

Fungal Diseases and Mycotoxins in Grain

Weather conditions in Nova Scotia tend to be very conducive to disease development due to warm, humid conditions during the growing season. *Fusarium* head blight (*Fusarium graminearum*) impacts both winter and spring cereals and has the potential to cause significant yield and quality losses. Corn is at risk for ear rots such as *Giberella* (*Giberella zeae*) and *Fusarium* (*Fusarium spp.*). If cereals or corn are going to be used on-farm for livestock feed, it is very important to have these tested for mycotoxins such as DON (deoxynivalenol) in order to determine whether they will be safe to feed to livestock. If mycotoxin levels are higher than acceptable, there are some options to ensure that the grain does not go to waste. Below is information on recognizing infected grain and recommendations on testing and management. Don't hesitate to reach out to your Perennia specialist for assistance interpreting reports or with any other questions on management where mycotoxins may be present.

What grains can be impacted by mycotoxins?

- Mycotoxins commonly impact barley, wheat, cereal rye, oats and corn and should be tested before feeding.
- Straw may also be impacted, though to a lesser extent than grain, so it should also be tested if being fed or used as bedding.

What are the symptoms of infected grain?

- *Fusarium*-infected grain may contain "tombstone" kernels, which are bleached white and shrivelled. Pink or orange fungal growth may also be present. The main mycotoxin produced by *Fusarium* head blight is DON. Symptoms are not always visible or obvious.



Figure 1. *Fusarium* damaged wheat kernels. Photo: Canadian Grain Commission

- *Giberella*-infected corn will have a white or pink-coloured mould starting at the tip of the ear and extending downward. This is the most common ear disease in corn and can produce several mycotoxins, including DON and ZEN (zearalenone).
- *Fusarium verticillioides* and *Penicillium* may also produce mycotoxins (fumonisins and ochratoxins, respectively). See the link below for a full description of corn ear rots.



Figure 2. *Giberella* ear rot in corn. Photo: Caitlin Congdon, Perennia.

What factors other than weather conditions could impact the level of infection in the corn crop?

- Physical injury to corn cobs can act as an entry point for fungal disease. This can be caused by insect or bird feeding damage.
- Lodged corn may remain wetter and not be able to dry down properly while also creating an environment conducive to the spread of fungal infections. Lodging may be caused by a number of factors, including severe weather events or wildlife (bear, raccoon) damage. Lodged corn should be harvested as soon as possible to prevent further infection and general loss of quality.
- In storage, improper sanitation of the bin, unsuitable temperature, wet spots, and insects may increase the risk of infection spreading to previously clean grain.

Where can samples be sent for testing? What mycotoxins should be tested for?

- A&L Labs and SGS Labs out of Ontario offer mycotoxin testing. Testing for single mycotoxins or panels of different mycotoxins are available and can be of good value.
- Aside from DON, zearalenone, T-2 toxin and HT-2 toxin are other toxins that result from *Fusarium* head blight that may show up on a feed test. It is not uncommon for multiple toxins to be present in the same sample.

What are safe feeding levels (DON specific) for different livestock species?

- 1 PPM (total diet) for lambs, calves, lactating ewes and cows, swine (AAFC)
- 5 PPM (total diet) non-lactating adult sheep and cattle, poultry (AAFC)
- 0.28-2.5 PPM (total diet) for mink
- Feed refusal and growth reduction in monogastric species and ruminants, as well as scouring in cattle, may be seen at lower levels than these, depending on the combination of mycotoxins present, length of exposure and stage of production of animals.

What other mycotoxin risks should be kept in mind?

- Zearalenone can have significant reproductive effects in swine; it's recommended to be below 1 PPM for sows and gilts. Mature boars and finisher hogs have a slightly higher tolerance.
- Ochratoxin A limits of 2 PPM for both poultry and swine. Kidney damage can be a concern for swine at levels as low as 0.2 PPM.

Is there any way to feed infected grain safely?

- Diluting infected grain with "clean" feed can reduce the overall concentration of mycotoxins in the diet. Feeding contaminated barley (for example, testing at 10 PPM) as 20% of the diet will mean that the entire diet contains 2 PPM of DON, assuming the rest of the diet does not contain the mycotoxin.

What are binders, and what do they do?

- Binders are feed additives that "bind up" toxins and can make it safer to feed contaminated grain. The caveat of this is that binders often are quite expensive and require a high inclusion rate.
- Binding agents may also bind up other essential nutrients, so they are not an ideal solution, but may be better than nothing.
- Binders can be fed separately but are best included in a mineral premix or complete feed to ensure it is homogenous throughout the feed to work most effectively.

What is the impact on straw for feed or bedding?

- If there is a chance a significant amount of barley or wheat straw from contaminated fields may be eaten by livestock, whether as feed or bedding, mycotoxin testing should be conducted, and the same precautions used for grain should be applied.

Will this affect fields in the subsequent cropping year?

- Giberella ear rot (*Giberella zeae*) in corn is the same pathogen that causes Fusarium head blight (*Fusarium graminearum*) in cereals. If an infected wheat or barley field is going to be rotated into corn in the subsequent cropping year, there may be higher levels of fungal inoculum present. Consider applying a fungicide at silking to protect against the development of ear rots.
- Cereals following cereals are also at increased risk of infection due to higher levels of overwintering fungal inoculum. If possible, rotate to a non-host crop like soybeans or alfalfa.
- Choose a cereal cultivar with low susceptibility to Fusarium head blight by consulting the [Maritime Cereal Cultivars Performance List](#).
- Fusarium overwinters primarily on crop debris but can also be carried over on the seed. Do not plant infected seed for either a main crop or cover crop.

Who can offer advice on interpreting my sample report?

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ADDITIONAL RESOURCES

- [Out Standing in the Field Podcast: Feed Quality of Cereals and Corn](#)
- [Feeding Fusarium Contaminated Grain to Livestock](#)
- [Regulatory Guidance: Contaminants in Feed \(AAFC\)](#)
- [Crop Protection Network: An Overview of Ear Rots](#)