Alternate Methods to Manage Soybean Rust:
David Wright and Jim Marois

Disease control is one of many management decisions (timeliness is critical)
High Impact Production Practices

- Variety selection- yield, pest resistance and maturity group, (only one chance to get it right)
- Planting date (May 1-June 1)
- High quality seed
- Fertility (residual)
- Irrigation (during pod fill)
- Conservation tillage
- Weed control (residual herb.)
- Rotations (grass, corn, cotton)
- Insect and disease control- normally make 1-2 insecticide applications and one fungicide application
- Timely harvest
Rotations

From most response to least: (for most diseases and nematodes)
- Soybean
- Peanut
- Corn
- Cotton
Resistant germplasm is best way to control pests
Soybeans planted on Sept. 1 to evaluate germplasm for resistance to ASR and light extended for plant height.
Management factors to minimize soybean rust

• Plant early
• Use early maturity groups
• Avoid double cropping (after wheat and especially after corn)
• Plant away from early planted fields or infected kudzu sites
• Take care not move spores on equipment or clothing from one field to another
• Rust can be controlled with little yield loss if treated timely with a fungicide
• Use resistant varieties (when available)
“We will not know the full impact of soybean rust until the majority of the kudzu sites become infected.” - Jim Marois

78 sites visited each year

Dry year
Soybean rust started on kudzu in this pecan tree in January and soybeans were planted in June. ASR gradient from this part of the field to the other end.

Are late applications of fungicides effective and economical?
Scout and spray for rust early. Once it gets to this point yield has been lost.

10% infection by leaf area reduces photosynthesis by 75%
Soybeans sprayed on Sept. 28 with Topguard at R-6 growth stage, defoliated in lower canopy from Asian soybean rust.

Gradient of ASR from source of inoculant (Bayer scale): 6, 7, 8
View in the canopy at time of fungicide application
Oct. 14 - two weeks after fungicide application, in R-7 growth stage with/without fungicide
Disease severity on Bayer scale at time of application, + with fungicide, - no fungicide.
Disease severity on Bayer scale at time of application, + with fungicide, - no fungicide

Fungicide applied at R6 GS

Disease severity

- 6-
- 6+
- 7-
- 7+
- 8-
- 8+

100 seed wt gm

A
A
B
B
AB
AB
Fungicide applied at R6 GS

Disease severity on Bayer scale at time of application, + with fungicide, - no fungicide

Yield bu/A

Yield from nearby plot with fungicide
From this study:

• Higher infections at time of treatment had more yield loss prior to fungicide application resulting in less total yield
• Yield increases of 20-50% were made when fungicides were applied to R6 soybeans at advanced stages of infection
• Fungicides help keep soybeans leaves green and on the plant which contributes to yield increases
• Fungicides did not result in higher seed moisture at harvest

Soybean development can be terminated as shown above and will result in yield loss in addition to smaller seed which is usually the case with late infections (beans shown here are not shattered)
Beans in the bottom part of the canopy are reduced in size.
Using Fungicides to Control Soybean Rust
Yield Loss

- Potential for yield loss is very large
- Typically yield loss is greater the earlier rust is established in field and the later it is treated
- Rust spreads quickly (especially within field)
Fungicide Timing

When is the best time to apply fungicides?

Resistance
no commercial varieties available

Fungicides
Triazole
Strobilurin
Co-packs and premixes
Methods

• Timing of application
  – Unsprayed control
  – Growth stage R1, R3, R5
  – R1 + R3 + R5
    (Infection started at R4)

• Data collected
  – Soybean rust severity
  – Defoliation
  – Yield
  – Seed weight
Rust observed at GS R4

Yield (bu/ac)

Florida Georgia

Control R1 R3 R5 Max
Fungicide timing

- Best timing depends on when rust first infects soybeans and severity of infection
- Early infection needs early fungicide application
- On later infections, the timing is less critical but better to spray too early than too late
- Fungicides may differ in sensitivity to timing
Florida “Quilt” Applications

White=non-sprayed control, Yellow=GS R1, Red=GS R3, and Blue=GS R5

Yield
Con=42 bu/a
R1=45 bu/a
R3=46 bu/a
R5=50 bu/a
Florida “Headline SBR” Applications

Yield
Con=42 bu/a
R1=46 bu/a
R3=58 bu/a
R5=62 bu/a

White=non-sprayed control, Yellow=GS R1, Red=GS R3, and Blue=GS R5
## Experimental Treatments in 2006

<table>
<thead>
<tr>
<th>ID</th>
<th>Description</th>
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<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Headline (9.2 oz/A) @ R1</td>
<td>13</td>
<td>Headline (6 oz) @ R1 + Folicur (3 oz) @ R3</td>
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<tr>
<td>2</td>
<td>Folicur (4 oz/A) @ R1</td>
<td>14</td>
<td>Folicur (3 oz) @ R1 + Headline (6 oz) @ R3</td>
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<td>3</td>
<td>Quilt (14 oz/A) @ R1</td>
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<td>Quilt (14 oz) @ R1 &amp; R3</td>
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<td>4</td>
<td>Folicur (3 oz/A) + Headline (6 oz/A) @ R1</td>
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<td>Folicur (3 oz) + Headline (6 oz) @ R1 &amp; R3</td>
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<tr>
<td>5</td>
<td>Headline (9.2 oz/A) @ R3</td>
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<td>Headline (6 oz) @ R3 + Folicur (3 oz) @ R5</td>
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<tr>
<td>6</td>
<td>Folicur (4 oz/A) @ R3</td>
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<td>Folicur (3 oz) @ R3 + Headline (6 oz) @ R5</td>
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<tr>
<td>7</td>
<td>Quilt (14 oz/A) @ R3</td>
<td>19</td>
<td>Quilt (14 oz) @ R3 &amp; R5</td>
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<tr>
<td>8</td>
<td>Folicur (3 oz/A) + Headline (6 oz/A) @ R3</td>
<td>20</td>
<td>Folicur (3 oz) + Headline (6 oz) @ R3 &amp; R5</td>
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<tr>
<td>9</td>
<td>Headline (9.2 oz/A) @ R5</td>
<td>21</td>
<td>Folicur (4 oz/A) @ R1 &amp; R3</td>
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<td>10</td>
<td>Folicur (4 oz/A) @ R5</td>
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<td>Folicur (4 oz/A) @ R3 &amp; R5</td>
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<tr>
<td>11</td>
<td>Quilt (14 oz/A) @ R5</td>
<td>23</td>
<td>Folicur (4 oz/A) @ R1, R3 &amp; R5</td>
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<tr>
<td>12</td>
<td>Folicur (3 oz/A) + Headline (6 oz/A) @ R5</td>
<td>24</td>
<td>CONTROL (No any spray)</td>
</tr>
</tbody>
</table>
(1) Except for Treatments 3 (14 oz/A Quilt at R1), 4 (3 oz Folicur+6 oz Headline at R1) and 7 (14 oz quilt at R3), all other fungicide treatments have higher seed yield compared to the no fungicide control ($P < 0.05$).

(2) Clear differences exist among the fungicide treatments. Treatment 23 (4 oz Folicur at R1, R3, R5) has the highest yield.
Fungicide Efficacy

- Quilt protected yield to some extent, but not as effectively as Headline SBR
- With higher rust severity, fungicide selection becomes more important
- Multiple fungicide applications give highest yield when rust epidemic is severe early in the season
- From a fungicide study done this year for BASF, one of the best fungicides in Brazil was in the middle of the pack in Quincy
• **NO** differences with increased coverage
Take Home Message

• Fungicides work well – some better than others

• Timing of fungicides is critical for best management of soybean rust
  – Use forecasting/scouting/sentinel plot systems (www.sbrusa.net) to watch soybean rust activity
  – Spray when risk of infection is HIGH

• Differences in coverage did not affect efficacy of fungicides
  – DON’T CUT CORNERS
Conclusions
• Plant early to avoid high spore loads later in the season
• Use early MG high yielding soybeans that have other suitable characteristics.
• Plant single crop soybeans in one area and double cropped soybeans in another to keep from passing infection from old to young soybeans.
• Soybean rust can be controlled and if you think you have an infestation treat with a triazole.
• Rotate chemistries, however, one fungicide application is usually sufficient if weather conditions are minimal for disease spread or it starts late in the season.
• Be alert to rust spread and catch it in early stages to prevent yield loss.
• Inoculum appears to be getting heavier, earlier with more kudzu infected in soybean producing states.
• Late fungicide applications at R6 can increase yields by 20-50% but significant yield losses may have already occurred.
• ASR control is one of many management decisions that has to be done timely for a profitable soybean crop.

We have yet to see the full effect of ASR until the majority of kudzu sites have been infected but caught a glimpse of it in the mid south in 2009.
Questions?

Special thanks to the *North Central Soybean Research Program* (NCSRP) for their support for this research.
Timeliness is key in good management and is important for top yields and profitability.
Profitable Soybeans

- Most profitable soybeans in the south are usually double cropped. Wheat is planted in November and harvested in mid to late May (60-70% of soybeans are double cropped in the SE).
- Works best if wheat and soybeans both have high prices. Soft red winter wheat had a $2 basis off CBOT this year so is not as profitable as it could be.
- Often straw is sold from the wheat and soybean are stripped tilled into wheat stubble. No fertilizer is used on most soybeans due to double cropping and little fertility response.
- Soybean yield behind perennial grasses can be 60-70 bu/A as well as after well rotated crops (soybean once every 3-4 years).
SE soybean acreage has increased with price (more potential for rust in the mid west)

- Low cost and ease of growing
- Use same planters and harvesters as for corn and wheat
- High cost of fertilizer
- High soybean prices
- When land is well rested and has had corn, cotton or perennial grasses for an extended period beans have high yield potential (60-70 bu/A)
- Can plant and manage many more acres than with cotton and peanut.
Using Fungicides to Control Soybean Rust

Tristan Mueller
This project has had:
Policy and research support, research and extension cooperation, and industry support
- North American growers can compete with anyone and need support for special problems and challenges and this is one of many that has to be considered and we are happy to be a part of it!

Special thanks to the North Central Soybean Research Program (NCSRP)
Infected kudzu patch near soybean plots
Disease severity on Bayer scale at time of application, + with fungicide, - no fungicide

Yield % of Max

Fungicide applied at R6 GS

Disease severity on Bayer scale at time of application, + with fungicide, - no fungicide
- Yield decrease is due to loss of seed weight, not a loss in seed number.
- Growth stage when fungicide is applied has less to do with control and yield response and infection rate than weather conditions after infection (dew until noon for 2-3 days).
- Dry weather will slow down the infection, and wet weather will increase the disease progress.
- Try to stay ahead of the disease.

15-30 bu/A difference in yield between defoliated and plots with leaves remaining.
Management of soybean rust

- **Resistance**
  - no commercial varieties available

- **Fungicides**
  - Triazole
  - Strobilurin
  - Co-packs and premixes

  - Single site mode of action
  - More systemic than strobilurins
  - Protectant and curative activity

  - Single site mode of action
  - Locally systemic
  - Protectant activity
Bottom Line

- ASR is only one of the many management decisions that has to be taken into account for a profitable soybean crop.
- Plant early to avoid high spore loads later in the season.
- Use early MG high yielding soybeans that have other suitable characteristics for high yields in your area.
- Plant single crop soybeans in one area and double cropped soybeans in other areas to keep from passing infections from old to young soybeans.
- Soybean rust can be controlled and if you think you have an infestation treat with a triazole.
- Rotate chemistries, however, one fungicide application is usually sufficient if weather conditions are minimal for disease spread.
- Be alert to rust spread and catch it in early stages to prevent yield loss.
- Inoculum appears to be getting heavier, earlier with more kudzu infected in soybean producing states.
- Late applications in R6 can make a significant impact on yield but significant yield losses may have already occurred.
Management Factors to Minimize ASR

- Plant early
- Use early maturity groups
- Avoid double cropping (after wheat and especially after corn)
- Plant away from early planted fields or infected kudzu sites
- Take care not move spores on equipment or clothing from one field to another
- Use resistant varieties (when available)
Asian Soybean Rust

- Early detection and treatment is key to high yield
- Rust can be controlled with little impact on yield if treated in a timely manner
- Many southern growers use fungicides for control of diseases such as frogeye, rust can be controlled along with other diseases
- Rust can impact farmers financially if several fungicide applications are made or if made too late