

Trait Enhancement

Pioneer Is Developing New Traits That Will Improve Seed Efficiency

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Progress made by Pioneer in its plant genetics and seed production was outlined recently by John F. Soper, Ph.D., vice president of Pioneer Crop Genetics Research & Development. Soper is responsible for advancing worldwide crop genetics research strategy, increasing productivity, and creating a new value for seed and ag value customers.

Referring to the Y Series soybeans, he said: "We are increasing our investments in plant breeding and trait development, with the goal of expanding our product performance and

plained.

Another area of targeted improvement is "Precision Phenotyping" which basically refers to a set of tools that allow breeders to obtain more accurate trait measurements. An example of this is a machine Pioneer calls the "Boreas wind machine. With windstorms and lodging a common problem, one of Pioneer's scientists decided that she was fed up with relying on Mother Nature to provide weather events for the prediction of root lodging and corn stalk strength. Since wind storms are hit and miss she took the corn plants to a wind tunnel where they were able to simulate the wind of storms. "The good news is it worked," he continued. "The bad news is we couldn't take a million new corn inbreds that we test every year and stick them in a wind tunnel. Instead, we developed a wind tunnel that we can take through the field. Now we are better characterizing new inbreds and hybrids for their tolerance to wind events."

One of the advantages of Soper visiting with farmers is so he can interact with them. He asked anyone who has an issue to share it with him.

"Knowing those things help us to focus on the things that are really important to you," he said.

Pioneer can tout good yields in soybeans. In



John F. Soper, Ph.D.,
Vice President of Pioneer
Crop Genetics Research
& Development, discussed
Pioneer's progress
in seed production
and its plant genetics.

Photo by John LaRose

being the most innovative trait supplier."

A strength of Pioneer is the ability to breed locally while leveraging a global network of researchers.

"Our recent expansion of the research program in Union City, Tenn., is a good example of our approach," he told the group. "Local research in Union City provided products well adapted to the mid-South region. At the same time, Pioneer has nearly 3,000 researchers globally that are focused on plant improvement. New ideas generated by any of these individuals can be leveraged to develop a better product for the market. It comes down to the concept of 'Right Product, Right Acre.' Ten years ago we were looking at corn hybrids and soybean varieties that were adapted across a wide area. DuPont has been significantly increasing its Ag & Nutrition research investment over the past few years, which has resulted in significant growth in Pioneer research programs, including our recent expansion at Union City, Tenn., where a 25,000 sq. ft. expansion of our facility has occurred and five new employees have been hired."

Pioneer also has a new research program at Kingston, N.C. Since the Carolinas and Southeast soil are quite different than the soils in the Midwest, local testing to meet the special needs of Carolina growers is warranted.

"We have a collection of technologies that help us drive yield gains at a faster pace," he said. "One component that helps accelerate product development is our network of winter nurseries. Winter nurseries are located in tropical and southern hemisphere locations including Hawaii, Puerto Rico, Chile and Argentina, allowing us to have extra cycles of plant breeding during the off season. In fact, in our nursery in Puerto Rico we can actually grow four cycles of corn per year using highly sophisticated techniques. This, in turn, allows us to bring improved products to the customer faster."

In corn, another technology being deployed to accelerate breeding is called "Doubled Haploids." It usually takes two to five years to develop new parent lines for corn hybrids. The Doubled Haploid technique takes that process down to 18 months.

"Again, this accelerates the rate at which we bring improved products to the customer," Soper said.

"Another new system is called 'Fast Corn.' This is a system that we use to evaluate a number of biotech trait genes and events," he said. "Two key traits that this system is being used to evaluate are drought tolerance and the ability of the corn to utilize nitrogen better."

Fast corn uses corn plants that were developed to mature in about 70 days. They're set up in a greenhouse with a whole set of robotics that handle the plants and take photos of the corn plants as they go through various experiments focusing on drought tolerance. The photo images are used to provide an unbiased "visualization" of wilting and other symptoms associated with the ability of the traits to provide improved drought tolerance.

"We also have a new technique called 'Laser-Assisted Seed Selection,' and one of a suite of technologies associated with the goal of accelerating yield gains. The technique allows rapid sampling of seed tissue that is genetically analyzed using molecular markers," Soper ex-

plained. 2009 on-farm trials, Pioneer soybean seed products demonstrated a 3 percent advantage over the competitive Roundup Ready products, and 5 percent advantage over Genuity Roundup Ready 2 Yield soybean products.

"We feel very good about our Y Series soybeans," Soper said.

Pioneer's maize program also is drawing good success stories. Drought tolerance and nitrogen utilization are traits in both corn and soybeans.

"We are also working on other traits, next generation herbicide traits, and we know you folks are having herbicide issues with tolerant weeds starting to show up," he said. "So we are working to get the next generation of herbicide tolerant traits out to the market."

"We are also working on next generation insect control traits. Genes providing protection against Lepidopteran and Coleopteran insects have looked great to this point, but they don't tend to last forever because the insects are evolving over time and there's always the risk that insects will develop resistance to the genes that we have today," he said. "So we have to continue thinking ahead and planning the next generation of traits that we'll put onto the market."

Though Pioneer has worked on drought tolerance for a long time, the company now is working on a two-phase project. The first phase is using molecular markers to identify the genes that control drought tolerance.

"We are using those markers to stack up genes for drought tolerance and improve the drought tolerance level," he added. "The second phase combines transgenic and native trait approaches to increase yield potential across a full range of yield environments."

Another trait that is really critical for growers is nitrogen utilization efficiency. The goal of this project is to develop a biotechnology trait that would allow growers to obtain the same yield they obtain today with the application of 30 percent less nitrogen. "Conversely, if you choose to apply the same nitrogen that you use today, you could get 10 percent more yield," he explained. "Obviously, the value is pretty clear cut. It reduces your input costs and it has a positive impact on the environment if we are able to reduce nitrogen and bring you the same level of yield. Some of the benefits include better uptake of nitrogen from the field, better storage of nitrogen within the plant and also improving root architecture."

In soybeans, Pioneer is working on several traits, including resistance to a number of diseases and pests. Among them are resistance to Asian soybean rust.

"We haven't had much Asian soybean rust here but it has penetrated several southern states and there's the potential to move into this area in the future," he said.

Another Pioneer effort is in transgenic yield enhancement. A long time goal is to have a transgene that can enhance yield by at least 8 percent.

"We continue to seek biotechnology solutions to enhance yield, but it's certainly a challenge to find single genes that enhance yields across all environments and stress situations," he summed. Δ

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