If fungicides work so well on wheat…

Why not use them on soybeans, too?

Martin A. Draper
Extension Plant Pathologist
Disease
environment
susceptible
plant

pathogen

susceptible plant
Optimizing success – Assessing Risk

- Wheat
  - Leaf spotters
    - Tan spot
    - Septoria blotch
    - Powdery mildew
  - Rusts
    - Stem rust
    - Leaf rust
    - Stripe rust
  - Fusarium Head Blight

- Soybeans
  - Leaf spotters
    - Brown spot
    - Frogeye spot
  - Mildews
    - Downy mildew
    - Powdery mildew
  - Soybean Rust?
Optimizing success – Assessing Risk

- Risk factors
  - Crop rotation
  - Tillage practices
  - Variety selection

- How do the wheat and soybean systems differ?
Optimizing success – Assessing Risk

- What are you treating/protecting?
  - Diseases
  - Yield building canopy
  - Other effects?
In the absence of apparent diseases...

- What should you expect?
What causes response in soybean?

- Considerations
  - Fungicide timing and Residual
    - Vegetative vs. Reproductive
  - Disease pressure
    - Foliar vs. Stem vs. Root
  - Fungicide chemistry
    - Strobilurin vs. Triazole vs. true protectants
What causes response in soybean?

- Two theories for strobilurin success
  - Disease theory
    - Response is due to...
      - Controlling seen diseases
      - Suppressing unseen, underlying diseases (nibblers)
  - Disease+ theory
    - Response is due to...
      - Controlling seen diseases
      - Physiological effects
        - Reducing ethylene accumulation
        - Reducing nitrogen oxide (see above)
All strobilurins are **NOT** the same

Graphic courtesy Syngenta
What causes response in soybean?

- Southern experience
  - Strobilurins provide consistent yield response
    - Normal disease pressure from...
      - Rhizoctonia aerial blight
      - Frogeye leaf spot
      - Other late season diseases
    - Long season maturities
What causes response in soybean?

- Northern experience
  - Strobilurins inconsistent in north
    - Significant leaf diseases are rare
    - Stress relief may be implicated, but poorly defined
    - Short season maturities
Northern Comparative Trials -2005
Northern Region ‘Defined’
Northern Region ‘Results’

- 13 states provided data
- 65 trial locations
- Small plot and strip trials
- Crop response in the absence of rust
  - Strobilurins
  - Triazoles
  - Combination products
  - Multiple treatments
Variability Across Northern Trials

- Maturity groups
  - RM 00
  - RM 0
  - RM I
  - RM II
  - RM III
  - RM IV

- Genotypic interactions

- Environments
  - Drought in 2005

- Confounding from foliar and stem disease
Disease Control

- Rust was not reported from any Northern trial site
- Brown spot, Bacterial blight and Bacterial pustule were most commonly reported
- Frogeye leafspot and Anthracnose in some locations
- Disease data not available from all sites
- Most sites had only minor leaf disease
Yield Response by Location

Strobilurin - Headline

Yield advantage (bu/A - deviation from control)

N=35

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin - Headline

N=35

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin - Headline

N=35

N=10 < untrt
~28%

N=14 > untrt < 4 bu/A
~40%

N=10 > 4 bu/A
~28%

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin - Headline

**Yield advantage (bu/A - deviation from control)**

10/35 sites with significant economic response (35.7%)

N=35

**Numeric response – Relative advantage of treatment**

Absence of soybean rust
All trials
Yield Response by Location
Strobilurin - Quadris

Trial Location

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=28
Yield Response by Location
Strobilurin - Quadris

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=28
Yield Response by Location
Strobilurin - Quadris

Relative advantage of treatment
Absence of soybean rust
*Assumes $5.00/bu - $12.00/A product - $7.00/A application
Yield Response by Location
Strobilurin - Quadris

Yield advantage (bu/A - deviation from control)

N=28

5/28 sites with significant economic response (17.8%)
Yield Response to Strobilurin
Across Locations

Ave. yield (bu/A)

Quadris
Headline
Combined

~ 4 bu/A needed for profit!

Assumes $5.00/bu - $12.00/A product - $7.00/A application
Conclusions & Concerns

- Strobilurin products provide excellent, broad spectrum disease control
- Something is happening in the absence of disease!
- Inconsistent
- How do we optimize the response?
- Separating influencing factors?
Yield Response by Location
Strobilurin/Triazole - Quilt

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=18
Yield Response by Location
Strobilurin/Triazole - Quilt

Yield advantage (% - deviation from control)

Trial Location

IL 1  IL 2  IL 3  IL 4  IL 5  IL 6  IL 7  IL 8  IL 9  KS 2  MD 1  MD 2  MI 1  MN 2  MO 1  MO 2  MO 3  SD 1

Significantly different from untreated at that location

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=18
Yield Response by Location
Strobilurin/Triazole - Quilt

Yield advantage (bu/A - deviation from control)

N=18
N=5 <untrt ~28%
N=6 >0 <4 bu/A ~33%
N=7 >4 bu/A ~39%

numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin/Triazole - Quilt

N=18

6/18 sites with significant economic response (33.3%)

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin/Triazole - Stratego

Yield advantage (bu/A - deviation from control)

Trial Location

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=18
Yield Response by Location
Strobilurin/Triazole - Stratego

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=18
Yield Response by Location
Strobilurin/Triazole - Stratego

Yield advantage (bu/A - deviation from control)

<table>
<thead>
<tr>
<th>Trial Location</th>
<th>N=18</th>
<th>N=4 &lt;untrt</th>
<th>N=6 &gt;0 &lt;4 bu/A</th>
<th>N=8 &gt;4 bu/A</th>
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<td>IL 6</td>
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<td>~22%</td>
<td>~44%</td>
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Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Strobilurin/Triazole - Stratego

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

5/18 sites with significant economic response (27.8%)
Yield Response by Location
Triazole - Folicur

N=19

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Folicur

N=19

Yield advantage (% - deviation from control)

Trial Location

IL 1  IL 2  IL 3  IL 4  IL 5  IL 6  IL 7  IL 8  IL 9  MD 1  MD 2  MD 3  MN 2  MO 1  MO 2  MO 3  OH 15  OH 16  SD 1

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Folicur

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Folicur

N=19

3/19 sites with significant economic response (15.8%)

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

South Dakota State University
Yield Response by Location
Triazole - Laredo

N=16

Yield advantage (bu/A - deviation from control)

Trial Location
IL 1  IL 2  IL 3  IL 4  IL 5  IL 6  IL 7  KS 1  KS 2  MD 1  MD 2  MO 1  MO 2  MO 3  OH 15  OH 16

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Laredo

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Laredo

Yield advantage (bu/A - deviation from control)

N=16

N=5 <untrt ~31%
N=6 >0 <4 bu/A ~35%
N=5 >4 bu/A ~35%

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Laredo

N=16

2/16 sites with significant economic response (12.5%)

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Domark

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Domark

N=17

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Yield Response by Location
Triazole - Domark

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials

N=17
N=6 <untrt
~35%

N=8 >0 <4 bu/A
~47%

N=3 >4 bu/A
~18%
Yield Response by Location
Triazole - Domark

N=17

2/17 sites with significant economic response (11.8%)

Numeric response – Relative advantage of treatment
Absence of soybean rust
All trials
Conclusions & Concerns

- Strobilurin components generally provide a slightly better chance of response in the absence of disease.
- Combination products and solo strobilurins appear to offer chance of response.
- Still inconsistent.
- Rare triazole response sites were a surprise.
Conclusions & Concerns

<table>
<thead>
<tr>
<th>Frequency of observed significant economic yield increase</th>
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<tbody>
<tr>
<td>Headline</td>
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<tr>
<td>Quadris</td>
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Future Plans

- Nationwide base protocols for soybean fungicides producing University assessments on crop response

- Share data across state lines for a “bigger picture” view of what may be happening