Fungicides and Management of rust

Advances in chemistries and application strategies

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Field crops rust diseases have become more important in recent years. Specifically, new concerns have surfaced with diseases such as Ug99 wheat stem rust, new races of wheat stripe rust, southern corn rust, soybean rust, and sugarcane rust which are demanding that we make scientific advances, rapidly, and on multiple fronts. Nothing less than world food security is at stake. The primary purpose of this first ever Field Crops Rust Symposium is to "circle the wagons" among the scientific community and compare notes, exchange ideas, and forge new relationships. The idea is to make rapid progress on all rust diseases of major field crops by enhancing scientific communication, collaboration, and cooperation.
BEYOND THE RESEARCH...

Recommendations for growers in the battles against rust

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OBJECTIVES

• Assess opportunities for management of rust diseases affecting different crops.

• Focus on Extension recommendations for use of fungicides against rust diseases of peanuts, soybeans, corn, and wheat.

• Ask questions of importance to growers for improved management of rust in future.
Extension References- Corn

- **Agronomic Spotlight: Southern rust in corn-midwest.** Monsanto Technology Development.
- **Integrated Crop Management: Yield responsiveness of corn to foliar fungicide application in Iowa.** IC-498(26). A. Robertson, L. Abendroth, and R. Elmore. Iowa State University.
- **Fungicides on corn?** MSU Grain Crops Update. E. Larson. Mississippi State University.
- **Corn disease management in Ohio: fungicides.** Bulletin 802. The Ohio State University.
- **Southern rust in corn.** Corn Disease Note 2. S. Koenning. North Carolina State University.
Extension References- Wheat


- Leaf issue of wheat, PPA-25. D.E. Hershman, University of Kentucky.


- Leaf rust of wheat. FactSheet AC-6-96. P.E. Lipps. The Ohio State University.


The South’s row-crop growers were no strangers to rust when Asian Soybean Rust arrived......

- Peanut is an important crop in the southern United States.

- Peanut rust (*Puccinia arachidis*) is a major disease of peanut, especially in tropical areas.

- The pathogen does not overwinter in the Deep South.

- There is unknown resistance available in commercial cultivars in the USA and the disease can be explosive if not managed.
Diseases of Peanut in the Southeastern US
Basic Recommendations for Peanut Disease Control in SE USA

• **Begin your fungicide program:**
  - 30 days after planting or no later than June 1st.
  - Continue on a 14-day interval.
  - **Begin fungicide management of soilborne disease 60 DAP.**
  - Tighten fungicide interval when weather favorable for disease OR **WHEN RUST IS OBSERVED.**
  - Finish program about 2-4 weeks before harvest
  - **Result:** 7 fungicide applications.

Dr. Tim Brenneman
Basic Recommendations for Peanut Disease Control in SE USA

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Dr. Tim Brenneman
EVOLUTION OF PEANUT FUNGICIDE PROGRAMS

- Rust typically affects crop late in season.
- Rust can be devastate some fields.
- Peanut growers respect potential of disease but (generally) do not scout specifically for rust.
- “Modern” fungicide programs not specifically targeted for peanut rust but are generally quite effective for rust control.
- If rust is detected “early” in season, growers likely to modify program:
  - Tighten spray interval
  - Change fungicide choice
RUST PERSPECTIVE IN GEORGIA

• **2003**: UGA Cooperative Extension had no clear recommendation for use of fungicides on field corn.

• **2004**: UGA Cooperative Extension had no clear recommendation for use of fungicides on soybean.

• **2009**: UGA Cooperative Extension recommends fungicide treatments for significant soybean acreage in state.

• **2010**: UGA Cooperative Extension recommends fungicide treatments for significant portion of field corn acreage.

What has changed growers’ willingness to use fungicides?
Results from sentinel plot monitoring programs give crop specialists information needed to recommend fungicide application and to give growers confidence in those recommendations.
Asian Soybean Rust
Fungicides for Soybean Producers

- Chlorothalonil
- Quadris (azoxystrobin)
- Headline (pyraclostrobin)
- Tebuconazole products
- Tilt/Bumper/PropiMax (propiconazole)
- Domark (tetraconazole)
- Laredo (myclobutanil)
- Quilt (Quadris + Tilt)
- Stratego (Tilt + Trifloxystrobin)
- TOPGUARD (flutriafol)
- Caramba (metconazole)
- Alto (cyproconazole)
- Proline (prothioconazole)
- Quadris Xtra (azoxystrobin + cyproconazole)
- Stratego Pro (trifloxystrobin + prothioconazole)
- Evito (fluoxastrobin)
- Evito T (fluoxastrobin + tebuconazole)

Terrell County, GA commercial fields
Photos: W. Duffie
<table>
<thead>
<tr>
<th>Trial</th>
<th>Yield Best Trt (bu/A)</th>
<th>Yield Unsprayed (bu/A)</th>
<th>Difference (bu/A)</th>
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<td>63.3</td>
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*Statistically significant.
Attapulgus Timing Study I

Rust first identified on 1 September

R. Kemerait and L. Sconyers

Application dates: 28 July (R1), 14 Aug (R3), and 28 August (R5)

Importance of timing: R3 (yellow) best in this study.
Attapulgus Timing Study I

Rust first identified on 1 September

R. Kemerait and L. Sconyers

Application dates: 28 July (R1), 14 Aug (R3), and 28 August (R5)
Managing Diseases of Corn with Fungicides
Puccinia polysora and southern corn rust

- Southern corn rust can cause significant losses in southeastern US.
- Southern rust and northern corn leaf blight are typically only diseases of importance.
Untreated

Two fungicide applications

2003 Terrell County, Southern Rust
Means compared only within a variety at p<0.05
2003 Terrell County Yield (Southern Rust)

Means compared only within a variety at p<0.1
2011 Fungicides for Corn

- Tilt (propiconazole): 2-4 fl oz/A
- “Folicur” (tebuconazole): 6 fl oz
- Stratego (Tilt + trifloxystrobin): 7.0-12.0 fl oz/A
- Stratego YLD: (Prothioconzole + trifloxystrobin)
- Quailt Xcel: Quadris + Tilt (10.5-14.0 fl oz/A)
- Headline (pyraclostrobin): 6.0 fl oz
- Headline AMP: 10 fl oz/A
2011 Fungicides for Corn

- EVITO 480 SC (2.0-5.7 fl oz/A)
- EVITO T (4-9 fl oz/A)
- Domark 230ME

**ADDITIONAL WHEAT FUNGICIDES:**

- Twinline (pyraclostrobin + metconazole)
- Caramba (metconazole)
- Prosaro 421 (prothioconazole + tebuconazole)
2010 Southern Corn Rust Trial
(DeKalb, Stripling Irrigation Park)
Disease Severity (% leaf affected)
28 Jul 2010
2010 Southern Corn Rust Trial
(Dekalb, Stripling Irrigation Park)
Yield (bu/A)
2010 Southern Corn Rust Trial
(Pioneer 31D59, Stripling Irrigation Park)
Yield (bu/A)
Growers, Fungicides, and Rust

Questions and Perspectives

- Do I need a fungicide on my crop for rust?
  - What is my risk if I don’t use a fungicide?
  - Which fungicide should I use?
  - Which fungicide gives me the broadest spectrum of activity? I have more than rust to worry about....
  - Which has best curative?
  - Can I just stick with tebuconazole?

- When should I apply the fungicide?

- Should I reapply? How long after first application?

- Should I automatically time a fungicide based upon development of my crop?

- How early is too early? How late is too late?

- When is my crop safe?

- What about “Plant Health”?
  - I want to control diseases, but I don’t want added headaches when it is time to harvest..
Extension Recommendations for Management of Rust Diseases with Fungicides

Fungicides are important tool for management of Asian soybean rust, southern corn rust, stripe rust, leaf rust, and, potentially, stem rust.

Fungicides available for management of rusts of soybeans, corn, and wheat are VERY similar.

Fungicides nearly all belong to classes “Qol-inhibitors” (strobilurins) and triazoles.

Strobilurins and triazoles are “site-specific” fungicides and are susceptible to RESISTANCE.
  – Reported resistance to triazole fungicides in Brazil.
  – Documented fungicide resistance with strobilurin fungicide to frogeye leaf spot in USA.
Extension Recommendations?

• **Question:** “Best Fungicide” for control of rust on soybeans, corn or wheat?
  - **Answer:** “For the most part, the modern fungicides that are labeled give VERY GOOD to EXCELLENT control of important rust diseases when applied appropriately.

• **Question:** “Tebuconazole can be bought at a bargain. Why don’t I just use that?”
  - Growers can get a good fungicide at a good price; however overuse will increase risk for fungicide resistance for the triazole class of fungicides.
  - Tebuconazole may not have the broad-spectrum activity the broad spectrum activity of other fungicides.

• **Question:** “What about ‘Plant Health’?”
  - Although none of the Extension materials I reviewed note Plant Health as a primary reason for use of fungicides, the door is left open for continued examination of concept.
Extension Recommendations for Management of Rust Diseases with Fungicides

• “Protective window” for fungicides generally reported as “14” to “21” days, preference given to fungicides with systemic activity.

• Fungicides should be applied **ahead** of disease but are reported as of little use when disease well established.
  – Protection of flag leaf for wheat.
  – Assessment of corn just prior to “tassel”; examine leaves below the “ear leaf” to determine need to spray or not.
  – Early reproductive growth in soybeans.

• Little discussion of need to re-apply fungicides.
Extension Recommendations

- **Question**: “Do I need a fungicide on my wheat/corn/soybean crop for management of rust?”
  - **Answer**: “MAYBE”
  - All recommendations note that rust diseases may need to be treated with fungicides at some time or other.
  - It seems that only Mississippi (for diseases other than rust) calls “automatic” fungicide application at R3-R4 growth stage.

- **Reasons given to consider spraying wheat, corn, and sb:**
  - What is yield potential of the crop?
  - What is the price of the crop?
  - Is crop susceptible or resistant to rust?
  - What is the growth stage of the crop?
  - **For corn**: Is the crop within 2 weeks of “black layer”? At “tasseling” is disease present on the 3\textsuperscript{rd} leaf below the ear?
  - **For wheat**: Heading, flowering, or milk?
  - What are predicted weather conditions in immediate future?
  - Is there additional potential for diseases other than rust?
  - Other reasons to make a trip across the field?
Timing for Control of Soybean Rust?

SAFE?? The Critical Zone? SAFE?
Crop Growth Stage
Timing for disease control and “safety”
Rust Diseases of Wheat

Stripe Rust

Stem Rust
Optimum Timing for Control of Rust on Wheat?

![Growth stages of cereals.](http://www.auburnbeanandgrain.com/images/E0063401/Wheat_Growth_Stages.jpg)

<table>
<thead>
<tr>
<th>STEM EXTENSION</th>
<th>HEADING</th>
<th>RIPENING</th>
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<tbody>
<tr>
<td>JOINTING</td>
<td>BOOT</td>
<td>STAGE 11</td>
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<tr>
<td></td>
<td>STAGE 10</td>
<td>STAGE 10.5 flowerin</td>
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<tr>
<td></td>
<td>STAGE 9 in &quot;boot&quot;</td>
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</tr>
<tr>
<td></td>
<td>STAGE 8 ligule of last leaf</td>
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</tr>
<tr>
<td></td>
<td>STAGE 7 second node of stem visible</td>
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<tr>
<td></td>
<td>STAGE 6 last leaf just visible</td>
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</tr>
<tr>
<td></td>
<td>STAGE 5 leaf-sheaths strongly erected</td>
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<td></td>
<td>STAGE 4 leaf-sheaths lengthen</td>
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<td>STAGE 3 tillers formed</td>
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<td>TILLERING</td>
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<tr>
<td>STAGE 2</td>
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<tr>
<td>STAGE 1</td>
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</table>

http://www.auburnbeanandgrain.com/images/E0063401/Wheat_Growth_Stages.jpg
The “Finger Print” of Soybean Rust on Extensiobn

• Availability and recommendations for use of a broad number of fungicides.

• Importance of “sentinel plot monitoring” for making effective recommendations for timing of fungicide applications.

• An OUTSTANDING model for a collaborative publication for management of an important disease.