FUSARIUM HEAD BLIGHT (HEAD SCAB) OF WHEAT

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Head Scab

- The pathogen that causes Fusarium head blight (FHB) can infect wheat and barley heads and result in significant yield losses and reduced grain quality.
- Grain loads may be “docked” or rejected due to the presence of DON, a toxin produced by the fungus that causes FHB.
- FHB is best managed by integrating predictive tools with resistant varieties, cultural practices and timely fungicide applications.

Biology and Disease Cycle

Fusarium head blight (FHB), also known as head scab, is caused by the fungal pathogen Fusarium graminearum. This pathogen has the potential to cause significant yield losses and reduced grain quality in wheat and barley. The fungus produces mycotoxins, known as deoxynivalenol (DON), that are harmful to humans and livestock. F. graminearum overwinters in infested crop residue and produces spores under periods of high humidity. These spores are dispersed by wind currents and infection occurs when they land on wheat and barley heads. Heads are more susceptible to infection during early flowering (Feekes 10.5.1) through the soft dough stage (Feekes 11.2). FHB infection is favored by extended periods of high humidity (>90%) and temperatures of 59°F - 86°F.

Symptoms and Mycotoxins (DON)

Symptoms of FHB include bleaching of some or all the spikelets while unaffected portions of the head remain green (Image 1). The fungus also infects the rachis causing the neighboring spikelets to become bleached. During warm humid weather, pink to orange spore masses may be

observed on infected spikelets (Image 2). If flowers are infected just after their emergence, kernels will not develop. If infected later, they will produce tombstones (shriveled, lightweight and discolored kernels). If tombstones are prevalent in harvested grain, DON is likely present. However sometimes the kernels will appear healthy but be contaminated with DON. Additionally, the presence of scab does not necessarily mean that DON is present and sometimes DON levels can be high when disease levels are low. Planting seeds contaminated with F. graminearum will result in poor stands, reduced germination and slow emergence and Fusarium crown and root rot may develop.

Consuming grain contaminated with DON may result in flu-like symptoms in humans. Livestock, especially hogs, may refuse to eat contaminated grain which can result in weight loss. The FDA has established maximum allowed DON levels (Table 1). When grain exceeds these levels, it will often be "docked" to remove tombstones or loads will be rejected. Only a chemical analysis can verify the presence and levels of mycotoxins in infected grain.

Management

FHB is best managed by integrating different management tactics. These include resistant varieties, cultural practices and chemical controls. A good predictive tool is also available to assess the risk of FHB infection and can be used to better time fungicide applications.

Resistant varieties: Resistance to FHB is not complete. Resistant varieties will still get infected but have reduced fungal growth and low levels of DON contaminated seed. 30-50% DON reduction is common in moderately resistant varieties compared to moderately susceptible and susceptible varieties. For an updated list of scab ratings across several commercial wheat varieties in IL follow this link and in other states follow this link.

Cultural practices: F. graminearum grows well on corn, wheat and barley residues. Planting wheat after corn, especially in no till or reduced till fields, likely increases local inoculum levels of FHB. Planting wheat behind non-host crops (i.e. soybeans) may reduce the amount of local

FHB inoculum. If crop rotation is not an option, tillage can help bury the residue and favor decomposition thus reducing the amount of local inoculum. However, a portion of FHB spores will not come from local residue but will be dispersed from other fields. Under appropriate weather conditions and wind, FHB spores may spread over long distances. In these situations cultural practices may have a greater benefit if performed over extensive areas.

Chemical control: Timely fungicide applications can aid in FHB management and suppression. FHB control is most effective when fungicides are used in combination with moderately resistant varieties. Nonetheless the use of fungicides on susceptible varieties can provide moderate levels of FHB control. A number of fungicides in the triazole chemical family are available for FHB management and are most effective when applied from early flowering (Feekes 10.5.1) through about 5 days after the start of flowering. This is especially true if conditions that favor FHB development continue past Feekes 10.5.1. Fungicides in the strobilurin group (QoI FRAC code 11) should not be used at early flowering as they have shown to increase DON levels compared to triazole fungicides. The Fusarium Head Blight Prediction Center is a great tool to predict the risk of infection in your area, determine the need for a fungicide and, if needed, fungicide application timing.

Maximum Allowable DON Level	Consumer
1ppm	**Humans**
5ppm	**Swine and all animal species (except cattle and poultry).** Not to exceed 20% diet for swine and 40% for other animals
10ppm	**Ruminating beef and feedlot cattle older than 4 months and poultry.** Not to exceed 50% of diet.

Table 1. Guidelines for maximum Deoxynivalenol (DON) levelsallowed in wheat products as established by the FDA. (Source: University ofDelaware)

Image 1: Bleaching symptoms caused by Fusarium head blight. (Source: GROWMARK, Inc.)
Image 2. Fusarium head blight spore masses on infectedheads. (Source: GROWMARK, Inc.)

Sources:

https://www.extension.purdue.edu/extmedia/BP/BP-33-W.pdf
http://extension.udel.edu/factsheets/fusarium-head-blight-management-in-wheat/
https://www.apsnet.org/edcenter/intropp/lessons/fungi/ascomycetes/Pages/Fusarium.aspx