INTERNATIONAL AG LABS
A BIOLOGICAL APPROACH TO AGRICULTURE

International Ag Labs

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BY JON C. FRANK

Enhancing Soybean Yield

Have you hit the soybean plateau? Are your average yields stuck between 45 and 60 bushels? We all know Kip Cullers' world record of 160 bushels per acre. That's three times the production found in the "soybean plateau." Much more significant than the world record is Kip's whole-farm soybean average: 90-100 bushels per acre; that's 1 ½ to 2 times the soybean plateau. This article looks at significantly increasing soybean yield on your farming operation. How far? That depends on you. I think 100 bushels per acre is an optimal number to shoot for with 75 to 80 bushels being an attainable goal.

Consult With your Doctor

While high yields make for some enjoyable bragging rights it is not the bottom line. What pays the bills is still profit per acre. As a result, this program may not be for everyone. Do you have short-term leased ground? Don't try to implement this program until you have sharpened your pencil and made sure it cash flows. Attaining high-yielding soybeans is usually the result of doing many small things right and is mostly the effect of a multi-year approach. It always starts by addressing the…

Foundations of High Yield

The foundations of high yield are extremely simple in concept but much harder in application. All you need to do is: 1) select appropriate genetics for your conditions and 2) create an optimum growing environment that supports two aspects of crop physiology—a dense canopy of leaves to harvest solar energy and a thriving, vibrant rhizosphere.

The rhizosphere is the place where plants harvest soil minerals. The job of the soybean plant is to combine the energy collected by the leaves with the minerals collected by the roots. To increase yield you also need a third component; energy in the plant. This energy comes primarily from the soil through soil conductivity. Additionally, the young plant needs to have adequate phosphorus early to make enough ATP. This is a subject we will come back to but for now let's return our attention to the rhizosphere. The rhizosphere needs to have a prolific rate of exchange between soil biology giving plants earth minerals and plant roots giving soil biology a continuous food supply via plant root exudates and sloughed off root cells. **This back-and-forth exchange in the rhizosphere is the key to crop productivity.**

Welcome

The growing season started a little rough for most throughout the Midwest. Cold, rainy conditions delayed corn and soybean planting later than normal—some areas are of the U.S. are still struggling to find fit planting conditions. Just when we begin to lose hope, providence smiles and somehow everything is planted, grown, and harvested each year. For that, we are thankful.

Although there are some drawbacks with late planting, there is still time to redeem your crops and push yields to new levels. It is our hope at International Ag Labs that you find the information here both informative and beneficial to your operation. As always, our door is open and we welcome any questions or requests for consultations. We especially enjoy hearing about your personal successes on your farm.

Here's to a great growing season and new, improved yields! ■

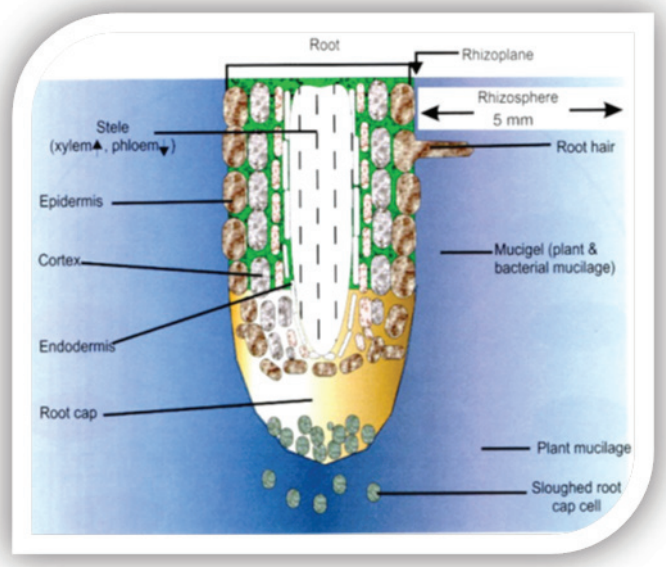
Your Aglabs Team

Employee Spotlight

Tammy Diersen

For 20 years Tammy has worked as a faithful employee with International Ag Labs. When IAL began, the lab functioned out of Dr. Skow's basement with a small amount of samples trickling in. As the amount of soil samples increased, the lab expanded residing in its current location. Soil Samples continued to roll in requiring more lab equipment, employees, and someone to oversee it all. In 1991 Tammy Diersen was hired as the Lab Manager and continues to oversee the lab's daily activities. Her other duties include conducting Morgan and C.E.C. soil tests, and processing fertilizer, manure, water, plant tissue and feed mycotoxin analysis. Most importantly, Tammy ensures that lab results are accurate providing precise information up to IAL customer standards.

Prior to her career with IAL, Tammy lived and worked on the farm while raising her two children. When she's not working she enjoys playing golf, boating, gardening, and spending time with family and friends. ■



The dense canopy of leaves and a thriving rhizosphere are both founded upon two foundational aspects of soil physics:

1. Mineral Availability
2. Electrical Conductivity

We will look at both of these later in the article but first we must…

Start with the Soil

Residue represents a significant reservoir of nutrients and the potential to build humus—it is also a yield drag. Many a bushel has been forfeited just because the soil had to expend so much energy digesting corn residue in July when it should be pumping out new soybean pods. The solution here is an aggressive residue program starting soon after corn harvest. See our earlier newsletter, **Residue Decomposition,** for the full details. A common misconception is that soybeans don't need much fertility. While beans can get by with much less nitrogen compared to corn; phosphorous, potassium, sulfur, calcium, and trace minerals still need to be supplied. I can assure you high yielding soybeans are not grown on poverty soil.

Here are some additional ideas when looking at soil:

✓ **Use some tillage**. Tillage helps incorporate residue for better digestion and increases the oxygen content of soils. This supports aerobic bacteria that help keep fungal disease organisms in check.

✓ **Take a soil test.** As previously mentioned, quality yields begin with the soil. See our earlier newsletter Accuracy of a Soil Test for more information.

✓ **Address calcium needs.** No amount of NPK can make up for a calcium deficiency. To achieve high soybean yields your fields may require limestone and gypsum.

✓ Apply limestone and **gypsum in the fall.** By applying soil amendments in the fall the soil is in better shape by planting time. In contrast, commercial fertilizers are ideally applied in the spring.

✓ **Use the right fertilizers.** Use mono-ammonium phosphate (11-52-0 or MAP) instead of the di-ammonium phosphate (18-46-0 or DAP), and potassium sulfate (0-0-50) instead of potassium chloride (0-0-60 or potash). These simple adjustments may gain several bushels.

✓ **Apply 100 lbs. of ammonium sulfate in the broadcast.** Until you see plenty of internally colored pink and red nodules on soybean roots, the plant could be severely nitrogen deficient which is remedied by the ammonium sulfate. Additionally, sulfates help make better proteins and increases oil content in the seeds.

✓ **Broadcast nutrients.** The bulk of the nutrients need to be applied across the whole acre, not just in a strip. This is important because roots should not encounter "poverty zones." A preferred fertility program is to broadcast 100 lbs. each of potassium sulfate, ammonium sulfate, and mono ammonium phosphate provided phosphorous and potassium are short in the soil.

✓ **Pass on grid fertilization.** This is just the latest gimmick by agribusiness to squeeze more profits out of farmers. While it sounds convincing in theory, to date I have not heard a single farmer testify that it increased **profit per acre.** Breakeven is the best hope with grid fertilization. Another negative is that farmers are locked into using only what the co-op has available – even if it is the wrong form. A good composite soil test with biological recommendations would do a lot more for yield than grid fertilizing ever will.

Planting for Success

Let's leave the discussion of soil and look at what can be done at planting to increase production.

✓ **Avoid the GMO yield drag.** That's right – plant non-traited beans with great genetics for better yields.

✓ **Plant soybean rows going east and west instead of north and south.** Here's why: nature follows the line of least resistance. The same electromagnetic lines of force that move a compass needle north also subtly directs plant roots in the same direction. Thus the majority of soybean roots grow toward magnetic north. When rows are planted east to west the roots going north have plenty of root pasture. If the rows are planted north and south they bunch up under each other – the roots equivalent of a traffic jam.

✓ **Plant beans in rows – not by drilling.** This may be controversial but there is one important reason for this; beans planted in rows can incorporate a starter.

✓ **Use a starter.** This could well be the most important practice to increase yield. Here is an optional soybean starter:

- 1 gallon Hydro-Carb
- 1 gallon 6-24-6 or 8-19-3
- 1 quart Z-Hume
- 1 ounce Seednique (optional).

Let's look at the components of the starter.

What is Hydro-Carb? It is a liquid carbohydrate with added nutrients encouraging microbial stimulation. Hydro-Carb contains humic and fulvic acids to enhance seed germination and is the perfect complement to the microbial inoculants Z-Hume and Seednique. The goal is to create a thriving microbial community in the root zone which jumpstarts a fully functioning rhizosphere.

From planting to functional rhizosphere maybe something like three weeks. What does biology feed on in the meantime? Carbohydrates found in Hydro-Carb fill this gap as well as stimulate rapid proliferation of bacteria. The pre-root creation of a thriving microbial community is an important aspect of International Ag Lab's biological approach to growing a healthy crop. Once the roots grow into this thriving microbial community the rhizosphere is created and plant growth really takes off. Why the 6-24-6? Keep reading - it's more important than you think.

The Critical Phase: V3-V5

Now that the beans are up and growing they soon enter an early critical phase. By V3 the stage has already been set for future yields. Earlier I mentioned that the job of soybeans is to combine the sugars made by the leaves with the minerals picked up by the roots. Of course plants also use these inputs to create proteins, oils, and many other phytonutrients. In short, it takes a tremendous amount of energy within the plant to do this. There are two variables that greatly contribute to internal energy within the plant. The first is electrical conductivity in the soil, which we will discuss later, and the second is the amount of ATP within the plant. ATP, short for adenosine tri-phosphate, is the metabolic engine that gets all the work done in the plant. The key point is that ATP cannot exist without phosphate. When phosphates are deficient the soybean plant is unable to construct enough ATP to optimally run its metabolism. Phosphorus in the form of ATP is needed for the plant to:

✓ **Produce sugars** – this occurs through the process of photosynthesis

✓ **Transport sugars** within the plant including to the roots. This has a direct impact on the health of the rhizosphere

✓ **Transport minerals** – soybeans must move minerals to construct new roots, leaves, and pods

The easiest way to tell if your soybeans have enough phosphorus within the plant tissue to make a good supply of ATP is to analyze the third trifoliate leaves at the V3 stage. If the percent of phosphorus is lower than 0.35% on a dry matter basis the soybeans will be at a disadvantage metabolically. This has a direct impact on yield. Just imagine the difference between a two-lane and a four-lane highway—the difference in traffic capacity is significant. Likewise in soybean production, if the plant does not have enough ATP the potential solar energy and soil minerals that could be combined to yield soybeans will not happen. Unfortunately, by V3 the pattern of ATP sufficiency or deficiency has already been set and will carry on throughout the life of the plant. In other words if your V3 plant tissue analysis for phosphorus comes back at 0.25% you can officially slap your head and say: "I should have had some phosphorous in my starter." **This scenario of low metabolic energy within the plant is all too common in beans and is the major reason why soybeans need a starter and why soybeans should be planted in rows to facilitate the starter.** Low phosphorus in a plant tissue can be partially compensated by aggressive foliar feeding of Bloomit later in the season. International Ag Labs offers plant tissue testing as one of our lab services.

The goal during the early growth stages is to build a strong infrastructure for high productivity. It is important that the plants have the ability to hold a heavy load of beans. To do this we look to an early application of plant growth regulators found in PGR. For more information about PGR please see the article ***Mastering Plant Nutrition*** or find it at www.foliarsprays.com.

The V3 Lift

The V3 Lift foliar spray contains 1 quart of PGR and 1 pint of RL-37 per acre. PGR is a liquid seaweed blend containing plant growth regulators that initiate rapid growth in response to the hormonal effects of cytokinins and auxins present in the seaweed. Not only does it promote rapid growth above ground, it also creates the same response in the roots. For the best response to foliar sprays the phosphorus content in the plant tissue should be 0.35% or higher and soil conductivity should be 500 micro Siemens per centimeter (Ergs on our soil test) or higher. If your conductivity reads 100 Ergs don't even bother with the V3 Lift – it won't be cost effective. Here are a few things to keep in mind during this critical phase.

✓ **Reduce herbicides** – Many of the systemic herbicides disrupt the rhizosphere. Sudden Death Syndrome is a classic example of a disrupted rhizosphere

✓ **Avoid glyphosate entirely** – This product is a liability. When cumulative effects reach a tipping point, yields—

even on good farms—can rapidly plummet

✓ **Increase cultivation** – Not only does this combat weeds it also stirs up plant growth

✓ **Use front-mounted cultivation** – "The cure for cultivator blight"

Keep Energy Flowing

I believe the greatest potential for increasing soybean yield comes from maintaining soil energy. Soil energy has a direct response on plant energy. By maintaining soil energy, plants respond better to nutritional foliar sprays.

A conductivity meter is the number one tool that must be in every farmer's toolbox. Soil conductivity is a measure of the soils ability to conduct electricity and is derived from electrolytes in the soil. Electrolytes are soluble nutrients in the soil solution. As plants grow these soluble nutrients are picked up by the plants resulting in a reduction of soil conductivity. High rainfall dilutes the electrolytes in the soil, again resulting in lower conductivity readings. As soil conductivity readings drop so does the metabolic energy in plants. Here are some practical considerations when monitoring and maintaining soil energy…

✓ Invest in a probe type conductivity meter. If soil is dry, water a small area with distilled water ½ hour before inserting the probe.

✓ Monitor your fields twice a week

✓ When soil energy dips below 400 micro Siemens per centimeter then broadcast a 100 pound mix right away. See accompanying handout for specific recipes.

✓ Ideally shoot for 800 to 1,000 micro Siemens per centimeter

The Last Push

Many a foot race was lost by not pushing hard enough in the home stretch. When it comes to soybeans the final push is where high yields are achieved. If you have applied appropriate fertility, addressed calcium needs, applied a biological starter, and maintained soil energy throughout the season, you are now ready for the final push.

On June 21, known as summer solstice, day length begins to shorten in the northern hemisphere. This triggers a physiological change in soybeans that initiates flowering and pod set. Since the plant already wants to set seed, all we need to do is push it in that direction. Here's how: apply Bloomit every two weeks from June 15th until full maturity is reached. Here is the exact formula:

- 2 quarts of Bloomit
- 4 ounces RL-37
- 20 gallons water

Bloomit contains four components all promoting the formation of new pods in soybeans. It is a clear liquid and is the strongest reproductive foliar spray that International Ag Labs manufactures. See the accompanying tech sheet for more information on Bloomit.

I hope this article has provided some insightful concepts and motivational ideas to help you raise high-yielding soybeans and most importantly—maximize profit per acre. ■

For better farming,

Jon Frank

BY JAMIE JONES

Soybean Staging

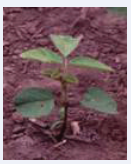
And Why It's Important to Understand

VE: Soybean seed begins to germinate when water is absorbed equaling about 50% of the seed's weight. Roots emerge and the hypotocyl begins to make its way toward the soil surface. The hypocotyl arch breaks through the soil crust, is exposed to light, and begins to straighten up pulling the cotyledons out of the ground.

VC: The cotyledons continue to feed the soybean plant as the unifoliate leaves begin to unfold.

The remainder of V-stages are determined by the number of fully-developed trifoliates off of the main stem. Trifoliate leaves on branches are not counted, only the trifoliates off the main stem.

V1: One set of unfolded trifoliate leaves.

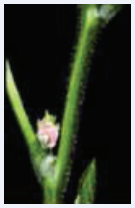


V2: Two sets of unfolded trifoliate leaves. Plants are typically 6-8 inches tall with three nodes. Nitrogen fixation from bacteria begins at this time. This is where a Brady Rhizobium bacteria seed inoculant is beneficial as it aids in forming nodules on the roots. Insides of healthy nodules should be pink or red.

V3-V5: Soybean plants at V3 will be 7-9 inches tall with four nodes and at the V5 stage will be 10-12 inches tall with six nodes. Branching may increase at this time especially in wider spacing or with lower plant populations. The total number of nodes is established at V5 and auxillary buds form on top of the stem. The buds will turn into flower clusters but more importantly, they will allow a soybean plant to recover from hail or wind damage. As long as the main growing point and at least one auxillary bud is intact, the plant will produce new branches and leaves.

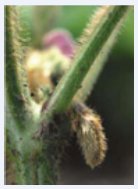
V6: Plants are typically 12-14 inches tall at this stage and the unifoliate and cotyledons may have senesced from the plant. Lateral roots underground have crossed over the row in 30 inch or less rows.

R-stages represent the reproductive stages of the soybean. At this point in the plants life, it is very harmful to apply herbicides as it may cause bud and/or bloom abortion. A normal soybean will typically lose 60-75% of their blooms and applying certain products, such as a herbicide, causes even more bloom abortion greatly decreasing yield potential.



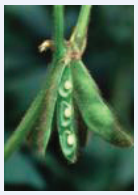
R1: Soybeans are beginning to flower. The beginning of this stage is identified when the plant has a minimum of one open flower on any given node.

R2: The plant shows an open flower at one of the two uppermost nodes. Soybean plants continue to grow throughout the reproductive stages and measure around 17-22 inches tall.



R3: Pods begin to develop and are 3/16 of an inch long. Yield potential may be greatly affected at this stage as temperature and moisture stress can affect the number of pods as well as beans per pod.

R4: Rapid pod growth begins in this stage with pods measuring around ¾ of an inch. R4 is the most crucial period pertaining to yield. Any stress caused to a soybean plant from R4-R6 results in greater yield reduction than any other stage.



R5: Seeds begin to set in the pods throughout the plant and there is an increase in water and nutrient demand from the plant. Plants reach maximum height, nodes, and leaf area. Nitrogen fixation also peaks and begins to drop.

R6: Pods containing green seeds begin to fill the pod cavity. Lower leaves of the plant may fall off

R7: Soybean plants begin to change color and at least one pod on the plant reaches mature pod color. Dry matter in seeds peak and all green color is gone from the seed and pod. At this stage the plant is safe from a killing frost.

R8: 95% of the pods have reached their full mature color and soybeans rapidly lose moisture. 13% or less moisture is desired for long-term storage.

Information derived from Iowa State University Extension and University of Wisconsin, Madison Extension.

Photos from Soybean Growth and Development by John Gaska, University of Wisconsin-Madison Agronomy.

Scripture Moment

The Sneeze

A True Story from Eastern Shore Disctrict High School – Musquodoboit Harbour, Nova Scotia

They walked in tandem, each of the ninety-two students filing into the already crowded auditorium. With their rich blue gowns flowing and traditional caps, they looked as grown up as they felt. Dads swallowed hard behind broad smiles, and moms freely brushed away tears.

This class would not pray during commencements, not by choice but because of a recent court ruling prohibiting it. The principal and several students were careful to stay within the guidelines allowed by the ruling. Inspirational and challenging speeches were given, but no one mentioned divine guidance and no one asked for blessing on the graduates or their families. The speeches were nice, but they were routine until the final speech which received a standing ovation.

A solitary student walked proudly to the microphone. He stood still and silent for just a moment. Then it happened—all ninety-two students suddenly sneezed! The student on stage simply looked at the audience and said "God Bless You" then walked off stage. The audience exploded into applause. This graduation class had found a very unique way to invoke God's blessing on their future with or without the court's approval. This is a true story—God Bless You!

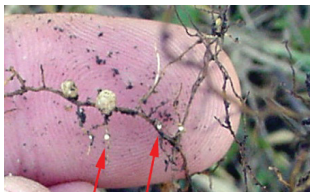
For it is written, *"I will destroy the wisdom of the wise, and the intelligence of the intelligent I will reject."* First Corinthians 1:19

"For the foolishness of God is wiser than men, and the weakness of God is stronger than men." First Corinthians 1:25 ■

BY JAMIE JONES

Yield Robbers

Know What Pests Are Stealing Yield



1. Two-Spotted Spider Mite:

Two-spotted spider mites are yellowish-green with a dark spot on both sides of the abdomen and have 8 legs. When hatching, these mites form colonies on the underside of plant leaves and produce a webbing over the leaf surface. Spider mite infestation worsens with drought-like conditions because they move from wilting permanent vegetation to surrounding soybean and corn fields. Higher temperatures favor mite reproduction resulting in explosive populations. Damage from two-spotted spider mite infestation appears in yellowish-white speckling and is typically more evident on the underside of the leaf. As the insects continue to feed by piercing and sucking out the leaf cell contents, photosynthetic surface decreases along with the leaf's ability to hold water. Damage begins in the lower canopy and progresses upwards and is typically more severe around the edges of a field.

2. Bean Leaf Beetles:

These soybean pests vary in colors ranging from orangey-yellow, tan, or red. Wing covers typically have four black spots with distinct black margins and always have a black backward pointing triangle behind the head. Adult female Bean Leaf Beetles lay their eggs in soybean fields just below the soil surface and once hatched are called the first in-season generation—this typically occurs in June or July. The first generation then lays their eggs creating in a second generation which emerges in August or September. Damage from both generations throughout the growing season consists of 'shot holing' of the leaves which are circular punctures eaten out of the leaf reducing photosynthetic surface, and pod clipping where the beetle eats the outer protective pod layer. Because of the sucking and chewing mouthparts, Bean Leaf Beetles transmit many diseases to soybeans resulting in further damage and yield reduction.

3. Stink Bug:

Stinks Bugs are typically more bothersome in the south and not so much in the northern states. These 6 legged insects, which emit a foul order to repel predators, can be green or brown. This pest is capable of producing 1-3 generations from May to September with a population peak in August and September. Stink bugs, both adult and their young, feed on various parts of the soybean plant including stems, blooms, leaves, pods, and developing seeds. A brown discoloration appears around the puncture wound on the plant. Young seeds appear deformed, small, and may even abort. Older seed becomes shriveled and discolored.

4. Wireworms:

Wireworms are small reddish-orange worms that feed on and damage soybean seed by completely hollowing it out leaving behind only the seed coat. This ultimately results in seedling death. Although wireworms are typically not found in soybeans, they are more prevalent in fields where sod, grass type crops or small grains were previously planted. Fields that remain wet for long periods of time may also be targeted by these pests. Utilizing an insecticidal seed treatment will help minimize wireworm destruction.

5. Soybean Aphids:

Relatively new the U.S., Soybean Aphids are soft bodied insects that can be pale yellow or green. Early generations are winged with a shiny black head and thorax, and dark green abdomen. Soybean Aphids are identified by two distinctive dark tipped cornicles (resemble tail pipes). Overwintering on buckthorn and flying off to their host plant—soybeans—these rapid reproducing bugs can have 15-18 generations in a growing season. Soybean Aphids have piercing-sucking mouthparts enabling them to extract plant leaf sap. Damage caused by persistent heavy aphid pressure (75+ aphids/plant) includes plant stunting, distorted leaves, and decreased pods, reduced seed size and quality, and eventually yield loss. Soybean plants will be coated in a thick, sticky, honey dew substance which is excreted by aphids.

At International Ag Labs we believe in protecting your crop from the ground up. With strong soil fertility, many of these infestations can be avoided, or at least held off longer compared to low-fertility fields.

6. Soybean Cyst Nematodes (SCN):

The three stages of a SCN consist of egg, juvenile, and adult. Female juveniles are the only stage in which the nematode can infect the soybean by penetrating and moving through the root. Once vascular tissue is contacted, the SCN will begin to feed. Females are white and become larger lemon-shaped but are hard to see with the unaided eye. SCN are much smaller than a soybean nodule. SCN plant injury isn't necessarily easy to identify as it

We Quote Delivered Prices

Fertilizer Brokerage is a service of International Ag Labs. If you're a crop producer trying to maximize your use of organic or commercial fertilizer, it's well worth you time to contact Fertilizer Brokerage. We have an extensive network of contacts and suppliers and a history of knowledge and expertise in the field of agriculture. That's why we look out for you and what's best for your operation by offering the best prices available in today's volatile markets.

We only recommend the best products on the market to meet your needs at the lowest prices. The nutrients and soil amendments we offer will meet the nutrient needs of the crop to be grown, while at the same time maximizing yields.

You can call to request quotes on different products. We quote delivered prices. If you don't see what you're looking for on our website, give us a call and we'll try to find it for you at the best price possible. ■

closely resembles iron deficiency chlorosis. The main difference between the two is that chlorotic symptoms typically appear in June but SCN injury is more likely to occur in July and August. Also, yellowing from SCN starts at the edges of the leaves and iron deficiency chlorosis symptoms affect the interveinal area of the upper leaves. High populations of SCN in a soybean field will result in circular-shaped areas of the field which are stunted and a discolored yellow. Affected roots are stunted and the number of nitrogen-fixing nodules is decreased.

As always, there are many insecticides available to 'treat' these pesky bugs. Of course this should be followed up by a high priced fungicide to help protect your soybeans from any lingering side effects—such as diseases transmitted during infestation. At International Ag Labs be believe in protecting your crop from the ground up. With strong soil fertility, many of these infestations can be avoided, or at least held off longer compared to low-fertility fields. Just as a pack of wolves surround and attack the weakest animal in the heard, that's just what insects do to plants of insufficient nutrient quality. Funneling more investment into fertility will provide more profitability in the long run…

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5. O'Neil, Robert J. and Ho Jung Yoo. Soybeans With Built In Bug Repellent. Iowa State University. 16 September 2009.
6. Tylka, G.L. Free-Living and Plant-Parasitic Nematodes (Roundworms). The American Phytopathological Society. 2011. ■

Bloomit Reformulation

NEWLY REFORMULATED TO INCLUDE MANGANESE!

International Ag Labs has added Manganese to Bloomit® as an added benefit to the already effective foliar spray. See enclosed Technical Bulletin on Bloomit® for more detailed information on the importance of Manganese. Bloomit® can help you achieve top soybean yields!

BY DR. DAN SKOW

High Yielding Soybeans

Look to Your Roots

Improving soybean yield is on many growers' minds especially when the market has placed a value of $13-14/bushel. High yielding soybeans require a massive root system which few fields possess. Soil texture, tilth, and over all fertility have a huge impact on root systems. There are a few things you can do at planting time to affect roots such as correct seed bed preparation, planting depth, and seed selection. Soil temperature and moisture conditions, as well as seedling vigor factor into root mass development. Emergence typically takes five to ten days depending on soil conditions and seedling vigor. I have witnessed the same variety of soybeans being planted at the same time but grown two different ways resulting in a five day difference in emergence. One area of the field was treated with International Ag Labs' RL-37 applied the previous spring; the other side received no treatment. The treated area had quicker emergence with a noticeable difference in plant vigor after ten days of emergence.

Creating a Better Root Mass

One way to dramatically improve root mass and nodulation is to add 8-19-3 or 6-24-6, Z-Hume, PGR, Dextrose, and water at planting. It's important that the 8-19-3 or 6-24-6 be made with orthophosphate as this form of phosphorous is immediately available to the plant upon application—no time is wasted in waiting for it to break down into plant useable form.

A fertilizer that greatly hinders soybean and other crop production is 0-0-60 (potash). Potash contains a high salt index—the higher the salts the greater the nematode problem. When soil needs potassium use manures, 0-0-50 (potassium sulfate), or 0-0-21.5-10.5Mg-21S (K-MAG).

Calcium, Carbon Dioxide, & Bacteria

The growing points on all roots require a lot of calcium and often not having enough bio-available calcium limits root mass and yield. Calcium carbonate in the root zone can greatly increase the soils production of carbon dioxide which is also very important to plant roots. Roots, just like leaves, can absorb carbon dioxide—this is an over looked factor in crop production. Bacteria in the rhizosphere of roots release a lot of carbon dioxide so it's important to support bacterial populations. Adding Z-Hume in the row at planting will aid in achieving this, and along with PGR, a plant growth hormone, will enhance root development at the same time. In doing so, research indicates a 30-40% increase in root mass over untreated controls.

Soybean Starter

- **1 gal/acre 8-19-3 or 6-24-6**
- **2 qt/acre Z-Hume**
- **1 pt/acre PGR**
- **1 lb/acre Dextrose**
- **5 gal/acre Water**

Compaction

There are many things that affect roots and compaction is a big one. Applying Gypsum along with Agri-SC can help reduce compaction.

✓ 300 lbs/acre Gypsum

✓ 10 oz/acre Agri-SC ■

If you want high yielding soybeans, give the crew at IAL a chance to help you.

Picture: Wendell Owens, International Ag Labs, standing in his soybean field.

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