

Fusarium graminearum – The Seed Corn Perspective

Introduction

Fusarium head blight (FHB) is a fungal disease that may affect a number of crops in Canada such as wheat, barley, oats, rye, corn and most grass species. Dicots such as beans, potatoes etc., can also serve as a secondary host. The disease is prevalent all over the world.

Fusarium head blight is not a new disease. It has been identified for many years in most of the grain production areas of North America and is known by a number of different names such as: headlight of maize, scab of maize, root rot of maize, stalk rot of maize, ear rot of maize, gibberella stalk rot, gibberella ear rot, red ear rot, pink ear rot, fusarium root and stalk rot, cobweb disease, malformation disease, tombstone in wheat and scab in wheat.

FHB has occurred across Canada for many years. Disease surveys have indicated outbreaks across Canada especially focusing on the root rot phase since the 1940's and 1950's. Outbreaks of the disease occurred in corn in Ontario in the mid 80's and in wheat in the mid 90's. Outbreaks of FHB have been prevalent in wheat in the Red River Valley during the 80's and 90's.

F. graminearum is only one of many species of fusarium, but it is considered the most important one in Canada because of the impact it has on yield and grain quality, its ability to produce several different toxins, its ability to infect the plant during many stages of growth and its abundance in eastern Canada and the eastern prairies.



Typical seed corn field note the male rows with tassels will pollinate the female rows with no tassels.

In eastern Canada, FHB appears to be well established in all the cereal growing areas. The expression of the disease is totally dependent upon the weather conditions at crop flowering time. In western Canada, *F. graminearum* is found most frequently in the black soil zones. These zones also have the most frequent and highest rainfall on the prairies. Infection is associated with rainfall during the flowering stage. The infection is spread by wind, birds, but planting infected seed also spreads the pathogen. It should also be noted that the disease could survive on old crop residue for many years.



Pathologist evaluating corn hybrids in an inoculated nursery for resistance to *Fusarium graminearum*.

Temperature is considered a primary factor in development of FHB. It was thought that warmer temperatures along with moist humid conditions were considered ideal for development of the disease. Some pathologists and plant physiologists now think if cool temperatures are prevalent during grain kernel initiation it may make the plant more susceptible to later infections of *Fusarium graminearum*.

FHB results in the production of visibly damaged seeds called fusarium-damaged kernels (FDK), as well as infected seeds, which did not display visible symptoms of infection. These non-symptomatic seeds usually outnumber the FDK by a considerable margin. Planting infected seeds can result in a second disease called seedling blight. Modern fungicide seed treatments do an excellent job of controlling seed borne fusarium spores.

What is the seed corn industry doing to limit the spread of *Fusarium graminearum*?

- Seed corn for Alberta is produced in many different corn production regions around the world. Seed corn is produced either on irrigated acres and/or in humid production regions under strict grower contracts. Companies work with contract growers and provide crop scouting and management advice throughout the growing season.
- The crop scouts use integrated pest management techniques and advise growers when insects and foliar leaf diseases need to be controlled.
- Once the seed corn is ready to harvest it is ear picked and trucked to specialized plants. The grain is dried on the ears so as to maximize seed quality and vigor.
- Before the ears are placed in the driers the ears are inspected by hand and any obvious off types or ears that have ear rots are discarded.
- Once the grain is finished its artificial drying cycle it is shelled and cleaned through conventional aspiration cleaners.
- Seed corn is also run over gravity tables to remove low-density seeds (*Fusarium graminearum* infected possibly).



Modern seed corn production not only entails conventional air screen cleaning equipment but gravity tables are often employed to ensure that seed with the highest density is used.

- Before sizing and packaging a number of quality tests are performed on the seed such as: warm germination and cold germination testing. Cold germination testing is an additional test to try and predict a seed lot's ability to emerge. Seed lots heavily infected with *Fusarium graminearum* will likely fail the cold test and thus not be marketed.
- Once it is determined that a seed lot meets Canadian Food Inspection Agency standards for certified seed and meets the companies internal standards for cold

germination then the seed can be sized, treated with a modern commercial fungicide, and packaged.



Highly trained lab technicians perform both warm germination and cold germination tests on corn seed to determine its ability to emerge in a variety of growing conditions.

What Does The Seed Corn Industry Think About Testing For *Fusarium graminearum* Infected Seed?

Although seed corn companies realize the seriousness of the *Fusarium graminearum* situation, it is apparent that the standard production practices employed by seed corn industry companies are limiting the risk of seed corn introducing significant quantities of disease spores.

- All seed corn destined for the province of Alberta is treated with a commercial seed treatment
- The seed corn industry does not believe the added expense of testing seed corn lots will reduce the risk of introducing infected seed lots or protect growers from a disease that may already be present in sufficient quantities either in the crop residue in the soil, on nearby host crops or from introduction by wind currents or birds.



Commercial seed corn treated with a modern fungicide versus *Fusarium graminearum* seed harvested from an inoculated nursery. Infected seed would be of low vigor and would not likely meet germination and vigor standards and therefore would not be sold.

What can growers do to reduce the spread of *Fusarium graminearum*?

- Plant certified seed treated with a modern seed treatment to reduce the chances of introducing the *Fusarium graminearum* through the seed.
- Practice a good crop rotation. Continuous cropping of susceptible species such as wheat and barley will build up disease inoculum over time.
- Utilize the provincial weather prediction models and apply fungicides to cereal crops when there is a high risk of infection.
- Plant crops or varieties with different flowering dates to spread out the risk of infection.
- Plant resistant varieties or species.

Other Internet resources on Fusarium Head Blight

Alberta Agriculture

<http://www.agric.gov.ab.ca/agdex/100/1006321.html>

<http://www.agric.gov.ab.ca/pests/diseases/63010130.html>

Manitoba Agriculture

<http://www.gov.mb.ca/agriculture/crops/diseases/fac12s00.html>

Feeding Fusarium Contaminated Grain to Livestock

<http://www.gov.mb.ca/agriculture/livestock/nutrition/bza00s01.html>

[Fusarium Head Blight Risk Forecast Program. Fusarium Risk Forecast of Wheat in Manitoba](#)

Saskatchewan Agriculture

Dealing with Fusarium Head Blight

http://www.agr.gov.sk.ca/DOCS/crops/integrated_pest_management/disease/fusarium.asp?firstPick=Crops&secondpick=Integrated%20Pest%20Management&thirdpick=Disease

North Dakota State University

<http://www.cc.ndsu.nodak.edu/instruct/stack/FHB/FHB.html>

US Wheat and Barley Scab Initiative

<http://www.scabusa.org>

