



**Improving management of white mold in dry beans:**  
1. Optimizing fungicide application timing

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**Michael Wunsch**

North Dakota State University Carrington Research Extension Center

# Thank you

## **Funding support:**

- USDA Specialty Crop Block Grant Program

## **Dry bean seed was donated by:**

- **Bollingberg Seeds Company** (Kurt Bollingburg; Cathay, ND)

## **Staff members** who played critical roles in project execution:

- **Billy Kraft**, research technician
- **Suanne Kallis**, research specialist

## Study design, data collection

**Replicates:** 15 replicates per study

*A large number of replicates was utilized due to the inherent spatial variability of white mold and the need to differentiate small treatment differences.*

**Row spacing:** 14 inches **Seeding rate:** 80,000 pure live seeds/ac (pinto beans); 100,000 pls/ac (black beans)

**Plot size:** 5 ft x 22 ft at planting, 5 ft x average 18 ft at harvest

**Disease assessments:** Every plant in in the middle two rows of each plot was individually assessed for white mold severity (%) at/near dry bean maturity.

*White mold severity was calculated for each plot by averaging the disease severity ratings taken across all plants in the plot.*

**Harvest:** Plants manually clipped at the base in conjunction with disease assessments and wind-rowed to permit dry-down (Oakes); desiccated and direct-harvested (Carrington).

# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

## Optimizing application timing – Single fungicide application

Oakes, ND (2017)

‘Eclipse’ black beans

14-inch row spacing

FIRST FUNGICIDE APPLICATION:

Fungicide Timing Application dates	Percent Bloom plants with open blossom	Pod Length maximum length (inch)	Canopy Closure % of ground covered	White Mold	Sclerotia	Yield
				late R7 / early R8 growth stage % of canopy diseased	contamination in grain Percent by weight	13.5% moisture Pounds/acre
<b>Non-treated control</b>				<b>74</b> d	<b>1.2</b> d	<b>2897</b> d
July 22	<b>68%</b>	-	75-95%	<b>64</b> cd	<b>1.0</b> d	<b>3197</b> cd
July 24	<b>100%</b>	-	75-100%	<b>56</b> bc	<b>0.8</b> cd	<b>3509</b> bc
July 26	<b>100%</b>	<b>0.5"</b>	85-100%	<b>49</b> ab	<b>0.7</b> bc	<b>3924</b> ab
July 28	<b>100%</b>	<b>1.0"</b>	95-100%	<b>42</b> a	<b>0.5</b> a	<b>4122</b> a
				CV: 21.1	CV: 34.1	CV: 11.8

Fungicide applied: Topsin 4.5FL 30 fl oz/ac

Nozzles: XR110015 flat-fan TeeJet nozzles, 35 psi (droplet size = fine)

Spray volume: 15 gal/ac



# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

## Optimizing application timing – Two fungicide applications

Oakes, ND (2017)

'Eclipse' black beans

14-inch row spacing

FIRST FUNGICIDE APPLICATION:

Fungicide Timing Application dates	Percent Bloom plants with open blossom	Pod Length maximum length (inch)	Canopy Closure % of ground covered	White Mold	Sclerotia	Yield
				late R7 / early R8 growth stage % of canopy diseased	contamination in grain Percent by weight	13.5% moisture Pounds/acre
<b>Non-treated control</b>				<b>74</b> c	<b>1.2</b> b	<b>2897</b> b
July 22, Aug. 3	<b>68%</b>	-	75-95%	<b>42</b> b	<b>0.5</b> a	<b>3943</b> a
July 24, Aug. 5	<b>100%</b>	-	75-100%	<b>39</b> ab	<b>0.5</b> a	<b>4302</b> a
July 26, Aug. 7	<b>100%</b>	<b>0.5"</b>	85-100%	<b>28</b> a	<b>0.3</b> a	<b>4441</b> a
July 26, Aug. 8	<b>100%</b>	<b>1.0"</b>	95-100%	<b>36</b> ab	<b>0.4</b> a	<b>4184</b> a
				CV: 21.1	CV: 34.1	CV: 11.8

**Fungicide applied:** Topsin 4.5FL 30 fl oz/ac followed by Endura 70WG 8 oz/ac

**Nozzles:** XR110015 flat-fan TeeJet nozzles, 35 psi (droplet size = fine)

**Spray volume:** 15 gal/ac



# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

## Optimizing application timing – Single fungicide application

Carrington, ND (2017)

‘Lariat’ pinto beans

14-inch row spacing

FIRST FUNGICIDE APPLICATION:

Fungicide Timing Application dates	Percent Bloom plants with open blossom	Pod Length maximum length (inch)	Canopy Closure % of ground covered	White Mold	Sclerotia	Yield
				late R7 / early R8 growth stage % of canopy diseased	contamination in grain Percent by weight	13.5% moisture Pounds/acre
<b>Non-treated control</b>				<b>83</b> a	<b>4.2</b> c	<b>1285</b> b
July 20	<b>80%</b>	-	95%	<b>85</b> a	<b>4.1</b> bc	<b>1209</b> b
July 22	<b>100%</b>	<b>1.0"</b>	99%	<b>75</b> a	<b>2.4</b> a	<b>1908</b> a
July 25	<b>100%</b>	<b>3.0"</b>	100%	<b>77</b> a	<b>2.9</b> a	<b>1864</b> a
July 27	<b>100%</b>	<b>4.0"</b>	100%	<b>75</b> a	<b>3.0</b> a	<b>1671</b> ab
				CV: 11.5	CV: 32.3	CV: 25.9

**Fungicide applied:** Topsin 4.5FL 30 fl oz/ac

**Nozzles:** DGXR80015 flat-fan TeeJet nozzles, 35 psi (droplet size = medium)

**Spray volume:** 15 gal/ac



# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

## Optimizing application timing – Two fungicide applications

Carrington, ND (2017)

‘Lariat’ pinto beans

14-inch row spacing

FIRST FUNGICIDE APPLICATION:

Fungicide Timing Application dates	Percent Bloom plants with open blossom	Pod Length maximum length (inch)	Canopy Closure % of ground covered	White Mold	Sclerotia	Yield
				late R7 / early R8 growth stage % of canopy diseased	contamination in grain Percent by weight	13.5% moisture Pounds/acre
<b>Non-treated control</b>				<b>83</b> b	<b>4.2</b> b	<b>1285</b> b
July 20, Aug. 1	<b>80%</b>	-	95%	<b>75</b> ab	<b>2.9</b> a	<b>1719</b> ab
July 22, Aug. 3	<b>100%</b>	<b>1.0"</b>	99%	<b>70</b> a	<b>2.2</b> a	<b>2163</b> a
July 25, Aug. 6	<b>100%</b>	<b>3.0"</b>	100%	<b>70</b> a	<b>2.4</b> a	<b>1974</b> a
July 27, Aug. 8	<b>100%</b>	<b>4.0"</b>	100%	<b>77</b> ab	<b>2.5</b> a	<b>1729</b> ab
				CV: 11.5	CV: 32.3	CV: 25.9

**Fungicide applied:** Topsin 4.5FL 30 fl oz/ac followed by Endura 70WG 8 oz/ac

**Nozzles:** DGXR80015 flat-fan TeeJet nozzles, 35 psi (droplet size = medium)

**Spray volume:** 15 gal/ac



# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

## Optimizing application timing – Single fungicide application

Carrington, ND (2017)

‘Lariat’ pinto beans

WIDE ROWS: 28-inch row spacing

FIRST FUNGICIDE APPLICATION:

Fungicide Timing Application dates	Percent Bloom plants with open blossom	Pod Length maximum length (inch)	Canopy Closure % of ground covered	White Mold	Sclerotia	Yield
				late R7 / early R8 growth stage % of canopy diseased	contamination in grain Percent by weight	13.5% moisture Pounds/acre
<b>Non-treated control</b>				<b>86</b> a	<b>3.9</b> a	<b>1297</b> a
July 20	<b>80%</b>	-	70%	<b>88</b> a	<b>4.4</b> a	<b>1215</b> a
July 22	<b>100%</b>	<b>1.0"</b>	95%	<b>80</b> a	<b>3.1</b> a	<b>1739</b> a
July 25	<b>100%</b>	<b>3.0"</b>	98%	<b>81</b> a	<b>3.2</b> a	<b>1595</b> a
July 27	<b>100%</b>	<b>4.0"</b>	100%	<b>80</b> a	<b>3.0</b> a	<b>1691</b> a
				CV: 9.8	CV: 34.2	CV: 24.2

**Fungicide applied:** Topsin 4.5FL 30 fl oz/ac

**Nozzles:** DGXR80015 flat-fan TeeJet nozzles, 35 psi (droplet size = medium)

**Spray volume:** 15 gal/ac



# IMPROVING WHITE MOLD MANAGEMENT IN DRY BEANS

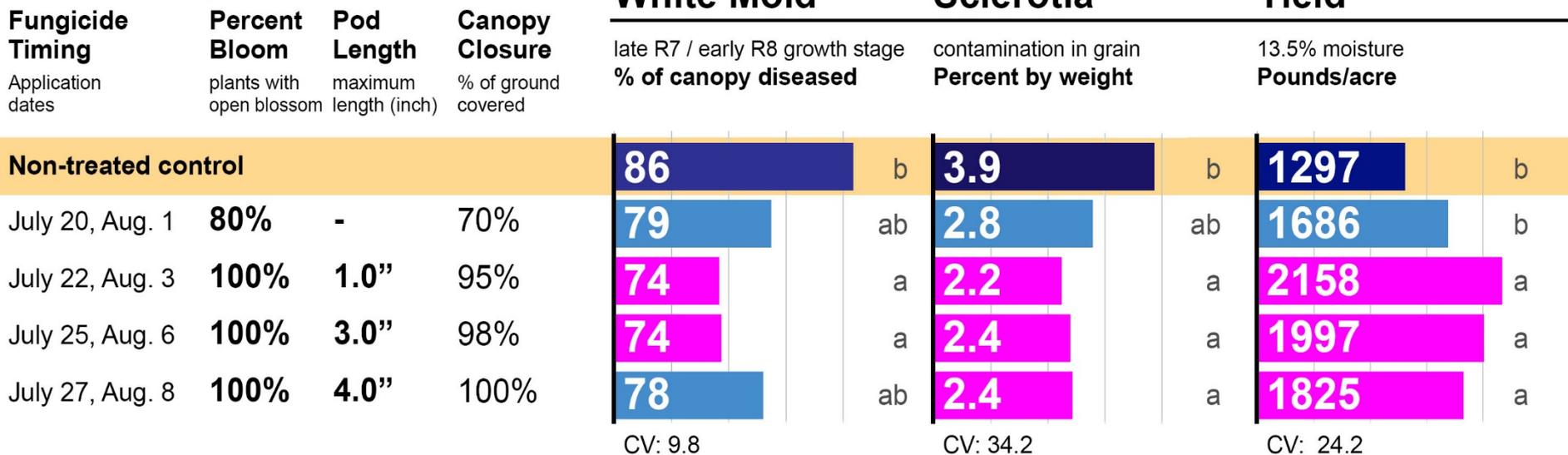
## Optimizing application timing – Two fungicide applications

Carrington, ND (2017)

‘Lariat’ pinto beans

WIDE ROWS: 28-inch row spacing

FIRST FUNGICIDE APPLICATION:



**Fungicide applied:** Topsin 4.5FL 30 fl oz/ac followed by Endura 70WG 8 oz/ac

**Nozzles:** DGXR80015 flat-fan TeeJet nozzles, 35 psi (droplet size = medium)

**Spray volume:** 15 gal/ac



## Optimizing application timing

### **Black beans and pinto beans:**

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*When conditions favored white mold as dry beans entered bloom, white mold control and dry bean yield under white mold pressure were maximized when fungicides were applied when*  
**100% of plants had an open blossom and first pin-pods were 0.5 to 1.0 inch long.**

CAUTION: These are preliminary results from initial testing.  
Additional field trials are planned for 2020.

SPECIALTY CROP  
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# OPTIMIZING FUNGICIDE APPLICATION TIMING

## Fungicide residual

**The concentration of fungicide active ingredient declines with time.**

*Causes: (1) New plant growth that received little or no fungicide  
(2) Degradation of the active ingredient*

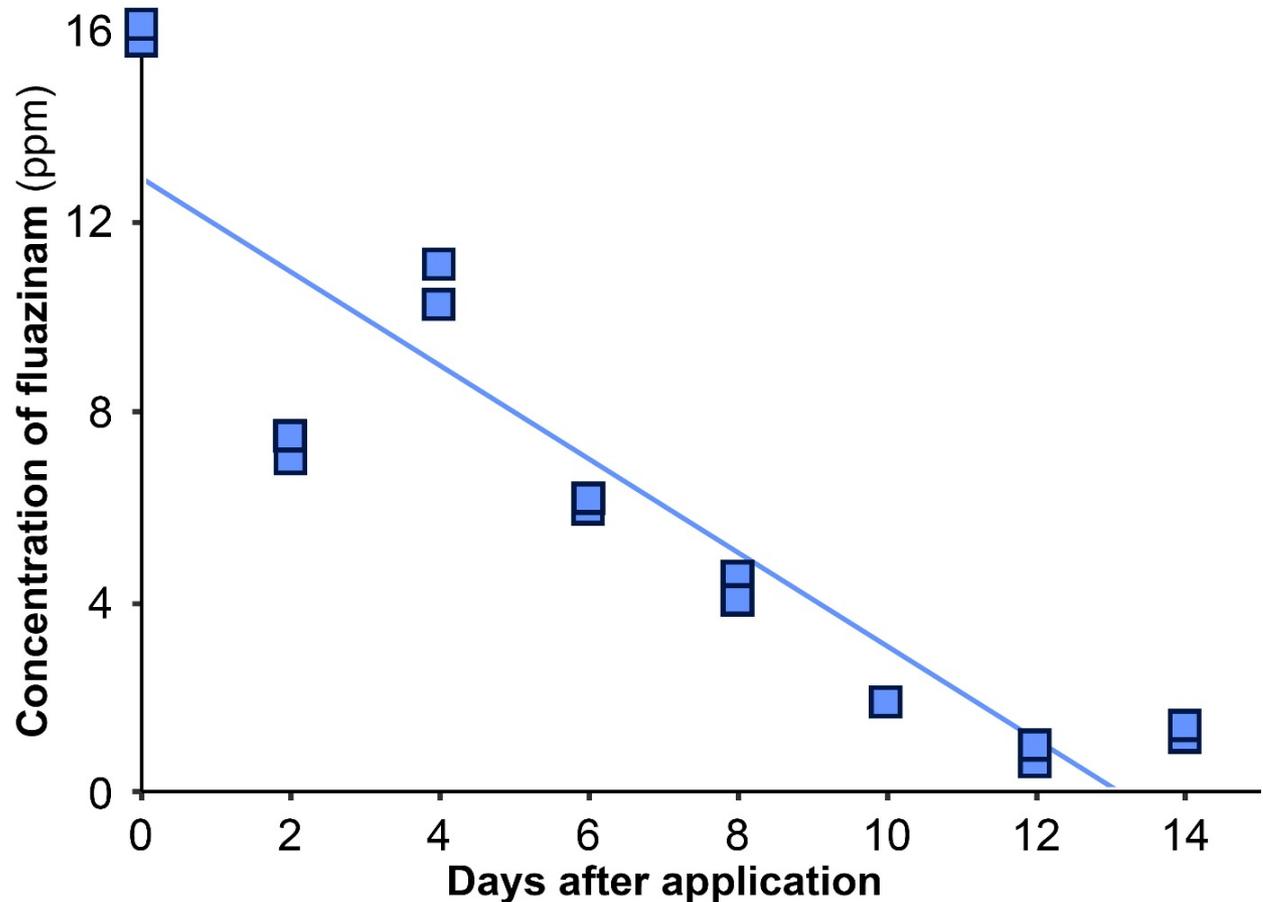
### DATA FROM SOYBEANS

Pereiras, Brazil (2014)

**Fungicide applied:**

Omega 500F 0.85

*Miorini et al., unpublished*





# Thank You!

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**Research funding:**  
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