

Researchers seek chemical-free way to eliminate aflatoxin in corn

STONEVILLE, Miss. (AP) — A researcher's work to eliminate aflatoxin in corn has attracted international collaboration.

Hamed Abbas, a plant pathologist with the USDA's Agricultural Research Service, and Cesare Accinelli, a microbiologist with the University of Bologna in Italy, are researching chemical-free methods — employing bioplastics — to prevent aflatoxin contamination of corn crops.

"The concept is simple," Abbas said.

"This form of protection is biodegradable. So, why not choose it? There is quality control at every step. No contamination. Everything is biological. Our research has an impact."

AFLATOXINS ARE toxic molds that are produced by the *Aspergillus flavus* fungi.

It is naturally occurring, enjoys the humid climate of the Delta and has the potential to wipe out entire crops.

The fungus causes \$200 million in annual crop losses in the United States.

"If a crop has more than 20 parts per million, the crop must be destroyed," Abbas said.

"Aflatoxin is carcinogenic. It can cause liver cancer in humans. Our area is dependent on farmers. A crop loss hurts our economy."

Usually, farmers only know their crop is infected when it's too late.

"SINCE THE fungi are microbial, you cannot tell if a crop has been attacked," said Abbas.

"You will start to see the mold, which is the visible reaction produced by the fungi. The best way to rid corn crops of harmful aflatoxin is through prevention, rather than treatment.

"We are fighting against invisible invaders and to defeat your enemy, you must know your enemy."

Accinelli, in looking for ways to prevent the spread of aflatoxin, found Abbas's research intriguing because of the use of biological substances rather than chemicals.

"Abbas was using a good strain of *Aspergillus flavus*.

"There were no chemicals involved," Accinelli said. "I was intrigued."

ACCINELLI, WHO began frequenting the Biological Control of Pest Research Unit in Stoneville a decade ago, wanted to work with Abbas to improve the delivery method of a benign strain of the fungus.

Previous experiments used the non-harmful strain of *Aspergillus flavus* onto barley or wheat seed, then distributed the seed in a corn crop.

The non-harmful spores attached themselves to the corn, diminishing the capacity for the harmful fungus to attach and spread aflatoxins.

"It is a matter of competitive exclusion," Accinelli said.

"The good spores infect the corn so that the bad spores can't attach. There is just no room."

"While it is great that the replacement of fungi took place, I was concerned with introducing another crop, such as barley or wheat, into a corn field," Abbas said.

"That is where Accinelli's research was beneficial."

After immersing himself in Abbas's research, Accinelli brought in the idea of using bioplastic granules for a delivery system.

The pea-sized granules are made primarily of cornstarch and vegetable oil.

The granules, once impregnated with the non-harmful fungi, provide spore nutrition and efficient delivery.

"We inoculate the granules with the fungi," Accinelli said.

"A farmer will spray it on its crops between six to eight weeks. As the corn grows, the

non-harmful fungi grow with the crop."

Compared to using barley or wheat seed, the bioplastic granules are not attractive to birds and rodents as food.

Also, the makeup of the bioplastic granules provides spore nutrients that are biodegradable.

Once the granules are in the field, rain and moisture break down the granules and allow the spores to germinate.

"Right now, we are experimenting with different life cycles," Accinelli said.

"We have some test fields where we are spreading granules as soon as crops are planted and some fields where the crop has been harvested.

"Our goal is to find the least-expensive and most-efficient means for the farmers to use this technology."

At this point, cost still remains an issue.

However, as bioplastics become a larger industry globally, Abbas and Accinelli said, they foresee the technology becoming more economical.

"WE ALREADY have a patent pertaining to this research," Accinelli said.

"Now, we are applying for a patent to use recycled biodegradable plastics to make the granules.

"This is 100 percent green and non-genetically modified. We want to recycle."

He said he is constantly amazed by how much ground-breaking research is done in the Delta.

"I am able to involve myself in practical research with local farmers," Accinelli said.

"I am very lucky to be here and involved in this wonderful collaboration.

"This is the most-important research center for biological control and the most important research I have done."