Improving management of white mold in soybeans:  
1. Optimizing fungicide application timing

Michael Wunsch, Michael Schaefer, Billy Kraft, Suanne Kallis - NDSU Carrington Research Extension Center
Leonard Besemann, Heidi Eslinger, Walt Albus - NDSU Robert Titus Research Farm, Oakes
Venkata Chapara, Amanda Arens, Pravin Gautam - NDSU Langdon Research Extension Center
Tyler Tjelde - NDSU Williston Research Extension Center Nesson Valley Irrigation Research Site, Hofflund

RESEARCH FUNDED BY THE NORTH DAKOTA SOYBEAN COUNCIL
FUNGICIDE APPLICATION TIMING – Single fungicide application

1. **Soybean canopy closed at mid/late R1 (60-85% of plants at R1)**

   Fungicide applied: Endura at 5.5 or 8.0 oz/ac

   When the canopy was closed at mid/late R1, delaying fungicide applications from R1 to early R2 conferred moderate reductions in white mold.

<table>
<thead>
<tr>
<th>study location</th>
<th>YEAR</th>
<th>Carrington</th>
<th>Carrington</th>
<th>Carrington</th>
<th>Oakes</th>
<th>Hofflund</th>
<th>Combined analysis</th>
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<tbody>
<tr>
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<td></td>
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<td>14 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>7.5 inches</td>
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<tr>
<td><strong>Endura</strong></td>
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<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>8.0 oz/ac</td>
<td>8.0 oz/ac</td>
<td>5.5 or 8.0 oz/ac</td>
</tr>
</tbody>
</table>

**CANOPY CLOSURE when fungicides were applied**

- R1 (60-85% R1)
  - 100%

**White mold incidence (% of plants diseased)**

- **Non-treated control**
  - R1 (60-85% R1)
    - 48
    - 30
  - Early R2 (80-98% R2)
    - 28
  - Full R2 (100% R2)
    - CV: 26.4
  - CV: 26.4

- **R1 (60-85% R1)**
  - 18
  - 16
  - 20
  - 14

- **Early R2 (80-98% R2)**
  - 28
  - 12

- **Full R2 (100% R2)**
  - 22
  - 12

- **CV:**
  - 45.7
  - 47.4
  - 16.6
  - 40.3
  - 12.7

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume:** 15 or 17.5 gal/ac
**FUNGICIDE APPLICATION TIMING – Single fungicide application**

1. **Soybean canopy closed at mid/late R1 (60-85% of plants at R1)**

   - Fungicide applied: Endura at 5.5 or 8.0 oz/ac

   When the canopy was closed at mid/late R1, applying fungicides at mid/late R1 versus early R2 conferred similar yield responses.

### Table: Study Location and Fungicide Application

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Year</th>
<th>Row Spacing</th>
<th>Endura Application Rate</th>
<th>Year</th>
<th>Row Spacing</th>
<th>Endura Application Rate</th>
<th>Year</th>
<th>Row Spacing</th>
<th>Endura Application Rate</th>
<th>Year</th>
<th>Row Spacing</th>
<th>Endura Application Rate</th>
<th>Combined Analysis</th>
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<tbody>
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<td>Carrington</td>
<td>2015</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
<td>2015</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
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<td>14 inches</td>
<td>8.0 oz/ac</td>
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<td>7.5 inches</td>
<td>8.0 oz/ac</td>
<td>five studies</td>
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<tr>
<td>Oakes</td>
<td>2014</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
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<td>8.0 oz/ac</td>
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<td></td>
<td></td>
<td></td>
<td>5.5 or 8.0 oz/ac</td>
</tr>
</tbody>
</table>

### Chart: Canopy Closure

**R1 (60-85% R1)**

- 100% for all locations

### Chart: Soybean Yield (bu/ac; 13% moisture)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Average</th>
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</thead>
<tbody>
<tr>
<td>Non-treated control</td>
<td>42</td>
<td>59</td>
<td>54</td>
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<td>22</td>
<td>45</td>
</tr>
<tr>
<td>R1 (60-85% R1)</td>
<td>47</td>
<td>59</td>
<td>57</td>
<td>55</td>
<td>22</td>
<td>48</td>
</tr>
<tr>
<td>Early R2 (80-98% R2)</td>
<td>47</td>
<td>59</td>
<td>55</td>
<td>54</td>
<td>23</td>
<td>48</td>
</tr>
<tr>
<td>Full R2 (100% R2)</td>
<td>49</td>
<td>60</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CV:**

- Year 1: 11.2
- Year 2: 5.1
- Year 3: 4.7
- Year 4: 8.3
- Year 5: 6.7

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume:** 15 or 17.5 gal/ac
2. **Soybean canopy at/near closure at early R2** (80-99\% of plants at R2)

Fungicide applied: Endura at 5.5 or 8.0 oz/ac

When the canopy was open at late R1 and at/near closure at early R2, delaying fungicide applications from mid/late R1 to early R2 improved white mold control.

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>YEAR</td>
<td>14 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>7 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>14 inches</td>
<td>5.5 or 8.0 oz/ac</td>
</tr>
<tr>
<td>Endura application rate</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>8.0 oz/ac</td>
<td>8.0 oz/ac</td>
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<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td></td>
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</tr>
</tbody>
</table>

**CANOPY CLOSURE when fungicides were applied**

<table>
<thead>
<tr>
<th>R1 (60-85% R1)</th>
<th>95%</th>
<th>95%</th>
<th>89%</th>
<th>95%</th>
<th>95%</th>
<th>93%</th>
<th>48%</th>
<th>48-95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early R2 (80-98% R2)</td>
<td>100%</td>
<td>100%</td>
<td>98%</td>
<td>98%</td>
<td>97%</td>
<td>87%</td>
<td>87-100%</td>
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</tbody>
</table>

**White mold incidence (% of plants diseased)**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CV</th>
<th>103.9</th>
<th>28.7</th>
<th>30.2</th>
<th>14.9</th>
<th>9.6</th>
<th>28.0</th>
<th>13.2</th>
<th>26.4</th>
<th>28.4</th>
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<tbody>
<tr>
<td>Non-treated control</td>
<td>1.8</td>
<td>7</td>
<td>a</td>
<td>34</td>
<td>b</td>
<td>73</td>
<td>b</td>
<td>85</td>
<td>c</td>
<td>37</td>
</tr>
<tr>
<td>R1 (60-85% R1)</td>
<td>1.2</td>
<td>6</td>
<td>a</td>
<td>28</td>
<td>ab</td>
<td>60</td>
<td>b</td>
<td>68</td>
<td>b</td>
<td>26</td>
</tr>
<tr>
<td>Early R2 (80-98% R2)</td>
<td>1.3</td>
<td>18</td>
<td>a</td>
<td>44</td>
<td>a</td>
<td>51</td>
<td>a</td>
<td>16</td>
<td>a</td>
<td>25</td>
</tr>
<tr>
<td>Full R2 (100% R2)</td>
<td>0.6</td>
<td>4</td>
<td>a</td>
<td>16</td>
<td>a</td>
<td>19</td>
<td>a</td>
<td>19</td>
<td>a</td>
<td>10</td>
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</table>

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume:** 15 or 17.5 gal/ac
When the canopy was open at late R1 and at/near closure at early R2, delaying fungicide applications from mid/late R1 to early R2 improved soybean yield.

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Year</th>
<th>Row Spacing</th>
<th>Endura Application Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakes</td>
<td>2015</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
</tr>
<tr>
<td>Carrington</td>
<td>2015</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>14 inches</td>
<td>8.0 oz/ac</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>14 inches</td>
<td>8.0 oz/ac</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
</tr>
<tr>
<td>Langdon</td>
<td>2016</td>
<td>14 inches</td>
<td>5.5 oz/ac</td>
</tr>
</tbody>
</table>

When fungicides were applied:
- Soybean canopy at/near closure at early R2 (80-99% of plants at R2)
- Fungicide applied: Endura at 5.5 or 8.0 oz/ac

**Non-treated control**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>CV</td>
<td>5.1</td>
<td>4.7</td>
<td>6.8</td>
<td>9.0</td>
<td>6.8</td>
<td>9.2</td>
<td>6.8</td>
<td>9.8</td>
<td>7.1</td>
<td>6.2</td>
</tr>
</tbody>
</table>

**Soybean Yield (bu/ac; 13% moisture)**

- **Non-treated control**
  - 75
  - 62
  - 45
  - 25
  - 25
  - 37
  - 26
  - 60
  - 42

- **R1 (60-85% R1)**
  - 77
  - 63
  - 48
  - 32
  - 30
  - 41
  - 30
  - 60
  - 45

- **Early R2 (80-98% R2)**
  - 77
  - 51
  - 37
  - 31
  - 44
  - 39
  - 58
  - 48

- **Full R2 (100% R2)**
  - 73
  - 64
  - 50
  - 37
  - 43
  - 61
  - 61
  - 61

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume:** 15 or 17.5 gal/ac
Across 19 field trials conducted at four locations and two years, delaying fungicide applications from mid/late R1 (60-85% R1) to early R2 (80-99% R2) improved disease control in 95% of studies and soybean yield in 74% of studies.

- Applying fungicides at early R2 was optimal except when canopy closure was 100% at mid/late R1 and weather favorable for white mold occurred at mid/late R1.

**Impact of delaying fungicide application from mid/late R1 (60-85% R1) to early R2 (80-99% R2):**

- **Disease response (percentage points):**
  - Reduction (positive value) or increase in Sclerotinia incidence.

- **Yield response (bushels/acre):**
  - Increase (positive value) or decrease in soybean yield.

**Canopy closure (%):**

- **30**
- **40**
- **50**
- **60**
- **70**
- **80**
- **90**
- **100**

**BLUE DOT** = response observed in an individual study.
When conditions favored white mold as soybeans entered bloom:

Applying fungicides at the mid/late R1 growth stage (60-85% R1) optimized white mold management when the canopy was closed at mid/late R1. (100% of the ground covered by the canopy)

Applying fungicides at early R2 growth stage (80-99% R2) optimized white mold management when the canopy was at or near closure at early R2. (95-100% of the ground covered by the canopy)

**R1**: at least one open blossom on the plant.

**R2**: at least one open blossom at one of the top two nodes of the plant.
3. Soybean canopy at/near closure at full R2 (100% of plants at R2)

Fungicide applied: Endura at 5.5 or 8.0 oz/ac

When the canopy was open at early R2 (<100% of plants at R2), delaying fungicide applications until 100% of plants were at R2 improved white mold control.

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Carrington Oakes</th>
<th>Hofflund</th>
<th>Carrington Oakes</th>
<th>Combined Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2014</td>
<td>2014</td>
<td>2014</td>
<td>Four studies</td>
</tr>
<tr>
<td>Row Spacing</td>
<td>21 inches</td>
<td>28 inches</td>
<td>30 inches</td>
<td>5.5 or 8.0 oz/ac</td>
</tr>
<tr>
<td>Endura Application Rate</td>
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<td>8.0 oz/ac</td>
<td>8.0 oz/ac</td>
<td>5.5 oz/ac</td>
</tr>
</tbody>
</table>

**Canopy Closure When Fungicides Were Applied**

- Full R2 (100% R2):
  - 98%
  - 95%
  - 85%
  - 90%
  - 85-98%

**White Mold Incidence (% of plants diseased)**

- Non-treated control: 80%
- R1 (60-90% R1):
  - 63%
  - 47%
  - 1%
  - 46%
  - 2%
  - 40%
- Early R2 (80-98% R2):
  - 54%
  - 36%
  - 0%
  - 34%
  - 2%
  - 31%
- Full R2 (100% R2):
  - 43%
  - 34%
  - 0%
  - 32%
  - 0%
  - 27%
- R2 (1-2 days after 100% R2): 46%
- R2 (3-4 days after 100% R2): 52%
- Early R3: 34%

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray Volume:** 15 or 17.5 gal/ac
### 3. Soybean canopy at/near closure at full R2 (100% of plants at R2)

Fungicide applied: Endura at 5.5 or 8.0 oz/ac

When the canopy was open at early R2 (<100% of plants at R2), delaying fungicide applications until 100% of plants were at R2 improved soybean yield.

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Carrington</th>
<th>Oakes</th>
<th>Hofflund</th>
<th>Carrington</th>
<th>Oakes</th>
<th>Combined Analysis</th>
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<td>Year</td>
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<td>2014</td>
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<td>28 inches</td>
<td>30 inches</td>
<td>28 inches</td>
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<td>5.5 oz/ac</td>
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<td>8.0 oz/ac</td>
<td>8.0 oz/ac</td>
<td>8.0 oz/ac</td>
<td>5.5 oz/ac</td>
<td>8.0 oz/ac</td>
</tr>
</tbody>
</table>

**Canopy Closure when fungicides were applied**

| Full R2 (100% R2) | 98% | 95% | 85% | 90% | 85-98% |

**Soybean Yield (bu/ac; 13% moisture)**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>23</th>
<th>51</th>
<th>30</th>
<th>30</th>
<th>72</th>
<th>44</th>
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</thead>
<tbody>
<tr>
<td>Non-treated control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 (60-90% R1)</td>
<td>31</td>
<td>57</td>
<td>29</td>
<td>35</td>
<td>72</td>
<td>49</td>
</tr>
<tr>
<td>Early R2 (80-98% R2)</td>
<td>33</td>
<td>59</td>
<td>30</td>
<td>37</td>
<td>72</td>
<td>50</td>
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<tr>
<td>Full R2 (100% R2)</td>
<td>34</td>
<td>59</td>
<td>40</td>
<td>76</td>
<td>52</td>
<td></td>
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<tr>
<td>R2 (1-2 days after 100% R2)</td>
<td>36</td>
<td></td>
<td>31</td>
<td>39</td>
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<td></td>
</tr>
<tr>
<td>R2 (3-4 days after 100% R2)</td>
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<td></td>
<td>29</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early R3</td>
<td></td>
<td>59</td>
<td>29</td>
<td>37</td>
<td></td>
<td></td>
</tr>
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</table>

**Notes:**

- Nozzles: XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)
- Spray volume: 15 or 17.5 gal/ac
Across 14 field trials conducted at two locations and three years, delaying fungicide applications from mid/late R1 (60-85% R1) to full R2 (100% R2) improved disease control and yield in 71% of studies.

- Applying fungicides at full R2 was optimal except when canopy closure was 100% at mid/late R1 and weather favorable for white mold occurred at mid/late R1.
Across 12 field trials conducted at two locations and two years:

- When the canopy was at or near closure (97-100% closure) at early R2, applications at early R2 (<100% of plants at R2) were optimal.
- When the canopy was open (<95% closure) at early R2, applications at full R2 (100% of plants at R2) were optimal.

Impact of delaying fungicide from early R2 (80-98% R2) to full R2 (as soon as 100% plants at R2)

**Disease response (percentage points)**
- Reduction (positive value) or increase in Sclerotinia incidence

**Yield response (bushels/acre)**
- Increase (positive value) or decrease in soybean yield

**Canopy closure (%) at early R2**

**Canopy closure (%) at early R2**

BLUE DOT = response observed in an individual study
When conditions favored white mold as soybeans entered bloom:

**Applying fungicides at the mid/late R1 growth stage** (60-85% R1) optimized white mold management when the canopy was closed at mid/late R1. (100% of the ground covered by the canopy)

**Applying fungicides at early R2 growth stage** (80-99% R2) optimized white mold management when the canopy was at or near closure at early R2. (97-100% of the ground covered by the canopy)

**Applying fungicides at full R2 growth stage** (100% R2) optimized white mold management when the canopy was open at early R2. (<95% of the ground covered by the canopy)

**R1:** at least one open blossom on the plant.

**R2:** at least one open blossom at one of the top two nodes of the plant.
FUNGICIDE APPLICATION TIMING – Single fungicide application

4. Soybean canopy at/near closure at early to full R3

Fungicide applied: Endura at 5.5 or 8.0 oz/ac

When conditions favored white mold as soybeans entered bloom, applying fungicides at early-full R2 optimized white mold control even when canopy did not close until R3.

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Combined Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrington Oakes</td>
<td>2015</td>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrington Langdon</td>
<td>2015</td>
<td>2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langdon</td>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Nozzles:** XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume:** 15 or 17.5 gal/ac

### CANOPY CLOSURE when fungicides were applied

- Early to full R3
  - Percentage: 95-98%
  - Carrington Oakes: 98%
  - Carrington Langdon: 96%
  - Langdon: 90%

### White mold incidence (% of plants diseased)

- **Non-treated control:** 23, 5, 7, 65, 11
- **R1 (60-90% R1):** 11, 4, 8, 56, 8
- **Early R2 (80-98% R2):** 8, 8, 40, 7, 8
- **Full R2 (100% R2):** 12, 5, 10, 8, 9
- **R2 (1-2 days after 100% R2):** 10, 4, 9, 6, 8
- **R2 (3-4 days after 100% R2):** 12, 5, 7, 53, 8
- **Early to full R3:** 12, 5, 7, 53, 8

**CV:** 48.1, 56.5, 60.3, 37.2, 35.0, 33.2
4. **Soybean canopy at/near closure at early to full R3**

Fungicide applied: Endura at 5.5 or 8.0 oz/ac

When conditions favored white mold as soybeans entered bloom, applying fungicides at early-full R2 optimized white mold control even when canopy did not close until R3.

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Carrington 2015</th>
<th>Oakes 2016</th>
<th>Carrington 2015</th>
<th>Langdon 2014</th>
<th>Langdon 2016</th>
<th>Combined Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>28 inches</td>
<td>28 inches</td>
<td>28 inches</td>
<td>30 inches</td>
<td>30 inches</td>
<td>Four studies</td>
</tr>
<tr>
<td>Endura application rate</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
<td>8.0 oz/ac</td>
<td>5.5 oz/ac</td>
<td>5.5 oz/ac</td>
</tr>
</tbody>
</table>

**CANOPY CLOSURE when fungicides were applied**

- Early to full R3
- 95% for Carrington 2015
- 98% for Oakes 2016
- 96% for Carrington 2015
- 90% for Langdon 2016

**Soybean Yield (bu/ac; 13% moisture)**

- **Non-treated control**: 47 a, 58 a, 47 b, 33 b, 60 a, 53 b
- **R1 (60-90% R1)**: 49 a, 60 a, 49 b, 37 ab, 60 a, 54 ab
- **Early R2 (80-98% R2)**: 48 a, 48 a, 40 a, 60 a
- **Full R2 (100% R2)**: 50 a, 59 a, 49 ab, 36 a, 55 a
- **R2 (1-2 days after 100% R2)**: 50 a, 59 a, 47 b
- **R2 (3-4 days after 100% R2)**: 50 a, 59 a
- **Early to full R3**: 49 a, 59 a, 51 a, 36 a, 62 a, 55 a

**CV**: 4.8, 2.9, 3.5, 9.4, 3.9, 1.6

**Nozzles**: XR8001 or XR80015 flat-fan TeeJet nozzles, 35 or 40 psi (droplet size = fine)

**Spray volume**: 15 or 17.5 gal/ac
Across 7 field trials conducted at three locations and three years, delaying fungicide applications from mid/late R1 (60-85% R1) to mid/late R2 (2 to 4 days after 100% R2) improved yield in 57% of studies.

- Applying fungicides at mid/late R2 was optimal only when conditions favorable for white mold did not develop earlier irrespective of canopy closure.

### Impact of delaying fungicide application, R1 (60-85% R1) to mid-R2 (2-4 days after 100% R2):

**Graphs:**
- **Disease response** (percentage points) or increase in Sclerotinia incidence.
- **Yield response** (bushels/acre) or decrease in soybean yield.

**Legend:**
- BLUE DOT = response observed in an individual study.
Across 8 field trials conducted at three locations and three years, delaying fungicide applications from mid/late R1 (60-85% R1) to early to full R3 improved yield in 50% of studies.

- Applying fungicides at early to full R3 was optimal only when conditions favorable for white mold did not develop earlier irrespective of canopy closure.

**Impact of delaying fungicide application from mid/late R1 (60-85% R1) to early to full R3:**

**BLUE DOT = response observed in an individual study**
When conditions favor white mold as soybeans entered bloom:

**Fungicides should be applied as soon as 100% of plants reach the R2 growth stage unless the canopy closes earlier.**

- **If the canopy is closed at mid/late R1** (60-85% of plants at R1), fungicides should be applied at mid/late R1.
- **If the canopy is closed at early R2** (80-99% R2), fungicides should be applied at early R2.

**R1:** at least one open blossom on the plant.
**R2:** at least one open blossom at one of the top two nodes of the plant.
IMPROVING WHITE MOLD MANAGEMENT IN SOYBEANS

Optimizing fungicide application timing
ACROSS FUNGICIDE APPLICATION METHODS & FUNGICIDE CHEMISTRIES

<table>
<thead>
<tr>
<th>Non-treated control</th>
<th>Boom-mounted nozzles 35% R1</th>
<th>Drop nozzles 35% R1</th>
<th>Boom-mounted nozzles 95% R2</th>
<th>Drop nozzles 95% R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsin 20 fl oz/ac</td>
<td>21 a</td>
<td>26 a</td>
<td>20 a</td>
<td>18 a</td>
</tr>
<tr>
<td>Proline 5 fl oz/ac</td>
<td>30 a</td>
<td>29 a</td>
<td>26 a</td>
<td>16 a</td>
</tr>
<tr>
<td>Endura 5.5 oz/ac</td>
<td>18 a</td>
<td>21 a</td>
<td>15 a</td>
<td>14 a</td>
</tr>
<tr>
<td>Aproach 9 fl oz/ac</td>
<td>25 a</td>
<td>33 a</td>
<td>26 a</td>
<td>17 a</td>
</tr>
<tr>
<td>Combined Analysis</td>
<td>24 a</td>
<td>27 a</td>
<td>22 a</td>
<td>16 a</td>
</tr>
<tr>
<td>CV: 53.8</td>
<td>CV: 41.8</td>
<td>CV: 38.2</td>
<td>CV: 47.3</td>
<td>CV: 15.2</td>
</tr>
</tbody>
</table>

**White mold** (percent of the canopy diseased)

**Soybean yield** (bushels/acre; 13% moisture)

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<td>47 a</td>
<td>50 a</td>
<td>48 a</td>
</tr>
<tr>
<td>Endura 5.5 oz/ac</td>
<td>50 b</td>
<td>50 ab</td>
<td>53 ab</td>
<td>52 ab</td>
</tr>
<tr>
<td>Aproach 9 fl oz/ac</td>
<td>48 ab</td>
<td>48 ab</td>
<td>48 ab</td>
<td>48 ab</td>
</tr>
<tr>
<td>Combined Analysis</td>
<td>48 b</td>
<td>48 b</td>
<td>50 b</td>
<td>50 b</td>
</tr>
<tr>
<td>CV: 8.9</td>
<td>CV: 7.9</td>
<td>CV: 5.4</td>
<td>CV: 6.0</td>
<td>CV: 7.1</td>
</tr>
</tbody>
</table>

CARRINGTON, ND (2017)

**BOOM-MOUNTED NOZZLES:** TeeJet XR11004, 40 psi (medium droplets); 4.0 mph, 15 gal/ac

**DROP NOZZLES:** '360 Undercover' drop nozzles (350 Yield Center; Morton, IL), XR11001 nozzles, side ports; TX-VK3 hollow-cone, lower rear port; 60 psi (very fine droplets); 15 gal/ac, 4.0 mph

**ROW SPACING:** 21 inches  
**VARIETY:** Dairyland 'DSR-0619/R2Y' (0.6 maturity)  
**SEEDING RATE:** 165,000 pure live seeds/ac
Thank You!

Research funding:
North Dakota Soybean Council