News From...
October, 2011
ADVANCING ECO-AGRICULTURE
Connecting the Missing Links for Full Potential Agriculture

Crop HEALTH Transitions

Our vision and mission is to help farmers produce healthy crops that are insect and disease resistant and greatly reduce or eliminate the need for toxic insecticides and fungicides. We can accomplish this by providing farmers with knowledge of how diseases and insects interact with plants, information about tools to monitor crop health in the field, and agricultural inputs that can be used to increase and enhance plant health.

A plant's health and immunity is based on its ability to form structurally complete compounds such as carbohydrates and proteins. Complete carbohydrates, proteins, and lipids are formed by healthy plants with a fully functional enzyme system, which is dependent on trace mineral enzyme cofactors.

Plant pathogens, bacterial and fungal diseases, and insects have less complex digestive systems than higher animals and lack the needed enzymes to digest complete plant compounds. In his book titled, "Healthy Crops", Francis Chaboussou has documented a fair amount of research on the plant-pathogen relationship, protein formation in plants, and the plant immunity connection. Francis' theory of plant health, which he terms "taophobiosis", has its foundation on the premise that insect and disease pests cannot utilize complete proteins and carbohydrates as a food source.

We work with a broad variety of fruit and vegetable and broad acre crops in many regions with different soils and climates. We have successfully grown insect- and disease-resistant crops on many farms. On many of the farms, we have noticed some interesting transitional stages of plant health (see Plant Hierarchy of health, next page) and energy levels as soil and plant health improve over time; frequently, over a period of a few months to several years, depending on the crop and previous soil conditions. These stages of improving plant health have been based on our own experiences and from field observations. Over time and with experience on many farms, a succession pattern of plant health stages is becoming clearer.

As charted in the graph on page 2, efficient photosynthesis and the formation of complete carbohydrates is the foundation of plant health and immunity.

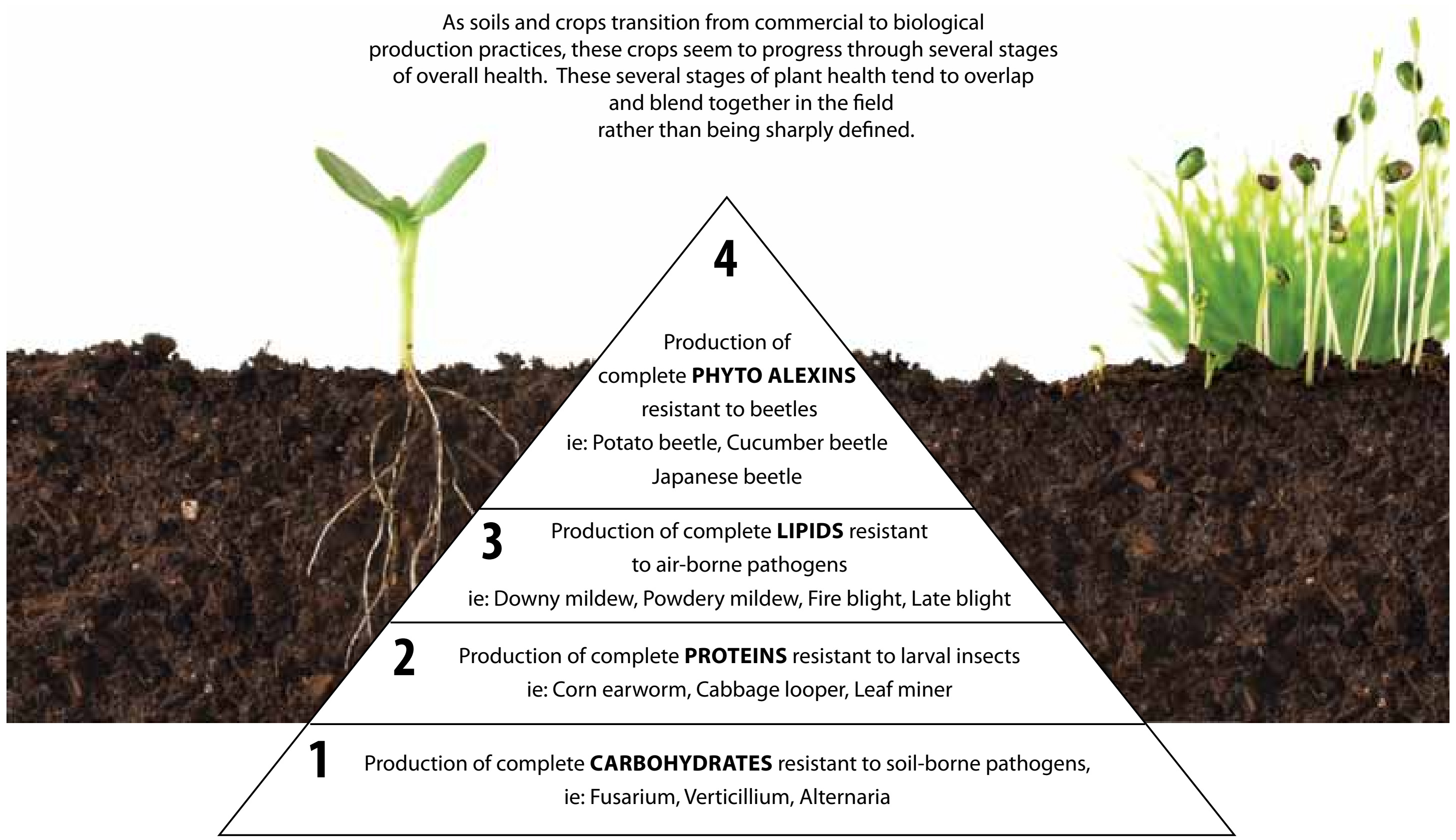
Without efficient photosynthesis, plants will not achieve any level of immunity or performance.

With functional photosynthesis and adequate levels of minerals and trace minerals to serve as enzyme cofactors, formation of complete proteins is initiated. As photosynthetic capacity and plant energy increase, plants begin to store surplus energy in lipids - plant oils. These lipids are the building blocks used to build plant protection compounds, called plant secondary metabolites (PSM5) or plant essential oils.

Continued on Page 2

Varying Degrees of Plant Health and Vitality

As soils and crops transition from commercial to biological production practices, these crops seem to progress through several stages of overall health. These several stages of plant health tend to overlap and blend together in the field rather than being sharply defined.



Phase I

In this foundational phase of plant growth and health, a plant's needs for adequate sunlight, air, water, and minerals are all being met; an efficient photosynthetic process is absorbing carbon dioxide from the air, water from the soil, and with the energy input from the sun, begins producing plant sugars and carbohydrates. Initially, the sugars formed during this process will be monosaccharides - simple sugars such as fructose, sucrose, and dextrose. As the process evolves, more complex sugars, called polysaccharides begin to develop. Cellulose, lignin, pectins, and starches are structural and store carbohydrates produced in greater quantities as plants become healthier.

In our experience, as long as plants are photosynthesizing properly and producing pectins and other complex carbohydrates, these plants do not seem to be susceptible to soil borne fungi – styled as "pathogens". Saprophytic fungi (fungi which decompose dead plant residue) such as alternaria, fusarium, and verticillium only become a problem when plants are unhealthy to the point where they no longer develop complete carbohydrates. As long as we have active photosynthesis and energy transfer, these "pathogens" cease to be a problem.

Join us on the Farmers' Conference Call
See page 5 for details

Phase II

As photosynthetic energy increases, plants begin to transfer greater quantities of sugars to the root system and the microbial community in the rhizosphere. This increase in energy and a food source for the soil microbes will stimulate them to mineralize and release minerals and trace minerals from the soil matrix, and provide them in a plant available form. Plants then utilize these essential minerals as enzyme cofactors which are needed to form complete carbohydrates and especially proteins. Soluble sugars, monosaccharides, when partnered with nitrogen, are the base materials used to form amino acids. Through the action of enzyme catalysts these amino acids are bonded together to form peptides from which complete proteins are formed.

Thanks to their rapid metabolism, insects need large amounts of protein for growth and reproduction. They can source their protein requirements from plants that have elevated levels of soluble amino acids in the plant sap. Many insects have a simple digestive system that lacks the digestive enzymes needed to digest complex proteins. In our experience, plants which are forming complete proteins and have low levels of soluble amino acids, are not susceptible to insects with a simple digestive system. This would include insects such as aphids and white flies and especially larval insects such cabbage earworm, alfalfa weevil, tomato hornworm, and many others.

Phase III

As photosynthetic energy and efficiency increases, plants develop a surplus of energy beyond that needed for basic growth and reproduction. Initially, large quantities of this surplus energy, in the form of sugars, are translocated to the root system, as high as 70% of the total sugar production. Later, the plant begins to store this surplus energy in the form of lipids – plant fats – in both vegetative and reproduction tissue. In vegetative tissue, these fats are primarily in the form of omega 3s, whereas omega 6s and 9s are mostly found in the storage organs or the fruit.

Plants always maintain a minimum baseline of lipid levels since they need these compounds to help form the phospho lipid cell membranes. As energy and lipid levels increase, this cell membrane becomes much stronger and more resilient enabling it to better resist fungal pathogens. It appears as though once plants achieve higher lipid levels and stronger cell membranes, they become more resistant to the airborne fungal pathogens such as downy and powdery mildew, late blight and others, as well as some bacterial invaders, notably fire blight, scab, rust, bacterial speck, bacterial spot, and others.

It should be noted that plants must have a functional digestive system (the microbial community in the rhizosphere) before they will develop to this stage of plant health, otherwise, they will lack the energy needed to develop higher levels of lipids.

Phase IV

The elevated lipid levels developed in Phase III are then used to build complex plant protectant compounds styled plant secondary metabolites. The plant builds these plant secondary metabolites (PSM5), or essential oils, to protect itself from would-be parasites, UV radiation, or overgrazing by insects or herbivores. Many of these compounds, which include terpenoids, bioflavonoids, carotenoids, tannins, and many others, contain anti-fungal and anti-bacterial properties, as well as digestion (enzyme) inhibitors.

Once plants achieve this level of performance they become immune to insect attack from insects that have a better developed digestive system, primarily the beetle family such as cucumber beetles, Colorado potato beetles, and Japanese beetles. At this point, plants have a tremendous level of stress tolerance and can cope with weather extremes reasonably well.

Again, these phases of plant health are based on our observations and experiences in the field. Transitions in the field are not always clearly delineated as in this chart, however, over time a clearer picture begins to emerge as crops and soils become healthier and healthier and "pathogens' become less and less of a problem. Farming can quickly become a most enjoyable occupation.

- John Kempf

Good News!

Our newsletter will soon be available electronically! If you would like to receive your issue electronically, please email us at *diane@advancingecoag.com*
You can always view our newsletters and information about our products at ....www.growbetterfood.com

Greetings farmers and food producers...

We are experiencing an unusually wet fall here in northeast Ohio. The cool, wet weather has provided the ideal conditions for several fall fungal pathogens such as late blight and downy mildew.

In this issue, Dave de Vries has contributed an article discussing the importance of fall soil management and the Soil Rejuvenate Program. The essential part of this program revolves around microbial stimulation. Many future disease challenges can be buffered or even eliminated by providing a strong beneficial microbial community to eliminate these pathogens before entering winter dormancy.

Apple scab provides an excellent example. Scab inoculum is carried over from year to year by the leaf litter on the orchard floor. If we can apply a microbial stimulant to enhance the soil's digestive system, a great deal of the leaf litter will be digested by the following spring and the chances of soil infection can be greatly reduced. This same principle holds true for many other plant diseases which overwinter in the soil as well.

With the increasing cloud cover as fall weather approaches, now is a good time to pay close attention to plant growth quality, especially in the production of salad greens and fall seeded small grains. As sunlight hours decline and photosynthesis slows down, many plants can begin to accumulate high levels of soluble amino acids and other plant compounds that increase susceptibility to insect and disease attack. As in the case of small grains, sometimes the effects cannot be seen until the following spring when it shows up as snow mold or various other diseases.

The challenges can easily be resolved by ensuring the plants have adequate mineral nutrition for efficient photosynthesis. Foliar applications of plant stimulants and nutrients can generate an excellent response when used properly at this stage of the growing season.

This is the time of year when soil sampling is in full swing as the crops are taken off the fields. Now is also a good time to start thinking about applying any needed soil amendments to build soil fertility.

New evidence of the harmful effects of pesticides in the environment continues to come to light. Newer generation botanical control methods are becoming increasingly effective and provide us with viable and environmentally positive options for increasing plant immunity and restricting plant pests. Stay tuned for new developments in this field.

Wishing all of you a healthy and happy season!

Happy growing!

- John Kempf

The field hibernates.
Dried stalks and leafless shrubs
stand out against a light
dusting of snow.

Nature and the gardener
draw a breath
after summer's frantic rushes
and fall's rich harvest.

Keeping Your Winter Soil *Alive!*

Beneath the snow, the soil lies frozen in a rock-like crust. At first glance, it seems lifeless and barren. However, as we look deeper to observe the rich interconnectedness of the soil web, we see that, while the field sleeps, the soil dreams of spring. When we have completed our work as farmers, replenished and protected the powerhouse of soil life, millions of organisms are eager to provide a surge of growth as the weather warms. Knowing what happens deep in the winter soil helps us to understand why our fall gardening practices are so essential.

In this article, I can only lightly touch on the vast complexity of the soil food web. I will pass over all the protozoan species, the nematodes (good and bad), and the vast range of insects and arthropods. My focus is just a sample of microorganisms and worms -- the smallest and largest inhabitants of the soil.

BACTERIA AND ARCHAEA

Soil microbes, like all living organisms, need food and energy. In winter, as the sun's warmth declines, these are at a premium. Annual plants die after setting seed, while perennials reduce growth and consolidate sugars in their roots; thus, less plant sap is available to feed carbohydrate-loving microbes. With decreased warmth and nutrients, decomposition of organic matter slows as microbes settle toward a quiescent state.

Because of their simple structure, many types of bacteria can freeze without harm. Unlike more complicated organisms, bacteria have membranes that do not burst when their internal fluids turn to ice. With soil rich in humus, bacteria can hibernate through the cold weather well protected within their carbon habitats. Soil that drains well and has humus content around 10% is an ideal environment for protective microbes over the winter.

Some microbes are even hardier and more primitive than bacteria. These are the archaea, a relatively recent discovery in soil biology. Archaea microorganisms are possibly the most ancient living things and have been found in every known environment from Yellowstone's hot springs to ice floes in the Arctic. Because they can live and reproduce in extraordinarily harsh ecologies, they are often called extrememophiles -- lovers of the extreme.

While only a few hundred types have been studied, it is probable that thousands of archaea species live in the soil. Until recently, it was thought that only certain bacteria were able to convert ammonia into nitrate, a process called nitrification, essential for plant nutrition. Scientists have found that Crenarchaeota archaea are, by far, the most effective at oxidizing ammonia -- up to 3,000 times more effective than bacteria. Archaea, with their extraordinarily simple cells, are still working at temperatures near 0°C when other microbes are fast asleep.

To promote soil life during fall and winter, I suggest the planting of cover crops. As the crop breaks down, it adds necessary humic matter to the soil not only from the plant itself, but also from the root system. I also suggest stimulating the soil's life with an application of biological folar program that would contain a form of usable sugars, humic acid and a biostimulant. A great example of this would be our Soil Rejuvenate Program. Crops such as rye, winter wheat and harry vetch protect the soil from leaching of minerals and also help stabilize soil carbon, essential for microbes. The Rejuvenate Program, with its diverse microbial population, supercharges the soil and roots with microbial life. Research shows that the population of microbes around roots can actually grow during winter, generating organic nutrients ready for spring.

SOIL FUNGI AND MYCORRHIZAE

Many species of soil fungi do not actively survive the winter; instead they set spores. As soon as the soil temperature rises, those spores begin to sprout, sending out masses of thread-like hyphae, connecting to their preferred nutrient sources. Most fungi are beneficial to the soil food web, breaking down cellulose to produce plant nutrients and humus. Others can be noxious pests, colonizing mulch, depleting nutrients and attacking plants.

Fungal spores causing rusts, blights, wilting, molds, damping off, and root rot are everywhere, floating in the air and settling in the soil. Many agronomists suggest that the ground be rough tilled in fall and weathered during winter to help rid the soil of unwanted fungi and insects. However, this is a two-edged sword. Fall tilling disrupts the network of beneficial fungal hyphae, particularly those belonging to mycorrhizae.

Continued on Page 6

Mark your calendar!

Farmers' Conference Calls

Join our conference calls for interesting discussions on hot topics. The dial-in number and call dates are listed below:

Dial-in number: 1-610-214-0200
Access Code: 828476#

Call Date:

October 19
How do I know my fertilizers are working?

November 2
Monitoring plant health
Using sap pH, brix, and tissue analysis

December 7
Selecting quality seed

January 4
Jumpstart planting

Time of call: 7:00 PM Eastern Time

To listen to past recorded calls, dial 1-712-432-8788, enter the access code 91847#, and then the appropriate sharing ID number

2011 Past Calls:
Blueberries ~ 3658#
Forages and small grains - not recorded
Tree fruit and orchards ~ 3759#
Fall cover cropping ~ 3806#
Garlic and onions ~3895#
Soil amendments ~3939#

AEA Consultants:

Dave de Vries *(Canada)*	519-503-2535
Dan Kittredge *(MA)*	978-257-2627
Dave Kunkle *(NY)*	585-476-2262
David Miller *(OH)*	740-623-0989
Charles Miller *(IA)*	319-683-3925
Lonnie Slabaugh *(KY)*	606-763-6117
Jonathan Zeiset *(PA)*	717-433-7702
Sam Zook *(PA)*	717-354-2115

Advancing Eco-Agriculture

Field Day 2011

Once again, John Kempf kicked off the event with a warm welcome to more than 130 customers who attended. The event featured the well-known speakers, authors, and lecturers such as Arden Andersen, Jerry Brunetti, Lawrence Mayhew, Marc Tainio, and Steve Becker. After garden tours, the day concluded with a tour of our new manufacturing facility.

Our 2012 Field Day
will be held on
Tuesday, July 17, 2012!
Mark your calendars now!!

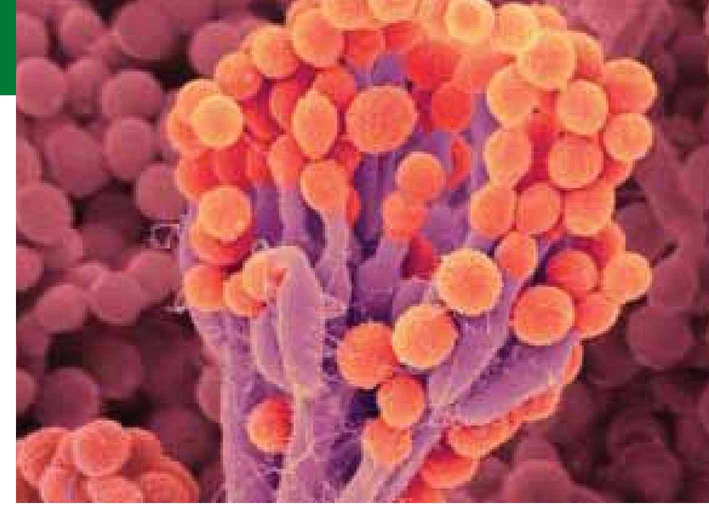
Save the Dates!

December 8-10, 2011
2011 Acres U.S.A. Conference
Optional Pre-Conference
Intensive Study (Dec 6-7)
Hyatt Regency, Columbus, Ohio
Look for us in Booth 417
To learn more, go to:
www.acresusa.com/events/events.htm

January 16-18, 2012
OPGMA Congress
Ohio Produce Growers Marketing Assoc. Congress, Booth 513
Kalihari Resort and Convention Center
7000 Kalahari Dr., Sandusky, OH 44870
To learn more, go to: http://www.opgma.org/?q=congress

And Don't forget.... ***Join us on the Farmers' Conference Call***

Next Farmer Conference Call date is ***Oct 19, 2011***
See page 5 for details



Keeping your Winter Soil ALIVE!
Continued from Page 5

Mycorrhizae have been shown to not only strengthen plant development, but also help prevent infestation by noxious fungi. Both spores and hyphae of mycorrhizae withstand winter temperatures and, if left undisturbed, can quickly colonize plant roots in the spring. Another beneficial fungi, trichoderma, actively attack destructive fungi in the soil and on plant surfaces. It even prevents snow molds that form on fields under snow. Healthy winter soil, full of beneficial fungal microorganisms, defends tender spring seedlings from attack and gives a boost to early growth.

Again, planting a cover crop is an effective way to strengthen populations of beneficial fungi. Trichoderma and mycorrhizae are found in large numbers in the soil after the cultivation of winter cereals. I believe that a soil well stocked with good fungi has enormous value in protecting plants from attacks of all kinds.

WORMS

Of all the myriad members of the soil food web, worms have the most interesting winter survival strategies. Before the soil freezes, common earthworms burrow down into the subsoil, below the frost line -- as much as six feet deep. There they form a slime-coated ball and hibernate in a state called estivation. Because they are wrapped in mucous, they can survive for long periods without moisture until spring rains wake them from their slumber.

Not all kinds of earthworms make the downward journey. Some lay eggs in cocoons safe in the soil, ready to hatch when conditions are right. Then they settle under leaf litter on top of the soil, where they freeze and die. A type of Northern worm, S. niveus, has evolved an extraordinary method of making it through the winter. S. niveus worms can manufacture glycerol as a kind of antifreeze in their internal fluids. This allows them to supercool their bodies to 15C and survive even the harshest cold.

Using a Soil Rejuvenate foliar and a providing a deep covering of healthy cover crops, will keep all those wonderful organisms in the soil snug and healthy throughout the winter. With all that life poised to spring into action, you can be sure your next growing season will exceed all your expectations.

- Dave de Vries

From Veronnika's Kitchen

by Veronnika Greanthum

Is there any better time of year than Autumn? Maybe it's the warm days and cooler nights and holding hands on an evening walk or, maybe it's the harvest, or the leaves changing color, or the excitement of upcoming holidays and time with family. Maybe it's just that we love apples and hot apple cider! Over the years, I've made my share of Apple Crisps and the following is one of the best recipes I've ever made. It's so good, you'll want to make it instead of pie for your company…..and everyone will want to go home with the recipe!

This recipe is made in 3 easy steps.

1. CREATE APPLE CONCENTRATE: Reducing cider and adding it to the filling concentrates the fruity flavor.

2. CREATE CARAMELIZED APPLES Sautéing sugared apples in butter contributes caramelized flavor and allows for easy stirring, so slices will cook evenly .

3. TRANSFER TO OVEN: Just 15 minutes at 450 degrees browns the topping without overcooking the apples and keeps the topping from turning mushy.

Skillet Apple Crisp **Serves 6 to 8**

Notes before you start. Your skillet needs to be oven-safe.
I like Golden Delicious apples, but any sweet, crisp apple such as Honeycrisp or Braeburn can be substituted.
DO NOT use Granny Smith apples in this recipe.

TOPPING
¾ cup (3 ¾ ounces) unbleached all-purpose flour
¾ cup pecans, chopped fine
¾ cup old-fashioned rolled oats (no Quick Oats)
½ cup (3 ½ ounces) packed light brown sugar
¼ cup (1 ¾ ounces) granulated sugar
½ tsp ground cinnamon, ½ tsp sea salt or table salt
8 Tbsp (1 stick) unsalted butter, melted

FILLING
3 lbs (about 7 medium) Golden Delicious apples, peeled, cored, halved, and cut into 1/2-inch-thick wedges
¼ cup (1 3/4 ounces) granulated sugar
¼ tsp ground cinnamon (optional)
1 cup apple cider, 2 tsp juice from 1 lemon,
2 Tbsp unsalted butter

INSTRUCTIONS

1. FOR THE TOPPING: Adjust oven rack to middle position and heat oven to 450 degrees F. Combine flour, pecans, oats, brown sugar, granulated sugar, cinnamon, and salt in medium bowl. Stir in butter until mixture is thoroughly moistened and crumbly. Set aside while preparing fruit filling.

2. FOR THE FILLING: Toss apples, granulated sugar, and cinnamon (if using) together in large bowl; set aside. Bring cider to simmer in 12-inch oven-safe skillet over medium heat; cook until reduced to ½ cup, about 5 minutes. Transfer reduced cider to bowl or liquid measuring cup; stir in lemon juice and set aside.

3. Heat butter in now-empty skillet over medium heat. Just when foaming subsides, add apple mixture and cook, stirring frequently, until apples begin to soften and become translucent, 12 to 14 minutes. (Do not fully cook apples.) Remove pan from heat and gently stir in cider mixture until apples are coated.

4. Sprinkle topping evenly over fruit, breaking up any large chunks. Place skillet on baking sheet and bake until fruit is tender and topping is a deep golden brown, 15 to 20 minutes. Cool on wire rack until warm, at least 15 minutes, and serve with natural vanilla ice cream or fresh whipped cream.

Early Order Discount

ORDER NOW, PAY NOW for 5% discount.
place order and pay before Dec 24 and get 5% off list.

ORDER NOW, PAY LATER for 2% discount
place order by Dec 24 and pay when delivered to get 2% discount

All orders will be delivered Feb-April 2012.

ADVANCING ECO-AGRICULTURE
4551 Parks West Rd., Middlefield, OH 44062

Visit us
at the ACRES conference!
Dec. 8-10, 2011 • Columbus, OH
Booth #417

Connecting the Missing Links for Full Potential Agriculture

Advancing Eco-Agriculture

Rejuvenate Your Soil

Take advantage of our 2012
Early Order Discount
See page 7 for details

Apply our Rejuvenate spray this fall for enhanced results next year!