Corn Diseases In Minnesota and Foliar Fungicides for Corn

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Topics to Be Covered

- Common corn diseases in Minnesota
- Possible changes in diseases over time
- Foliar fungicide applications to corn
Common corn diseases in MN

Are these diseases a concern?

- Leaf Diseases
- Stalk Rots
- Ear rots and mycotoxins
Common corn diseases in MN

- **Leaf Diseases**
  - NCLB, GLS, Common Rust, Eye spot
- **Stalk Rots**
  - Fusarium, Gibberella, Anthracnose
Corn Leaf Diseases

- common rust
- eyespot
- northern corn leaf blight
- gray leaf spot
Common Rust

RUST in SE MN, D. MALVICK
Common Rust

Cause: *Puccinia sorghi* (a fungus)

Symptoms: Circular to elongate brown pustules on both leaf surfaces, often in bands

Favored by: Moderate temperatures (61-76°F), High humidity (greater than 95%), Epidemics in southern U.S. and Mexico

*Inhibited by:* High temperatures (over 85°F)
Eyespot
Eyespot
(caused by the fungus Kabatiella zeae)

Favored by cool, humid weather
Control: resistance
  tillage and crop rotation
  fungicides
Northern Corn Leaf Blight

- Widespread disease
- Yield losses can be up to 50%
- Favored by moderate temperatures (65-81°F) and prolonged periods of dew
Northern Corn Leaf Blight

Matt Montgomery, Sangamon-Menard Extension

Matt Montgomery, Sangamon-Menard Extension
Gray Leaf Spot

- Caused by the fungus *Cercospora zeae-maydis*

- One of the most serious, yield-limiting corn diseases in the Midwest and worldwide

- Yield reductions up to 44% in the Midwest and up to 69% in Virginia
Factors Favoring GLS

- Prolonged high humidity (>95%, >24 HR)
- Warm temperatures (70-85 F)
- Susceptible and late maturing hybrids
- Protected fields
- Corn residue on fields
Distribution of Gray Leaf Spot in the U.S.

Figure 2. Gray leaf spot distribution as determined by members of the NCR-25 Technical Committee. Risk areas were identified based on reactions of susceptible hybrids, severity of past epidemics, the likelihood of favorable environmental conditions and use of conservation tillage. Map developed in 1996.
Corn Stalk Rots

- Fusarium stalk rot
- Gibberella stalk rot
- Anthracnose stalk rot

Photos courtesy D. White
University of Minnesota  D. Malvick
Stalk Rots

Favored by a combination of factors:

- stalk debris on soil surface
- susceptible hybrids
- leaf disease and insect damage
- high plant populations
- drought stress
- low N or low P in mid to late summer
- high fertility, especially very high N
Fusarium Stalk rot
Gibberella Stalk Rot

Photos courtesy D. White
Anthracnose: stalk rot phase

Anthracnose also has leaf blight and top dieback phases
Corn Anthracnose Disease Cycle
(Bergstrom and Nicholson, Plant Dis. 1999)

Leaves

and

Stalks

Systemic colonization stalk rot

Seedling blight

Repeating secondary inoculum

Primary inoculum

rain

University of Minnesota     D. Malvick
This *Field Guide to Corn Diseases* is an extensive guide to identification of common corn diseases in the United States. Disease identification and management will be aided with the brief descriptions and multiple color photographs for the 56 different diseases that are included in this guide.

Can be ordered via the internet: shop.extension.umn.edu
Or call: 1-800-876-8636
Changes in Corn Disease Incidence?

- Is the risk of corn diseases increasing?
  - increased corn on corn
  - reduced tillage?
  - more corn residue
  - changing climate?

- Results from Ontario
Foliar Fungicides for Corn

Types
- Strobilurins
- Triazoles
- Others

Uses
- for disease control
- to promote yields without evidence of disease to manage
CORN (Zea mays)  
Gray leaf spot; Cercospora zeae-maydis

E. L. Stromberg and C. C. Kenley, Department of Plant Pathology, Physiology & Weed Science, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0331


<table>
<thead>
<tr>
<th>Treatment in fl oz product/A</th>
<th>18 Oct</th>
<th>Yield\textsuperscript{a} Bu/A</th>
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<td>Non-treated</td>
<td></td>
<td>115.5</td>
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<td>Quadris 2.08SC 9.2</td>
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<td>184.9</td>
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Corn Foliar Fungicides

- Uses

> to promote yield without evidence of disease to manage
## Estimated Fungicide Use on Corn in 2007

<table>
<thead>
<tr>
<th>State</th>
<th>% corn acres</th>
<th>~ number of acres</th>
</tr>
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<tbody>
<tr>
<td>Minnesota</td>
<td>3 - 4%</td>
<td>250,000 - 300,000</td>
</tr>
<tr>
<td>North Dakota</td>
<td>10 - 15%</td>
<td>250,000 - 370,000</td>
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<tr>
<td>Iowa</td>
<td>10 - 40%</td>
<td>3 million</td>
</tr>
<tr>
<td></td>
<td>in different parts of IA</td>
<td></td>
</tr>
<tr>
<td>Nebraska</td>
<td>10 - 15%</td>
<td>1.0 – 1.5 million</td>
</tr>
<tr>
<td>Illinois</td>
<td>23 – 31%</td>
<td>3 - 4 million</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>10 - 15%</td>
<td>400,000 - 500,000</td>
</tr>
<tr>
<td>Indiana</td>
<td>16%</td>
<td>1 million</td>
</tr>
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2006 and 2007
Corn Foliar Fungicide Data

- National
- Minnesota
## National University Data 2006

<table>
<thead>
<tr>
<th>State</th>
<th>Fungicide</th>
<th>Disease Pressure</th>
<th># Comps</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>H</td>
<td>?</td>
<td>2</td>
<td>-3 to 1.0</td>
</tr>
<tr>
<td>IL (south)</td>
<td>H</td>
<td>Y</td>
<td>8</td>
<td>4.3 to 25.4</td>
</tr>
<tr>
<td>MD</td>
<td>H</td>
<td>Y</td>
<td>8</td>
<td>-15.2 to 28.3</td>
</tr>
<tr>
<td>VA</td>
<td>Q</td>
<td>?</td>
<td>5</td>
<td>-2 to +2</td>
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</tbody>
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Source: Arv Grybauskas, U of Maryland
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<td>VA</td>
<td>Q</td>
<td>?</td>
<td>5</td>
<td>-2 to +2</td>
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<tr>
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<td>H</td>
<td>?</td>
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<td>WI</td>
<td>H</td>
<td>Y/N</td>
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<td>2 to 11</td>
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<tr>
<td>MO</td>
<td>H</td>
<td>?</td>
<td>18</td>
<td>-3.8 to +42</td>
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<tr>
<td>VA</td>
<td>H</td>
<td>Y</td>
<td>2</td>
<td>34 to 51</td>
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<tr>
<td>TN</td>
<td>H</td>
<td>Y</td>
<td>3</td>
<td>17 to 34</td>
</tr>
</tbody>
</table>

Source: Arv Grybauskas, U of Maryland
Effect of Headline on Corn Yield
U of M SWROC 2006

Variety x fungicide interaction N.S.
Effect of Headline on corn yield
U of M SWROC 2006

Headline

No significant difference

206.9

203.0
2007 University Corn Fungicide Trials

Summary from Carl Bradley, University of Illinois

- States/Province in which trials were conducted:
  - Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Minnesota, Missouri, Nebraska, North Dakota, Ohio, and Ontario

- Mixture of on-farm strip trials and small-plot trials (majority were small-plot trials)

- All had a minimum of 3 replicates per location
Summary from Carl Bradley, University of Illinois

61 out of 162 = 38% of the time had a yield increase of 6 bu/A or greater.
Conclusions from 2007 University Trials

Summary from Carl Bradley, University of Illinois

- Overall, a foliar fungicide application would have been profitable 38% of the time, and overall mean was 3 bu/A better than the untreated.

- Fungicides applied to hybrids with Fair to Poor resistance to GLS would have been profitable 50% of the time, with a mean of 6 bu/A better than the untreated (vs. 39% with good/excellent resistance).

- Previous crop being corn did not make fungicide applications more profitable than previous crop being soybean, sugarbeet, or wheat. Impact of tillage??
Minnesota Corn Foliar Fungicide Data 2007
Small Plot Lamberton Trial- 2007

Trial conducted by B. Potter (6 reps per treatment)

Two of four hybrids yielded signif. more with Headline applications

LSD at 5% level = 10.1
Headline effect on corn
Across 4 hybrids
U of M SWROC, Lamberton 2007

Bushels/acre
175.99
169.11
4.23

Headline
Untreated
LSD (0.05)
2007 MN Cooperative Corn Fungicide Strip Trials

Counties with Strip Trials, 25 Trials
2007 MN Cooperative Corn Fungicide Strip Trials
Yield of Treated Strips Relative to Untreated Strips
(Examples of types of responses from 25 different Locations)

Potter and Malvick, 2007
2007 MN Cooperative Corn Fungicide Strip Trials
Yield based on average of ≥2 pairs/site: SW, SC, WC and C MN

Bushel difference (treated - untreated)

@84% at or below break-even level

Break even level @ $18.00 (fungicide + application cost) and $3.50 / bu. corn sale

p(F) < 0.05 Average = 2.1 Bu increase (1.4%)

Potter and Malvick, 2007
Summary- MN Corn Diseases & Fungicides

- Many diseases occur - how common and significant?
  - Leaf diseases
  - Stalk rots

- Grain production < susceptible than seed prod. fields.
- Environmental conditions and hybrid strongly affect disease development and symptoms

- Will corn disease become more common and important in MN as corn acreage increases and tillage decreases?

- Value of fungicides in MN? - inconclusive & difficult to predict response when significant diseases not present.
Questions or comments?

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