2016 Horse Progress Review

ISP has enjoyed the opportunity to work with many Amish communities across the past several decades, and the Amish remain one of our most important growth areas. Many have embraced the opportunity of vegetable production, and have become very good at growing high quality tomatoes, peppers and other important vegetable crops. Yields are often impressive, and their desire to continually learn and improve is an important factor in their continuing success.

As part of this relationship, ISP has participated in their annual Horse Progress Days, often directly by supplying plant foods for the produce demonstrations. This year it was held in Howe, Indiana, and it may have been the most successful of all that we have participated in. It was reported that attendance was in excess of 20,000, and based upon the number of people that stopped by our exhibit in the produce area there was no question that attendance was high.

ISP again had the privilege of providing both plant food and management input into the greenhouse and outside produce. Pictured at right is Bigdena tomatoes, one of the indeterminate varieties in the greenhouse. Although I'm not sure we managed to match the high
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Using Plant Tissue Analysis for Maximum Yields

Steve Bogash, Vegetable Crop Advisor

After preplant soil testing, proper application of granular nutrients and variety selection, timely plant tissue analysis is a tool with the potential to help you maximize yields of tomatoes, peppers, and other high value produce crops. Unlocking high plant yields and fruit quality requires up to date information on major and minor plant nutrient levels (N, P, K, Ca, Mg, S, B, Zn, Mn, Cu, Fe and Si).

The key to good plant tissue analysis results is taking an appropriate sample and getting that sample to the lab while still in good condition. Knowing the correct parts of a plant, how much plant and the right time to collect plant tissue are essential to this process. For example, useful tomato tissue testing requires 10-15 entire leaves, including the petiole taken from the most recently fully expanded leaves. These are usually the 4th or 5th leaf down from the growing tip. These leaves are now at their full size and have changed to a mature coloration. Leaves older than these store excess nutrients and can indicate plenty of some nutrients. The younger leaves are still taking up nutrients, thus may indicate a deficiency that does not exist. Collect leaves only from plants that appear average. Stunted plants or extra large plants will be poor indicators of the overall nutrient needs of a planting.

Each sample should be all the same cultivar as mixed varieties will degrade the usefulness of the results as well. If necessary, send in multiple samples. One method to manage the number of tissue samples is to select one or more 'indicator' varieties, then base your nutrient applications on those results versus testing every variety separately. The downside to this is the potential to under or over feed varieties that have special needs. In high tunnel research plantings at Penn State University's SEAREC, we've experienced certain heirloom (Arkansas Traveler) varieties that yielded little but a heavy leafy canopy when sharing a nutrient program with high yielders such as BHN 589.

Tomatoes go through three relatively different stages of growth during their lives. First the plant increases rapidly in size leading up to flowering. Sampling the plants at about 4 weeks after transplanting and before the first flowers emerge will give you a snapshot of early fruiting needs and go a long way to providing nutrient info to prevent yellow shoulders, blossom end rot and other related, non-pathogen caused diseases. Two weeks later as the first fruit is setting is another critical window to tissue test, then sample every two weeks until the last fruit are ripening. The quickly growing fruits use quite a lot of calcium, magnesium and potassium along with other nutrients. Tissue analysis will help you to assess your nutrient program and answer the question: Are you keeping up with your plants' needs?

Note on tissue testing: In order to get the best results, pull your tissue samples at about the same time of day every time. Also, if your first test was on a sunny day, then try to stay with sunny days for pulling samples. One of the benefits of tissue testing comes from comparing past results to current results and deciding how your program needs to change. If you introduce variables such as cloudy days or early day samples versus late day samples, then it becomes difficult to compare results with any confidence. Always send your tissue samples in the paper envelopes provided by your laboratory, **never plastic bags or brown lunch bags**. It is not a problem if they wilt as the laboratory will dry them completely before processing. Samples that sweat in a plastic bag will grow grey mold, thus ruining any possibility of good results.

Peppers benefit from this same program, but require 25 leaves with petioles for a proper sample. Be sure to indicate the stage of the plants that you are testing on your sample submittal form. If in doubt, talk to the technical staff at your laboratory prior to collecting samples. Most labs are very helpful in making suggestions so they get the best samples and you get the best information. While running a proper testing program for tomatoes and bell peppers requires biweekly tissue testing, vine crop growers can get all of the information they need with testing twice; as the plants first start to runner and again at first fruit set.

Continued on page 7:



Photo left:
One tomato
leaf.

Photo Below:
A complete
sample ready
to be sent to
the lab.

Foliar Applications on Alfalfa To Increase Yield and Quality

Gary Shafer, Field Researcher

Hay quality can be easily improved with foliar nutrients following each cutting

At ISP, the first step in assembling a crop recommendation is to study the crop and how it grows. From standing alfalfa, we've identified several key aspects of plant physiology that will have a significant impact on both tonnage and quality. First, is to ensure that crown health (or vigor) is maintained. MetaboliK HV-1 has shown for several decades to aid with crown vigor, encouraging an increase in the number of vegetative shoots that initiate following each cutting.

Second is to understand that once you have removed the previous cutting of hay, there is at most three weeks before it will be time to cut hay again. This being the case, it is imperative that the crown begins to aggressively initiate and grow new vegetation. Last, is that quality hay is determined by both protein and trace mineral content. By far the most effective way to maintain animal health is to feed forage and/or grain that has high mineral content.

Alfalfa is a cool season legume grown in many parts of the world. Optimum day and night temperatures are 80/70 and growth is slowed considerably once temps are in the 90's. It requires high levels of both water (from 4" to 5" per ton of hay) and nutrient to achieve maximum potential. Soil type, and depth of the soil, will also have a significant impact upon both hay quality and stand longevity.

It's a crop that we've studied since the 80's, and we believe we have a number of applications that will benefit your alfalfa. One option that has consistently shown positive results is a foliar application of 8 - 10 lbs./ac. of 28-16-7 Alfalfa, with 6 ounces of MetaboliK HV-1. This should be applied as soon as the hay has been removed, assuming there is adequate soil moisture to support aggressive regrowth. The 28-16-7 Alfalfa has a different secondary and trace mineral formulation than our standard 28-16-7, as it has been specifically formulated for alfalfa.

This program has shown positive benefits in research field trials in Colorado, Indiana, Michigan, Ohio and Pennsylvania. Yield increases are common, although it should be noted that this increase is more the result of an increased number of vegetative shoots from the crown, producing a "thicker" stand, rather than an increase in overall plant height.

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standards set last year in Odon, overall the tomatoes and peppers looked very good. In addition, there are definite varietal differences as to growth habits, general plant health, fruit set and fruit quality. Yield data from each variety is being recorded, and will be available at the end of the season.

All of us at ISP would like to express our appreciation to the members of the planning committee, Larry Weaver, Joe Troyer and especially John Miller. John is the young man who rode his bike two to three times per day to perform the actual management activities necessary for the produce presentations.



Tomatoes and pepper varieties being grown outside, Horse Progress 2016, Howe, Indiana.

Other common observations include a more solid stem, more numerous and larger leaf structure, and an increase in feeding quality. Shown below are two comparisons from Ohio, 2014 and 2015, comparing feeding quality between a control portion of the field and foliar treated portion of the same field.

2014:		
	Control	Foliar
Crude Protein	21.6	23.1
RFV	139	150
RFQ	136	161
Est. Milk/Ton	1,681 gal.	1,875 gal.
2015:		
	Control	Foliar
Crude Protein	23.32	26.44
NDF	45.05	41.07
NEC	.55	.62
TDN	54.26	60.36
RFV	121.44	142.24

Data was submitted by Cushman Creek Supply, Holton, Michigan.

Empty Greenhouse Space? How About Producing Trellised Cucumbers?

Steve Bogash, Vegetable Crop Advisor / Researcher

Are you looking at empty greenhouse or high tunnel space now that your bedding plants, hanging baskets, and containers have been sold and moved out? Consider growing trellised, parthenocarpic cucumbers. This crop can be successfully grown both in soil and in soilless media, so any structure will do. Unlike tomatoes and peppers with long days to harvest from seeding, you can begin to harvest cucumbers 45-50 days from seeding, so even a mid-July seeding can provide a good return on investment.

Marketing

When we first began growing cucumbers in tunnels, we were targeting only the early, high value market, prior to the glut of field-grown cukes. Then we discovered the visual beauty and high quality fruit that was possible growing cucumbers indoors and trellised. By hanging and excluding pollinators during fruit set and maturity, the fruits are largely long and straight with a very low cull rate. By keeping cucumber beetles excluded from the crop, plants don't experience bacterial wilt and the fruits are free of feeding scars. This makes for beautiful fruit that have consistently brought higher prices than field grown.

Through sequential planting and replanting production is possible from April through November. When faced with space limitations when growing spring annuals, planting cucumbers can be postponed until late June or July. This planting will be producing fruit by mid-August and stay in production until mid-November with a bit of added late season heat. These late season cucumbers generally market well compared with the late field-grown cukes.

Varieties

While any cucumber can be grown indoors, the parthenocarpic varieties are ideally suited for these conditions. Several years of trialing these varieties at the PSU SE Research Farm has given us the following list (all are parthenocarpic):

Corinto (Johnny's Seeds): This variety has the dark green skin and bumpy appearance of a field-grown cucumber, but sets high yields of straight fruit that taste great and market well.

Lisboa (Seedway Seeds): Very similar to Corinto, but just a shade below in quality and yield.

Katrina (Seedway Seeds): This is one of the Beit Alpha types with very thin, smooth, light green skin. The skin is nearly bitter free. It performed strongly in PSU SE trials.

Picolino (Seedway Seeds): This is another of the Beit Alpha types with very thin, smooth, light green skin. The skin is nearly bitter free. Picolino was our top performer in the PSU SE farm trials. It came in earliest and producing the longest.

Socrates (Seedway Seeds): Same as Katrina.

Excelsior (Seedway Seeds and others): This is a typical pickling variety that is extremely crisp so performs well in farmers markets.

Iznik and Unistar (Johnny's Seeds): If you've got a market for mini-cukes, both of these varieties are excellent performers. Don't skip a day of harvesting or these will no longer be 'mini'.

Definition: parthenocarpic: fruit set that does not require pollination or fertilization of the ovule to set fruit. When seeds are present, they are sterile. In cucumbers, parthenocarpic varieties should be protected from pollinators or fruit quality can suffer. The most common symptom when parthenocarpic varieties are pollinated is misshapen or curved fruit.

Planting and soil

As noted in the opening paragraph, both soilless and soil-grown production work well. Soilless media will add a bit to the investment, but through multiple uses over several years, this cost can be managed.

For soil grown, work in about half of the crops expected fertilizer needs using granular materials based on a recent soil test. According to Knott's Handbook for Vegetable Growers, cucumbers need #100-125 N, #100 P, and #150-200 of K per acre. Based on those starter numbers and applying 50% of expected nutrients needs at 'plowdown', a grower would need to apply #1.5 N, #1.5 P and #2.25 - 3 K per 100' of row preplant. Translated to an actual granular fertilizer: #15 of 10-10-10 plus, #3 Potassium Sulfate.

For soilless media, use a high porosity blend that contains substantial coir and composted bark versus a peat lite blend. ProMix BRK, Frey Bros. #300 and Berger #6 all meet this specification. These types of mixes will maintain their structure over long production runs and with just a bit of replacement and rewetting allow for multiple croppings before requiring replacement.

In work done at the Penn State Southeast Research Farm, we've found that a 6" in row spacing and 4.5 - 5' between row spacing has worked well (2 plants per 12" pot). We allow one fruiting node to form off of the main stem before pruning and trellis straight up. In NY, growers have told me that they plant on 12" spacings, but leave 2-3 fruiting nodes per break from the main stem before pruning, and MN growers report using a 4" in row spacing with a single fruiting node. MN growers also tell me that they trellis theirs at angles with each plant going opposite the next for better ventilation and sunlight capture.

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Everyone uses a combination of tomato twine tied to purlins or cables, vine clips and vine wrapping to keep the vines vertical. The vines must be pruned and trained weekly with the occasional second pruning and training during high growth times.

If direct seeding, apply Metabolik SB at 3.2 oz + PhytoGro Xtra at 2 oz. per 10 gallons transplant solution for a great germination. Add #.8 of 10-45- 10 to the mix if transplanting to aid with rapid establishment.

Fertilization

There are two paths to providing the necessary nutrients to achieve high yields of superior quality fruit: 1) Pulse feeding 2-3 times per week based on a pounds per acre per day model. And 2) Constant feed on a six days on, 1 day off model using a ppm-based program (the day off is to run clear water in order to minimize the buildup of excess salts). Both 'programs' are below. Tissue testing at least twice during the season is highly recommended, so your nutrient can be adjusted based on actual plant needs.

Test when the first flower bud is sighted and again as the first fruit is ready to harvest. A good cucumber tissue sample consists of 20-25 leaves of the fifth leaf in from the growing tip with petiole collected from average plants. Keep a special eye on Ca, Mg, and K levels as they are challenging to maintain and watch out for excessive levels of N.

Photo: Katrina cucumbers



Pulse Feeding: Cucumbers need approximately #.25 -.3 N per acre per day. There are 7,260' of cucumbers in a standard mulched acre. Since cucumbers are generally planted on 12" centers, that gives us a per acre population of 7,260 plants. As we are growing them indoors, let's convert this to 100' of row: $\#.25N / 72.6$ (decimal equivalent of our planting size from an acre) = $\#.0035$ N per 100' per day.

Double these numbers if planting on 6" centers and triple them if planting on 4" centers. We'll work in 2 windows, 'up until flowering' and 'after flowering':

Pre flowering: We need $\#.0070N$ per 100' per day. Since we are splitting that between 28-16- 7 and 10-20-20, each will provide $\#.0035N$ per day. The math: $\#.0035/.28 = .0125$ lb. of 28-16- 7 + $\#.0035/.10 = .035$ lb. of 10-20- 20. Grams are easier to work in at these low numbers, so $.0125 \times 454$ (grams per pound) = 5.6g of 28-16- 7 + 16g of 10-20- 20 per day. Multiply each by 3.5 days for a twice per week feeding and you get 11 grams of 28-16- 7, plus 56 grams of 10-20-20 per twice per week feeding per 100' of row.

Double these rates if working in soilless media and consider adding a pelleted, controlled release fertilizer at label rates to each pot that you reapply after 8-10 weeks.

Post Flowering: like tomatoes, peppers, watermelons and muskmelons, cucumbers require plenty of K to develop properly and keep pushing development of new flowers. Switch to 4-18- 38 at the onset of flowering.

New formula: $\#.007$ N per 100' per day using 4-18- 38, $\#.007/.04 = \#.175$. $\#.175 \times 454$ (grams per pound) = 80 grams per day. $80 \text{ g} \times 3.5 = 280 \text{ g}$ of 4-18- 38 per 100' of row on a twice per week feeding program.

Constant Feeding: Here we are basing our nutrients on ppm of N. These needs change as the plants grow so we will build a schedule. Zero week is right after transplanting or once the first true leaf has expanded for direct seeded plants.

Weeks from transplanting	Desired ppm based on N	Plant Food and amount per gallon of stock solution using a 1/100 proportional injector
0 – 2 weeks	75	50g 28-16- 7 + 141g 10-20- 20
3 – 4 weeks	150	100g 28-16- 7 + 282g 10-20- 20
5 – 6 weeks	200	950g 4-18- 38 + 380g 10-20- 20
7 – 8 weeks	200	4.2 lb. 4-18- 38 (2k)
9 – 10 weeks and beyond	200	4.2 lb. 4-18- 38 (2k)

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What's the Big Deal with Silicon?

Steve Bogash, Vegetable Crop Advisor/Researcher

ISP recently released two new products containing plant available silicon. The products SiMag 58 and SiGuard are designed to enhance levels of silicon, promoting a number of plant functions. After oxygen, silicon (Si) is the most abundant element in the earth's crust, but very little of what is found in soil is in a form that plants can utilize. Therefore, we've created products that contain highly available forms of Si and are easy for you to apply.

What does silicon do in plants?

Si is not currently considered either a major or micro-nutrient, yet it is a beneficial nutrient in plant biology. All plants take up silicon and use it in the construction of cell walls which greatly contribute to a plants structural strength. Increasing available (soluble) Si directly increases the amount deposited in cell walls. It then becomes part of the wall matrix; making them stronger. In addition to this structural role, Si helps to protect plants from both insect attack, and specific diseases, plus aids the plants ability to withstand environmental stress.

Specific benefits from increased silicon nutrition:

- Directly stimulates plant growth and yields.
- Can counteract the negative effects of excessive N.
- Suppresses plant diseases caused by bacteria and fungi. This includes helping manage powdery mildew on cukes, pumpkins and other cucurbits.
- Suppresses stem borers, spider mites and various leaf hoppers. While still a work in progress, Si applications should help to suppress Western Flower Thrips as well.
- Alleviates a number of abiotic stresses such as lodging of small grains, drought, temperature extremes and chemical stresses such as high salt levels and nutrient imbalances.

Are you or have you been Si deficient?

It's difficult to look at a crop and say that it is Si deficient. Increased lodging and susceptibility to powdery mildew could be one indicator. Contact your laboratory to see if they are able to include Si levels in your test results.

Applying SiMag58 and SiGuard

- SiMag58 is designed to provide highly available magnesium chelate plus a good dose of potassium silicate. It will assist tomato, pepper, cucumber and melon growers in maintaining Mg levels far beyond what epsom salt (MgSO₄) products can do, while also helping increase potash and silicon levels for enhanced growth and plant protection. Apply it foliarly at 1 teaspoon/gallon every 10 days and/or (you can do both) through your fertigation system at 8-12 ounces/application every 10 to 14 days.

-SiGuard is 84% highly soluble silicon. It is specifically designed to fulfill all of the functions described above. Foliar applications will provide enhanced insect/disease protection and fertigation applications will greatly increase Si that plants move into the cell walls.

Staying Ahead of Broad Mite In Fruiting Vegetables

Steve Bogash, Vegetable Crop Advisor/Researcher

Broad Mites have recently become more of a problem on tomatoes and peppers on Mid-Atlantic Farms. Damage by Broad Mites can be quite severe on tomatoes and peppers, so growers need to be prepared to protect crops with an effective miticide prior to this pest causing economic losses (see photo below).

Due to their extremely small size (too small to see with the naked eye or even a 10X hand lens) and the challenges in scouting, I recommend an application of a miticide that is specifically for control of Broad Mites at the formation of the first flowers and a second application in 4 weeks. By the time damage is observed, it is far too late to react. Even an earlier timing is warranted if Broad Mites have been a problem in past production. Growers with damage will sustain high economic losses by the time damage is visual. Inspection of transplants in greenhouse peppers has regularly revealed plants with Broad Mite feeding damage. Therefore, pepper and tomato plants may require miticide applications for Broad Mites as early as the seedling stage. Another distinction with Broad Mites, is plants with spider mites can recover unless their populations are allowed to go unchecked. However, Broad mite damaged plants are often permanently stunted and may never fully recover.

The difficulty in minimizing damage is due to the extreme difficulty in scouting for them. It's not just their very small size, but where they feed. Unlike spider mites that can readily be seen without a hand lens and are associated with feeding on the bottom of leaves, Broad Mites feed within growing meristems and require dissection of the growing points under a microscope to identify. It is not unusual to see fruit that is damaged and the typical twisted and distorted leaves that their feeding leaves behind, but not be able to isolate them in growing points.

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Broad Mites continued: Materials for Broad Mites (not all miticides are effective on Broad Mites):

- Oberon: The rate for Oberon is 7-8.5 oz/acre and allows for up to 3 applications per season. The PHI is one day on tomatoes and peppers. Since Oberon has an IRAC code of 23 and Portal is 21A, this could be a good material to rotate to in order to prevent pesticide resistance.

- Portal: Recommended use rates are 2 pints/acre using a minimum of 20 gallons of water per acre. The maximum use per acre per crop cycle is 4 pints, and the preharvest interval for Portal applications is 1-day. The use of a non-ionic surfactant is recommended.

- Zeal: Zeal is registered for Spider Mites in PA, but has a special needs label in Florida for Broad Mites. With an IRAC code of 10B, Zeal could be important in managing resistance. Since Spider mites are a constant irritant in tunnels, by managing Spider mites you also get Broad mite control. The rate is 2-3 oz./acre with a 7 day PHI.

- Met 52: Growers in California have found Met52 to be an effective biological control for Broad mites. The label rate is 8-64 oz. /acre with a zero day PHI. This fungus-based material will probably be difficult to find in 2016, but should re-emerge in 2017 under new name(s) and with broader labels.

- Grandevo: Work in Florida demonstrated efficacy in using this biological for Broad Mites. The rate is 2-3 lb./acre with a zero day PHI

- Venerate: This newest product from Marrone Bio Innovations has also demonstrated Broad Mite control. The rate is 4-8 qts/acre with a zero day PHI.

Due to their small size and where they feed the use of spray equipment with high pressure and very fine droplet size is highly recommended. Don't wait until you see 'alligatored' fruit to begin management.

Gary Shafer discussing ISP and plant management at Horse Progress, Howe, IN.



Tissue Analysis Continued: Here are definitions of the most common and confused terms on tissue analysis results:

Deficiency: There is not enough of the nutrient present to meet even the most minimal requirements. In tomatoes, deficiencies are commonly found in Ca, Mg and K. Shortages of these nutrients cause many of the common packing house losses as tomatoes are downgraded due to cracking, blossom-end rot, and yellow shoulders. Depending on the specific nutrient and the degree of deficiency, you may be able to make up the difference with foliar applications, injected fertilizers, or a combination of injected and foliar applied nutrients.

Sufficiency: This is probably the most common area of confusion when determining how much nutrient to apply, as sufficiency is often expressed as a percentage. At the low end of the scale (less than 50% sufficiency), there may be enough nutrient present to carry a small crop or light fruit load, but not enough to prevent all nutrient related maladies, or to grow a profitable crop. As the percentage moves closer to 100% sufficiency in all nutrients and they are kept in balance, the likelihood of a great crop that moves easily through packing increases. Nutrient balance is especially important as nutrients can compete for binding sites. The balance between K, Ca and Mg is one that directly impacts fruit quality. Once flowering has begun in earnest, strive for plant tissue levels of 3% plus on potassium, 3% on calcium and .8-1% for magnesium.

Toxicity: Once a nutrient is above 100% sufficiency, some other nutrient is probably lacking as all nutrients are carried in plants in a balance. Toxicities can be expressed as phytotoxicity (leaf scorch or burn), or more often as deficiencies as other nutrients are no longer as available. In extreme cases, nutrient toxicities can kill plants.

Once you have your tissue test in hand, the next step is to determine what to apply and when. Talk to your ISP Technology dealer for help in solving your nutrient challenges. The ISP plant foods, SiMag, MetaCal and CalStore are all formulated to provide in-season nutrient solutions. They are all readily available for plant uptake and utilization, and have proven time and again to offer both effective and profitable results.

*Striving for success without hard work,
is like trying to harvest where you haven't planted.*
- David Bly

*As a farmer you learn quick, you don't get
anything you don't work hard for.*
- Evan Thomas

Trellised Cucumbers Continued:

SiMag 58 can be added directly into the fertigation stock tank along with the other fertilizers to maintain magnesium levels, assist with keeping potash levels up, and to provide silica to promote growth and also to aid in managing insects and diseases. Add this to stock solutions at 1 tablespoon per gallon of stock solution or as indicated by tissue test results. Once per week inject either CalStore or MetaCal at label rates separately from any P containing fertilizers to maintain Ca levels.

Pest Management

Major cucumbers pests include: cucumber beetles, spider mites, western flower thrips, aphids, powdery mildew and downy mildew. Of these, vectoring of the bacteria that causes bacterial wilt by cucumber beetles is the most significant. When growing outdoors we are forced to apply broad spectrum insecticides regularly to manage these pests. Indoors we can apply screening to the inlets and rolled up sides to keep cucumber beetles out of the greenhouse. Once you no longer have to apply broad spectrum insecticides, it is much simpler to run a biologically-based program.

Alternating Grandevo with Venerate and Met-52 provided us with a mite and insect-free environment. Including the new ISP Silicon materials SiGuard and SiMag58 will greatly assist in preventing spider mites and thrips from reaching damaging populations.

Powdery Mildew (PM) and Downy Mildew(DM) are hazards in keeping a steady supply of cucumbers ripening. A biological program consisting of Regalia – Actinovate – Metabolik HV-1 applied 5 days apart will provide a good basis for disease prevention. Being ready to add a PM or DM material to this program as seasonal conditions require can largely prevent these diseases. In general, the insect/mite program/disease prevention program/foliar nutrient program are all compatible in tank mixes. The first time you create a new blend, be sure to try it proportionally in a jar test, then apply it to a few plants, wait two days and see if any damage occurs. Keep good notes on what works and what doesn't.

Harvesting

Harvest daily if at all possible. Every other day harvesting will also work, but expect some of the fruit will be oversize during ideal growing conditions. Cut the fruit from the vines rather than pulling so as not to damage your carefully trained and trellised vines. It's also recommended to refrigerate if at all possible for an extended storage life.

Be ready for loads of the highest quality cucumbers you've ever grown! They will be straight, blemish-free and absolutely delicious.

Strawberry Project: Early Results

Gary Shafer, Field Research

Although this is just a small part of the overall data, we wanted to get some initial information out. If you are planning to plant strawberries this summer, we would highly recommend that you apply 16 ounces of Metabolik HV-1 prior to, or just after planting. This is based upon the data from the strawberry project at Kalamazoo, MI.

Data below shows results on 7 of the ten varieties (One variety was not picked due to disease, and two others are not to the point where the data has been completely entered and/or compiled.

Both Control and HV-1 received ISP plant foods (10-20-20, 4-18-38) through the drip lines. The HV plots had Metabolik HV-1 applied at a rate equal to 16 ounces/acres following planting. Another application equal to 12 ounces/acre was applied this spring after the straw was removed.



VARIETY	CONTROL	HV-1	Difference
	grams/plot	grams/plot	+/- %
AC Valley	21,840	31,122	42.50%
Annapolis	22,434	31,443	40.16%
Chandler	14,550	21,826	50.00%
Earliglo	18,295	26,036	42.31%
Flavorfest	20,607	32,191	56.21%
Honeyoye	29,255	41,801	42.88%
Itasca	20,047	31,853	58.89%

This newsletter, as well as the articles included, are available for reprinting on the ISP website. (isptech.com).

If there are topics you would like to see, please let us know and we'll do what we can to get the information together.

We would also appreciate your comments as to how your crops performed, especially if you have comparative data.