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Growing with ISP

Integrated Solutions for Improved Food Quality with Environmental and Economic Sustainability

Spring 2017
Integrated Soil & Plant Technologies, Inc.

www.isptech.com

Spring 2017

IN THIS ISSUE

UPCOMING EVENTS

June 30 & July 1
Horse Progress, 2017
Lancaster area, PA

July 15 - 18:
Cultivate 2017
Columbus, Ohio

July 25: PA Vegetable Field Day at Penn State SE Farm. Hosted by PVGA.

There's a number of greenhouses that have already been planted, with some getting close to picking the first tomatoes of the season. As Steve Bogash's wife, Roberta says, there are only two seasons of the year ... "tomato season, and waiting for tomato season." With that in mind we are getting very close to TOMATO SEASON!

Despite the obvious fact we're beginning to prepare our taste buds for that first "fresh picked" tomato, we want to add a couple articles for row crops in this issue. We offer a very strong program for both produce and field crops, and we continually explore how to make them better. Obviously, income potential per acre is not nearly as great with row crops and grain compared to produce, so input costs must be watched fairly closely. Even so, ISP offers several products that have proven to provide a significant positive impact upon several key components of field production.

As with all crops, yield potential is determined by soil composition and the interactions of a soil's characteristics. Too often, growers tend to concentrate primarily upon the chemical component of the soil (fertilizer), paying insufficient attention to the physical and biological properties. Yet it's often these physical/biological issues that create yield robbing situations such as leaching of fertilizers, excessive disease or insect pressure, compaction, excessive erosion, and a wide range of environmental stress such as pooling of water or poor water retention.

Greenhouse tomatoes getting very close to the first picking! Tomato season is getting close! Can taste them already!

At ISP we engage all aspects of soil fertility. We certainly look at current nutrient levels, with recommendations to ensure that there is adequate nutrient to support yield goals. Depending upon individual water quality, we may also make recommendations adjusting water chemistry. We also observe water drainage and/or "hot spots" in a field, and if necessary make recommendations for specific tillage operations such as deep-ripping of a field. At the same time we are actively working toward improving the soils biological makeup, using an array of biostimulants such as MetaboliK HV-1; humic acids such as PhytoGro Xtra, or combinations of humic/fulvic acids and bio brews, with several examples being Pow'r Pak, ReStore 3G and MetaboliK Seed Boost. *(In the previous Winter Issue, we discussed the many benefits of an active and proper biological profile.)*

It's been rewarding to observe high CEC soils in South Dakota and how they've changed in soil structure across several years of using these biological stimulants. In low CEC and OM soils it's been equally rewarding to see OM increase, with a steady increase in productive potential. While none of these products are "magic bullets", they do play an important role in soil management, and have provided solutions to a wide range of soil problems.

It's also been interesting to observe the "marketplace" across the last four decades. When we began working with these materials in the late 1970's, we were pretty much alone. Today,

Water, water, water ... Too Much Is Not a Good Thing!

by Gary Shafer, *Research Director*

We've discussed soil compaction, poor drainage, and the negative effects of excess water for several decades. Several of the ISP products have very positive effects upon all of these potentially serious situations. These include MetaboliK HV-1, Phytogro Xtra, Pow'r Pak, ReStore 3G and even to a lesser extent MetaboliK SB. We used to walk fields of all soil types with penetrometers to measure resistance to soil penetration, and consistently recorded significantly less resistance where these products were being used. We also used to measure soil hydrophobia, or the reluctance of a soil surface to absorb water. Hydrophobia adds greatly to the problem of water runoff and pooling into lower areas. As with penetration, the time required to soak in one inch of water was greatly reduced where a biostimulant was applied.

With some of the recent growing seasons these water issues, and the resulting crop damage, has once again brought "water" to the forefront of many growers' thoughts. Obviously tile will greatly aid in reducing these problems, but even with tile the water still has to soak downward to reach the tile and leave the field. In soils with poor aggregation, this can be slowed dramatically, plus when the water does drain from the field it can carry a higher percentage of soil micro-particles with it. That, of course, is called erosion and will greatly reduce the productive potential in any field.

The use of ISP biostimulants, and the resulting increase in beneficial soil fungi and other microbes, will improve soil aggregation thus improve pore space, and will also aid in building soil organic matter. Improved aggregation and pore space of course leads to better drainage and less soil micro-particles being removed with the water itself. Aggregation is a basic aspect of soil biology, particularly soil fungi, and can be demonstrated by draining water through soil taken from a fence row compared to a tilled agricultural soil taken in close proximity. Cornell University demonstrates this quite graphically on their website.

Aside from the use of HV-1, PhytoGro or other products, water soak can be improved by leaving a little residue on the soil surface. If there has been any interaction between the soil and residue, it acts almost like a pipe or wick, allowing water to enter the surface much more rapidly, thus reducing the possibility of "pooling". But even if you've laid tile, used biostimulants for years, and leave some residue on the surface, there are still going to be days where the soil is still too wet for tillage or planting. Obviously, this is just the way it is.

In several weeks, as you start watching the calendar and want to plant, you may realize that you could be headed into fields that are less than ideal for planting. Wet soils are easily compacted, and most everyone understands the negative effects from both surface compaction, or crusting, and subsoil horizontal compaction layers, or what is commonly referred to as "plow pans". Less understood are the very negative effects of sidewall compaction. During planting this can be a problem, especially if the crop is "mudded-in" and a dry spell occurs after planting.

Sidewall compaction typically occurs when planting into soils that are too wet, planting too shallow and setting too much down pressure on the gauge wheels and closing wheels. Sidewall compaction is never beneficial and again, it will be the most detrimental when the soil becomes dry after planting.

Since it is difficult to quickly eliminate sidewall compaction once it occurs, it should be prevented whenever possible. The most effective way to prevent sidewall compaction is to wait until soil moisture conditions are suitable for planting. Of course, this is easier said than done given the calendar date and planting delays we often experience. Here are several simple methods for determining if the soil is too wet to plant.

Mark Hanna, agricultural engineer at Iowa State University, recommends the following methods for assessing planting conditions. Collect a handful of soil from the top 2 to 3 inches and form it into a ball. Then throw the ball of soil as if throwing a runner out at first base. If the ball stays mostly intact until it hits the ground, the soil is too wet to plant. Additionally, he says to take a sample in your hand and squeeze the soil in your fist. Use your thumb and forefinger to form a ribbon of soil. If the ribbon extends beyond 3 inches before breaking off, the soil is probably too wet to plant. Paul Jasa, agricultural engineer at the University of Nebraska, adds the following method: Take a similar soil sample and form it into a ball and drop it to the ground from about waist-high. If the ball remains mostly intact or breaks into only a few pieces, the soil is too wet.

You can also evaluate whether the soil is to wet by how the planting equipment is operating in the field. If soil is building up on the rubber closing wheels, the soil is too wet to plant. Inspect the sides of the seed furrow periodically for signs of soil smearing (smooth, shiny appearance). Check to make sure that the seed furrow is closed while using minimal down pressure on the closing wheels. Angled closing wheels are designed to perform best when planting at a depth of 2 inches. The risk of the seed furrow not being closed or opening up increases with shallower planting depths.

A good way to provide loose soil for closing the seed-vee is to close after the seed is placed in the furrow. Spoked closing wheels are available to replace the standard press wheels. These spoked closing wheels till in the sidewall around the seed. Less aggressive spoked wheels provide some seed-to-soil contact and reduce air pockets around the seed. More aggressive spoked closing wheels tend to dry the soil more. These typically require a seed firmer to provide seed-to-soil contact and a drag chain behind them to level the soil.

Watch Down Pressure

Excessive down pressure is always going to create some root inhibition, but in wet soils this can be especially damaging. Again, be careful not to have too much down pressure set on some of these spoked closing wheels as they may "till" the seeds out of the seed-vee. To reduce the aggressiveness of the tillage and to provide some soil firming and depth control, some growers will run one spoked closing wheel and one standard wheel. This situation works well in a wide variety of situations.

While the seed furrow closing devices are important, too much down pressure on the depth gauge wheels will also create sidewall compaction as the disk opens the seed furrow. The disk openers may create some sidewall smearing while pushing the soil outward. If there is too much down pressure on the depth gauge wheels, they will pack the soil downward at the same time, causing compaction that may be too dense for the closing wheels to fracture. When this occurs, growers typically put more pressure on the closing wheels trying to close the seed-vee, making conditions worse yet. Down pressure on both the row unit (gauge wheels) and the closing wheels should be reduced in wet soil conditions.

Jasa provides some other excellent recommendations for reducing sidewall compaction when planting into less than ideal soil moisture conditions.

- If possible, wait for drier soil conditions before planting.
- Reduce down pressure in wet conditions to avoid compaction.
- Plant corn at least 2 inches deep and fracture the sidewall while closing the seed-vee.
- Evaluate seed-to-soil contact at seeding depth. Resist the temptation to increase down pressure to close the seed-vee.
- Leave residue over the row to reduce the seed zone from drying out and the soil from shrinking.
- Build soil structure using no-till, manure or cover crops. Soil with good aggregation is less likely to smear or compact.
- Level the planter front-to-rear, or even operate it slightly tail down, to improve seed-to-soil contact and closing the seed-vee.
- Use an attachment to till and loosen some soil for closing the seed-vee.
- Till in the sidewall with spoked closing wheels (need seed firmers for seed-to-soil contact).
- Use one spoked closing wheel and one standard wheel to close the seed-vee and firm the soil.
- If possible, stagger the angled closing wheels, one in front of the other, to reduce the seed-vee from opening back up as the soil dries. (If using one spoked wheel, place it in front.)

These are all positive recommendations, and to it we will add another. Apply one of the ISP biostimulants in the seed row at planting. If your planter is not set up to apply in the seed row, then the more common 2"X2" placement will be almost as good. Using MetaboliK SB, or Pow'r Pak, etc., will create a little "hot area" of bio activity as well as providing some valuable organic acids and growth compounds. In addition, the root stimulants in these products will enable the seedling roots to push downward and outward with a little more strength so that if there is some sidewall compaction perhaps the root can push through it.

Combined with our 15-30-15, or 10-45-10 plant foods, these biostimulants provide a very strong "pop-up" nutrient package. Yield potential is determined very early, possibly at or just days after emergence, and this application will help you set a higher yield potential. Visiting with Nelson Martin, the ISP dealer servicing the Shiloh, Ohio area, I was told that one of his clients used this "pop-up" mix in parts of several corn fields this past season. The yield increase ranged from nine to fifteen bushels more corn per acre. This is not only good protection against excess soil moisture, but it's also really profitable corn production. Anytime you can increase production at a cost of less than $1.00 per bushel of increase you're making money. While commodity prices may at times be down somewhat, they are never that low. *(For more information on ensuring early vigor, see the article on MetaboliK SB in this publication, or visit with your local ISP representative.)*

High Tunnel Bell Pepper Research 2016

- Steve Bogash, Vegetable Crop Advisor

Producing fully colored bell peppers in the field can be a challenge due to diseases aggravated by weather conditions. Weather often causes fruit rots just as the peppers begin to reach full color. The simple practice of growing peppers in a high tunnel is often enough to "flip the script", resulting in beautiful red, yellow and orange peppers and reducing cull rates to single digits.

If possible, adding heat and environmental controls will significantly speed up maturation so that beautiful green bells are also available to market much sooner and at better prices field grown green bells. Once your field peppers have large green peppers, you can then continue to grow under cover for the colored markets.

During the 2016 season, we observed results from foliar nutrient applications on two popular red to green pepper varieties, Revolution and Vanguard. We chose these varieties as they had proven themselves in earlier studies to produce consistently good color at full maturity and were often among the highest yielding in other studies. The project was conducted using one of the high tunnels at the Penn State Southeast Research and Extension Center. The high tunnel used was under construction in the spring of 2016, so planting date was delayed until May 15.

The objective was to see what impact specific regularly applied foliar nutrient materials would have in a program specifically focused on the production of colored bell peppers. We collected data as to size (measured by weight), and yields of #1, #2 and culls.

The treatments below were applied every 10 days beginning four weeks after transplanting:

1) SiGuard at 5 ml (1 tsp.) per gallon
2) SiMag 58 at 5 ml per gallon
3) 4-18-38 at 15 ml (1 tbls) per gallon
4) Water only control

Each plot consisted of 12 plants and each treatment was replicated 3 times. The plants were 18" apart in row and each bed had two rows. The plants were supported using a box trellis system. While there was little difference between the varieties throughout the season, the data is presented by variety in separate tables. The data has been extrapolated to reflect yields based on 100 plants to make it easier to compare with actual grower situations.

Fertigated nutrient program was based on the ISP indoor peppers crop sheet, and tissue tests during the season showed consistently good nutrition levels. The only insect damage noted during production and harvest was due to European Corn Borer, but this was relatively minor. Disease management was Regalia + Badge (copper) alternated with Actinovate AG + Metabolik HV-1 every 5 - 7 days.

Revolution (per 100 plants):

Foliar Treatment	#1 Fruit Count	#1 Fruit Wt. (lbs.)	Ave. Fruit Wt. (lbs.)	#2 Fruit Count	#2 Fruit Wt. (lbs.)	Cull Wt. (lbs.)	Marketable #1 + #2 Wt. (lbs.)	+/- Lbs. to Control	% to Control
SiGuard	1,335	1,110	.83	138	118	88	1,228	+ 290	130.92%
SiMag 58	1,470	1,170	.80	150	120	84	1,290	+ 352	137.53%
4-18-38	1,499	1,235	.82	148	112	78	1,347	+ 409	143.60%
Control	1,147	860	.75	92	78	148	938		

Vanguard (per 100 plants):

Foliar Treatment	#1 Fruit Count	#1 Fruit Wt. (lbs.)	Ave. Fruit Wt. (lbs.)	#2 Fruit Count	#2 Fruit Wt. (lbs.)	Cull Wt. (lbs.)	Marketable #1 + #2 Wt. (lbs.)	+/- Lbs. to Control	% to Control
SiGuard	1,563	1,188	.76	360	478	195	1,666	+ 289	120.99%
SiMag 58	1,573	1,196	.76	348	504	170	1,700	+ 323	123.46%
4-18-38	1,600	1,248	.78	320	544	168	1,792	+ 415	130.14%
Control	1,400	952	.68	346	425	212	1,377		

In both Revolution and Vanguard all of the foliar treatments produced consistently higher fruit counts, heavier fruit weight, and an increase the number of #1 fruit and overall marketable yields. All of the treatments resulted in a significant increase when compared to the control. The trend with both varieties was that the 4-18-38 had the highest yield, SiMag 58 the second highest, and SiGuard the 3rd highest. In retrospect it would be interesting to have the 4-18-38 coupled with one of the silicon products. The vast majority of the #2 fruit in all treatments were misshapen, but had no or very minimal scarring on the fruit itself. Culled fruit had rots, insect damage or surface scars that would render them unmarketable, although some could have been used for chunking/processing.

There is More To Your Potting Media Than Just Peat Moss and Perlite

- Steve Bogash, Vegetable Crop Advisor

Growing vegetables indoors in high tunnels and greenhouses often provides opportunities to produce longer season, higher quality crops at higher densities and greater yields when compared to 'outdoor, in-soil', production. Many growers successfully use the soil in their greenhouse or tunnel, but there are some major advantages in growing in a well-constructed artificial media. As in the move from outdoors to indoors, production in an artificial media as compared to soil culture often results in higher quality produce and greater yields. The primary factors in this advantage come from being better able to manage plant nutrient needs and the amount of air that can more easily circulate through a well-structured growing media.

So the question, "what are you buying when you purchase potting media?" While all commercial media come with a nutrient 'charge', this does not last very long as there is nothing to hold the nutrients in place as the particles dissolve, allowing the nutrients to be part of the soil solution. Organic media often uses animal manure-based compost for some or all of the nutrient charge. These materials last longer than most conventional sources, but that is often only a small portion of the media. Since the nutrient charge is short-lived that can't be what we are purchasing, as we are constantly renewing it through fertigation. In effect, this means that we are actually purchasing structure. The reason media companies make so many types is that different crops and different plant growth stages can be optimized by varying the soil structure. One other note is that there are multiple research papers indicating that in any media, the addition of 4 to 8 ounces of SiGuard per cubic yard will be beneficial.

While there are many variations on this basic theme, growing media can be roughly categorized into 3 categories; 1) Fine, which is best for seed starting and rooting cuttings. 2) Medium, which is often considered 'all-purpose' by many growers. These peat-lite blends work reasonably well for seed starting except in small plug sizes and are great for up to 4" pots or short season crops. And, 3) Coarse or high porosity, which are ideal for crops that will be in place for many months (like fruiting vegetables), hanging baskets, and large containers. Begonias and Geraniums prefer a media with a slightly higher pH than most other annual flowers, but media pH is largely managed by the irrigation and fertigation solution pH as the lime, gypsum or dolomitic lime charge is rapidly either flushed out or used up. The secret that large container growers all know is that high porosity medias work best where a crop will be in place for a long period as in tomato, cucumber and pepper production and where there is an economic reason to reuse the media.

The problem with using an "all-purpose" media in large containers is that is does not take long to lose air space within the media as the peat moss biodegrades. All-purpose media is just made of two ingredients, peat moss and perlite (hence the name "peat-lite") plus a little nutrient charge and sometimes a dash of bios. These blends work reasonably well over a wide range of uses, but over multiple months and potentially multi-season usage, the primary reason that medias are so useful, the air space, is lost. High porosity (HP) blends on the other hand, typically contain coir (waste from coconut husk processing) which degrades very slowly and can aid in rewetting, composted bark fines and mediums which create most of the air space, plus 30-50% of the same ingredients as peat-lite blends. High percentages of composted bark and coir create massive amounts of air space that lasts for a long time and can be reused often unless a soil-borne disease finds its way into your production area.

The large air spaces in HP media also drain faster so these type media tend to dry out faster. This is huge advantage during early and late season production when we get so many cool, cloudy days as it's much easier to manage a drier soil under these conditions versus a finer soil that holds onto water tightly. Also, air flow through a root system is very

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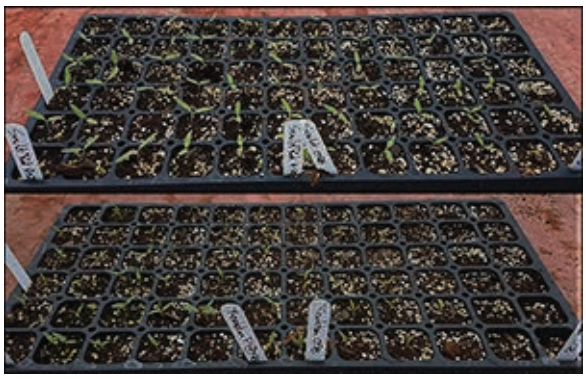
MetaboliK Seed Boost - Ensuring Early Vigor

- Gary Shafer, Research Director

MetaboliK SB showed a very strong response in the 2016 outside peppers and tomatoes trials at Howe, Indiana. (Data published in the Winter issue of this newsletter.) Seeing this, we decided to do further experimentation this spring, and are performing a couple of research projects with MetaboliK SB, studying emergence and early vigor on tomatoes and peppers. Most produce crops are "time sensitive" with early prices being very strong, then dropping considerably once normal production comes to market, then strengthening again in the late season. Any help in getting produce to market, even several days earlier, can be a strong economic benefit.

In addition, we all agree that vigorous emergence and early growth is important whether it be with produce or row crops. Again, the question is what can we do to enhance this critical stage of plant development? MetaboliK SB has proven for more than a decade that it performs extraordinarily well for this purpose, and is probably our most widely used product. To a fermented molasses base a concentrated bio-brew has been added, plus a variety of proven root stimulants and vitamins, and a specific blend of trace minerals. There's also a 3-4-3 macronutrient analysis, which provides a small amount of essential nutrient to supplement the energy within the seed itself.

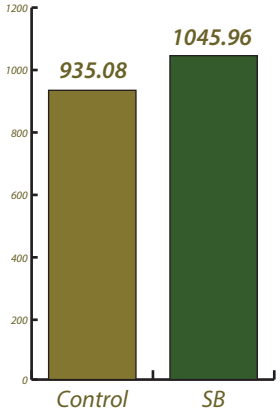
SB is a cornerstone of our produce programs and with it's low cost per acre, ranging from less than $4.00 to $7.50 per acre, it's also widely used on row crops such as corn, soybeans, cotton and grains. Not only does it provides an immediate stimulation to emerging roots, MetaboliK SB aids in creating a zone of enhanced biological activity so that additional nutrients are made more available to the young seedling, and with stronger root "push" will also aid in offsetting side wall compaction, which was discussed on page 2.



The picture at right illustrates trays of tomato and pepper seedlings at the PSU SE research station. The left half of the trays where SB was applied show earlier emergence and improved vigor. These seedlings will be grown for several more weeks, then dissected to measure and weight individual plant parts.

This project is similar to one we performed in 2008 with field corn. We had read, according to corn research, that early root formation (radicle and seminal roots) was dependent upon the "energy" in the seed itself, and not impacted by nutrition in the soil solution surrounding the seed. We found this was not true. In our study we were able to achieve a 5.17% increase in the mass of the radicle (the anchoring root moving downward from the germinating seed), a 20.48% increase from the seminal roots (the lateral roots above the seed), and a 24.83% increase in above ground, green plant tissue. Additionally, although not measured there was a noticeable improvement in the development of nodal root buds. which would develop into the true feeding roots of a corn plant.

University of Arkansas
Cotton, 1999



This early increase in early vigor and root formation explained to some degree the significant yield increases we had seen with corn, cotton, and other field crops. In lighter soils we had recorded as much as 20 bushel per acre increases, and in heavier soils from 7 to 9 bushels more corn. The graph at left illustrates 1999 research with MetaboliK SB at the University of Arkansas Keiser Research Station (average of four replications). Cotton is a very sensitive seedling, reacting negatively to any adverse weather conditions. Many of the older cotton growers used to say, "cotton is a plant that comes up looking for a place to die'. With an increase of more than 1,000 pounds of lint/aacre, this was very profitable.

SB is also a very versatile product as well as it mixes with all liquid fertilizers for in-furrow, or 2X2 placement for corn and other row crops, applied as part of a transplant solution or drip fertigation, and is even used as a bio-brew foliar supplement with many of the produce crops. It's also part of our product Pow'r Pak, which has shown strong results with row crops. In lighter sandy soils to high sodic clays, Pow'r Pak has shown to provide more uniform and vigorous emergence, and very profitable yield increases.

With spring planting conditions often being rather cold and wet, the addtion of MetaboliK SB or Pow'r Pak can provide assurance that your crop will have the strong start it needs to support high yield potential. Coupled with the ISP plant foods, or your own liquid fertilizer, they make economic and agronomic sense.

Soil Solarization: Using the Sun as the Ultimate Biofumigant

- Steve Bogash, Vegetable Crop Advisor

Are you growing more intensively, but soil-borne diseases seem to keep getting ahead of you? If the answer to this question is "yes", please read on. Diseases, insects, nematodes and other pests have many methods of finding their way into your soils. Sometimes the plants or media on transplants is infected, some fungal and bacterial spores are wind and water borne and we can carry the spores on our clothing and tools. We've got a great number of tools and techniques to deal with soil-borne diseases. Among these are disease resistant varieties, rotation within your garden, sanitation, drip irrigation, biological inoculants, and soil solarization.

The varieties of vegetables we use today are resistant to many diseases. Be sure to do the research before you order seeds or plants. Most seed catalogs will indicate which varieties are resistant to what diseases. To get the most out of crop rotations, plan several years ahead and try to keep high value plants like solanaceous crops (tomatoes, peppers, eggplant and potatoes) out of an area for at least 3 years.

It's often best to remove all crop residue after harvest and compost that material before reapplying it to your soil. Composting can kill most disease-causing organisms and insects. Never compost obviously diseased plant parts as heat required for this kind of cleanup is difficult to reach unless the entire composting system is well managed. Instead, burn it when conditions are safe.

Drip irrigation is more efficient than overhead watering, and it reduces diseases by keeping roots uniformly moist and the leaves dry. The downside of drip is that swimming spores such as phytopthora can spread in the thin film of water within the soil or along drip lines.

When you've done everything right and problems persist, you can either quit that patch of ground and leave it fallow for many years, or try some form of fumigation or solarization. When Southern Blight (Sclerotium rolfsii) found its' way into several of the Penn State high tunnels, we tried mustards, then went with steam from a coal fired steam tractor. Soil steaming is highly effective, but the necessary equipment may not be readily available. Soil solarization uses radiant heat from the sun to "cook" the soil free of insects, disease causing organisms, and reduce many weeds.

Here is the "cookbook method" to soil solarization:

Step one: This technique works best during the long hot days of summer and requires at least several weeks to be effective. Longer periods will reduce more problems. High tunnel and greenhouse soils may be able to begin the process earlier or later due to the longer season indoors.

Step two: Work your ground well to 8" deep and remove or break up all clumps and large pieces of organic matter. Sunflower and corn root crowns do not break down well and can reduce the effect of solarization. If you suspect a hardpan or are trying to improve overall percolation, consider ripping with a subsoil shank prior to treatment.

Step three: Apply enough water to the prepared ground to thoroughly wet the soil to 8". This may take several applications if the ground is very dry as you do not want to make surface mud. Installing a drip irrigation manifold and tape over the area to be treated will allow for easy rewetting for the maximum effect.

Step four: Cover the ground with a thin layer of clear plastic and bury the edges completely. The clear plastic allows the sunlight to heat the ground beneath while trapping much of the heat generated. This is the greenhouse effect in action. Do not use black plastic as it only gets hot on the surface of the plastic as it will prevent trapping the suns long heat rays under the plastic.

Step five: Leave the cover in place for at least four weeks, longer is better. If you are curious about the heat generated, place a soil or compost thermometer through the plastic and 6" deep. Purslane seems the be the only weed that can survive this treatment. If purslane gets going under the plastic, remove the cover, treat the purslane and replace.

After removing the cover begin or resume practicing good crop rotations, variety selection and sanitation. If legumes (beans and peas) are your target crop, be sure to reinoculate the soil with the right Rhizobium bacteria as solarization will kill off most of this beneficial nitrogen fixing bacteria. After any treatment that impacts the entire rhizosphere (plant root zone), it's a good idea to reintroduce beneficials' and Restore 3G to your soil. An application of Terra Grow + Restore 3G is the gold standard in reestablishing a good soil biome. Solarization can be an excellent method to rid your soil of really tough problems. The best part is that the hard work is done by the sun and no chemicals need be applied. There is an excellent article on soil solarization online at http://ipm.ucanr.edu/PMG/PESTNOTES/pn74145.html.

continued from front page: humic acids, bio-brews and stimulants, they are almost as common as traditional fertilizers. Every company or fertilizer outlet offers at least several choices. In recent months there has been a number of articles in trade publications (Greenhouse Grower, Growing Produce News) discussing these types of products, and the benefits that they offer. While certainly beneficial for produce crops, keep in mind that most all plants grow in the soil. Improving a soil's productive potential makes sense whether you grow corn, tomatoes, or any other crop.

Last year we completed our first season with the new silicon products, and have continued to discover additional information as well as other research into what probable advantages these materials bring to individual management programs. We hope to have several comparisons this season to add to what is already a very impressive list of benefits. (There is a new product sheet now available on SiGuard and SiMag 58, if you wish to receive one, just let us know.

So ... as we close out the winter and start getting ready for "tomato season", we look forward to a profitable growing year. We are well aware that the 'perfect year' doesn't exist, but we also know that there are many management options to improve the potential of having a great year. ISP offers a number of them.

continued from page 5: important for overall root and soil health. Aerobic conditions slow the development of many root diseases and increase root growth. The only challenge that HP soils present is during hot sunny days when plants are growing rapidly and the demand for water is high. HP media requires more frequent waterings.

Artificial media is one of the major economic inputs when moving from soil to pot-based culture. At approximately $3.00 per cubic foot, a single 5 gallon pot can contain $1.50 – 2.00 worth of media. It is possible to get 2 crops per season in an indoor cucumber operation and reuse a good HP media over 2 or more seasons, so the cost of media replacement would mount rapidly if not reused. Sanitizing the filled pots between crops with a peroxyacetic acid drench, solarization, or steaming are excellent practices to keep a media in top condition.

Growing with ISP is a quarterly publication from ISP Technologies, Inc. If you do not currently receive a copy, but have seen it and are interested in having it mailed to you, please send your name and address to:

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It's also available in a pdf version if you would prefer receiving an electronic version. Please email your request to stevebogash@isptech.co

Every winter we plan our research projects for the coming season, and this year was no different. In some respects this is one of the most enjoyable activities, as we're enthusiastic about what we might be able to learn, and as Steve likes to say, "so far everything is perfect!" To date we have no weather events, diseases or insects to worry about. Well maybe one exception is the strawberries which are in their second and final season of research. For the most part it's all good!

- Red determinate tomatoes, 24+ varieties: Studying growth characteristics and yield potential. Locations will be at the Penn State SE Extension Farm, Michigan, and South Dakota. This project will have both outside and greenhouse/tunnel production.
- Processing tomato variety and yield trials: PSU SE Farm. Last year we maximized the yield on Heinz 3406 at 63 ton/acre. This year we shoot for 75 tons or more under intensive management. A small duplication of this project will be established in Michigan.
- Bell Pepper variety showcase: We'll be growing some of the latest bell peppers outside in Lancaster, PA, Michigan & South Dakota. Checking for yield and other quality indicators. Greenhouse production of same varieties in Michigan.
- Russet potato variety and nutrient trial: Growing russet potatoes successfully in the Mid-Atlantic is very challenging due to hollow heart. We will study three different levels of potash and six varieties of russets for yield and quality.
- High Tunnel Cucumber Variety trial: Parthenocarpic cucumbers continue to generate substantial buzz as an alternative high tunnel crop. This year we'll be looking at several new varieties in the PSU SE farm high tunnel.
- Restore 3G Field Corn trial: We are able to have large plots (30' x 200') where we'll be looking at yield advantages to using Restore 3G both with and without MicroZorb applied at growth stage V5 in high density plantings. PSU SE Research Farm.
- Projects with Virginia Tech and University of Maryland on wine grape production and grape quality.
- Seedless watermelon: Will have 12 varieties, and will also study plant response, fruit counts and quality from Metabolic HV-1 and a foliar program. Project will be in southwest Michigan.
- Muskmelon variety and fertility project, also studying yield and fruit quality, with and without MetaboliK HV-1. In addition, there will be several specialty varieties grown that will not be part of the replicated research.
- Onion project to observe the effects of SiGuard on thrip pressure. Will also include a yield comparison of Candy to Delgado.
- We also want to have several comparison projects with SiGuard on pumpkins, biostimulants on yellow field corn, and blackberries.