

Genetics For Ethanol

Pioneer Works To Offer Best Genetics For Ethanol Production

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Genetics plays a bigger part than environment in corn hybrids with higher starch content for ethanol production, according to Douglas Haefele, Ph.D., senior research scientist for Pioneer Hi-Bred.

“There is an easy way to begin thinking about that,” he said. “If you look at average corn across the United States, it has probably 72 percent starch. We know that corn genetics, good competitive hybrids can have up to 76 percent total starch, so that is a 4 percent boost in

process enzymes. Some of those starch granules are just going to get buried in protein matrix, especially if they are smaller. They might never get exposed to the enzymes that do the hydrolysis.

“However, in the end it is probably pretty simple things that contribute to the hydrolysis,” Haefele said. “To be accurate in talking about genetic potential for ethanol production we have had to take our thinking from where it was in the mid ‘90s and begin to realize we have to think in terms of actual fermentation yield from industry type fermentation.”

Pioneer has two corn breeders who evaluate



starch, which is an important ethanol yield advantage. With that kind of range in better hybrids, you can bet we are busy trying to figure out how to bring those advantages to customers through genetics, through a plant breeding approach, and any other way we might think of to bring that to customers in new products.”

While soil nitrogen can impact the starch content of corn as do many other things, the “big dog” is the genetics, Haefele said.

“The environmental effect then is probably going to be complicated and mediated by many things, some of which we probably know about, some of which we don’t yet,” he added. “It is easy to spot the big one, genetics, but when you are getting in the details there is a lot of work and many other things figuring in the equation.”

Pioneer is hard at work to provide those advantages, and the company already has lines with high yield and strong agronomic traits, plus today’s selections include High Total Fermentable (HTF) grain for corn acres intended for dry-grind ethanol end-use. Pioneer has a team of business and technical experts to support and develop this market segment. As the dry-grind industry continues to grow, Pioneer will continue to provide growers and processors with the hybrids and information needed to maximize ethanol yields.

The HTF trait is a more accurate indicator of dry-grind ethanol production than total starch or extractable starch, according to Crop Insights, a Pioneer publication, edited by Haefele and Steve Butzen, Pioneer Agronomy Sciences information manager. HTF corn hybrids from Pioneer offer dry-grind ethanol producers grain with above average ethanol production potential in dependable, high yielding hybrids.

Pioneer has been emphasizing starch content in corn for a very long time, however in the mid-90s it became evident that ethanol was going to be a new avenue for corn producers.

“We had been working with the animal nutrition part of corn, the wet milling and the use of corn grain well before that,” Haefele said. “Then, in the mid-90s, it was obvious that ethanol production was becoming a high priority for our customers.”

Pioneer found it made sense at that time to work to better understand the normal range and variation of ethanol yield from grain. While Pioneer was aware of the high starch hybrids and suspected how they would perform in ethanol production, the company began doing fermentations, making ethanol and quantifying ethanol. It was learned that fermentation data is a better predictor of ethanol production than total starch.

“One of the important things we figured out early on was you really need to talk about the ethanol yield from a sample rather than just measure the starch

of the sample,” Haefele said. “Certainly, the starch is the underlying big part of things. It is on average 72 percent of the kernel, and simpler sugars probably make up less than 2 percent of the kernel. But all of that starch is not equally available for breakdown by the

genetics for the end use traits for either wet milling or dry grind ethanol production.

“There are several folks like myself who are pretty lab bound and then there is a group of people who are doing molecular marker work all the way into the field,” he explained. “We are pretty good about not having barriers between us and making sure everybody is talking because that is how you make progress.”

While progress is being made, Pioneer is not yet ready to market specific hybrids for premiums at the ethanol plant.

“It is hard to see how you can make the economics work with a premium,” Haefele said. “However, if I am a buyer for a fuel ethanol facility and I know you have HTF-grain from Pioneer, I know that is worth more than ordinary grain.

“We want to provide genetics that let the customers that do business with us compete for that exchange,” he said. “We want to make sure the customer has the best products in terms of the ordinary and most important measures of success, bushel yield, and agronomic traits. Yet, in addition to that, we want them to have very good grain quality and ethanol yield potential so that when a guy goes into the market to buy he can begin to do that mental math himself and say who he wants to do business with.”

Pioneer’s catalog has been giving the hybrids a rating according to their HTF potential for several years. Today’s choices are either an HTF hybrid or one that is not HTF.

“We have been really straight forward about how those ratings come about,” Haefele said. “We say that, within the maturities for this hybrid, if it is a 108-day hybrid or a 113-day hybrid, we put it with all the other hybrids in that maturity and we do a bunch of analyses across growing environments. So we have genetic potential for ethanol yield for this hybrid, and then we line all those hybrids up within that maturity to determine the average. If a hybrid is above average for the maturity, then it is a high total fermentable hybrid; if it is not, then it is still an absolutely stellar product, but is not the best for fermentation.”

There are tools available today to analyze corn that comes into ethanol plants. Pioneer has partnered with FOSS North America, the instrument manufacturer that provides most of the grain analytical instruments to the world, to make the technology available in the marketplace.

“We have aligned ourselves with FOSS, provided them the software to use in their new infrared machines to help analyze the yield potential of incoming grain at ethanol plants,” Haefele said.

“That is a closed loop system, in a sense, so the farmer then knows the ethanol evaluation of the grain and the ethanol plant does as well,” he continued. “That is the start hopefully of our education process for the industry, to point out that there are differences in potential ethanol yields of hybrids.”

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