Practical management of Fusarium head blight (head scab)

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U.S. Wheat & Barley Scab Initiative

13.3 million bushels of wheat lost to FHB in Kansas alone in 2021

- Stripe rust
- Fusarium head blight
- Wheat streak mosaic virus
- Tan spot
- Bunt and loose smut
- Leaf rust
- Barley yellow dwarf virus
- Septoria complex
- Bacterial leaf complex
- Soilborne and spindle streak
- Stem rust

Yield Loss (%)
Fusarium head blight (aka Scab, FHB)

- Caused by the fungal pathogen *F. graminearum* (and friends: *F. culmorum, F. avenaceum, others*)
- Survives in wheat, corn, and soybean residue
- Disease results in both *yield and quality loss*
  - Lightweight, chalky kernels
  - Decreased yield and test weight
  - May negatively impact wheat protein quality
  - Several pathogens are produced

When it comes to scab we need to manage both *grain damage* and *mycotoxin accumulation*

- **Deoxynivalenol (DON) aka VOMITOXON**
- Acetyldeoxynivalenol (3-ADON, 15-ADON)
- Nivalenol (NIV)

  - These secondary metabolites increases infection efficiency

  - Harmful to humans and livestock and regulated (1 ppm for human consumption)
    - Vomiting
    - Feed refusal
    - Neurological problems

  - Contaminated grain will be blended or discounted
So, how do we manage scab?

**Pre-planting**
- Crop Rotation
- Tillage
- Select variety with highest available level of resistance – may reduce FHB and DON by up to 50%

**Within-season**
- Fungicide applications
- Timing is critical

**Harvest**
- Harvest timing and proper grain storage can limit DON accumulation
- Combine settings
What fungicide products do we use in wheat?

<table>
<thead>
<tr>
<th>QoI</th>
<th>DMI</th>
<th>SDHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quinone outside inhibitors</td>
<td>Demethylation inhibitors</td>
<td>Succinate dehydrogenase inhibitors</td>
</tr>
<tr>
<td>FRAC CODE 11</td>
<td>FRAC CODE 3</td>
<td>FRAC CODE 7</td>
</tr>
<tr>
<td>Example: azoxystrobin</td>
<td>Example: tebuconazole</td>
<td>Example: fluopyram</td>
</tr>
</tbody>
</table>

What we know about managing FHB with fungicides?

- DMI fungicides (triazole group) most effective against FHB and DON, although there are differences between individual products.
- DMI single application reduces FHB and DON 40-50% (Paul et al. 2008).
- QoI fungicides are not recommended and can result in increased levels of DON (Paul et al. 2018).
- Moderately resistant cultivar + DMI fungicide can reduce FHB and DON by >70% (Willyerd et al. 2012).
- There have been several reports of fungicide resistance to DMI group fungicides in recent years (Anderson et al. 2020, Spolti et al. 2014).
- The addition fungicides within the SDHI group are promising for FHB management.
Key products labeled and effective for FHB control

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate (fl oz/A)</th>
<th>Pre-harvest interval</th>
<th>GROUP NAME</th>
<th>FRAC CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosaro</td>
<td>6.5-8.2</td>
<td>30 Days</td>
<td>DMI</td>
<td>FRAC 3</td>
</tr>
<tr>
<td>Proline</td>
<td>5-5.7</td>
<td>30 Days</td>
<td>DMI</td>
<td>FRAC 3</td>
</tr>
<tr>
<td>Caramba</td>
<td>10-17</td>
<td>30 Days</td>
<td>DMI</td>
<td>FRAC 3</td>
</tr>
<tr>
<td>Miravis Ace</td>
<td>13.7</td>
<td>Feekes 10.5.4</td>
<td>DMI + SDHI</td>
<td>FRAC 3 + FRAC 7</td>
</tr>
</tbody>
</table>

- New products to be labeled: Sphaerex (metconazole and prothioconazole) and Prosaro Pro (Tebuconazole + Prothioconazole + Fluopyram (Group 7))

Revisiting fungicide timing for scab control

- Fusarium head blight applications should be made at early flowering Feekes 10.5.1 for maximum efficacy.
- Previous work found > 30% increased efficacy of DMIs when applied at early anthesis compared to heading

Miravis Ace- evaluating the efficacy and timing of a new (ish) product

- Labeled for early (Feekes 10.3) applications

- Propiconazole (11.4%) + Pydiflumetofen (13.7%)

- DMI + SDHI products

Get a Head Start on Head Scab

Miravis® Ace fungicide takes the stress out of wheat disease control with the power to control head scab as early as 50% head emergence.

USWBSI Multi-state Coordinated Project

<table>
<thead>
<tr>
<th>Treatment Program</th>
<th>Rate (fl oz/A)</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nontreated (Check)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Prosaro</td>
<td>6.5</td>
<td>Feekes 10.5.1</td>
</tr>
<tr>
<td>Miravis Ace</td>
<td>13.7</td>
<td>Feekes 10.3-5</td>
</tr>
<tr>
<td>Miravis Ace</td>
<td>13.7</td>
<td>Feekes 10.5.1</td>
</tr>
<tr>
<td>Miravis Ace fb Tebuconazole</td>
<td>13.6/4.0</td>
<td>Feekes 10.5.1/4-6 DAA</td>
</tr>
</tbody>
</table>
Results across 125 environments, 2018-2021

2018-2021: 125 ENV with IND > 2 or DON > 1ppm, summary prepared by Wanderson Moraes, OSU

Comments on fungicide timing for FHB

- Pre-anthesis treatments are effective at reducing FHB and DON, but are less effective than anthesis applications (particularly for DON control).

- Pre-anthesis applications still provide improved control compared to nontreated check, which may be important when perfect timing cannot be achieved

- Two-treatments programs - an anthesis application of Miravis Ace followed by Folicur 4-6 days later led to highest levels of DON and FHB control

- Combining an anthesis application with genetic resistance results in lower FHB and DON than resistance or fungicide application alone.

Kansas State University
Scab weather-based risk is published on wheatscab.psu.edu

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