



PHOTO BY MARTIN SCHWALBE

# The disturbing romance between corn, fungus and mycotoxins

A four-year study is underway  
to identify which hybrids are best  
equipped to resist this fungal disease

**M**ycotoxins seem to love corn, but you might say that's where the romance ends.

Gibberella ear rot is caused by the fungus *Gibberella zeae* (*Fusarium graminearum*). This pathogen produces toxic metabolites like deoxynivalenol (DON), also known as vomitoxin in infected kernels.

These mycotoxins, always a threat to corn, can render the crop unfit for human consumption and can very nearly eliminate it from the pig diet, because these animals are especially sensitive to the presence of DON in their feed.

Victor Limay-Rios, a research associate in the department of plant agriculture at the Ridgetown Campus, University of Guelph, is just completing the first year of a four-year study to shed light on a problem that has cost producers hundreds of millions in the past. At the end of their study, Limay-Rios and his co-researcher, Art Schaafsma, expect they will have identified corn hybrids that are able to resist this fungal disease. They also expect they will have identified and may help reduce market hybrids that are highly susceptible to DON contamination.

"Our objective is at least to try

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and identify the most susceptible hybrids and get those hybrids out of the market," he said. To that end, he and his colleague are conducting trials with 50 hybrids under artificial inoculation and mist irrigation and working with two companies — Pioneer Hi-Bred and Bayer Crop Science — to assess the *Fusarium* risk to hybrids in field trials around the province. In addition to hybrids, the big determinant for fungal infection and toxin accumulation in kernels is weather.

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However, region alone doesn't predict whether there will be an outbreak. In 2009, there was hardly any *Fusarium* in southwestern Ontario — there are always pockets — but there was a moderate outbreak in the Ottawa area and nearby parts of Quebec.

One of the tools in the fight against fungus in corn is the use of fungicides, and a new generation of triazoles is showing promise.

"Up to a 60 per cent reduction was observed in inoculated corn ears grown in controlled environments using misting to simulate rain," Limay-Rios says. There was a 50 per cent success rate in farm trials using a high clearance sprayer equipped with flat fan drop nozzles. Limay-Rios stresses that these are preliminary results and multi-year trials are needed.

However, nothing will rid us of *Fusarium* completely, because the fungus spores are always in the air waiting for suitable moisture conditions. In corn, the most critical time is when the silk is forming. "When the silks are starting to turn brown is the most critical stage," Limay-Rios notes.

In a 2006 study analyzing 2,029 Ontario corn samples, 83.4 per cent contained toxin levels ranging from 0.5 to 54 parts per million (ppm) with an average concentration of 4.8 ppm. That level exceeded levels for recommended tolerance specified in the Canadian regulatory guidelines for swine, young calves and lactating dairy animals. In order to feed corn to pigs that year, it would have to be diluted with other feed stuffs.

Researchers hope to perfect a quick, easy test for corn to determine DON levels in whole corn samples using near infrared technology. Limay-Rios says they do sampling now at Ridgetown for local farmers and they hope to reduce the test time to about two minutes.

Although DON is the most commonly encountered mycotoxin, other mycotoxins are also likely to be present in corn fields. The researchers are trying to develop a laboratory method that uses liquid chromatography mass spectrometry (LC-MS) to simultaneously detect chemically diverse mycotoxins.

One of their research collaborators is Weather Innovations Incorporated (WIN) of Chatham, which specializes in providing weather-based monitoring and modelling solutions for producer organizations. When samples are taken for analysis, researchers are able to find the nearest WIN weather station to compare weather data with test results.

The ultimate goal of the research is to be able to construct a website that gives farmers accurate, pre-harvest information about DON contamination levels. "Farmers will be able to go online and see the field and see, more or less, the quantity of toxin expected in their field," Limay-Rios says. With that information, they can plan effective spraying strategies and, in the future, select hybrids that are less susceptible to *Gibberella* ear rot. **■**

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