Cereal Killers
What we saw in 2007
What we should be aware of in 2008
Dr. Mary Burrows
Montana State University Bozeman, MT
Pesticide update: 2008

• Folicur (tebuconazole) registration for control of head scab in wheat and barley???
• Do not use strobilurin fungicides for aschochyta control in chickpea (Headline, Quadris, Quilt - fungicide resistant strains)
• Ascochyta in *pea and lentil* = different species, strobilurins still okay
• Poast in camelina – Yes/No September 2008
  – Ask Amy Bamber, MT Department of Ag for details
    • Thursday @ 3:30 Canadian Room
Fusarium head blight (scab)

Stripe rust

Septoria/Tan spot (early season leaf diseases)

Root lesion nematodes

Wheat streak mosaic virus (WSMV)
Root lesion nematodes damaging to wheat

Pratylenchus thornei

Pratylenchus neglectus

Oregon and Washington yield losses up to 36% in intolerant cultivars
(Smiley et al. 2005)

Oregon and Washington yield losses up to 70% in intolerant cultivars
(Smiley et al. 2005)
<table>
<thead>
<tr>
<th>Good Hosts</th>
<th>Moderate Hosts</th>
<th>Poor Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>Barley</td>
<td>Field Pea</td>
</tr>
<tr>
<td>Canola</td>
<td>Oat</td>
<td>Faba Bean</td>
</tr>
<tr>
<td>Mustard</td>
<td>Durum</td>
<td>Lentil</td>
</tr>
<tr>
<td>Chickpea</td>
<td>Wild Oat</td>
<td>Triticale</td>
</tr>
<tr>
<td></td>
<td>(Vanstone 2002)</td>
<td>Safflower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flax</td>
</tr>
</tbody>
</table>

**Root lesion nematode biology**

Wide host range for *P. neglectus*

Anhydrobiosis

Migratory endoparasites
Why didn’t we look before?

Infestations mimic and are exacerbated by fungal infestations, nutrient deficiencies, and drought.
2006 Survey results for root lesion nematode
2007 Survey results for root lesion nematode
Root lesion nematodes

2006 Previous Crop

Pratylenchus neglectus/ kg soil

Spring Wheat

Winter Wheat

p=0.02

2007 Previous Crop

Pratylenchus neglectus/ kg soil

Spring Wheat

Winter Wheat

p=0.15
# Root lesion nematode management

## Rotation to non-host crop

- **Good Hosts**
  - Wheat
  - Canola
  - Mustard
  - Chickpea

- **Moderate Hosts**
  - Barley
  - Oat
  - Durum

- **Poor Hosts**
  - Field Pea
  - Faba Bean
  - Lentil
  - Triticale
  - Safflower
  - Wild Oat (Vanstone 2002)
  - Flax

## Variety selection

- Canola
- Mustard
- Chickpea
- Oat
- Durum
- Wild Oat (Vanstone 2002)

## No chemical control
Early season leaf diseases

- Septoria
- Tan spot
- Moist chamber
Effect of early season Stratego fungicide application on yields of winter and spring wheat in Montana, 2007.

<table>
<thead>
<tr>
<th>Region</th>
<th>Wheat</th>
<th>No. producers</th>
<th>No. harvested</th>
<th>Increase</th>
<th>Neutral</th>
<th>Decrease</th>
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<tr>
<td>Central</td>
<td>Winter</td>
<td>15</td>
<td>14</td>
<td>7</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Eastern</td>
<td>Spring</td>
<td>11</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Total</td>
<td></td>
<td>26</td>
<td>25</td>
<td>11</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

Winter wheat: 50% ↑ yield  
Spring wheat: 36% ↑ yield  
Overall: 44% of fields ↑ yield  
(at least 0.3 bu/a; avg. increase = 2 bu/a)
Stripe Rust

- Stripe rust
- Stem rust
- Leaf rust
- Yellowstone
- Promontory

Johnston & Grey, 2006
Influence of fungicide application on two stripe-rust infected WW varieties

Yellowstone (Resistant)

Big Sky (Susceptible)

(Quilt, 14oz, Bozeman 2007; P < 0.001, LSD = 6.3)
**Fusarium** head blight (scab)

- DON limit 1 ppm for human food; 2 ppm for feed
Fusarium head scab: Should I be concerned?

- Do you have a history of scab? *Residue-borne*
  - Partially bleached heads
  - Pink kernels (moist chamber)
  - Tombstone kernels
  - Brown at base of head
- Fully or partially bleached heads?
  (root and crown diseases, drought, sawfly)
- Irrigation type
- Tillage regime
- Previous crop
Variety reactions to *Fusarium* head blight*

<table>
<thead>
<tr>
<th>Variety</th>
<th>Scab (%)</th>
<th>DON</th>
<th>Yield (Bu/a)</th>
<th>Test wt</th>
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<tr>
<td>Glenn</td>
<td>3</td>
<td>0.14</td>
<td>70</td>
<td>64</td>
</tr>
<tr>
<td>MT0550</td>
<td>5</td>
<td>0.25</td>
<td>83</td>
<td>62</td>
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<tr>
<td>Alsen</td>
<td>6</td>
<td>0.11</td>
<td>71</td>
<td>62</td>
</tr>
<tr>
<td>Granite</td>
<td>7</td>
<td>0.38</td>
<td>75</td>
<td>62</td>
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<tr>
<td>Freyr</td>
<td>9</td>
<td>0.25</td>
<td>87</td>
<td>61</td>
</tr>
<tr>
<td>Knudson</td>
<td>8</td>
<td>0.36</td>
<td>83</td>
<td>60</td>
</tr>
<tr>
<td>Explorer</td>
<td>15</td>
<td>2.11</td>
<td>55</td>
<td>56</td>
</tr>
<tr>
<td>MT0551</td>
<td>13</td>
<td>1.33</td>
<td>67</td>
<td>60</td>
</tr>
<tr>
<td>Kelby</td>
<td>16</td>
<td>0.36</td>
<td>81</td>
<td>62</td>
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<tr>
<td>Vida</td>
<td>20</td>
<td>1.41</td>
<td>70</td>
<td>58</td>
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<tr>
<td>Howard</td>
<td>22</td>
<td>1.08</td>
<td>66</td>
<td>60</td>
</tr>
<tr>
<td>Choteau</td>
<td>22</td>
<td>2.83</td>
<td>78</td>
<td>61</td>
</tr>
<tr>
<td>Espresso</td>
<td>27</td>
<td>3.30</td>
<td>77</td>
<td>60</td>
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<tr>
<td>Hank (CK)</td>
<td>55</td>
<td>9.28</td>
<td>56</td>
<td>53</td>
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</table>

* 2 year average, 2006 & 2007, Grey and Dyer; Irrigated, Manhattan, MT
Scab in barley vs. scab in wheat

• Barley flowers before head emergence; spray earlier
• 2-row barley less susceptible than 6-row barley (head architecture)
• No variety resistance is available
**Wheat streak mosaic virus**

- Infects both winter and spring wheat
- Earlier infection = greater yield loss
- Grassy weeds, volunteer wheat, corn, etc. can harbor both WSMV and the mite vector
Disease cycle of WSMV

Spring
- Infected winter wheat
- Mites
- Virus
- Volunteer wheat and seeded spring wheat

Summer
- Mites
- Virus
- Winter wheat seedlings

Fall
- Winter wheat

Winter
- Mites
- Virus
- Overwintering winter wheat crop and volunteers

Get rid of volunteers!
# Weed Host: Volunteer Wheat

## Table 2. Capacity of prevalent grassy weeds in Montana to serve as mite and virus hosts.*

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Life cycle</th>
<th>Mite host</th>
<th>WSMV host</th>
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</thead>
<tbody>
<tr>
<td>Jointed goatgrass</td>
<td><em>Aegilops cylindrica</em></td>
<td>Annual</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Crested wheatgrass</td>
<td><em>Agropyron cristatum</em></td>
<td>Perennial</td>
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<tr>
<td>Wild oat</td>
<td><em>Avena fatua</em></td>
<td>Annual</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Smooth brome</td>
<td><em>Bromus inermis</em></td>
<td>Perennial</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Japanese brome</td>
<td><em>Bromus japonicus</em></td>
<td>Perennial</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Downy brome/Cheatgrass</td>
<td><em>Bromus tectorum</em></td>
<td>Annual</td>
<td>Yes</td>
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<tr>
<td>Persian darnell</td>
<td><em>Lolium persicum</em></td>
<td>Annual</td>
<td>Unknown</td>
<td>Unknown</td>
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<tr>
<td>Western wheatgrass</td>
<td><em>Pascopyrum smithii</em></td>
<td>Perennial</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Feral rye</td>
<td><em>Secale cereale</em></td>
<td>Annual</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Yellow foxtail</td>
<td><em>Setaria glauca</em></td>
<td>Annual</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Green foxtail</td>
<td><em>Setaria viridis</em></td>
<td>Annual</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Wheat virus survey, 2008

- 9 states in Great Plains Diagnostic Network: WY, MT, CO, KS, OK, TX, SD, ND, NE
- 5 Wheat viruses:
  - *Wheat streak mosaic virus*
  - *High Plains virus*
  - *Triticum mosaic virus*
  - *Barley yellow dwarf virus – PAV*
  - *Barley yellow dwarf virus - RPV*
How to control plant diseases

• Scout early and often
• IDENTIFY the disease
• Apply proper control measures
• Plan ahead for next year
Montana AgAlerts Fax is a service of Montana State University Extension. AgAlerts is a service of the National Plant Diagnostic Network’s Plant Diagnostic Information System.

Notification about disease, insect, weed, and rodent issues in your region (AgAlerts) will be sent as a weekly fax digest. If you would like to receive pest notifications by fax, please fill out this form and fax to Dr. Mary Burrows, Extension Plant Pathologist, Montana State University (406) 994-7600.

If you would like to receive pest alerts by e-mail please go to http://pdis.org and under AgAlerts, click Login/Subscribe, and ‘Setup a new account,’ then follow the instructions.

Name (or business name):
Phone number:
Fax number:
County:
If you would like AgAlerts from more than one region, please specify which region(s):

Supported by MSU Extension and the National Plant Diagnostic Network (www.npdi.org; www.pdis.org)
This guide is intended to provide current effective management options for insect and other arthropod pests, and for plant pathogens affecting all major field crops grown in Colorado, Montana, Wyoming, and Western Nebraska. Chemical and non-chemical control practices, when available, are described in detail for individual pests and pathogens. These practices include cultural and biological control options, and host plant resistance. By including alternatives to pesticides, we hope to create a ready reference of management strategies growers will consider when faced with a pest problem.

High Plains Integrated Pest Management Guide for Colorado, Western Nebraska, Wyoming, Montana and Western South Dakota

A cooperative effort of the Universities of Nebraska, Wyoming, Colorado and Montana supported by USDA, Western Region IPM and EPA Region VIII. The search and indexing features of the High Plains IPM Guide developed by DMO Productions.
### Wheat Symptoms Diagnostic Key

To have a paper copy of the factsheet sent by mail:

1) check the boxes next to the factsheet, 2) click the 'Submit' button, 3) fill in the form that pops up, and then 4) click 'Send'.

<table>
<thead>
<tr>
<th><strong>Bacteria:</strong></th>
<th>Images:</th>
<th>Mail:</th>
<th><strong>Insects:</strong></th>
<th>Images:</th>
<th>Mail:</th>
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<td>View</td>
<td>☐</td>
<td>Armyworm, pdf</td>
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<td>Bacterial Streak, Black Chaff</td>
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</table>
Schutter Diagnostic Laboratory

Montana State University and the Cooperative Extension Service provide plant pest identification through the Schutter Diagnostic Lab. Services provided by the clinic include the identification:

- insect
- Plant
- Plant diseases
- Mushroom

Also, we aide in the diagnosis of cultural problems and management recommendations for agricultural producers and homeowners/gardeners. We utilize a wide range of techniques for diagnosis including visual identification, pathogen culture, microscopic identification, and biochemical detection. Early diagnosis of problems facilitate implementation of management strategies resulting in savings to producers. Our specialists have expertise in providing specific recommendations for control, and interface with agronomists and cropping systems specialists to supply information on the best agronomic practices and plant varieties to produce healthy, productive crops.

Our Goals:

- Aid growers in identifying insect/plant problems and their solutions.
Informational sites

- AgAlerts: [PDIS.org](http://www.pdis.org)
- Schutter Diagnostic Lab: [Diagnostics.montana.edu](http://www.diagnostics.montana.edu)
- [Highplainsipm.org](http://www.highplainsipm.org)
- Greenbook.net: Pesticide labels
- NDSU fungicide guide
- MontGuides:
  [http://extn.msu.montana.edu/Publications/ESCatalog/ANRPublicCatalogAGlist.asp](http://extn.msu.montana.edu/Publications/ESCatalog/ANRPublicCatalogAGlist.asp)
- Wheat diseases of Montana
  [http://scarab.msu.montana.edu/Disease/DiseaseGuid/](http://scarab.msu.montana.edu/Disease/DiseaseGuid/)
Barley, N of Bozeman, MT
Roundup (glyphosate): April 16
Planting date: April 17

Planting date: 1 week later
Effects of glyphosate timing on barley yield

Smiley et al 1992
Seed treatments:

- **Bare Patch**: Baytan, Dividend and Vitavax
- **Pythium**: Apron, Allegiance, Dividend XL, RTA and Raxil XT

*All Metalaxyl-based products*
Other controls

• Timely weed and volunteer control
• Fallow period
• Soil disturbance (disking)
• Crop rotation (*Rhizoctonia* species tend to be host-specific, but some isolates like AG-8 in OR/WA infect wheat, barley, pea, lentil)
  – *Rhizoctonia solani*: Cereals/monocots
• Variety resistance, if available