

Yield Boosters Gain Respect

Unique micronutrient formulations, inoculants and adjuvants aim to improve plant performance and reduce stress.

BY KURT LAWTON

PHOTO: WYLIE MAERCKLEIN

Jim Rodman

These products are not like your father's inoculants, or like those numerous hocus-pocus additives that are usually here today and gone tomorrow. We're talking about better-formulated and researched products that are working inside plants to help them ward off stress and make better use of sunlight.

Granted, there still isn't a lot of independent university research to date on some of these products. One good resource to check for independent trials is <http://extension.agron.iastate.edu/compendium/index.aspx>. But companies, with smaller research budgets, focus more on efforts to get their products on farms and let the producers decide if those products fit in their cropping practices.

One such veteran "on-farm researcher" of both good and not-so-good products claiming to improve his corn, soybeans and wheat is Ohio grower Jim Rodman. "I've played with a lot of products over the years, and most of them don't live up to their claims. But when we find those that work, we halt the tests and make them part of our practice," he says.

For instance, three years ago a friend suggested he take a look at a company called Stoller USA and their product, X-tra Power, to enhance early corn growth.

"So we did a test plot where we compared it used alone versus a combo of it mixed with our usual 10-34-0 starter, versus starter alone. Come harvest, X-tra Power increased yields by 3 to 5 bushels [per acre]," Rodman says. (Cost to apply 2 pints per acre is around \$10.)

REDUCED FERTILIZER NEEDS. The following year, he did some rate tests using the product with less starter. "What I learned, as did a neighbor friend of mine, was that even though we thought it was an expensive product, it not only delivered more bushels, but also reduced my starter fertilizer amount by 75% while maintaining yields."

Intrigued by what Rodman saw from the company, his retailer suggested he try Stoller's sidedress product, PowerPlus, another unique micronutrient formulation developed to increase the effectiveness of nitrogen. "I had my son add it to one tank of 28% and apply it on one of our poorer pieces of ground.

"When I ran the combine, the first half of the field delivered 160 bushels, which is good for that ground so I thought the product helped. But when I got to the other half, we were running consistently over 200 bushels an acre. So I called my son and asked him which half of the field got the PowerPlus. He told me I was in it, and I told him it helped us gain 40% more

yield. The next year, it increased yields by a minimum of 10 bushels up to a high of 30 bushels. Now we use both products on every acre of corn,” Rodman says. “There’s quite a few farmers in the area using them too.” (Cost for PowerPlus runs around \$16 per acre.)

SOYBEAN ANTIOXIDANT. Last summer, Rodman tried another Stoller product called Bio-Forge on soybeans, which his retailers said reduces the impact of stress on plants. “It worked too, because half the field where we added it averaged 10 bushels more than the untreated portion,” he says. “The best news is that all these products made me money. I can’t tell you the exact costs, but I know they have made us money every year.” (A 1-pint-per-acre application is around \$12 to \$15 per acre. And treated seed, at 4 ounces per cwt of seed, runs around \$4 per acre.)

So just why are these Stoller products unlike your father’s crop protection additives? Research is showing that the genetic expression technology formulations are managing plant hormones at optimum levels throughout the growing cycle, reducing the impact of stress. “I realized back in the early 1990s that climatic conditions had a bigger influence on yields. That greatly influenced our research—to investigate these effects and how they limit crop yields,” says Jerry Stoller, founder and president of Stoller USA.

“What we’re doing, no one else is attempting to do, because it’s very hard and you have to do all kinds of research and experiments to understand plant processes. We’re learning how to develop formulae that stimulate more genetic expression from genes and cells—to get higher rates of production by triggering plant hormones,” he says.

“We know that, genetically, corn is capable of 500 to 600 bushels per acre and soybeans are capable of 150 bushels and beyond. Then why are we averaging only 156 bushels for corn and 43 bushels for soybeans? Our goal is to help growers achieve a quantum leap in yields, and to do that the plant must overcome all the stress variables: climate, soil type, etc.,” he says.

TODAY’S INOCULANTS. Back in the day, inoculants were used regularly on soybeans to improve nodulation on roots to help facilitate nitrogen uptake for optimum growth. But today, given improved seed genetics and a corn-soybean rotation, inoculants are used less frequently and are not recommended as much by university researchers.

A university study by researchers from five Midwest states, published in the January 2010 issue of *Crop Science*, looked at 51 inoculant product trials from

2000 to 2008. Researchers concluded the inoculants were similar and did not produce a yield response relative to an untreated control different from zero in 63 environments. They calculated the probability of attaining a 2-to-1 return on investment was 11% for Nebraska, 2% in Wisconsin, 1% for Minnesota, 7% in Indiana and 0.2% for Iowa.

The researchers’ current recommendations for states in the Upper Midwest are to use inoculant if fields have no history of soybean production in the past three to five years, a soil pH of less than 6.0, sandy soil, low organic matter and have been flooded for more than a week.

TRIPLE-STACK. However, in all fairness to this research, there have been new products since 2008 that deliver multiple modes of protection and crop improvement that were not tested, according to companies developing these products. For example, Becker Underwood’s new product for 2010, Vault HP, is a three-component biological treatment. “It contains an inoculant with one of the highest counts of rhizobia on the market; plus it contains a performance booster/energy drink for rhizobia, and a biofungicide [Integral] component to protect roots against such early diseases as fusarium and rhizoctonia,” says Russ Berndt, inoculant product manager for the company.

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“In tests we conducted across the country last year, we saw an average yield increase of 2.5 bushels per acre with Vault HP compared to untreated soybeans. With a cost around \$4 per acre, that’s a pretty good return on investment with \$9 soybeans,” Berndt adds.

“Think of these biological products like traits in a hybrid. The single-trait inoculant worked well in specific conditions, but when we stack three or four biological components, we obtain much more consistent performance enhancement,” says Charlie Hale, marketing manager for Becker Underwood. “And these new products and future products will always be stacked products.”

Aplington, Iowa, grower and Pioneer seed dealer Josh Peters knows the role that inoculants play, but he doesn’t plant or recommend using a seed-applied inoculant on every bag for nitrogen uptake alone.

“The reason we choose Optimize from EMD Crop BioScience is not for the inoculant component, although that is a big bonus for us,” he says. “The big thing is the LCO Promoter Technology. It gets the plant growing more quickly. When we pull roots later, there are a lot more nodules on treated plants.”

NATURAL MOLECULE. Most soybean growers understand the importance of good nodulation, but the concept of LCO (lipochitooligosaccharide) Promoter Technology may be new to many. LCO, proprietary to EMD Crop BioScience, is a naturally occurring molecule that enhances root and shoot development, nodulation and nitrogen fixation, immediately and independently of the environment

EMD also is currently testing an experimental foliar-applied product called AMP, which uses the same LCO promoter technology in Optimize. And it’s receiving rave reviews, even from soybean yield champ Kip Cullers, of Purdy, Mo. “We use Optimize because it adds 2 to 3 bushels per acre and is a return-on-investment no-brainer. But I’m really excited with what I see in this AMP product. In one application last year, it delivered a darker green plant and a much bigger leaf area—and 6.3 more bushels,” he says.

Chuck Broughton, North American marketing manager for EMD Crop BioScience, says AMP basically activates plant genes to increase photosynthesis, making better use of sunlight and getting more CO₂ into the plant, which drives the growth process. “We’re seeing a higher and more consistent yield response in corn, and about a 7% yield increase [2 bushels per acre] in soybeans,” he says.

UNIQUE ADJUVANT. Biobased USA, of East Bend, N.C., claims its surfactant SoySoap accelerates the natural transport of nutrients through plant circulation systems and within cells for healthier plant growth.

SoySoap colloids are less than a billionth of a meter, says owner Don Wilshe. These “nanotech” colloids link to water molecules using principles of quantum physics, greatly reducing the surface tension of water.

When SoySoap is applied soon after emergence, the crop’s first response is deeper, larger roots. He says Southern corn and soybean growers typically see yield benefits of 10 to 20 bushels per acre under drought stress or on low-fertility soils. Tobacco growers report quality improvements with two to four applications, plus yield gains of up to 1,000 pounds per acre.

Across the Midwest in 2009—a cool season with virtually no dry weather stress—dozens of random replicated field trials averaged about a 2-bushel-per-acre gain in soybeans and about a 4-bushel boost in corn, says Wilshe. (Product cost is about \$9 per acre.)

According to Wilshe, growers are reporting that SoySoap’s surfactant and transport effect help overcome glyphosate resistance in weeds such as marestail and palmer amaranth. This spring, he’s formulating a new product specifically to cope with resistant weeds.

Wilshe adds that SoySoap is formulated with non-toxic food additives listed on the Food and Drug Administration’s EAFUS (Everything Added to Food in the United States) list. Biobased USA sells only through licensed distributors who private-label products in accordance with state or federal regulations. ●



Early root and nitrogen-fixing nodule development is greatly enhanced with Vault HP (right), a product that stacks three biological components.

and soil conditions. Optimize is a signaling material that speeds up nodule establishment and growth, while the LCO component helps nodules form earlier.

“In our test plots, we had some soybeans that weren’t treated,” Peters says. “You could look at them a week to 10 days after planting and tell they were slower to come out of the ground. The plant population per acre was 15,000 to 20,000 less. When you dig roots, treated plants have a lot bigger root mass, with more nodules on them, which contributes to higher yields at harvest. In the past two years, there was a yield benefit in side-by-side plots,” he says. “In 2008, the treated beans were 3 bushels better. In 2009, it was 11 bushels.”

FOR MORE INFORMATION

Stoller USA: www.stollerusa.com

Becker Underwood: www.beckerunderwood.com

EMD Crop BioScience: www.emdcropbioscience.com

Biobased USA: www.biobased.us