

# Wisconsin Field Crops Pathology Fungicide Tests Summary

## 2015

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## Evaluation of fungicides for control of foliar diseases of alfalfa in Wisconsin, 2015

ALFALFA (*Medicago sativa* '55V50')

Spring black stem; *Phoma medicaginis*

Leptosphaerulina leaf spot; *Leptosphaerulina briosiana*

Common leaf spot; *Pseudopeziza medicaginis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The alfalfa cultivar '55V50' was seeded on 1 May 2013 in a field with a Plano silt loam soil (2 to 6 percent slopes). The experimental design was a randomized complete block with four replicates. Plots were 40 ft long and 10 ft wide. Standard alfalfa production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 10 fungicide treatments. Fungicides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles calibrated to deliver 20 GPA at 27psi. Fungicides were applied after each cutting of alfalfa once plants had reached a height of six inches. Dates of fungicide application were 22 Apr, 1 Jun, and 2 Jul 2015. Natural sources of pathogen inoculum were relied upon for disease. Disease severity and defoliation were evaluated at harvest for all three cuttings by visually estimating both parameters with the aid of standard area diagrams. A small-plot harvester was used to cut a 31-in wide by 37.4 ft long area of each plot to determine wet yield. A subsample of alfalfa was also collected from each replicate (~0.50 lb.), weighed, then dried and weighed again to determine dry matter yield. Harvest was performed on 19 May, 23 Jun, and 29 Jul. All disease, defoliation, and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ). Each cutting was rated for the most common diseases. Yield was reported as the total yield from all three harvests.

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. There was no significant difference among treatments in disease severity for the first and third harvest (Table 1). Plots treated with Endura 70WG at both rates, Priaxor 4.17SC, Aproach 2.08SC + Fontelis 1.67SC, and Sercadis 2.47SC had significantly less leaf spot severity and lower average defoliation for the second harvest. Plots treated with all other products had levels comparable to the non-treated control. There was no significant difference in total annual yield for any treatment. Phytotoxicity was not observed for any treatment.

**Table 1.** Disease severity, average defoliation, and dry matter yield of alfalfa treated with various foliar fungicides

Treatment and rate/A	Leptosphaerulina		Common Leaf Spot Severity (Crop #3; %) <sup>y</sup>	Average Defoliation (%) <sup>y,x</sup>	Dry Matter Yield (Tons/a) <sup>w</sup>
	Spring Black Stem Severity (Crop #1; %) <sup>y</sup>	leaf spot Severity (Crop #2; %) <sup>y,x</sup>			
Non-treated Check	3.1	6.9 a	3.9	1.1 a	5.2
Aproach 2.08SC 12.00 fl oz <sup>z</sup>	1.6	8.1 a	3.0	1.0 ab	5.9
Quadris 2.08F 6.00 fl oz <sup>z</sup>	2.2	5.1 ab	3.3	0.9 ab	5.7
Aproach 2.08SC 6.00 fl oz <sup>z</sup>	1.6	5.0 ab	2.4	0.8 abc	5.8
Fontelis 1.67SC 1.50 pt <sup>z</sup>	1.6	5.0 ab	3.8	0.6 ad	5.5
Headline 2.09SC 6.00 fl oz <sup>z</sup>	1.3	5.6 ac	6.0	0.5 ad	5.6
Endura 70WG 3.25 oz <sup>z</sup>	1.1	1.1 b	3.5	0.4 bd	6.0
Priaxor 4.17SC 4.0 fl oz <sup>z</sup>	0.6	1.5 bc	2.4	0.3 cd	6.0
Aproach 2.08SC 6.00 fl oz + Fontelis 1.67SC 14.00 fl oz	0.0	1.9 bc	2.9	0.2 cd	5.9
Sercadis 2.47SC 2.20 fl oz <sup>z</sup>	0.9	2.1 bc	3.1	0.2 cd	5.8
Endura 70WG 6.50 oz <sup>z</sup>	0.7	1.0 b	2.5	0.2 d	6.0
LSD ( $\alpha=0.05$ )	ns <sup>v</sup>	4.3	ns <sup>v</sup>	0.6	ns <sup>v</sup>

<sup>z</sup>Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to the fungicide treatment

<sup>y</sup>Values are based on the average disease severity or defoliation prior to harvest on 19 May, 23 Jun, and 29 Jul

<sup>x</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.05$ )

<sup>w</sup>Total annual yield based on harvests on 19 May, 23 Jun, and 29 Jul.

<sup>v</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of fungicides for control of diseases of dent corn in Wisconsin, 2015

DENT CORN (*Zea mays* 'DKC45-51RIB')

Eyespot; *Kabatiella zeae*

Northern corn leaf blight; *Exserohilum turcicum*

Anthraxnose stalk rot; *Colletotricum graminicola*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'DKC45-51RIB' was chosen for this study. Corn was planted on 1 May 2015 in a field consisting of a Plano silt loam soil (2 to 6 percent slopes) with a Joy silt loam intrusion (0 to 4 percent slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 7-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of two non-treated controls and 30 fungicide treatments. Pesticides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30psi. Pesticides were applied at growth stages V6 (16 Jun), V8 (30 Jun), VT (21 Jul), R1 (21 Jul) or V6 and VT. Natural sources of pathogen inoculum were relied upon for disease. Eyespot was rated on 20 Aug. Northern corn leaf blight (NCLB) and greening on 1 Oct, stalk rot on 13 Oct. and lodging on 23 Oct. All foliar diseases were visually assessed by inspecting ear leaves on 5 plants in each plot with the aid of standardized area diagrams. Stalk rot was assessed on five plants in each plot at R6 by cutting stalks with a knife and rating using the Illinois 0-5 scale where 0=no stalk rot and 5=severe stalk rot with lodging. Greening was rated by assessing percent green foliage at R6 growth stage. Lodging was assessed at harvest by visually estimating the percent plants per plot leaning greater than 45 degrees from vertical. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All foliar, greening, lodging, and yield data were analyzed using a mixed model analysis of variance (ANOVA;  $P=0.05$ ). Means were separated using Fisher's test of least significant difference (LSD). Stalk rot data were analyzed using non-parametric analysis and reported as rank estimates due to the ordinal nature of the ratings and reported as rank estimates.

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Severity of northern corn leaf blight (NCLB) and stalk rot was moderate to high in this trial (Table 2). Eyespot severity was low and insignificant. Severity of NCLB in plots treated with fungicide was not significantly reduced compared to at least one of the non-treated check plots. Plots treated with Quilt Xcel 2.2SE at the VT growth stage had significantly lower stalk rot severity than non-treated checks. All other treatments had stalk rot severity comparable to the non-treated checks. Plots treated with Topguard EQ 4.29SC (VT), Equation 2.08SC (VT), Quilt Xcel 2.2SE (VT), and Quadris 2.08F (V6) + Quilt Xcel 2.2SE (VT) had significantly more greening than the non-treated checks. All other plots were comparable to non-treated controls. There were no significant differences in lodging or yield among all treatments. Phytotoxicity was not observed for any treatment.

**Table 2.** Disease severity, greening, lodging, and yield of dent corn treated with various foliar fungicides

Treatment and rate/A (crop growth stage at application) <sup>z</sup>	Eyespot severity (%) <sup>y</sup>	NCLB severity (%) <sup>y,v</sup>	Stalk rot Rank Estimate <sup>x,v</sup>	Greening effect severity (%) <sup>w,v</sup>	Lodging (%)	Yield (bu/a)
Non-treated check 1	1.5	32.5 bdf	100.8 a	9.4 d-i	3.8	246.6
Fortix 3.22SC 5 fl oz (V6)	0.0	46.3 abc	91.4 abd	5.6 f-i	3.1	258.6
Fortix 3.22SC 5 fl oz (V6) <sup>t</sup>	0.8	33.8 bdf	91.4 abd	6.9 f-i	1.3	256.1
Fortix 3.22SC 5 fl oz (V8) <sup>t</sup>	0.1	36.3 bdf	100.8 a	5.6 f-i	4.4	254.3
Fortix 3.22SC 4 fl oz (VT) <sup>t</sup>	0.2	36.3 bdf	67.3 bde	5.0 f-i	1.9	255.3
Fortix 3.22SC 5 fl oz (VT) <sup>t</sup>	0.0	35.0 bdf	84.0 abd	15.6 b-i	4.4	252.1
Fortix 3.22SC 5 fl oz (V6) <sup>t</sup>	0.0	40.2 af	65.3 a-f	12.5 b-i	3.8	238.6
Fortix 3.22SC 5 fl oz (VT) <sup>t</sup>	0.3	22.5 f	40.0 efg	11.3 b-i	0.6	251.0
Fortix 3.22SC 5 fl oz (V6; VT) <sup>t</sup>	0.0	37.5 bdf	67.3 bde	14.4 b-i	3.1	243.4
Headline AMP 1.68SC 10 fl oz (V6) <sup>t</sup>	0.0	43.8 a-e	49.4 d-g	6.9 f-i	3.1	257.6
Headline AMP 1.68SC 10 fl oz (V8) <sup>t</sup>	0.0	32.5 bdf	84.0 abd	5.0 f-i	2.5	254.4
Headline AMP 1.68SC 10 fl oz (VT) <sup>t</sup>	0.8	36.3 bdf	32.4 e-h	21.9 abd	1.3	243.8
Topguard EQ 4.29SC 5 fl oz (V6) <sup>t</sup>	0.1	25.0 ef	98.8 ab	10.0 b-i	4.4	257.7
Topguard EQ 4.29SC 5 fl oz (V8) <sup>t</sup>	0.0	33.8 bdf	74.6 a-e	5.0 f-i	0.0	254.2
Topguard EQ 4.29SC 5 fl oz (VT) <sup>t</sup>	0.0	23.8 f	23.0 gh	30.0 a	6.9	240.6
Equation 2.08SC 6 fl oz (V6) <sup>t</sup>	0.0	25.0 ef	93.4 ac	7.5 e-i	3.1	250.6
Equation 2.08SC 6 fl oz (VT) <sup>t</sup>	0.1	30.0 bf	23.0 gh	25.0 ac	3.1	253.2
Stratego YLD 500SC 4 fl oz (VT) <sup>t</sup>	0.8	36.3 bdf	32.4 e-h	15.0 b-i	0.6	248.0
Stratego YLD 500SC 2 fl oz (V6) <sup>t</sup>	0.0	43.8 a-e	74.6 a-e	5.0 f-i	2.5	242.5
Stratego YLD 500SC 2 fl oz (V6) <sup>t</sup>						
Stratego YLD 500SC 4 fl oz (VT)	0.4	45.0 abc	31.5 fgh	21.3 abe	1.3	247.8
Quilt Xcel 2.2SE 10.5 fl oz (VT) <sup>t</sup>	0.1	27.5 cf	14.5 h	23.8 ab	3.1	261.3
Approach Prima 2.34SC 6.8 fl oz (VT)	0.3	32.5 bdf	76.6 abd	18.1 ag	1.3	259.3
Priaxor 4.17SC 3 fl oz (V6) <sup>t</sup>	0.0	48.8 ab	69.3 a-g	4.4 ghi	1.3	255.0
Priaxor 4.17SC 3 fl oz (V6) <sup>t</sup>						
Headline AMP 1.68SC 10 fl oz (VT) <sup>t</sup>	0.1	27.5 cf	23.0 gh	17.5 ah	1.3	255.0
Tilt 3.6SE 4 fl oz (VT)	0.4	45.0 abc	57.9 def	4.4 ghi	1.3	246.5
Domark 230ME 4 fl oz (VT)	0.6	28.6 bf	84.0 abd	7.5 e-i	3.8	236.2
Quadris 2.08F 6 fl oz (V6) <sup>t</sup>						
Quilt Xcel 2.2SE 10.5 fl oz (VT) <sup>t</sup>	0.1	28.8 cf	49.4 d-g	23.8 ab	1.9	239.0
Quadris 2.08SC 6 fl oz (V6)	0.0	60.0 a	91.4 abd	9.4 d-i	1.3	250.5
Non-treated check 2	0.1	30.0 bf	73.5 a-g	3.8 hi	2.5	240.4
Stratego YLD 500SC 4 fl oz (V6) <sup>t</sup>	0.4	50.0 ad	91.4 abd	3.1 i	3.8	244.8
Proline 480SC 5.7 fl oz (R1) <sup>t</sup>	1.5	28.8 cf	58.8 b-g	21.3 abe	1.3	249.7
Stratego YLD 500SC 5 fl oz (R1) <sup>t</sup>	0.2	27.5 cf	49.4 d-g	18.8 af	0.0	257.2
LSD ( $\alpha=0.05$ )	ns <sup>u</sup>	19.7	33.0	13.7	ns <sup>u</sup>	ns <sup>u</sup>

<sup>z</sup>Glyphosate herbicide applied to all plots at V6 growth stage<sup>y</sup>Foliar disease ratings were assessed on 5 ear leaves in each plot with the aid of a standard area diagram; means for each plot were used in the analysis.<sup>x</sup>Stalk rot was assessed on five plants in each plot using the Illinois 1-5 scale where 0=no stalk rot and 5=severe stalk rot with lodging; means for each plot were used in the analysis.<sup>w</sup>Greening effect determined by rating the percentage green foliage still present in each plot at early black layer<sup>v</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.05$ )<sup>u</sup>ns = no least significant difference ( $\alpha=0.05$ )<sup>t</sup>Treatments including the non-ionic surfactant Induce 90SL at 0.25

## Evaluation of foliar fungicides for control of northern corn leaf blight of sweet corn in Wisconsin, 2015

SWEET CORN (*Zea mays* ‘Serendipity’)

Northern corn leaf blight; *Exserohilum turcicum*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The sweet corn variety ‘Serendipity’ was chosen for this study. Sweet corn was planted on 18 Jun 2015 in a field with a Plano silt loam soil (0 to 2 percent slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of six 30-in. spaced rows, 50 ft long and 15 ft wide with 6-ft alleys between plots. Standard sweet corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and seven fungicide treatments. Fungicide treatments were applied using a CO<sub>2</sub> pressurized, self-propelled high-clearance sprayer equipped with 8002 XR TurboJet flat fan nozzles, spaced 20 in. apart, and calibrated to deliver 20 GPA at 40psi. Fungicides were applied at the V9-10 (7 Aug) and VT-R1 (21 Aug) growth stages. At harvest (11 Sep), leaf disease severity (0-100%) was rated and averaged using a standard area diagram on five ear leaves in each plot. Marketable ears were harvested by hand from one center row of each plot. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Favorable conditions lead to strong disease pressure from northern corn leaf blight (NCLB) (Table 3). Levels of NCLB were high in non-treated plots. All plots treated with fungicide had significantly less NCLB severity than the non-treated control. Plots treated with Quilt Xcel 2.2 SE at V9/10 and R1 had the highest yields and low to moderate NCLB severity. Plots treated with Headline AMP 1.68SC, Quilt Xcel 2.2SE then Tilt 3.6EC, and Priaxor 4.17SC had significantly lower yield than plots treated with Quilt Xcel 2.2SE only; but higher yield than the non-treated controls. Phytotoxicity was not observed in any plot.

**Table 3.** Northern corn leaf blight severity and yield of sweet corn treated with various foliar fungicides

Treatment and rate/A (crop growth stage at application)	NCLB severity (%) <sup>z,y</sup>	Yield (tons/a) <sup>y</sup>
Non-treated Check	31.5 a	9.6 c
Prosaro 421SC 6.5 fl oz (V9/10)		
Stratego YLD 500SC 4.0 fl oz (R1)	12.6 b	10.1 bc
Stratego YLD 500SC 4.0 fl oz (V9/10)		
Prosaro 421SC 6.5 fl oz (R1)	7.4 bd	10.3 bc
Aproach 2.08SC 12.0 fl oz (V9/10; R1)	11.6 bc	10.4 bc
Priaxor 4.17SC 4.0 fl oz (V9/10; R1)	8.3 bd	10.5 b
Quilt Xcel 2.2SE 14.0 fl oz (V9/10)		
Tilt 3.6EC 4.0 fl oz (R1)	7.2 cd	10.6 b
Headline AMP 1.68SC 10.0 fl oz (V9/10; R1)	5.8 d	10.6 b
Quilt Xcel 2.2 SE 11.0 fl oz (V9/10; R1)	9.6 bd	11.5 a
LSD ( $\alpha=0.05$ )	5.4	0.8

<sup>z</sup>Leaf disease severity (0-100%) was rated on five ear leaves in each plot and averaged at harvest using a standard area diagram.

<sup>y</sup>Means followed by the same letter are not significantly different based on Fisher’s Least Significant Difference (LSD;  $\alpha=0.05$ )

## Evaluation of fungicides for control of brown spot and brown stem rot of soybean in Wisconsin, 2015

SOYBEAN (*Glycine max* 'NK Brand S17-B3')

Brown spot; *Septoria glycines*

Brown stem rot; *Cadophora gregata*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'NK Brand S17-B3' was chosen for this study. Soybeans were planted on 19 May 2015 in a field with a Joy silt loam soil (0 to 4 percent slopes) with a Plano silt loam intrusion (0 to 2 percent slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 19 fungicide and/or insecticide treatments. Pesticides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles, spaced 15 in. apart, and calibrated to deliver 20 GPA at 30psi. Pesticides were applied at growth stages R1 (14 Jul), R3 (27 Jul), or both R1 and R3. Natural sources of pathogen inoculum were relied upon for disease. Brown spot was evaluated at growth stage R6 by visually estimating leaf disease severity using a standardized area diagram. Brown Stem rot (BSR) was evaluated at the R6 growth stage by visually estimate the percent plot area with symptoms of BSR (disease incidence) and rating BSR severity using a 1-9 scale where 0=healthy plants and 9=dead plants. The BSR index was calculated using the following formula: BSR index = brown stem rot incidence (%) x (brown stem rot severity/9). Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance and means were separated using Fisher's least significant difference ( $\alpha=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Brown spot persisted for the entire growing season due to weather. Application of fungicide resulted in no significant decrease in brown spot severity or BSR index and no significant increase in yields among all treatments (Table 4). Despite no significant differences in yield, brown spot severity or BSR index, defoliation severity was significantly reduced in plots treated with 11 of the 19 fungicide programs compared to non-treated controls. Plots treated with Fortix 3.22SC 5 fl oz (R1), Topguard 1.04SC 7 fl oz (R3), Priaxor 4.17SC 4.0 fl oz + Fastac 0.83EC 3.8 fl oz (R3), Fortix 3.22SC 5.0 fl oz (R3), Stratego YLD 500SC 4.0 fl oz (R3), Quadris 2.08F 6.0 fl oz (R3), Trivapro 14.6 fl oz (R3) and Proline 480SC 3.0 fl oz (R1) then Stratego YLD 500SC 4.0 fl oz (R3) all had no significant difference in defoliation compared to the non-treated control. No phytotoxicity was observed in this trial.

**Table 4.** Brown stem rot disease index, brown spot severity, defoliation, and yield of soybeans treated with various foliar fungicides

Treatment rate/A (crop growth stage at application) <sup>z</sup>	BSR Index (0-100) <sup>y</sup>	Brown Spot Severity (%) <sup>x</sup>	Defoliation (%) <sup>w,v</sup>	Yield (bu/a)
Non-treated Check	22.4	12.5	21.3 a	72.5
Fortix 3.22SC 5 fl oz (R1)	22.7	10.0	20.0 a	64.6
Topguard 1.04SC 7 fl oz (R3)	6.3	8.8	16.3 ac	76.2
Priaxor 4.17SC 4.0 fl oz				
Fastac 0.83EC 3.8 fl oz (R3)	6.5	13.8	15.0 ab	73.2
Fortix 3.22SC 5.0 fl oz (R3)	8.9	16.3	15.0 ab	72.1
Stratego YLD 500SC 4.0 fl oz (R3)	18.2	8.8	15.0 ab	67.0
Quadris 2.08F 6.0 fl oz (R3)	4.9	11.3	13.8 ab	73.3
Trivapro 14.6 fl oz (R3)	13.4	11.3	12.5 ab	70.1
Proline 480SC 3.0 fl oz (R1)				
Stratego YLD 500SC 4.0 fl oz (R3)	19.6	10.0	12.5 ab	69.6
Headline 2.08SC 12 fl oz (R3)	5.9	11.3	8.8 bc	76.9
Quadris Top 2.72SC 8.0 fl oz (R3)	15.2	10.0	8.8 bc	74.5
Stratego YLD 500SC 4.0 fl oz (R1)	11.7	5.0	8.8 bc	69.7
Quilt Xcel 2.2SE 10.5 fl oz (R3)	3.5	10.0	8.8 bc	67.9
Fortix 3.22SC 5 fl oz (R3)	16.7	15.0	8.8 bc	66.1
Approach Prima 2.34SC 6.8 fl oz (R3)	8.8	6.3	7.5 bc	74.1
Trivapro 14.6 fl oz				
Endigo 2.06ZC 3.5 fl oz (R3)	2.4	5.5	7.5 bc	70.3
Priaxor 4.17SC 4.0 fl oz (R3)	12.1	10.0	6.3 bc	72.7
Headline 2.08SC 12 fl oz (R1)	10.2	2.5	6.3 bc	69.0
Approach 2.08SC 9.0 fl oz (R1; R3)	3.1	3.8	5.0 b	73.4
Headline 2.08SC 12 fl oz (R1; R3)	11.7	2.5	5.0 b	69.2
LSD ( $\alpha=0.05$ )	ns <sup>u</sup>	ns <sup>u</sup>	10	ns <sup>u</sup>

<sup>z</sup>Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to the pesticide treatment.

<sup>y</sup>BSR Index = brown stem rot incidence (%) x (brown stem rot severity/9). Severity rated on a 1-9 scale where 1=no symptoms and 9=dead plants.

<sup>x</sup>Brown spot severity was visually assessed using a standard area diagram. Scale is from 0% to 100% coverage of leaves by brown spot lesions.

<sup>w</sup>Defoliation was calculated by average % of nodes missing leaves.

<sup>v</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD  $\alpha=0.05$ ).

<sup>u</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of foliar fungicides for control of *Sclerotinia* stem rot of soybean in Arlington Wisconsin, 2015

SOYBEAN (*Glycine max* 'NK S22-F8')

*Sclerotinia* stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'NK S22-F8' was chosen for this study. Soybeans were planted on 4 May 2015 in a field with a Joy silt loam (0 to 4 percent slopes). The field was overhead irrigated between growth stages R1 and R3 to promote disease. The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with no 5 ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 22 fungicide treatments. Fungicides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles, spaced 15 in. apart, and calibrated to deliver 20 GPA at 30psi. Pesticides were applied around planting (19 May) and growth stage R1 (29 Jun). *Sclerotinia* stem rot severity was rated at growth stage R6 (1 Sep). *Sclerotinia* stem rot severity index (DSI) was determined by rating 30 arbitrarily selected plants in each plot and scoring plants on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9. Natural sources of pathogen inoculum were relied upon for disease. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Levels of *Sclerotinia* stem rot were low at the time of fungicide applications (Table 5). Fungicide treatments Omega 500F 12 fl oz + Incognito 4.5F 10 fl oz and Endura 70 WDG 11 oz applied at growth stage R1 were the only treatments that resulted in significantly lower levels of *Sclerotinia* stem rot compared to non-treated controls. No significant differences in yield were identified among treatments. Phytotoxicity was not observed with any treatments in this trial

**Table 5.** White mold disease severity index, disease incidence, and yield of soybeans treated with various foliar fungicide programs

Treatment and rate/A (crop growth stage at application)	Sclerotinia Stem Rot DSI (0-100) <sup>z,x</sup>	Disease Incidence (%) <sup>y,x</sup>	Yield (bu/a)
SA-0040310 23 fl oz (R1)	31.6 a	24.7 a	67.2
SA-0040309 13 fl oz (R1)	30.6 ac	18.8 ab	65.2
Omega 500F 12 fl oz (R1) + Headline 2.08SC 6 fl oz (R1)	29.2 ab	18.7 ab	61.2
Contans WG 1 lb (At-Plant) SA-0040310 23 fl oz (R1)	28.8 ab	14.2 abc	63.0
SA-0040314 16 fl oz (R1)	28.2 ab	15.2 abc	68.3
Headline 2.08SC 12 fl oz (R1)	26.2 ab	15.8 abc	67.8
Omega 500F 12 fl oz (R1) + Headline 2.08SC 12 fl oz (R1)	24.7 ab	15.5 abc	70.9
Non-treated Check	24.3 ab	14.3 abc	64.4
SA-0040304 32 fl oz (R1)	22.9 ab	8.5 abd	63.7
Omega 500F 12 fl oz (R1) + Incognito 4.5F 20 fl oz (R1)	20.7 ab	13.4 abc	65.8
SA-0450107 20 fl oz (R1)	17.0 abd	8.1 abd	64.7
Domark 230ME 5 fl oz (R1)	15.5 abd	9.8 abd	65.5
Headline 2.08SC 6 fl oz (R1)	15.2 abd	6.4 ae	64.8
Echo 720F 24 fl oz (R1)	14.4 abd	7.3 ae	63.8
Contans WG 1 lb (At-Plant) SA-0040104 6 fl oz (R1)	11.6 abd	5.8 be	70.0
SA-0040104 6 fl oz (R1)	9.9 ae	5.7 be	65.4
Incognito 4.5F 20 fl oz (R1)	9.9 ae	4.4 be	67.4
Omega 500F 12 fl oz (R1)	8.5 bce	3.1 cde	66.1
SA-0040309 16 fl oz (R1)	7.9 be	3.2 cde	67.1
Omega 500F 12 fl oz (R1) + Incognito 4.5F 10 fl oz (R1)	3.2 de	1.3 de	64.2
Endura 70 WDG 11 oz (R1)	0.4 e	0.1 e	70.2
LSD ( $\alpha=0.05$ )	22.9	19.0	ns <sup>v</sup>

<sup>z</sup>Sclerotinia stem rot DSI was generated by rating 30 arbitrarily selected plants in each plot and scoring plants with on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9.

<sup>y</sup>Average number of symptomatic plants in 40 feet of row.

<sup>x</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.05$ ).

<sup>v</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of foliar fungicide treatments for control of *Sclerotinia* stem rot of soybean in Hancock Wisconsin, 2015

SOYBEAN (*Glycine max* 'AG2031')

*Sclerotinia* stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2031' was chosen for this study. Soybeans were planted on 12 May 2015 in a field with a Sparta loamy sand soil (0 to 2 percent slopes). The field was overhead irrigated as needed to prevent wilt and to promote disease. The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 5 ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 20 fungicide treatments. Fungicides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles, spaced 15 in. apart, and calibrated to deliver 20 GPA at 30psi. Pesticides were applied at growth stages R1 (7 Jul), R3 (27 Jul), both R1 and R3 or weekly from R1-R3. *Sclerotinia* stem rot severity was rated at growth stage R6 (16 Sep). *Sclerotinia* stem rot severity index (DSI) was determined by rating 30 arbitrarily selected plants in each plot and scoring plants on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9. Natural sources of pathogen inoculum were relied upon for disease. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. No fungicide application resulted in a significant reduction in *Sclerotinia* stem rot at R1 and R3 growth stages (Table 6). No significant differences in yield were identified among treatments. Applying Poacic acid weekly between the R1-R3 growth stages did not result in any significant difference in *Sclerotinia* stem rot severity or yield compared to the non-treated control. Phytotoxicity was observed in plots where Cobra 2EC was applied and lasted for approximately two weeks post application.

**Table 6.** White mold disease severity index, disease incidence, and yield of soybeans treated with various foliar fungicides

Treatment and rate/A (crop growth stage at application)	Sclerotinia Stem Rot DSI (0-100) <sup>z</sup>	Disease Incidence (%) <sup>y</sup>	Yield (bu/a)
Non-treated Check	35.0	18.8	61.1
Topsin 4.5 F 20 fl oz (R1)	31.7	16.8	67.6
Poacic Acid 1500 ppm (R1-R3)	31.1	20.5	67.3
Domark 230ME 5 fl oz (R3)	30.0	16.3	56.9
Domark 230ME 6 fl oz (R3)	28.3	14.8	72.2
Proline 480SC 5 fl oz (R3) <sup>x</sup>	27.2	14.3	65.7
Fortix 3.22SC 5 fl oz (R3)	27.2	13.3	71.9
Endura 70WDG 8.0 oz (R1) <sup>x</sup>	26.9	14.8	64.5
Omega 500F 0.75 pt (R1) <sup>x</sup>	26.9	13.5	69.5
Fortix 3.22SC 5 fl oz (R1)	25.6	13.5	67.5
Stratego YLD 500SC 4 fl oz (R3)	25.3	16.3	67.2
Aproach 2.08SC 9.0 fl oz (R3) <sup>x</sup>	25.0	11.8	71.7
Omega 500F 0.75 pt (R1) <sup>x</sup>			
Trivapro 14.6 fl oz (R3) <sup>x</sup>	24.7	12.0	67.8
Domark 230ME 5 fl oz (R1)	23.3	12.0	61.8
Aproach 2.08SC 9.0 fl oz (R1) <sup>x</sup>			
Aproach 2.08SC 9.0 fl oz (R3) <sup>x</sup>	22.9	12.5	69.5
Domark 230ME 6 fl oz (R1)	22.5	11.0	67.3
Proline 480SC 5 fl oz (R1) <sup>x</sup>	18.9	11.0	65.1
Aproach 2.08SC 9.0 fl oz (R1) <sup>x</sup>	18.3	17.8	72.0
Poacic Acid 1000 ppm (R1-R3)	17.5	9.3	60.0
Proline 480SC 3 fl oz (R1) <sup>x</sup>			
Stratego YLD 500SC 4.0 fl oz (R3) <sup>x</sup>	12.5	5.0	63.8
Cobra 2EC 6.0 fl oz (R1) <sup>x</sup>	7.5	3.8	64.8
LSD ( $\alpha=0.05$ )	ns <sup>v</sup>	ns <sup>v</sup>	ns <sup>v</sup>

<sup>z</sup>Sclerotinia stem rot DSI was generated by rating 30 arbitrarily selected plants in each plot and scoring plants with on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9

<sup>y</sup>Average number of symptomatic plants in 40 feet of row

<sup>x</sup>Induce 90SL (Non-ionic surfactant) at 0.25% v/v was added to the fungicide treatment

<sup>v</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of fungicide application timing for control of *Sclerotinia* stem rot of soybean in Wisconsin, 2015

SOYBEAN (*Glycine max* 'AG2031')

*Sclerotinia* stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2031' was chosen for this study. Soybeans were planted on 12-May 2015 in a field with a Sparta loamy sand soil (0 to 2 percent slopes). The field was overhead irrigated as needed to prevent wilt. The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 5 ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 18 herbicide or fungicide treatments. Pesticides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles, spaced 15 in. apart, and calibrated to deliver 20 GPA at 30psi. Pesticides were applied at growth stages V3 (19 Jun), V5 (30 Jun), R1 (7 Jul), R3 (27 Jul), both R1 and R3, R4 (5 Aug), or R5 (12 Aug). *Sclerotinia* stem rot severity was rated at growth stage R6 (16 Sep). *Sclerotinia* stem rot severity index (DSI) was determined by rating 30 arbitrarily selected plants in each plot and scoring plants on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9. Natural sources of pathogen inoculum were relied upon for disease. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

White mold pressure in this particular field was relatively low compared to other areas of the research station. Thus, no fungicide or herbicide application resulted in a significant reduction in white mold at any of the growth stages (Table 7). No significant differences in yield were identified among treatments. However, there were some numerical differences in yield when timing of application of product was considered. Yield for R1 applications ranged from 0 to 2.5 bu/a higher than yields in plots where fungicide was applied at R3 or later. Application of fungicide at R3 resulted in an average increase of 3.8 bu/a over application at R4 and 2.5 bu/a better than the same products applied at R5. While not statistically significant, these preliminary data suggest that application of fungicide between R1 and R3 tend to result in marginally higher yields than application of the same products at R4 or R5.

Application of the herbicide Cobra resulted in phytotoxicity at all growth stages, that typically lasted about two to three weeks after application. In this trial, the phytotoxicity observed did not drastically effect yield. However, when herbicide application at R1 was compared to fungicide application at the same timing, fungicide application resulted in 1.6 bu/a higher yield than applying herbicide.

More research needs to be performed on fungicide and herbicide application timing. This trial will be repeated in the 2016 growing season in a field with documented presence of the white mold fungus.

**Table 7.** White mold disease severity index, disease incidence, and yield in plots treated with different fungicide products at various soybean growth stages

Treatment and rate/A (crop growth stage at application)	White Mold DSI (0-100) <sup>z</sup>	Disease Incidence (%) <sup>y</sup>	Yield (bu/a)
Non-Treated Check	15.7	7.1	63.8
Approach 2.08SC 9 FL OZ/A (V5) <sup>x</sup>	9.7	5.3	59.2
Approach 2.08SC 9 FL OZ/A (R1) <sup>x</sup>	16.4	6.0	72.9
Approach 2.08SC 9 FL OZ/A (R3) <sup>x</sup>	15.9	6.3	66.9
Approach 2.08SC 9 FL OZ/A (R4) <sup>x</sup>	7.2	2.5	61.7
Approach 2.08SC 9 FL OZ/A (R5) <sup>x</sup>	6.7	2.3	71.9
Approach 2.08SC 9 FL OZ/A (R1; R3) <sup>x</sup>	14.4	5.8	64.3
Endura 70WDG 6 OZ/A (V5) <sup>x</sup>	10.3	4.3	64.1
Endura 70WDG 8 OZ/A (R1) <sup>x</sup>	10.3	4.3	64.8
Endura 70WDG 8 OZ/A (R3) <sup>x</sup>	15.0	6.8	68.9
Endura 70WDG 8 OZ/A (R4) <sup>x</sup>	8.9	3.3	64.9
Endura 70WDG 8 OZ/A (R5) <sup>x</sup>	10.0	3.5	65.4
Proline 480SC 5 FL OZ/A (R1) <sup>x</sup>	32.2	17.8	64.6
Proline 480SC 5 FL OZ/A (R3) <sup>x</sup>	8.3	3.5	66.4
Proline 480SC 5 FL OZ/A (R4) <sup>x</sup>	13.6	6.5	64.0
Proline 480SC 5 FL OZ/A (R5) <sup>x</sup>	9.0	3.5	57.4
Cobra 2EC 6 FL OZ/A (V5) <sup>x</sup>	12.0	7.0	65.1
Cobra 2EC 6 FL OZ/A (R1) <sup>x</sup>	14.7	5.3	65.8
Cobra 2EC 6 FL OZ/A (V3) <sup>x</sup>	12.8	7.3	57.7
LSD ( $\alpha=0.05$ )	ns <sup>v</sup>	ns <sup>v</sup>	ns <sup>v</sup>

<sup>z</sup>Sclerotinia stem rot DSI was generated by rating 30 arbitrarily selected plants in each plot and scoring plants with on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9

<sup>y</sup>Average number of symptomatic plants in 40 feet of row

<sup>x</sup>Induce 90SL (Non-ionic surfactant) at 0.25% v/v was added to the fungicide treatment

<sup>v</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of HeadsUp Seed Treatment for control of Sclerotinia stem rot of soybean in Wisconsin, 2015

SOYBEAN (*Glycine max*)

Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. Soybeans were planted on 12-May 2015 in a field with a Sparta loamy sand soil (0 to 2 percent slopes). The field was overhead irrigated as needed to prevent wilt. The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 5 ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 12 fungicide seed treatments. Seed treatments were applied to the soybean cultivar ‘AG2031’ prior to planting. Sclerotinia stem rot severity was rated at growth stage R6 (16 Sep). Sclerotinia stem rot severity index (DSI) was determined by rating 30 arbitrarily selected plants in each plot and scoring plants on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9. Natural sources of pathogen inoculum were relied upon for disease. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. No fungicide seed treatment resulted in a significant reduction of Sclerotinia stem rot (Table 8). No significant differences in yield were identified among all treatments.

**Table 8.** White mold disease severity index, disease incidence, and yield in plots with various seed treatments

Treatment	White Mold DSI (0-100) <sup>z</sup>	Disease Incidence (%) <sup>y</sup>	Yield (bu/a)
Votivo+Apron Max+Heads Up 1/2x	20.9	9.5	73.1
Votivo+Apron Max+Heads Up 1x	21.7	9.3	71.7
Non-Treated Control	20.6	9.0	79.1
Heads Up ST 1x Rate	18.6	6.8	69.8
ILeVo+Apron Max+Headsup 1/2x	15.9	6.3	76.0
Votivo+Heads Up 1/2x	11.9	5.3	76.4
Votivo+ Heads Up 1x	12.8	5.0	74.6
Bayer ILeVo + Heads Up 1/2x	9.7	4.5	72.6
Apron Max + Heads Up at 1x	10.6	4.3	71.4
Apron Max + Heads Up at 1/2 x	12.8	4.0	75.3
Bayer ILeVo Standard	10.9	3.5	85.6
ILeVo+Apron Max+Headsup 1x	9.2	3.5	69.2
Apron Max Standard	7.8	3.0	66.0
LSD ( $\alpha=0.05$ )	ns <sup>x</sup>	ns <sup>x</sup>	ns <sup>x</sup>

<sup>z</sup>Sclerotinia stem rot DSI was generated by rating 30 arbitrarily selected plants in each plot and scoring plants with on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9

<sup>y</sup>Average number of symptomatic plants in 40 feet of row

<sup>x</sup>ns = no least significant difference ( $\alpha=0.05$ )

**Evaluation of foliar fungicide and herbicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2015**

SOYBEAN (*Glycine max* ‘AG2031’)

Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar ‘AG2031’ was chosen for this study. Soybeans were planted on 12-May 2015 in a field with a Sparta loamy sand soil (0 to 2 percent slopes). The field was overhead irrigated as needed to prevent wilt. The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in. spaced rows, 20 ft long and 10 ft wide with 5 ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 4 pesticide treatments. Fungicides were applied using a CO<sub>2</sub>-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles, spaced 15 in. apart, and calibrated to deliver 20 GPA at 30psi. Pesticides were applied at growth stages R1 (7 Jul), R3 (27 Jul), or both R1 and R3. Sclerotinia stem rot severity was rated at growth stage R5/R6 (Aug 25). Sclerotinia stem rot severity index (DSI) was determined by rating 30 arbitrarily selected plants in each plot and scoring plants on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9. Natural sources of pathogen inoculum were relied upon for disease. Yield was determined by harvesting the center two rows of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Plots not treated with pesticide had the highest DSI and DI scores (Table 9). Lowest DSI and DI scores were observed in plots that received Vida at the R1 growth stage followed by Domark at the R3 growth stage. Domark applied at R1 resulted in similar disease levels as not treating. All other treatments resulted in intermediate disease levels. While there were differences in disease levels among treatments, overall disease levels were low and did not result in a significant reduction in yield; no significant differences in yield were observed among all treatments.

**Table 9.** White mold disease severity index, disease incidence, and yield in plots with various treated with foliar fungicides

Treatment and rate/A (crop growth stage at application)	Sclerotinia Stem Rot DSI (0-100) <sup>z</sup>	Disease Incidence (%) <sup>y</sup>	Yield (bu/a)
Non-treated check	11.9 a	4.3 a	79.8
Domark 230ME 6 fl oz (R1)	9.4 ab	4.0 a	73.7
Domark 230ME 6 fl oz (R3)	1.9 bc	0.8 b	75.2
Vida 0.208EC 1 fl oz (R1)	2.5 bc	0.8 b	70.3
Vida 0.208EC 1 fl oz (R1) Domark 230ME 6 fl oz (R3)	1.4 c	0.8 b	71.6
LSD ( $\alpha=0.10$ )	8.0	2.8	ns <sup>x</sup>

<sup>z</sup>Sclerotinia stem rot DSI was generated by rating 30 arbitrarily selected plants in each plot and scoring plants with on a 0-3 scale: 0 = no infection; 1 = infection on branches; 2 = infection on main stem with little effect on pod fill; 3 = infection on main stem resulting in death or poor pod fill. The scores of the 30 plants were totaled for each class and divided by 0.9

<sup>y</sup>Average number of symptomatic plants in 40 feet of row

<sup>x</sup>ns = no least significant difference ( $\alpha=0.10$ )

## Evaluation of foliar fungicides for control of Fusarium head blight of wheat in Wisconsin, 2015

WHEAT, SOFT WINTER (*Triticum aestivum* ‘Kaskaskia’)  
Fusarium head blight; *Fusarium graminearum*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soft red winter wheat cultivar ‘Kaskaskia’ was chosen for this study. Wheat was planted on 24 Sep 2014 in a field with a Plano silt loam soil (0 to 2 percent slopes). The experimental design was a randomized complete block with four replicates. Plots were 21 ft long and 7.5 ft wide with four-ft alleys between plots. Standard wheat production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and nine fungicide treatments. All fungicide treatments contained the non-ionic surfactant Induce 90SL at 0.125% v/v. Fungicides were applied using a CO<sub>2</sub> pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 21psi. Fungicides were used to target general wheat disease in the area. Fungicides were applied either just before jointing (Feekes 5), at emerging flag leaf (Feekes 8), at anthesis (Feekes 10.5.1), or using two sprays with the first occurring just prior to jointing (8 May) or at emerging flag leaf (21 May) and the second spray being applied at anthesis (3 Jun). Plots were inoculated at a 100 lbs/A rate of *Fusarium graminearum*-colonized corn grain on 18 May. Fusarium head blight was evaluated by visually estimating average incidence (% plants with symptoms) per plot. Level of deoxynivalenol (DON) was also evaluated in grain harvested from each treatment. Yield was determined by harvesting the center five feet of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance and means were separated using Fisher’s least significant difference ( $P=0.05$ ).

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. All fungicide treatments had a significant decrease in Fusarium head blight incidence compared to the non-treated control (Table 10). Fungicide treatments Stratego YLD 500SC 5.0 fl oz at Feekes 8, Prosaro 421SC 6.5 fl oz at Feekes 8, Stratego YLD 500SC 2.0 fl oz at Feekes 5 then Prosaro 421SC 6.5 fl oz at Feekes 10.5.1, Prosaro 421SC 6.5 fl oz at Feekes 10.5.1 and Stratego YLD 500SC 5.0 fl oz at Feekes 8 then Prosaro 421SC 6.5 fl oz at Feekes 10.5.1 had significantly higher yields compared to non-treated plots. Stratego YLD 500SC 2.0 fl oz applied at growth stage Feekes 5 then Prosaro 421SC 6.5 fl oz at growth stage Feekes 10.5.1 had the highest yield in this trial. There were no significant differences in test weight and DON among all treatments. Phytotoxicity was not observed with any treatment.

**Table 10.** Fusarium head blight incidence, yield, test weight, and DON content of wheat treated with various foliar fungicides

Treatment and rate/A (crop growth stage at application) <sup>z</sup>	FHB Disease Incidence (%) <sup>y,x</sup>	Yield (bu/a) <sup>x</sup>	Test Weight (lbs/bu)	DON (ppm)
Non-treated control	20.0 a	90.6 d	57.6	1.1
Quilt Xcel 2.2SE 10.5 fl oz (Feekes 8)	13.8 b	95.8 ad	56.8	1.0
Stratego YLD 500SC 5.0 fl oz (Feekes 8)	12.5 b	99.2 ab	56.9	1.0
Prosaro 421SC 6.5 fl oz (Feekes 8)	11.3 bc	98.1 ac	57.6	1.0
Trivapro 14.6 fl oz (Feekes 8)	11.3 bc	93.0 bcd	58.1	1.1
Stratego YLD 500SC 2.0 fl oz (Feekes 5)				
Prosaro 421SC 6.5 fl oz (Feekes 10.5.1)	6.3 cd	102.5 a	57.8	1.2
Prosaro 421SC 6.5 fl oz (Feekes 10.5.1)	6.3 cd	98.4 ab	58.6	1.1
Priaxor 4.17SC 2.0 fl oz (Feekes 5)				
Caramba 90EC 13.5 fl oz (Feekes 10.5.1)	4.7 d	91.4 cd	57.7	0.8
Stratego YLD 500SC 5.0 fl oz (Feekes 8)				
Prosaro 421SC 6.5 fl oz (Feekes 10.5.1)	3.3 d	98.0 ac	58.5	1.1
Quilt Xcel 2.2SE 10.5 fl oz (Feekes 8)				
Prosaro 421SC 6.5 fl oz (Feekes 10.5.1)	3.0 d	92.7 bcd	57.1	1.1
LSD ( $\alpha=0.05$ )	5.58	6.79	ns <sup>w</sup>	ns <sup>w</sup>

<sup>z</sup>Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to all fungicide treatments.

<sup>y</sup>Fusarium head blight incidence was visually assessed as the % plants symptomatic per plot.

<sup>x</sup>Means followed by the same letter are not significantly different based on Fisher’s Least Significant Difference (LSD;  $\alpha=0.05$ ).

<sup>w</sup>ns = no least significant difference ( $\alpha=0.05$ )

## Evaluation of foliar fungicide timing for control of Fusarium head blight of wheat in Wisconsin, 2015

WHEAT, SOFT WINTER (*Triticum aestivum* ‘Kaskaskia’ ‘Sunburst’ ‘Pro200’ and ‘Hopewell’)  
Fusarium head blight; *Fusarium graminearum*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soft red winter wheat cultivars ‘Kaskaskia’ ‘Sunburst’ ‘Pro200’ and ‘Hopewell’ were chosen for this study. Wheat was planted on 24 Sep 2014 in a field with a Plano silt loam soil (0 to 2 percent slopes). The experimental design was a randomized complete block with four replicates. Plots were 21 ft long and 7.5 ft wide with four-ft alleys between plots. Standard wheat production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of four non-treated controls and eight fungicide treatments. Fungicides were applied using a CO<sub>2</sub> pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 21psi. Fungicides were used to target Fusarium head blight in the area. Fungicides were applied at anthesis (Feekes 10.5.1) (6 Jun) or applied five days later (8 Jun). Plots were also inoculated at a 100 lbs/A rate of *Fusarium graminearum*-colonized corn grain on 18 May. Fusarium head blight was evaluated by visually estimating average incidence (% plants with symptoms) per plot. Level of deoxynivalenol (DON) was also evaluated in grain harvested from each treatment. Yield was determined by harvesting the center five feet of each plot using an Almaco SPC40 small-plot combine equipped with a HarvestMaster HM800 Classic Grain gauge. All disease and yield data were analyzed using a mixed model analysis of variance and means were separated using Fisher’s least significant difference ( $P=0.05$ ) for disease incidence and yield and ( $P=0.10$ ) for levels of DON.

Temperature and precipitation for the 2015 season were comparable to the 30-year average at this location. Application of ProSaro 421SC at both anthesis (Feekes 10.5.1) and five days after anthesis had significantly lower disease incidence for the susceptible cultivars Hopewell and Kaskaskia compared to plots not treated with fungicide (Table 11). Application of fungicide at either timing on the moderately-resistant cultivars Pro200 and Sunburst had no significant effect on disease incidence compared to not treating. ProSaro 421SC applied at both anthesis and five days after anthesis resulted in significantly higher yields for Hopewell compared to not treating (Table 12). Applying fungicide to all other cultivars resulted in no significant increase in yield compared to non-treated controls. Applying ProSaro 421SC at anthesis or five days after anthesis resulted in a significant decrease in levels of DON for all cultivars compared to not treating with fungicide (Table 13). For the cultivar Hopewell, applying ProSaro 421SC five days after anthesis resulted in significantly lower DON levels than applying fungicide at anthesis. Phytotoxicity was not observed for any treatment.

**Table 11.** Fusarium head blight disease incidence on multiple wheat varieties treated with Prosaro at Feekes 10.5.1 or 5 days after Feekes 10.5.1

Treatment (crop growth stage at application)	Hopewell <sup>z,y</sup>	Kaskaskia <sup>z,y</sup>	Pro 200 <sup>z</sup>	Sunburst <sup>z</sup>
Prosaro 421SC 6.5 fl oz/a (Feekes 10.5.1)	9.5 b	2.0 b	0.5	4.0
Prosaro 421SC 6.5 fl oz/a (5 days after Feekes 10.5.1)	7.5 b	5.3 b	2.8	2.8
Non-treated control	31.3 a	17.5 a	3.0	1.5
LSD ( $\alpha=0.05$ )	6.44	6.44	ns <sup>x</sup>	ns <sup>x</sup>

<sup>z</sup>Fusarium head blight incidence was visually assessed as the % plants symptomatic per plot.

<sup>y</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.05$ ).

<sup>x</sup>ns = no least significant difference ( $\alpha=0.05$ ).

**Table 12.** Yield Data for multiple wheat varieties treated with Prosaro at Feekes 10.5.1 or 5 days after Feekes 10.5.1

Treatment (crop growth stage at application)	Hopewell <sup>z</sup>	Kaskaskia	Pro 200	Sunburst
Prosaro 421SC 6.5 fl oz/a (Feekes 10.5.1)	110.5 a	102.1	100.2	106.7
Prosaro 421SC 6.5 fl oz/a (5 days after Feekes 10.5.1)	109.3 a	102.1	95.9	109.1
Non-treated control	88.1 b	99.4	94.8	107.0
LSD ( $\alpha=0.05$ )	8.1	ns <sup>y</sup>	ns <sup>y</sup>	ns <sup>y</sup>

<sup>z</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.05$ ).

<sup>y</sup>ns = no least significant difference ( $\alpha=0.05$ ).

**Table 13.** Levels of deoxynivalenol (DON) for multiple wheat varieties treated with Prosaro at Feekes 10.5.1 or 5 days after Feekes 10.5.1

Treatment (crop growth stage at application)	Hopewell <sup>z</sup>	Kaskaskia <sup>z</sup>	Pro 200 <sup>z</sup>	Sunburst <sup>z</sup>
Prosaro 421SC 6.5 fl oz/a (Feekes 10.5.1)	2.0 b	0.9 b	0.7 b	0.9 b
Prosaro 421SC 6.5 fl oz/a (5 days after Feekes 10.5.1)	1.3 c	1.0 b	0.5 b	0.8 b
Non-treated control	2.5 a	1.5 a	1.0 a	1.3 a
LSD ( $\alpha=0.10$ )	0.3	0.3	0.3	0.3

<sup>z</sup>Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD;  $\alpha=0.10$ ).