TO: U.S. Peanut Growers

FROM: Russ Berndt
Product Manager,
Advanced Seed Enhancements

RE: 2015 Peanut Grower Inoculant Guide

We are pleased to be able to continue to sponsor this helpful and informative peanut product guide.

Our goal is to help you achieve more yield per acre. One of the best ways to do this is to supply you with fresh inoculant each growing season.

When deciding which peanut inoculant product to use, be sure to:

1. Select the inoculant that delivers the freshest, most vigorous *rhizobia* for ensuring maximum root nodulation and nitrogen fixation.

2. Choose the inoculant that delivers the newest technology and most advanced *rhizobia* in a formulation that fits your management program and application equipment.

Each of our Vault® peanut inoculant formulations contains high-performing *rhizobia* made fresh for each growing season. Select the in-furrow or at-planting application that’s right for your situation.

**Vault® Liquid** – Features the latest technology with advanced *rhizobia* bacteria plus Integral® – an EPA-registered biofungicide in a liquid in-furrow application formulation

**Vault® SP** - A highly potent, sterile, peat-based *rhizobia* product that is applied on the seed in the planter box at planting.

**I hope you enjoy and find value in this year’s Peanut Inoculant Guide. And, from all of us at BASF, I wish you success in 2015.**

To learn more, visit agproducts.basf.us or talk to your BASF Authorized Retailer.
Unlocking Profit Potential

The yield potential of each seed is at its maximum when it is put into the ground. Decisions such as crop rotation and field selection help the seed reach its full potential. Irrigation and pest management help protect that yield potential. However, stresses, such as disease pressure, drought and not being timely with inputs, lowers the bar on what yields can be achieved.

Peanut profitability is reached through high yields or by cutting production costs. Reducing inputs to cut production costs can negatively impact yields, thereby reducing the profit margin. A better plan is to focus on giving the crop every possible opportunity to achieve that maximum yield potential.

More Yield, More Profit

Profitability involves putting all the pieces together from the inputs with a fixed cost to those variables that are truly key components such as timing but have no actual cost, to bring about a quality product that yields above what is needed to cover those costs. Valuable yield is waiting in each peanut seed and the profit potential begins in the root zone.

One critical component to peanut growth is the inoculation process. Researchers agree that peanuts respond better to the nitrogen fixation provided by rhizobia bacteria than it does to direct application of nitrogen fertilizer.

The question is, “Should you trust that viable, peanut-specific rhizobia is in the soil in sufficient amount to properly nodulate the crop or should you make sure it is there?”

A lack of viable, peanut-specific rhizobia in the soil and in close proximity to the seed means that time is lost while the seedling waits for bacteria to arrive. The lack of nitrogen slows the growth process and allows for problems, such as disease, to attack the sluggish seedling.

Placing a fresh, high quality inoculant in a concentrated area around the seed where it can enter into the root quickly will give that emerging peanut plant the best start. At the earliest opportunity, the beneficial bacteria can enter into the roots and begin multiplying, making nitrogen quickly available to the plant. From here, vigorous growth is achieved, and canopy closure is attained more rapidly. IG

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A Commitment To Efficiency

Applying an inoculant to peanut is a choice for sustainability.

For centuries now, agricultural producers have known that to bring forth crops from the soil required care of that soil and of the water and other resources. To stay in one place and farm the same area of land required a long-term view of agriculture production. Any farmer who has wanted to stay in business or have something to pass down to the next generation has always worked to be a sustainable agriculture system.

Harness The Plant’s Own Power

One concept of sustainable agriculture is to make efficient use of natural resources. As a legume, the peanut plant has a most efficient way of securing nitrogen readily available from the air. Nitrogen provided any other way would not be ecologically aware as through the mutual relationship the peanut plant has with *rhizobia* bacteria.

Taking advantage of the relationship between nitrogen-fixing *rhizobia* bacteria and the host legume, peanut, is simply being sustainable. The plant supplies an environment, nutrients and organic substrate in which the microbial Rhizobium can grow and thrive. In turn, the *rhizobia* reduce atmospheric nitrogen to a form the plant can use. Consider the high energy requirements to make synthetic fertilizers and you’ll appreciate the power of the peanut plant and his humble sidekick, *rhizobia* bacteria.

Choose To Be Sustainable

Applying an inoculant at planting ensures that an adequate amount of peanut-specific bacteria will be present in the soil in close contact with peanut seed and roots where infection, the beginning of the symbiotic relationship, can occur. Strains of *rhizobia* may already be present in the soil, but their numbers or their specificity to a particular legume are usually far less than optimum.

To choose to add an inoculant so that the plant can do what it is normally supposed to do or be the most efficient is the sustainable choice.

Doing More With Less

Just as peanut seed have been improved upon and now contain resistance to certain diseases or tolerance to insect pressure, inoculant products have also undergone a transformation to greatly improve the product performance and give more value to the farmer.

The BioStacked technology contained in BASF inoculant products combines beneficial biologicals with multiple modes of action as a system to provide more consistent and dependable performance across a broad range of environmental conditions.

BioStacked technology can provide improved nodulation and nitrogen fixation in legumes. These synergistic components also improve nutrient uptake, plant vigor and yield potential.

Always Working Together

To help producers be more successful, BASF conducts extensive research in the laboratory as well as in the field, and partners with farmers and other customers to incorporate input and feedback. These new ideas and technologies will help farmers get the most out of every acre and achieve higher yields, healthier plants and maximum profit potential.

Despite the challenges, producers deliver on their commitment to respect nature and be stewards of the land. BASF is committed to partnering with farmers to enable them to continue growing food in an efficient and sustainable way. IG
BASF Is Committed To Sustainable Agriculture

BASF defines sustainable agriculture as achieving more yield from existing land, using less water and energy, while ensuring the profitability of farming, caring for the environment and meeting the needs of society and future generations.

Specifically, BASF believes that sustainable agriculture:

- **is an integral part of society.** Prosperous agriculture is part of a stable and reliable social environment, and sustainable agriculture should therefore be an integral part of political and economic debate.

- **depends on farmers.** As stewards of the land, farmers are ultimately responsible for putting sustainable agriculture into practice on a daily basis. BASF is committed to partnering with farmers to enable them to continue growing food in an efficient and sustainable way.

- **saves resources and protects the environment.** Fact-based scientific principles should be used to improve farming efficiency, which will be necessary if we are to increase agriculture production over the coming decades and make the most efficient use of natural resources.

- **is dynamic.** Farming techniques, socio-economic factors and the ecological environment in cultural landscapes can change. Farming concepts, which are exclusively driven to maintain the status quo or to re-establish historical farming practices, should not be implemented on a large scale basis when better alternative solutions are available.

- **requires a diversity of solutions.** There are many types of farms and methods of farming, including conventional, integrated crop and pest management and precision farming. BASF supplies products, technologies and services for all types of sustainable farming methods, and supports the co-existence of all these systems at the farm level.

- **needs collaboration and partnership.** Farming in the future should ensure farmers an adequate income, protect the land and provide abundant, healthy and affordable food. This can only be achieved through increased and broader investment in agricultural research by governments and industry, joint partnerships, dialogue, and the responsible, thoughtful behavior of all involved.

- **looks to the future.** New answers need to be found through innovative agricultural research initiatives, and the development and use of new agricultural technologies.

- **needs research and innovation.** While new technologies require careful and detailed assessments of their associated risks and benefits, the exclusive or disproportionate consideration of risk only, isolated from the benefits, is not the right way to successfully implement the principles of sustainable agriculture.

- **needs to be quantified and managed.** Products in development by BASF will help to provide clear measurement of sustainability programs.

- **needs dialogue.** BASF engages in ongoing stakeholder dialogue and consultation with feedback integrated into its sustainable agriculture programs and initiatives.
The Research Proves It

Studies show the importance of inoculant use.

Researchers continue to learn more about the unique relationship peanuts have with the bacteria that inhabit their roots and form nodules that allow the plant to collect nitrogen from the air and convert it into a usable compound for the plant.

Scott Tubbs, University of Georgia cropping systems agronomist, has conducted some of the more recent research on inoculant use.

In one study, he looked at applying liquid inoculants in-furrow at planting on new ground. Tubbs found that the inoculated peanuts out-yielded the non-inoculated peanuts, not necessarily at a statistical difference as far as data analysis, but enough to be an economical difference to the producer and enough to have paid for the use of the product.

In another research project, Tubbs found that foliage color is not the best indicator of an inoculant failure. Tubbs found that foliage color may differ to a greater extent based on genetics than it does based on inoculated versus non-inoculated peanuts.

Don’t Go By Color

“A grower should not depend solely on foliage color to determine an inoculant failure,” he says. “You have to get below the surface, see that the nodules are there and that they are active.”

Finally, in another aspect of getting to the root of the matter, Tubbs studied the nodulation achieved through inoculation of peanut plants.

“We conducted an experiment where the roots of the peanut were carefully cut off of the plant, and then the nodules were slowly and carefully pulled off of the root cuttings. We then weighed the nodules from the different plants.

“As expected, the plants that had an inoculant applied had much more nodulation than the untreated check plants. The inoculated peanuts did better than the untreated check on all variables.”

Starter Fertilizer Can Be Costly

In a study on the use of starter fertilizer, Tubbs found that the use of starter fertilizer decreased profitability. In one year he found that starter fertilizer decreased profitability by $24 to $29 per acre, and the next year, profit was decreased from $15 to $54 per acre, except at the rate of 15 pounds of N per acre.

“In most years, it takes merely a 50-to 80-pound-per acre increase in yield to cover the cost of the inoculant application at planting,” he says.

Evidence supporting the yearly use of inoculants and the price for not doing so continues to mount. IG

Placing an inoculant in the root zone leads to:

• A vigorously growing crop with a better yield potential.
• A greater ability to withstand disease pressure than peanuts under stress.
• A good start with the use of fresh rhizobia versus potentially sluggish indigenous rhizobia.
• A low-cost way to ensure the proper strain of bacteria is present.
• Savings from using the peanuts’ natural nitrogen-fixing ability.
HERE COMES ANOTHER SATISFIED CUSTOMER.

Give the peanuts what they want. Take control of weeds with Cadre® herbicide, and apply Priaxor® fungicide for 21 day control of leaf spot, overall Plant Health and increased yield potential—because healthy plants are productive plants.

Ask your BASF Authorized Retailer about the Peanut Portfolio today.

Apogee® Plant Growth Regulator  Cadre® Herbicide  Priaxor® Xanthomonas Blight Fungicide  Poast® Herbicide  Prowl H20 Herbicide

BASF
The Chemical Company

Always read and follow label directions. Apogee, Cadre, Poast, Priaxor and Prowl are registered trademarks of BASF. ©2014 BASF Corporation. All Rights Reserved. APN 14-MKT-0047
Get The Best Start Possible

Set yourself up for success by using a fresh inoculant every year.

Cleaning products advertise the ability to kill harmful bacteria in the home. Horror movies feed on the fear of harmful bacteria causing a plague to sweep across the populations. The truth is bacteria get a bad rap, but they are critically important. Where would we be without bacteria to breakdown waste of every form? You can imagine.

For legumes like the peanut, bacteria are a beautiful thing, a true partner in getting the job done for the producer. Rhizobia bacteria stand at the ready to march into the roots of developing peanut plants and do their job of converting atmospheric nitrogen into a form the plants can use. All the bacteria ask in return is a little nourishment and a place to stay.

Benefits From Day One

Putting rhizobia into the soil at planting benefits the plant’s health from the time it germinates.

Because it’s the natural way to do things, inoculants are cost effective. The

How do you choose the most effective inoculant?

• **Start Fresh** – All Vault peanut inoculants are made fresh every year and the amount of active rhizobia is guaranteed. Each product contains a freshness/expiration date.

• **Select Advanced Rhizobia** – All Vault peanut inoculants are made with the most advanced Bradyrhizobium bacteria for optimum compatibility and viability.

• **Stack On The Benefits** – Vault Liquid with BioStacked Technology combines multiple beneficial biological components in one product.
peanut plant benefits from the use of an inoculant from day one. By the time a lack of nitrogen is realized, the plant has already lost yield. With an inoculant, the plants are healthier and more vigorous right from planting, plus some products have added protection against seedling disease.

If you do apply nitrogen fertilizer too early, you are taking away from the bottom line in multiple ways. First, fertilizer is expensive, and much more expensive than inoculant at times. More importantly, if you have too much early nitrogen fertilization, the rhizobia in the soil don’t do their job. The plant takes up the nitrogen that’s been added to the soil and doesn’t use the more efficient method from the symbiotic relationship with the rhizobia. What happens long term when the fertilizer is used up? The crop will not have the nodulation caused by the multiplying rhizobia, and nitrogen deficiency is a real possibility.

Make A Plan For 2015
This year’s wet weather left many low spots in fields saturated at times. These anaerobic conditions impact the rhizobia population in the soil, and good nodulation is essential to high yields because it is the main source of nitrogen from seedling stage to maturity. Using a fresh, robust product to put rhizobia back into the soil will be important in 2015.

From 2014 Peanut Information
David Jordan, North Carolina State University Extension peanut specialist

Growers should inoculate their peanut seed or fields to ensure that adequate levels of rhizobia are present in each field. The data in Table 3-16 are from multiple locations and years and give an indication of the possible response of peanuts to inoculant applied as a liquid or granular in the seed furrow.

While peanut response to rotation is often predictable, response to inoculant and rotation combinations is less predictable. Therefore, peanuts should be inoculated in all years regardless of previous rotation history to minimize risk and maintain yield.

Generally, a peanut plant with 15 nodules by 40 days after emergence has adequate nodulation. Oftentimes, foliar symptoms of nitrogen deficiency will be apparent by this time if nodulation is not effective.

Later in the season, the plant will need many more nodules, more than 100, for optimum growth, development and yield. If fewer than 15 nodules are noted 40 days after emergence, especially if peanut foliage is yellow, growers should consider application of ammonium sulfate.

Inoculant Tips:
- Extreme conditions, such as heat, drought or flooding, can reduce rhizobia populations in the soil.
- Know the factors that affect successful nodulation of the crop.
- Do not rely on foliage color as different varieties vary in color.
- The number of years between planting may not be the most accurate way to determine whether or not to apply an inoculant.
- Greater yield can be achieved through the use of an inoculant.

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Q. Why should I use an inoculant?
A. As a legume crop, peanuts can supply their own nitrogen, but only if *rhizobia* bacterium is available in the root zone and in close proximity to the emerging seedling to enter into the root and begin fixing atmospheric nitrogen. To do this successfully and with the utmost efficiency, there also needs to be a sufficient quantity of bacteria that is in vigorous condition to move into the roots and multiply quickly.

Q. Do I need to apply an inoculant every year?
A. Although bacteria can survive in the soil for many years, today’s inoculant products are far superior to bacteria found natively in the soil. Producers need a product that is ready to colonize in the root, form nodules and begin fixing nitrogen as quickly as possible. Because it is a live organism, *rhizobia* already in the soil and not applied fresh at planting has spent its energies just trying to survive in the soil and may not be the vigorous product producers’ need.

In some areas, such as the Southwest, fresh inoculant must be added every year because of the harsh field conditions. Liquid, in-furrow products have been found to work best in with arid, dry soils. Even in the Southeast, conditions such as high temperatures or water-logged soils can exist that make it a sound investment to add new inoculant every year.

Conditions that can affect the viability of the *rhizobia* in the soil are as follows:
- **Acidity:** *rhizobia* and/or their effectiveness may be reduced in soils with a pH below 5.5 or above 8.0.
- **Organic matter:** *rhizobia* survive better in soils with increased organic matter.
- **Temperature:** *rhizobia* populations can be reduced in hot, dry soils—particularly at planting— or may not be available to shallow-planted seed. Cool soil temperatures may slow bacteria movement into the roots.
- **Drought:** Moisture is needed for *rhizobia* to survive. Prolonged drought, combined with high temperatures, can reduce levels.
- **Flooding:** In contrast, flooding and the depletion of oxygen in the root zone will also kill the bacteria.
- **Competition:** Other strains of bacteria and soil organisms competing for moisture and nutrients may reduce the amount of *rhizobia*.
- **Plant stress:** Any practice or conditions that puts stress on the plant can reduce the nutrients available to the bacteria thereby reducing formulation of nodules.
- **Nitrogen level:** Formation of nodules can be reduced with applied fertilizer nitrogen levels as low as 30 pounds per acre in the soil.
- **Seed treatments or pesticides:** Some products are toxic to the bacteria.
- **Soil conditions such as compaction and erosion may reduce *rhizobia* populations.**

Re-introducing fresh, robust Rhizobia through a quality inoculant product will help ensure that these conditions are not affecting the potential nodulation of the peanut crop.

Q. Can I use leftover soybean inoculant for peanuts?
A. No. The product may be similar in name, but the species of bacteria needed for these two legume crops are different. Bacteria know what their primary host is and the signal chemicals sent out from the roots of the soybean are different than those sent out by peanut. The soil is full of many different types of bacteria, but those signal chemicals tell exactly which bacteria to respond. Putting a soybean inoculant is simply wasting money.

Today’s inoculant products may contain more than the bac-
teria. For example, Vault Liquid peanut inoculant, with BioStacked technology, delivers not only peanut-specific robust rhizobia bacteria, but also Integral biofungicide for enhance root vigor, nutrient uptake and suppression of Rhizoctonia and Fusarium root rot.

To get the benefits of nitrogen fixation and the resulting vigorous root growth, disease protection and, ultimately, a boost in yields, an inoculant specially produced for peanuts should be used.

Q. What do I need to remember about handling and applying an inoculant?
A. An inoculant should be bought fresh each year for maximum viability. Inoculants should be kept completely away from direct sunlight, and are best stored at temperatures from 40 to 77 degrees Fahrenheit. Do not freeze the product. Once a package has been opened, use it within 24 hours.

At application, make sure the inoculant is placed in direct contact with the seed for maximum uptake. If planting conditions are less than ideal, consider using a little more than the recommended rate. If water is used as a carrier for the inoculant, chlorine-free water, such as well or rain water, should be used.

Refer to the product label for further care and handling instructions and for application rates.

In the soil and ready to move into growing peanut seedling roots to begin converting atmospheric nitrogen into something usable for the plant is just where rhizobia want to be.

Q. How can I get the best efficacy from an inoculant product at planting?
A. It starts with selecting the right product fresh every year. Then, it needs to be stored and handled properly in that time between delivery and planting, as mentioned above.

At planting, proper calibration of application equipment is important. Check all nozzles and spray tips, and make sure everything is clean, in working order and calibrated correctly.

Remember that heavy applications of nitrogen too soon after planting may hurt or lessen the activity of the rhizobia bacteria. Nitrogen-fixation through the symbiotic relationship with peanut-specific bacteria is the best, most efficient and sustainable way to supply the plant with nitrogen.

Q. What does a grower need to know in order to choose the most effective inoculant product?
A. Inoculant products are thoroughly field tested. Evaluate university field trials, in your area if possible, to determine what inoculant product might work best in your production system.

Without adequate nodulation, you won’t have the yields you need. What a grower should look for in an inoculant product, first and foremost, is something specific to peanuts. You need a product with a high volume of rhizobia in it — such as can be found in liquid inoculant products, which provide a lot more rhizobia than other formulations.

Q. How do I make sure the inoculant is working?
A. Peanut growers should target two key times to scout their nodulation. First, scout five to six weeks after planting to assess early nodulation in advance of decisions about applying mid-season nitrogen. Second, checking late-season nodulation from mid-August to early September will confirm early observations and or flag fields that nodulated poorly.

For poorly nodulated fields, try to examine why nodulation did not occur to the amount desired and what can be done to enhance nodulation in next year’s crop.

Obvious signs where the inoculant was misapplied are yellow rows or even spotty green/yellow areas throughout the field or light pea-green field color suggesting nitrogen deficiency.

Common causes of minimal to no taproot nodulation despite inoculant application are as follows:

• Poor placement of in-furrow granular or liquid inoculant. Make sure the liquid stream is coming right in on top of the seed and that granular drop hoses do likewise.

• Shallow planting, less than one and a half inches, especially at one inch, particularly for liquid inoculants, where surface soil may become hot or dry out. Death of inoculum and reduced nodulation may also occur when little soil is drug back over the seed even if planted deeper.

• Large amounts of starter nitrogen near the seed at rates beginning near 30 pounds per acre. This will reduce nodule development, and larger applications of mid-season nitrogen can reduce peak nodulation as peanut plants take the lazy approach and use the fertilizer before fostering nodule development.

• Incompatibility with other products applied at planting. Always read and follow the label for product compatibility or consult your inoculant company representative. IG
MISSING
1,200 LBS PER ACRE?

Discover Lost Yield Potential

Vault® peanut liquid plus Integral® biological fungicide added an average of 1,200 pounds more yield per acre over non-inoculated peanut acres in three years of trials at the Sunbelt Ag Expo.*

Vault peanut liquid plus Integral ensures millions of fresh, nitrogen-fixing *rhizobia* are available for developing peanut plants. And the Integral biofungicide helps enhance nutrient uptake, root vigor and extends protection from key soil-borne diseases.

Don’t let missing *rhizobia* reduce your peanut yield potential. Include an in-furrow or planter-box Vault peanut inoculant in your peanut program.

Discover what you have been missing!

Vault
Inoculant

Ask for Vault Peanut Inoculants
To learn more, visit agproducts.basf.us or ask your BASF Authorized Retailer today.

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*Yield data based on independent yield trials conducted in 2010, 2011 and 2012 at the Sunbelt Ag Expo in Moultrie, GA.

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