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Mycotoxin Mitigation Begins at the Soil and in the Field

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Dating back to graduate school, I began to recognize the interaction among the growing environment, plant genetics and mold in forage. My first research experiment involved harvesting hybrids with unique fiber and starch characteristics, bagging the experimental hybrids and feeding them out in a controlled study. The research took an abrupt turn as two of the four hybrids, each with a single gene mutation to affect the grain hardness, were far moldier in the bag during feed-out. The study didn't carry through to completion due to the spoiled feed. This was a real-world indicator that different seed genetics, grown in virtually the same conditions, can be afflicted with far different fungal disease in the field. These were eventually far moldier feeds relative to the stronger and the more resistant hybrid. This was an example of agronomic interactions with nutrition and feed cleanliness.

Mold (fungi) and mycotoxins feed cleanliness risk factors: These two are related, with mycotoxins being secondary metabolites produced by fungi. Mycotoxins are thought to be produced by fungi in response to stress. Think of it as a fungi defense mechanism. The exact conditions in which mycotoxins are produced, however, are poorly understood. Many mycotoxins originate in the field, being produced by ear and stalk rot and plant diseases during the growing season. Unfortunately, harvested mycotoxins will be present in silage, with little opportunity to decontaminate the forage. Dilution and mycotoxin abatement solutions are the only strategy to manage this contaminated forage.

Some mycotoxins are produced during the ensiling process and during feed-out. Understanding this, it might be perceived that visibly moldy feed is high in mycotoxins. However, research and Rock River Laboratory database evaluation shows the correlation between mold and yeast analysis and mycotoxin levels is not strong. Quantifiable mold in feed does not mean mycotoxin contamination, and substantial mycotoxin contamination can exist without visible mold. Remember, **much of our mycotoxin contamination comes from the field**. Taking this discussion back to the field, there are agronomic practices and disease-resistance traits in hybrids that can lessen the risk for ear and stalk rot and, in turn, mycotoxin contamination.

To learn more about agronomic factors, I've followed Damon Smith and Martin Chilvers' work. They are accomplished plant-pathologists at the University of Wisconsin-Madison and Michigan State University, respectively. While I have much to learn, one critical point I've taken from them is the concept of three interconnected aspects of a disease triangle, which contributes to plant health and disease challenges.

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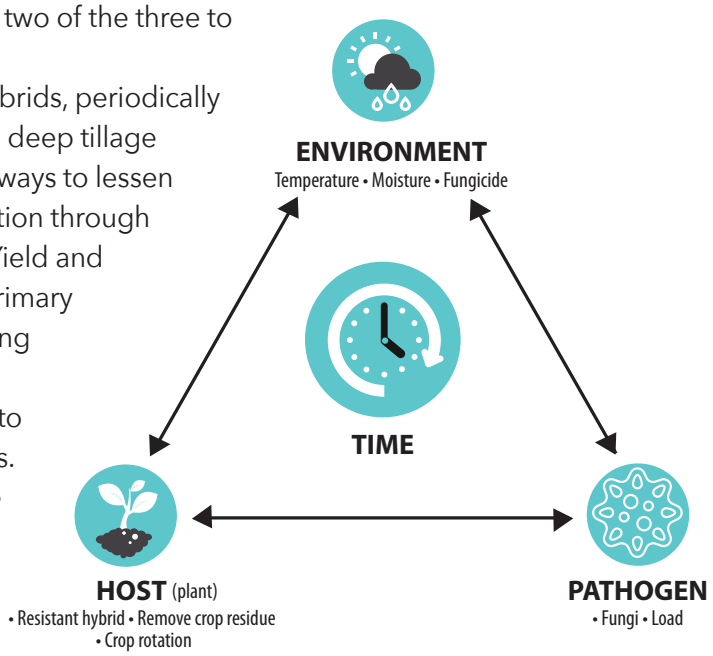
The three aspects to consider are: the host (plant), the pathogen load and the environment. We can manage two of the three to lessen mycotoxin risk.

Selecting disease resistant hybrids, periodically removing crop residue through deep tillage and rotation of crops are three ways to lessen potential mycotoxin contamination through managing the pathogen host. Yield and forage quality have been our primary selection criterion when choosing seed corn for silage; however, plant disease resistance needs to come into our selection process. Lignin is a known plant defense mechanism following crop damage or disease pressure. While low lignin hybrids may be desirable for dairy performance, they are also weaker, agronomically, and need to be managed accordingly. This management includes applying a fungicide around tasseling.



Disease triangle affecting mycotoxin presence

Fungicide application aims to reduce the field pathogen load. This is the second aspect of the disease triangle and another one we can manage. The correct fungicide applied at VT through R3 can lessen vomitoxin contamination by reducing the fungal disease in the growing crop and improving plant health. Damon Smith and his research laboratory have been demonstrating fungicide application impact on silage mycotoxin load with groundbreaking research in the dairy forage quality area. Work with your agronomist to understand which fungicides have this effect, as not all are created equal. Some can actually make mycotoxin risk worse.

The last aspect of the disease triangle is beyond our control, but it's one we need to monitor to understand disease and mycotoxin risk. The growing environment has been increasingly volatile over the past decade. Cool and wet growing conditions will equate to substantially greater disease and mycotoxin risk, whereas hot and dry conditions also can pose a risk, but via different pathogens. A hot topic in the past few years, and increasingly prevalent in Northern regions, is tar spot. Tar spot has been identified in a number of states and is poorly understood. This plant disease is not a mycotoxin concern; however, it will kill off plants and rapidly speed up plant dry down. This latter outcome substantially shortens the corn harvest window for silage and presents silage fermentation and feed-out stability concerns. In this case, mycotoxin contamination is a secondary response that can be substantial if overly dry silage is harvested with poor feed-out stability.

Mycotoxins are always present and difficult to control. Mycotoxin prevalence in analyzed samples in 2021 showed 98 percent were contaminated with mycotoxins and 50 percent had two or more mycotoxins.

In summary, mycotoxin risk and contamination is a complex issue. Fungi are soil-borne organisms that live and grow on residue and the growing crop. Agronomic practices have strong known relationships with plant disease and mycotoxin risk. Looking at 2023, try to further manage your fields to lessen your mycotoxin risk in forage. **Don't let molds and mycotoxins intercept your profits. Contact your AB Consultant for solutions.**

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