November 2010

News From...
ADVANCING ECO-AGRICULTURE

Connecting the Missing Links for Full Potential Agriculture

Mid Summer Decline as it Relates to Fall Soil Management

Mid Summer Decline is a term I coined to describe the rapid loss of plant energy and vitality many crops experience after fruit set and as they enter fruit sizing.

At this point in the plant's growth cycle, it is under the heaviest pressure from a variety of plant pests and pathogens.

Mid Summer Decline can be attributed to a variety of factors which affect overall plant health. Drought stress can be a problem as well as other environmental challenges over which we have no control. However, in my experience there is a single major source of most of the challenges a plant faces. This is a lack of readily available nutrition.

A prime example of this phenomena is the case of early blight in tomatoes. The causative agent of early blight is a beneficial resident on tomato leaves. Only when the plant weakens under large potassium demands to fill the fruit, does this microbe express itself as a pathogen. This same holds true for other microbes as well, such as, fusarium or verticillium or, for that matter, E-coli in our own digestive tract.

This lack of available nutrients can be caused by a variety of factors. Soils lacking in moisture don't seem to release nutrients very well for some odd reason, and the same holds true for soils which contain high salt levels. It seems to me, though, one of the biggest shortfalls of many soil systems is the very limited digestive capacity.

Digestive capacity refers to a soil's microbial community's ability to extract or synthesize nutrients from the reserves which are held in the soil's mineral matrix and in organic matter, and provide them in a form which can be utilized by plants. The soil's role in plant nutrition is remarkably similar to the digestive system of a ruminant animal. A cow's rumen is essentially a large fermentation vat in which various species of bacteria and yeasts consume the feedstuffs the cow ingests. The metabolites produced by this microbial community are the energy source utilized by the cow to fuel her own metabolism.

This same scenario holds true for the soil's plant relationship as well. The soil is a plant's digestive system. The micro flora and fauna in the soil system need to digest the food sources which are introduced into the soil such as organic material, root exudates, etc. If adequate feedstuffs are available and the microbial community is functioning well, the metabolites they produce are utilized by plants as their primary source of nutrition to fuel their own growth processes.

In many soils, this digestive system is functioning inadequately, which results in rapid decline in plant health at the point where crop demand for available nutrients exceeds the digestive system's capacity to supply the need.

Why does the digestive system fail? The nutrient delivery supply chain could collapse for any number of reasons, but the most common limiting factors are fairly elementary. Most living organisms have several basic requirements for life and growth which can be simply summarized as being oxygen, water, food, and comfort. In many soils, these basic needs are not being met.

Let's look at each in turn.

Oxygen availability is fairly critical to establishing a viable microbial community in the rhizosphere. Providing adequate oxygen is related to soil structure, having good soil aggregation, and providing adequate drainage. Good soil structure and soil aggregation is related to healthy fungal populations, which are dependent on good sources of stable carbon, i.e., organic materials.

Water is also needed at all times to build a strong digestive system. If the water supply fails, the digestive system fails as well. Again, soil carbon provides a reservoir capable of holding large amounts of water and releasing it as needed during the growing cycle. Without this reservoir, the crop is susceptible to any minor fluctuation in the water supply. If irrigation is being used, the quality of the water source is also a point of concern. A very low level of some contaminants can have a strong inhibiting affect on the soil's digestive system.

Food. The soil micro flora's primary food source can be summarized simply as 'carbon'. Yet that carbon can come in many different forms. Crop residue, cover crops, mulches, compost, and root exudates are all possible sources. For those 'raw' sources of carbon to supply us with the nutrient and water holding capacities we wish for, it will need to be digested to form stable humic substances which occurs primarily through the actions of fungi.

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Mid Summer Decline as it Relates to Fall Soil Management

(Cont'd from pg. 1)

From my perspective, fungi are vastly under rated and under utilized to build organic matter and provide plant available nutrients. Soil fungi can be somewhat roughly divided into four main groups with a slight overlap. These four groups are: mychorrizal, saprophytes, endophytes, and parasitic. Much has been written recently about mychorrizal fungi, but what about the other groups? What might their benefits be? This discussion will be the subject of another article. For now we can note that slicing and dicing below a certain level is not conducive to any fungal species.

In the final analysis, we can see that mid summer crop decline is directly connected to a dysfunctional digestive system, which is frequently related to inadequate supplies of carbon and the carbon not being properly digested to build stable humic substance by soil fungi. How can we take this into consideration as we review our fall soil management?

Fall Soil Management

As we well know, each season provides its own challenges and can vividly demonstrate the quirks of nature with vagaries of the weather and pest problems unique to each season demonstrating these quirks of nature in its many forms.

This past year, farmers had a variety of yield limiting factors to contend with - excess water in certain areas and water shortages in other areas compounded with temperature extremes, provided for some interesting scenarios. What can we do to offset some of these stress factors on our farm, besides covering it with a high tunnel?

How about building soil carbon?

Elevated levels of humus content in the soil provides us with innumerable benefits such as holding soil water, increasing aeration, providing better nutrient cycling, and better air and water penetration. Do any of these appear as if they might benefit us?

These are several primary challenges which many farms seem to struggle with on a continuing basis. Challenges which can be significantly improved by building soil humus. Building humus and carbon level in our soil is a subject never very far from a good farmer's mind. The decisions we make every day will, over time, have a large impact on our soils' humus level and overall health.

The approaching finish of the harvest season is an especially good time to consider our hopes and goals for the upcoming season and how we could possibly influence our soils positively. We have the opportunity to get our soils off to a head start in the spring by caring for it well this fall.

In our efforts to build soil humus and prepare for a good crop year, I believe it is imperative to have the soil covered with a growing crop at all times. Leaving soil exposed to the elements sets an entire cascade of negative effects into motion, such as erosion, weathering, compaction, and the oxidation of soil carbon to CO2, which is released into the atmosphere.

We strongly favor planting a cover crop in the fall to provide soil cover over the winter and to hold and release nutrients for the crop the following year.

The key to building soil carbon is to promote rapid digestion of raw organic matter to form humus. If digestion is slower, the raw organic matter can begin to oxidize and release carbon into the air as carbon dioxide (CO2). Stimulating an excellent decay system is central to building humus.

In a situation in which building humus is a key proposition, we need to start in the fall. Our first opportunity to enhance the soil's digestion system is to apply a digestive stimulant on the remaining crop residues and shallowly incorporate them into the soil, which is then followed by seeding an over-wintering cover crop. After we have incorporated our crop residues, we have an excellent opportunity to run a soil analysis and apply any needed soil correctives in the fall, which gives them time to be made available for a crop the following year. This is especially beneficial as root secretions from the growing cover crop enhance microbial digestion during the fall and early spring months before being incorporated. The growing cover crop will, in all likelihood, absorb some of the minerals applied in the fall and once incorporated and digested, these minerals will be in a readily plant-available form for rapid absorption by the growing crop.

When a cover crop is incorporated in the spring, especially a more mature crop with higher lignin content, it can be very beneficial to apply a biological digestive stimulant to help decompose these residues rapidly and release the minerals and other compounds needed for rapid crop growth.

If we utilize all of these different aspects of incorporating crop residues, cover cropping, and biological stimulation, in due time we will be able to enjoy the benefits of working with soil that contains high levels of active humus and has an over achieving microbial digestive system, which will ensure high levels of plant-available nutrients throughout the growing season. ~ JK

Greetings farmers and food producers...

Join us on the **Farmer Conference Call**
See page 5 for details

We have been enjoying some beautiful fall weather in northeast Ohio in the past few weeks. We have been receiving an adequate supply of moisture for which we are quite thankful after an extended dry period this summer.

This time of year provides many of us with an excellent opportunity to review the history of the recent production season, and note where improvements and modifications can be made in the future while the experiences are fresh in our memory. I find it helpful to critically review any procedure that slowed production and write down any ideas for improvement. Once we analyze our farming methods more closely, it becomes surprising how many steps we take at times simply because it has "always been done that way".

Many farmers had the opportunity to plant a cover crop on their otherwise empty fields this fall to provide a protective cover for the soil and to help build microbial populations. I have not experienced any other means of building soil organic matter which achieves results at the same level as incorporating a dense cover crop.

During the soil's seemingly dormant period in the fall and winter, the metabolic processes of soil microbes shift and slow down although they never stop completely. While the crops are dormant and not assimilating large levels of nutrients, the soluble nutrition from these microbes' metabolic processes is slowly accumulated in the soil. At the break of plant dormancy in spring, a fairly large supply of plant nutrition is readily available. This reservoir of plant available nutrients is one reason for the dramatic growth spurt of plants in the spring time. Our goal needs to be to extend this reserve of energy through the entire growing season. If we can accomplish this objective, our crops will be able to reach their full genetic potential.

As we can see, this reserve of available nutrients is the result of continued microbial action during a period of reduced plant requirements. To satisfy the plant's requirements through its complete growth cycle, we need to raise the bar on microbial performance during the growing period. Higher levels of microbial activity will generate increased levels of metabolites for plant nutrition which will help produce healthier and more productive crops.

It is quite possible to achieve these levels of performance, which was witnessed this past growing season in a tomato high tunnel. Tomatoes transplanted into the high tunnel in February had no diseased leaves in mid-October while producing exceptional quality tomatoes the entire year.

I find it quite interesting to review the life and growth patterns of the various microbes which people call pathogens. My personal definition of a plant pathogen is "a beneficial microbe at its maximum potential". Yes, you read that right. These microbes are beneficial in several senses. Beneficial in that they are the natural means of eliminating a sick fruit before it will be eaten. But primarily beneficial simply because they are beneficial. We can use several fungal pathogens as an example, such as alternaria, the causative agent for early blight, verticellium, or fusarium. Each of these microbes plays a role in digesting soil nutrients or has an otherwise positive relationship with healthy plants. It is only when plants lose their health and vitality and their energy field begins to weaken that these microbes become a dominant species since they find themselves in an environment conducive to rapid growth and reproduction. Dis-ease is a proper name for this process.

We have been very pleased with the results being reported from various field trials throughout the country with various products. This is especially so with the reports of stabilizing nitrogen, which was very evident and valuable with the high levels of rainfall many areas received this summer. Some data on our preliminary trials will be forthcoming shortly.

On another note, progress is being made on our new production facility. Our intentions are to have it operational for the spring season which we are anxiously looking forward to. We have been experiencing steady growth for some time which necessitated the move.

With more space available, we will also be expanding our capabilities to include custom blending and brokering of dry soil amendments and soil correctives in addition to our usual liquid mixing and custom formulating capabilities.

In keeping with the steady growth we are currently experiencing, Advancing Eco-Agriculture is looking for potential consultants and distributors. Please contact us if you have interest in the possibility of joining our team.

Advancing Eco-Agriculture is also offering a Early Order Program which is advertised elsewhere in the newsletter. Taking advantage of the prepay translates into significant savings for you.

We will be attending several conferences this winter, such as Acres, PASA, OPGMA, and others as well as having our winter meetings throughout the East and Midwest. I hope to see you then! - ***JK***

FIRST ANNUAL AEA FIELD DAY

Our first annual field day was held in July and was a great success! The weather was dry and warm and we had over 100 attendees.

John Kempf kicked off the event with a welcoming speech. The day was filled with break-out sessions covering crop monitoring, tomatoes, and vine crops to name a few, along with exhibitor displays and machinery exhibits.

Following the afternoon sessions, Lawrence Mayhew wrapped up the day thanking everyone for taking the time to attend.

If you missed this event, you won't want to miss 2011!
Mark your calendar now for July 19th!

Research Finds ...

Organic Farms
Produce Better Fruit, Create Healthier Soil

Side-by-side comparisons of organic and conventional strawberry farms and their fruit found the organic farms produced more flavorful and nutritious berries while leaving the soil healthier and more genetically diverse.

"Our findings have global implications and advance what we know about the sustainability benefits of organic farming systems," said John Reganold, Washington State University Regents professor of soil science and lead author of a paper published in the peer-reviewed online journal, PLoS ONE. "We also show you can have high quality, healthy produce without resorting to an arsenal of pesticides."

The study is among the most comprehensive of its kind, analyzing 31 chemical and biological soil properties, soil DNA, and the taste, nutrition and quality of three strawberry varieties on more than two dozen commercial fields -13 conventional and 13 organic.

"There is no paper in the literature that comprehensively and quantitatively compares so many indices of both food and soil quality at multiple sampling times on so many commercial farms," said Reganold.

The researchers found that organic had significantly higher anti-oxidant activity and concentrations of ascorbic acid and phenolic compounds. The organic strawberries also had longer shelf life.

The researchers also found the organic soils excelled in a variety of key chemical and biological properties, including carbon sequestration, nitrogen, microbial biomass, enzyme activities, and micronutrients.

(Reprinted with permission from The Organic & Non-GMO Report, Oct. 2010)

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Plant Tissue pH = Energy

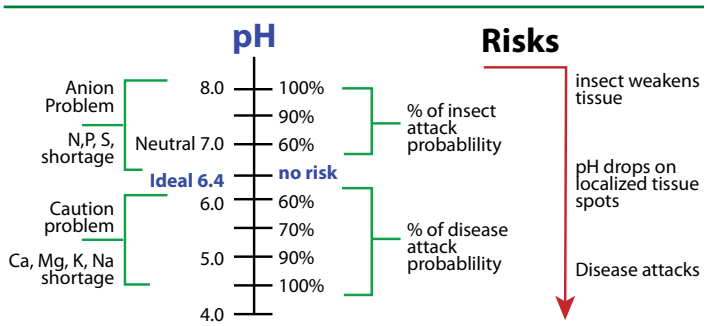
By Bruce Tainio

While laboratory soil and tissue tests are good and necessary tools, we often don't receive the results for several days, or even up to two weeks in some cases. On a growing crop, that can be too late.

With this in mind, we developed a diagnosis of plant health based on liquid pH values of plant tissue sap, which has been used in our biological program at Tainio Technology & Technique since 1989. Simple to use and 100 percent accurate, a quick plant tissue pH test is an instant snapshot of the state of health of any plant and can tell us the following information:

1. Enzymatic breakdown of carbohydrates (sugars) for proper growth and vitality of the plant.
2. Risk potential for insect damage.
3. Risk potential for foliage disease attack.
4. Nutritional balance in the growing crop.
5. Quality of nutrition in the fresh fruit or vegetable crop to be harvested.
6. Shelf storage potential of fresh fruits and vegetables.

The table below is a general guideline to determine what tissue pH means. With this scale we can predict the probability of insect and disease resistance or susceptibility.



The dictionary defines pH as "a number equal to the logarithm of the reciprocal of hydrogen ion concentration within a solution." That's a mouthful, but more simply put, pH represents the percentage of hydrogen ions in a solution. In our case, the solution is the liquid of the plant cell, or the sap.

It is important to know that a change in the pH level of a solution of just one unit equals a tenfold change in the hydrogen ion concentration. If the pH is increased or decreased by two units, the hydrogen ion concentration changes by a hundredfold! Thus we can see why what appears to be only a slight shift in pH can spell disaster for the farmer.

A neutral pH of 7 within the cell fluid means it contains 100 percent saturation of cations other than hydrogen (in other words, the sap contains no free hydrogen ions). At a plant's ideal cellular fluid pH of 6.4, the saturation of cations other than hydrogen is about 88 percent. At 88 percent saturation – principally of calcium, magnesium, potassium and sodium – the ionization and activity of these elements generates an electrical frequency of between 7.5 and 32 Hertz, which is one of the "healthy" frequency ranges of all living cells.

To decrease cellular pH to 6.0 is to lower the saturation of the above four principle elements to 80 percent, thus lowering the plant's frequency to a level of lower resistance to bacterial, fungal and viral plant pathogens.

Studies have shown that insects are attracted to a tree or plant by the tree or plant's frequency. If the saturation of Ca, Mg, K and Na increases to over 88 percent saturation, the frequency from these ions in the cell are increased, and consequently, insects are attracted to the higher-than-normal cell frequency.

The same process occurs in animal and human cells. Hydrogen accumulation in the cell tissue means the saturation of Ca, Mg, K and Na is decreasing, thus causing the frequency to decline. This low frequency leaves the cell an easy target for disease.

Oftentimes we see both insect and disease problems occurring at the same time. This can happen when insects attack due to a high plant tissue pH, and the tissue becomes weakened in the localized areas of attack. Next, localized, rapid energy loss (a drop in pH) occurs at the insect-damaged spots, resulting in tissue disease attack of those areas on the plant.

When a pH shift of a half point (0.5) or more from the ideal 6.4 occurs in the cellular liquid, a laboratory tissue test should be taken to determine exact imbalances and which materials should be applied.

Tissue pH Rule of Thumb

Low pH + Moderate Brix = Calcium Deficiency

Low pH + Low Brix = Potassium Deficiency

6.4 pH + High Brix = Balance

In the interim, for a quick adjustment to bring up the pH, calcium can be foliar applied in small amounts per acre. To quickly bring down a pH that is too high, on the other hand, small amounts of phosphate can be applied to the foliage. These types of quick fixes are usually only temporary, however, and should only be used while awaiting a complete tissue test analysis.

Like most busy people, we have neither the time nor the patience to puree the two pounds of plant tissue it takes to get enough for a conventional pH meter readings; so we use the Cardy Twin drop pH tester, made by Horiba. With this pH meter, a reading can be taken out in the field in less than one minute. We just take a few leaves, roll them up into a tight ball, and squeeze out a few drops of sap using a garlic press. Be sure and use a good quality stainless-steel press, as a cheaply made garlic press will break.

Generally, the more mature leaves on the plant will give the most accurate picture of the plant's health, level of resistance or susceptibility to problems. Since the plant spends most of its energy supporting new growth, the pH of new leaves will not reflect the pH of the rest of the plant as a whole.

pH & SUGAR

An indirect method of determining the energy levels of a plant is to measure the carbohydrate (sugar) levels in the cell liquid. For this

(Continued on Pg. 6)

Mark your calendar!

Farmers' Conference Calls

We will be having conference calls for farmers who are interested. The dial-in number and call dates are listed below:

Dial-in number: 1-712-432-8787
Access Code: 91847

Call Dates: August 12, 2010 *(sharing ID 2304)*
November 11, 2010
January 13, 2011
March 10, 2011
April 14, 2011

Time of call: 2:00 PM Eastern Time

To listen to calls dial 1-712-432-8788 and enter the appropriate sharing ID code.

Plant Tissue pH = Energy *(Continued from Pg. 5)*

test, a refractometer is used to determine the level of sucrose in the cellular fluid. This reading is referred to as the brix scale.

Within a given species of plant, the crop with the higher refractive index will have a higher sugar content, a higher mineral content, a higher protein content and a greater density. This adds up to sweeter-tasting, more nutritious food with a lower nitrate and water content and better storage characteristics. Such produce will generate more alcohol from fermented sugars and be more resistant to insects, reducing the need for insecticides. Crops with higher sugar contents will also have a lower freezing point and therefore be less prone to frost damage. Soil fertility needs can also be ascertained from this reading.

The brix levels should not be taken as an exact measurement of a plant's vitality, but rather as a guideline. Stored sugar is not a cellular energy source until its carbon-hydrogen-oxygen molecular links are enzymatically broken apart. If this line breaks or energy release occurs faster than the cell can use it, then that energy is lost into the air. This condition usually occurs when the liquid pH of the cell is below 6.4 and most often indicates low Ca and high K.

The reverse can also occur – if the links between the carbon, hydrogen and oxygen molecules of a sugar are broken too slowly due to low enzyme activity, the plant becomes starved for the energy it needs for growth. This is usually caused by low manganese or zinc, or from high nitrogen/high tissue pH levels, coupled with drought stress.

As a general rule, we can say that when a plant has a low tissue pH and a moderate brix level, there is usually a calcium deficiency involved. On the other hand, a low pH with a low brix level usually indicates a potassium deficiency. The ultimate goal is to achieve a pH of 6.4 with a high brix level.

Plant tissue pH management is a relatively small but invaluable investment of your time and budget, which cannot only help you prevent disease or insect attacks, it can stop them in their tracks even once they have gotten started. This means better yields, bigger profits and most importantly, less need for chemicals.

Bruce Tainio can be contacted at Tainio Technology & Technique, Inc. S. 12102 Andrus Rd., Cheney, Washington 99004, phone 509-747-5471, e-mail info@tainio.com, website www.tainio.com/tainio. Tainio's 2004 Acres U.S.A. Conference presentation, "Managing by Plant Tissue pH," is available on audiotape at www.acresusa.com.

Reprinted with permission from Acres U.S.A., March 2007.

Ground breaking Study Shows

Roundup Linked to Birth Defects

Glyphosate, the active ingredient in the world's best-selling weed killer Roundup, causes malformations in frog and chicken embryos at doses far lower than those used in agricultural spraying and well below maximum residue levels in products presently approved in the European Union.

The findings were recently published in Chemical Research in Toxicology. The research was led by Professor Andrés Carrasco, director of the Laboratory of Molecular Embryology at the University of Buenos Aires Medical School and member of Argentina's National Council of Scientific and Technical Research.

At a press conference during the 6th European Conference of GMO Free Regions in the European Parliament in Brussels, Carrasco said, "The findings in the lab are compatible with malformations observed in humans exposed to glyphosate during pregnancy."

Reporting of such problems started in 2002, two years after large scale introduction of RR soybeans in Argentina. The experimental animals share similar developmental mechanisms with humans.

The authors concluded that the results raise "concerns about the clinical findings from human offspring in populations exposed to Roundup in agricultural fields." Carrasco added, "I suspect the toxicity classification of glyphosate is too low. In some cases this can be a powerful poison."

The maximum residue level (MRL) allowed for glyphosate in soy in the EU is 20 mg/kg. The level was increased 200-fold from 0.1 mg/kg to 20 mg/kg in 1997 after GM RR soy was commercialized in Europe. Carrasco found malformations in embryos injected with 2.03 mg/kg glyphosate. Soybeans can contain glyphosate residues of up to 17 mg/kg.

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2nd Annual AEA Field Day

Save the Date!

Join us on July 19, 2011
for our
2nd Annual Field Day

- Presentations
- Discussion groups
- Tours

Early Order Program

Orders for spring-delivered products placed and paid in full through Dec. 24th qualify for a 5% discount off list price.

Orders for spring-delivered products placed through December 24th and paid in full upon shipment qualify for a 2% discount off list price.

Orders from the Early Order Program will be shipped February through April unless other arrangements are made.

The above discounting applies to all Advancing Eco-Agriculture standard liquid products and custom formulated liquids as well as dry soil amendments.

GM Traces Found in Milk and Animal Tissue

DNA fragments from genetically modified plants are increasingly found in animal tissue such as milk, inner organs, and muscles. Most recently, in April 2010, scientists from Italy reported DNA sequences stemming from genetically engineered soy in milk from goats. Traces of specific DNA were also identified in kids fed with the goat's milk.

For years now, it has been known that in general, DNA from plants is not completely degraded in the gut, and can be found in inner organs, the blood stream and even in the offspring of mice.

"Recent publications could lend support to those stakeholders in favor of labeling products such as meat, milk and eggs derived from animals fed with genetically engineered plants," says Christoph Then from Testbiotech.

Regarding health risks, researchers did find that enzyme activity in kids fed with goat's milk containing specific DNA was found to be enhanced.

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And Don't forget....

Join us on the Farmer Conference Call
See page 5 for details

ADVANCING ECO-AGRICULTURE
15266 Hayes Rd., Middlefield, OH 44062

Connecting the Missing Links for Full Potential Agriculture

You are invited to take advantage of our...

EARLY ORDER DISCOUNT

(See Page 7 for details)

Advancing Eco-Agriculture

Amendment Brokerage

See page 6 for details