March Toward Antidote for Aflatoxin in Corn Continues

For the past eight years LSU AgCenter plant breeder Dr. Steve Moore has been looking for ways to combat aflatoxin in corn. For the first time, this year he is evaluating lines developed in his own breeding program.

Moore, an LSU AgCenter researcher and plant breeder at the Dean Lee Research Station near Alexandria, has about 3,000 screening plots he's studying at the research station to try to find a commercially viable line that's resistant to the fungus that leads to aflatoxin.

"Aflatoxin, a deadly toxin, is a byproduct of Aspergillus flavus, a naturally occurring fungus," Moore explained.

The fungus is found in the soil all over the country and is harmless until conditions are right – such as drought. But under such conditions the fungus emerges and leads to the development of the cancer-causing toxin.

Moore, who is working with his research associate Mildred Deloach, said the objectives for his research are to identify new genes that provide superior resistance to aflatoxin and to incorporate them into commercial corn cultivars, as well as to evaluate using glufosinate and using atoxigenic fungi to reduce aflatoxin.

"Aflatoxin-contaminated grain is a major production concern for Louisiana corn growers and can be devastating throughout the southern United States," Moore explained. "Although resistant lines have been identified, resistance has not been transferred into commercially useful hybrids at the desired level of performance."

The LSU AgCenter researcher said developing resistant germplasm that can be placed into commercial application is the primary objective of his research. Another area getting attention in his research this year, however, is the ability for glufosinate, a key ingredient in Liberty herbicide, to help reduce the toxin.

"We know that Liberty raises the ammonia level in the corn, which breaks down aflatoxin, but last year our results weren't where we would have liked," Moore said, adding, "We believe the application of the herbicide was not at the right time. So this year we are applying the glufosinate each week that it's not raining."

In addition to using genetic and chemical technologies to control the fungus, biological controls have shown some effectiveness in cotton.

But Moore said his results with such atoxigenic strains in corn have not shown significaant results. Those tests involve using naturally occurring strains of the Aspergillus flavus fungus that have been shown not to produce aflatoxin. In this process, the atoxigenic strains of the fungus are used to compete with the toxic strains at infection sites on ears of corn.

Moore said the work is progressing at a good pace, but he does not see an end to aflatoxin research any time soon.

"If we got to a point where we produced a variety that is consistently resistant to aflatoxin, then we would proclaim victory, but we would probably have to search for resistance to future biotypes," Moore said.

Fortunately for farmers, Moore said, the rainy conditions the South and Southwest have seen this summer probably mean there shouldn't be much of a problem with the fungus this year. But in other years the monetary loss aflatoxin causes to producers can be very significant.

"In 1998, when corn was at $2.50 per bushel, farmers were getting about half that if they had the fungus in their fields," Moore said. "Now that corn is selling at $3.50 per bushel, it would just depend on how severe the contamination was as to what producers were paid."

Moore said there are 40,000 to 60,000 corn lines globally to choose from and that he tries to plant a least 300 of these lines each year. From the lines he has planted, Moore selected more than 30 he hopes will show better resistance than what is available now.

The increase in the state's corn acreage for biofuels just makes the work to prevent aflatoxin even more important, according to Moore, who said, "The more corn is grown, the more important my work becomes."

Johnny Morgan

Photos by John Chaney

LSU AgCenter agronomist Dr. Steve Moore uses paper bags to collect pollen from the tassels of corn and then transfers pollen to the silks by inverting the bag. Moore's purpose is to develop corn with improved resistance to aflatoxin.

Photo by Mark Claesgens

LSU AgCenter scientist Dr. Bill Williams talks about his weed control research during a field day last summer at the AgCenter's Northeast Research Station. Williams' work in 2007 is focused on emerging weed problems and whether those are resulting from species shifts or herbicide resistance.

Keeping Weeds Under Control
in Feed Grains, Wheat

Louisiana feed grain and wheat producers have to deal with continually shifting weed populations and post-harvest weed control.

Emerging weed problems, whether because of herbicide resistance or a species shift, is a major thrust of research in 2007, according to LSU AgCenter experts.

Feed grain and wheat weed control research conducted at the AgCenter's Northeast Research Station during 2006 focused on evaluation of burndown programs for corn and grain sorghum; evaluation of weed control programs for corn, grain sorghum and wheat; and evaluation of new herbicides for weed control in corn and wheat.

Despite excellent weed control from the herbicide glyphosate, several producers are reporting increased problems with annual grasses and teaweed, said LSU AgCenter weed scientist Dr. Bill Williams.

"The cause of these problems has not been documented but may be due to the increased use of glysophate and decreased use of residual herbicides," Williams said. "Or the problem may be associated with the increased use of shorter-season varieties that allow more time for weeds to mature and set seed following harvest."

Research for controlling teaweed after corn harvest will continue through 2007, Williams said.

In studies so far, the herbicides Permit and Yukon applied alone prevented new teaweed emergence but resulted in less than 50 percent control of existing teaweed, Williams said. Atrazine herbicide also prevented new teaweed emergence but was ineffective at controlling existing teaweed populations, he said, adding, however, that herbicide combinations of Yukon plus Unison resulted in best teaweed control.

The LSU AgCenter weed scientist said other research in 2006 confirmed the 2005 results that effective weed control before planting is required to maximize corn yields.

Additional research projects being planned or under way will evaluate experimental and/or new herbicides for ryegrass control in wheat, perennial weed management, morningglory control and johnsongrass management. Wheat response to herbicides also will be evaluated, and efforts to determine wheat varietal tolerance to the herbicide Sencor will be expanded, Williams said.

The LSU AgCenter researcher also said possible weed resistance to glyphosate will be carefully scrutinized.

"We collected samples of ryegrass from a producer's field that were suspected of glyphosate resistance," Williams said. "In the initial screening, the suspect ryegrass tolerated a four-times rate of glyphosate."

Williams said, however, that the ryegrass in question was very large, so scientists cannot be certain if resistance to glyphosate was the issue or whether the results were due to size or other factors.

"This is an area we will spend quite a bit of time with," he said.

Mary Ann Van Osdell