

February 2021 Small Grains Shared Learning Call: Managing for Fusarium in Small Grain

Invited guest: **Jochum Wiersma**, extension professor and small grains specialist at University of Minnesota, wiers002@umn.edu, +1 218 281 8629

What is Fusarium head blight?

- Disease that is caused by a number of fusarium species, but most common disease-causing fusarium species is *Fusarium graminearum*, which is a saprophyte Jochum describes as an “opportunistic bastard”
- This is the same organism that causes stalk rot in corn. Corn breeders have bred for resistance; it is now a minor issue, but corn stover is still host for *Fusarium graminearum*

“You shall never, ever follow a small grain crop after corn”

- Because corn stover is a host for fusarium, we need to widen rotation so that stover and associated inoculum can’t ‘muck up’ your small grains
- If using a three-year rotation, the ideal rotation is corn-soybean-small grain

When did FHB become prevalent in North America?

- In the 1920s, prior to prohibition, in part because there are German immigrants, there was a lot of barley grown for breweries in the Midwest, and it was sourced locally. Barley slowly left the landscape when FHB appeared because it became challenging to produce barley
- Historically, brewers kept hogs in the breweries to detect FHB. If pigs didn’t eat it, the brewers wouldn’t use it

How does FHB and resulting DON impact how we market grain?

- FHB or scab produces DON—a mycotoxin/vomitoxin in grain
 - If husk/hull is removed, can remove roughly half of the DON content
- Food grade markets
 - Products can’t have more than 1 ppm DON; some elevators will accept an upper limit of 2 ppm DON and will blend with “clean” grain

- DON and livestock feed—DON can cause reduced gains and for pregnant sows, abortion and smaller litter sizes
 - Ruminants can eat up to 20 ppm DON
 - Monogastrics such as swine and poultry should not be fed anything with above 2 ppm
- DON and malting barley
 - DON levels above 3-4 ppm, barley will malt, but higher DON in malt results in “gushing”

How does fusarium get into our small grain fields?

- Can survive on many grass species including corn
- Unlike a leaf rust or stripe rust, it doesn’t need live tissue
- Scabby seed is rarely a source of inoculum for FHB but can be a source of inoculum for crown rust

How do we reduce prevalence of this disease in our crop?

1. Rotation: Don’t raise small grain after corn
2. Variety selection: Choose varieties with best possible genetic resistance, but know that there are no varieties that are fully resistant. Look into multiple variety studies across multiple years. Variety trial info exists for the following
 - Spring wheat: good data on what is and isn’t resistant
 - Winter wheat/rye in upper Midwest: getting more data on what
 - Barley: relatively small differences in resistances
 - Oats: overall less susceptible to FHB, not because it is resistant, but because of the shape of the grain head. Panicle is open enough that it isn’t so wet for the spores to germinate and infect developing kernels
3. Avoid inclement weather by planting early—see subheading “Diseases require the three parts of the disease triangle”
 - The earlier you plant, the less likely you will have the ideal disease conditions (warm, moist days) for FHB
4. Fungicide: For conventional systems, fungicide can be an effective tool to reduce fusarium by 60-70%
 - Fungicide application timing

- Spray at anthesis (pollen shed) of the crop
- Little response if applied after anthesis
- Fungicide products available (these fungicides also prevent crown rust in oats)
 - Caramba (metconazole)—apply at anthesis or six days after flowering
 - Prosaro (prothioconazole plus tebuconazole)—apply at anthesis or six days after flowering
 - Miravis Ace (Propiconazole and pydiflumetofen)—can be applied earlier: before anthesis
- Fungicide application best practices
 - [See NDSU resource](#)
 - Critical to apply fungicide to vertical grain head for it to be effective
- 5. Can remove some scabby kernels post-harvest
 - In wheat fusarium looks like “tombstone kernels,” kernels that are white, chalky, lightweight
 - If you have FHB kernels, you can grain clean it or put it through gravity table to get the lighter fractions out. Applicable to all small grain crops. Helps to get under limits

Diseases require the three parts of the disease triangle

1. Pathogen
2. Susceptible host (small grains are most susceptible flowering or pollen shedding, and are susceptible up until harvest—grain is not susceptible when in the bin)
3. Specific weather conditions: keep an eye on weather (hot and humid conditions)
 - a. A good rule of thumb is that if starting 5-10 days before the grain heads out, weather conditions are such that you want to turn on AC to sleep well at night (high dew point, warm nights, overcast during day, intermittent rain showers), FHB risk is greater
 - b. Watch weather-based risk assessment models
 - i. [See national model: Fusarium Risk Tool](#)
 - ii. [See Minnesota-specific, more granular model: Scab Epidemic Risk Model](#)

Other thoughts from Jochum and Q&A:

- Fusarium head blight is a monocyclic disease, meaning that there will be only one disease per season. We can't look for symptoms and then decide to spray; we need to look at models. If you see symptoms, you're too late
- What is it about QOI fungicides that have the potential to increase DON content

- when used in an untimely manner?
- Marcia McMullen observed that strobilurins “piss off” the FHB disease to where it over produces DON
 - Is scabby seed a source of inoculum for FHB?
 - Scabby seed will likely result in fusarium root rot and crown rot: seedling death, but the infections do not carry all the way through to heading
 - Best to use seed source that isn’t scabby, or clean it well
 - If germination is 80-85%, use a seed treatment to prevent early spring root rot. Otherwise, it helps to up seeding rate to account for seedling loss
 - FHB is not very commonly transferred on seed. Mostly stover or grasses. The survival structure (perithecia) will produce spores with heat and rain showers. Spores can spread wind and raindrop splash
 - How do we test for DON?
 - Look for scabby kernels: 1% of grain is equal to 1-2 ppm. Most feed labs will test for DON using HBLC methods.
 - At home ELISA kits are available, but error range is large. More qualitative than quantitative
 - If I’m using my small grain for forage, not grain, do I need to worry about fusarium on the seed?
 - If you’re cutting crop haylage at early boot stage—no issue
 - But once the grain has headed out, this could be more of an issue
 - I’m an organic farmer with no livestock, and I raise corn – cereal rye cover crop ahead of soy—oats. I typically terminate rye by rolling at anthesis and work ground after soybeans before oats. Do I have to worry about fusarium head blight in the oat crop?
 - If you can still see rye, and corn stover, these are still sources of inoculum. You could bury the rye residue in the spring with a disk or disk ripper. Crown rot would be more of an issue than fusarium head blight
 - One good way to reduce inoculum load is to bury the residue. Ruth Del Mackie: completely no till is better than partial tillage, but the best way to

reduce the risk of infection is to use a moldboard plow to bury the stover

- Could have more success with rolling rye earlier-- before anthesis. Once stover is lignified, fusarium is more likely to stick around be an inoculant
- Is there a way to eliminate the fusarium reproductive structures?
 - No, the hard spore structure will overwinter; no way to kill this
- Is there any advantage to split applying the fungicide?
 - Longer periods with active ingredient on the plant: more effective at controlling fusarium
 - Miravis Ace followed by Prosaro or Caramba is most effective in controlling, but can be cost prohibitive