Improving management of white mold in soybeans:

2. Optimizing fungicide application frequency

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Endura 8.0 oz/ac: single application at late R1 to early/mid R2
Active ingredient: boscalid 159 g ai/ac

Fungicide application methods: 15 to 17.5 gal/ac, 35 or 40 psi, flat-fan nozzles with fine or medium droplets

Fungicide performance across 33 field trials conducted at four locations (Carrington, Hofflund, Langdon and Oakes, ND) across six years

Relationship between yield response and disease pressure: $y = 1.2438 + 0.1013x$
Strength of the correlation: $R^2 = 0.4545$ ($P < 0.0001$)
**Endura 8.0 oz/ac:** two applications, late R1 to early/mid R2 + 10-14 days later

**Active ingredient:** **boscalid** 159 g ai/ac

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**Relationship between yield response and disease pressure:**

\[ y = 1.7658 + 0.1593x \]

**Strength of the correlation:** \( R^2 = 0.8157 \) \((P < 0.0001)\)

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**Fungicide application methods:** 15 to 17.5 gal/ac, 35 or 40 psi, flat-fan nozzles with fine or medium droplets

**Fungicide performance across 11 field trials** conducted at one location (Carrington, ND) across four years
Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity

CARRINGTON, ND (2018)

<table>
<thead>
<tr>
<th>White mold</th>
<th>00.5 to 00.9 maturity</th>
<th>0.1 to 0.5 maturity</th>
<th>0.6 to 1.0 maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of canopy</td>
<td>12</td>
<td>24</td>
<td>31</td>
</tr>
</tbody>
</table>

Soybean yield

<table>
<thead>
<tr>
<th>Soybean yield</th>
<th>00.5 to 00.9 maturity</th>
<th>0.1 to 0.5 maturity</th>
<th>0.6 to 1.0 maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>bushels/acre</td>
<td>52</td>
<td>47</td>
<td>43</td>
</tr>
</tbody>
</table>

Fungicide application methods: 15 gal/ac, 40 psi, TeeJet XR110015 flat-fan nozzles (fine droplets)

Fungicide application timing – first application: 0 to 2 days after 90% of plants at reached the R1 growth stage

Fungicide application timing – second application: 10-12 days after the first application
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Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity
CARRINGTON, ND (2018)

B. Two applications of Endura (5.5 oz/ac); Carrington, ND (2018)

Fungicide application methods: 15 gal/ac, 40 psi, TeeJet XR110015 flat-fan nozzles (fine droplets)
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Fungicide application timing – first application: 1 to 9 days after 90% of plants at reached the R1 growth stage
Fungicide application timing – second application: 10-12 days after the first application

Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity
OAKES, ND (2018)
Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity

OAKES, ND (2018)

A. One application of Endura (5.5 oz/ac); Oakes, ND (2018)

Fungicide application methods: 15 gal/ac, 40 psi, TeeJet XR110015 flat-fan nozzles (fine droplets)
Fungicide application timing – first application: 1 to 9 days after 90% of plants at reached the R1 growth stage
Fungicide application timing – second application: 10-12 days after the first application

PINK DOT = soybean variety in which fungicide application was profitable at $8/bu
BLUE DOT = soybean variety in which fungicide application was not profitable at $8/bu

Frequency that fungicides were profitable
Percent of varieties assuming total cost of $27/ac (product + application) for one fungicide application

$8/bu soybeans
- maturity rating = 0.1 - 0.5: 45%
- maturity rating = 0.6 - 1.0: 50%
- maturity rating = 1.1 - 1.3: 33%

$10/bu soybeans
- maturity rating = 0.1 - 0.5: 73%
- maturity rating = 0.6 - 1.0: 50%
- maturity rating = 1.1 - 1.3: 67%

Regression equation:
\[ y = -0.9451x + 3.7895 \]
\[ R^2 = 0.0185 \]
\[ P = 0.5168 \]
Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity

OAKES, ND (2018)

B. Two applications of Endura (5.5 oz/ac); Oakes, ND (2018)

Fungicide application methods: 15 gal/ac, 40 psi, TeeJet XR110015 flat-fan nozzles (fine droplets)

Fungicide application timing – first application: 1 to 9 days after 90% of plants at reached the R1 growth stage

Fungicide application timing – second application: 10-12 days after the first application

Frequency that fungicides were profitable

Percent of varieties assuming total cost of $54/ac (product + application) for two fungicide applications

<table>
<thead>
<tr>
<th>$8/bu soybeans</th>
<th>$10/bu soybeans</th>
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</thead>
<tbody>
<tr>
<td>maturity rating = 0.1 - 0.5</td>
<td>maturity rating = 0.6 - 1.0</td>
</tr>
<tr>
<td>27%</td>
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</tr>
<tr>
<td>maturity rating = 1.1 - 1.3</td>
<td>maturity rating = 1.1 - 1.3</td>
</tr>
<tr>
<td>50%</td>
<td>75%</td>
</tr>
<tr>
<td>60%</td>
<td>60%</td>
</tr>
</tbody>
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PINK DOT = soybean variety in which fungicide application was profitable at $8/bu
BLUE DOT = soybean variety in which fungicide application was not profitable at $8/bu

Yield response to fungicides (bu/ac)

Soybean maturity rating

$y = -3.061x^2 + 6.396x + 3.7335$

$R^2 = 0.0536$

$P = 0.5453$
Response to 1 vs. 2 fungicide applications targeting white mold relative to soybean maturity

<table>
<thead>
<tr>
<th>CARRINGTON (2019)</th>
<th>00.5 to 00.9 maturity</th>
<th>0.0 to 0.2 maturity</th>
<th>0.3 maturity</th>
<th>0.4 maturity</th>
<th>0.5 to 0.6 maturity</th>
<th>0.7 to 0.8 maturity</th>
<th>0.9 to 1.0 maturity</th>
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<tr>
<td>varieties assessed: 6</td>
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### Fungicide Application Methods
15 gal/ac; TeeJet AIXR110015 flat-fan nozzles at 60 psi (medium droplets) when canopy was open
15 gal/ac; TeeJet AIXR110015 flat-fan nozzles at 40 psi (coarse droplets) when canopy was at or near closure

### Fungicide Application Timing
within 24 hours of 70% of plants reaching R2 growth stage (application #1) and 10 days later (application #2)

<table>
<thead>
<tr>
<th>White mold</th>
<th>10</th>
<th>8</th>
<th>6</th>
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<tr>
<td>% of canopy</td>
<td>b</td>
<td>a</td>
<td>a</td>
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<table>
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<tr>
<th>Soybean Yield</th>
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<th>46</th>
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Fungicide application timing: within 24 hours of 70% of plants reaching R2 growth stage (application #1) and 10 days later (application #2)
When conditions favor white mold from the R2 through the late R4 growth stages (when soybeans are most susceptible to white mold), two sequential fungicide applications targeting white mold are often more profitable than a single fungicide application in soybeans of mid-zero maturity and longer.

Longer-maturity soybeans have longer bloom periods. In soybeans of mid-zero maturity and longer, the residual activity from the first application is insufficient to provide protection through late R4, which can result in late white mold infections.

R2: at least one open blossom at one of the two uppermost nodes of the plant.
R3: pods are 3/16 inch long at one of the four uppermost nodes of the plant.
R4: pods are 3/4 inch long at one of the two uppermost nodes of the plant.
R5: seed is 1/8 inch long within one or more pods at one of the four uppermost nodes of the plant.
Thank You!

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