2019

Wisconsin Field Crops Pathology Fungicide Tests Summary

Brian Mueller, Assistant Researcher, UW-Madison, Plant Pathology

Damon Smith, Associate Professor and Extension Specialist, UW-Madison, Plant Pathology

Extension
UNIVERSITY OF WISCONSIN-MADISON

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Trial 1: Evaluation of fungicides for control of foliar diseases of alfalfa in Wisconsin, 2019

ALFALFA: *Medicago sativa*; 'DKA40-21HVXRR', 'Hybriforce-3430', 'DKA40-51RR'
Common leaf spot: *Pseudopeziza medicaginis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The alfalfa cultivars used, 'DKA40-21HVXRR', 'Hybriforce-3430', 'DKA40-51RR', and were seeded on 18 May 2018 in a field with a Saybrook silt loam (2 to 6% slopes) and Plano silt loam (2-6% slopes). The experimental design was a randomized complete block with three replicates. Cultivars and fungicide treatments were randomized together within each replicate (block). Plots were 390 ft long and 45 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 Priaxor fungicide treatment for each cultivar. Fungicides were applied using a Demco 1050 self-propelled sprayer equipped with 8001 TurboJet flat fan nozzles calibrated to deliver 20 GPA. Fungicides were applied after each cutting of alfalfa once plants had reached a height of 6-8 in of growth. However, second cutting did not receive fungicides. Dates of fungicide application were 4 May, 15 Jul, and 20 Aug. Natural sources of pathogen inoculum were relied upon for disease. Disease severity and defoliation were evaluated at harvest for all four cuttings by visually estimating both parameters with the aid of standard area diagrams. A John Deere 8600i forage harvester was used to cut 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 6 Jun, 8 Jul, 7 Aug, and 6 Sep. Disease data was rated for the most common diseases at each cutting. Milk/ton was calculated using the Milk 2006 model. Disease, defoliation, and milk/ton data were converted to average values across all four cuttings. Dry matter yield was converted to total for all four cuttings and reported as the total annual yield from four harvests. All disease, defoliation, yield, and milk data were analyzed using a mixed model analysis of variance (P=0.05).

Spring and early summer had cooler temperatures with average to above average precipitation observed throughout the growing season. Regardless of variety, plots treated with Priaxor significantly decreased common leaf spot severity and defoliation compared to the non-treated control (Table 1). Average milk per ton were significantly different among cultivars, but not between treatments within cultivar. There were no significant differences among treatments in total dry matter yield. Phytotoxicity was not observed for any treatment.

Table 1. Common leaf spot average severity, average defoliation, dry matter yield, and average milk/ton for alfalfa treated with fungicide or not treated with fungicide on three cultivars in Wisconsin in 2019.

Cultivar	Treatment and rate/a[z]	Common Leaf Spot Average Severity (%) [y, x, w]	Average Defoliation (%) [y, x, w]	Dry Matter Yield (tons/a) [u]	Average Milk/Ton (lbs) [t, v]
DKA40-21HVXRR	Non-treated check	6.5	4.8	5.6	2550.2
	Priaxor 4.17SC 4.00 fl oz	4.6	2.8	5.5	2504.9
Hybriforce-3430	Non-treated check	6.7	5.0	4.9	2502.6
	Priaxor 4.17SC 4.00 fl oz	4.5	3.0	5.6	2495.5
DKA40-51RR	Non-treated check	6.5	4.1	5.1	2432.2
	Priaxor 4.17SC 4.00 fl oz	5.4	3.8	5.8	2431.9
P-value		<.01	<0.01	ns[s]	<0.01

[z]Induce 90% SL (Non-ionic surfactant) at 7.0 fl oz/A was added to the fungicide treatment
[y]Values are based on the average disease severity or defoliation prior to harvest on 25 May, 3 Jun, 2 Aug, and 5 Sep.
[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05)
[w]Significantly different based on treatment effect.
[v]Significantly different based on cultivar effect.
[u]Total annual yield based on harvests on 6 Jun, 8 Jul, 7 Aug, and 6 Sep.
[t]Values calculated from milk 2006 model
[s]ns = no least significant difference (α=0.05)

Trial 2: Evaluation of foliar fungicides for control of diseases of dent corn in Wisconsin, 2019

DENT CORN: *Zea mays* 'DKC 52-68RIB' **Tar spot:** *Phyllachora maydis* **Stalk rot:** *Gibberella zeae*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'DKC 52-68RIB' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 13 May in a field consisting of a Plano silt loam soil (0 to 6% 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 corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of two non-treated controls and 22 fungicide treatments. Some fungicide treatments were mixed with non-ionic surfactant Induce 90SL at 0.25% v/v. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Pesticides were applied at growth stages V6 (1 Jul), V12 (26 Jul), R1 (30 Jul), and R3 (22 Aug). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated during the V12-R2 growth stages to encourage foliar disease. Canopy temperature was taken on 19 Aug using a Flir One thermal camera on the iOS operating system. Tar spot severity and canopy greening were rated on 3 Oct, and stalk rot was rated on 7 Oct. Tar spot were visually assessed by estimating average severity (% ear leaf with symptoms) per plot with the aid of standardized area diagrams. Greening was rated by assessing percent green foliage at late R5 growth stage. Stalk rot severity was rated by the stalk push test on 10 plants per plot and converted to a percentage of snapped stalks per 10 stalks. Yield (corrected to 15.5% moisture) 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. Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

The cool spring and early summer delayed the crop by about two weeks compared to an average season. Average to above average precipitation was observed throughout the growing season. Applications of Miravis Neo, Veltyma and Experimental 1 at R1 and Veltyma, Delaro, Quilt Xcel, and Revytek applied at R3 significantly reduced tar spot severity compared to the non-treated checks (Table 2). There were no significant differences in canopy temperature, stalk rot severity, canopy greening, and yield among all treatments. Phytotoxicity was not observed for any treatment.

Table 2. Canopy temperature, tar spot severity, stalk rot severity, canopy greening, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (growth stage at application)	Canopy Temperature (°C)[z]	Tar Spot Severity (%)[y, t]	Stalk Rot Severity (%)[x, t]	Canopy Greening (%)[w, t]	Yield (bu/a)
TrivaPro 2.21SC 13.7 fl oz (VT/R1)	22.3	5.3 a	10.4	40.0	285.7
Non-treated check 1	22.6	4.3 ab	24.8	32.5	276.5
Delaro 325SC 8.0 fl oz (VT/R1)	22.2	4.3 ab	9.2	43.8	283.7
Headline AMP 1.68SC 10.0 fl oz (R3)	22.4	3.8 a-d	9.9	41.3	285.2
Non-treated check 2	22.5	3.8 a-c	9.6	33.8	285.3
TrivaPro 2.21SC 13.7 fl oz (V12)	22.6	3.8 a-c	19.8	45.0	282.0
Lucento 4.17SC 5.0 fl oz (VT/R1)	22.2	3.8 a-c	20.4	38.8	280.0
Miravis Neo 2.5SE 13.7 fl oz (V12)	22.7	3.5 a-f	0.0	50.0	285.6
Miravis Neo 2.5SE 13.7 fl oz (V6)[u]	23.0	3.1 a-e	20.3	37.5	280.2
Quilt Xcel 2.2SE 10.4 fl oz (VT/R1)	22.5	3.0 a-e	9.6	40.0	282.8
Lucento 4.17SC 5.0 fl oz (R3)	22.6	2.7 a-e	9.6	47.5	290.8
TrivaPro 2.21SC 13.7 fl oz (R3)	22.9	2.6 a-e	15.7	40.0	273.7

Veltyma 3.34S 7.0 fl oz (VT/R1)	22.4	2.5 b-e	9.9	42.5	285.8
Miravis Neo 2.5SE 13.7 fl oz (R3)	22.4	2.5 b-e	0.0	43.8	282.1
TrivaPro 2.21SC 13.7 fl oz (V6)[u]	22.6	2.4 b-e	9.8	30.0	278.8
Revytek 3.33LC 8.0 fl oz (VT/R1)	22.2	2.1 b-e	9.9	45.0	288.1
Revytek 3.33LC 8.0 fl oz (R3)	22.7	1.9 de	31.1	50.0	287.9
Headline AMP 1.68SC 10.0 fl oz (VT/R1)	22.7	1.9 c-e	9.6	47.5	283.4
Miravis Neo 2.5SE 13.7 fl oz (VT/R1)	22.9	1.8 ef	9.9	47.5	293.6
Veltyma 3.34S 8.0 fl oz (VT/R1)	22.9	1.8 ef	21.1	42.5	290.7
Quilt Xcel 2.2SE 10.4 fl oz (R3)	22.7	1.8 ef	10.4	42.5	288.6
Experimental 1 (VT/R1)	22.8	1.7 ef	9.6	42.5	298.0
Veltyma 3.34S 7.0 fl oz (R3)	22.5	1.7 ef	13.7	37.5	279.1
Delaro 325SC 8.0 fl oz (R3)	22.7	1.6 ef	0.0	47.5	290.2
P-value	ns[s]	<0.01	ns[s]	ns[s]	ns[s]

[z]Canopy temperature was assessed using a Flir One thermal camera on the iOS operating system at R3 growth stage.
[y]Tar spot severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.
[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[w]Stalk rot severity was rated by the stalk push test on 10 plants per plot and converted to a percentage of snapped stalks per 10 stalks.
[v]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer.
[u]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v
[t]ns = not significant (α=0.05)

Trial 3: Evaluation of foliar fungicides for control of diseases of dent corn in Wisconsin, 2019

DENT CORN: *Zea mays* 'Jung 56SS538' **Northern corn leaf blight:** *Setosphaeria turcica*
Tar spot: *Phyllachora maydis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'Jung 56SS538' was chosen for this trial. Corn preceded this crop. Corn was planted on 13 May in a field consisting of a Plano silt loam soil (2 to 6% 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 corn 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_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Pesticides were applied at growth stage R1 (31 Jul). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated during the V12-R2 growth stages to encourage foliar disease. Northern corn leaf blight severity, tar spot severity, and canopy greening were rated on 3 Oct. Northern corn leaf blight and Tar spot were visually assessed by estimating average severity (% ear leaf with symptoms) per plot with the aid of standardized area diagrams. Greening was rated by assessing percent green foliage at late R5 growth stage. Yield (corrected to 15.5% moisture) 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. Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

The cool spring and early summer delayed the crop by about two weeks compared to an average season. Average to above average precipitation was observed throughout the growing season. Applications of Miravis Neo, Topguard EQ, and Quilt Xcel applied at R1 resulted in significantly higher canopy greening compared to the non-treated check (Table 3). There were no significant differences in Northern corn leaf blight severity, tar spot severity, and yield among all treatments. Phytotoxicity was not observed for any treatment.

Table 3. Northern corn leaf blight severity, tar spot severity, canopy greening, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (growth stage at application)	Northern Corn Leaf Blight Severity[z]	Tar Spot Severity (%)[y]	Canopy Greening (%)[w,x]	Yield (bu/a)
Non-treated check	5.0	3.3	48.8 c	245.4
Trivapro 2.21SC 13.7 fl oz (R1)	3.4	2.1	57.5 bc	245.5
Miravis Neo 2.5SE 13.7 fl oz (R1)	2.4	2.2	76.3 a	266.7
Delaro 325SC 12.0 fl oz (R1)	6.0	2.2	52.5 c	262.2
Headline AMP 1.68SC 14.4 fl oz (R1)	2.4	2.3	60.0 bc	275.1
Topguard EQ 4.29SC 7.0 fl oz (R1)	2.8	1.7	65.0 ab	248.4
Quilt Xcel 2.2SE 14.0 fl oz (R1)	2.8	2.9	66.3 ab	262.5
Aproach Prima 2.34SC 6.8 FL OZ/A (R1)	4.0	2.0	50.0 c	251
Headline 2.08SC 12.0 fl oz (R1)	2.1	1.9	50.0 c	263.6
Proline 480SC 5.7 fl oz (R1)	3.3	2.5	50.0 c	246
Veltyma 3.34S 8 fl oz (R1)	0.0	3.0	60.0 bc	274.3
P-value	ns[v]	ns[v]	<0.001	ns[v]

[z]Northern corn leaf blight severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis

[y]Tar spot severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.

[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).

[w]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer.

[v]ns = not significant (α=0.05)

Trial 4: Evaluation of foliar fungicides for control of diseases on P0956AMX silage corn in Wisconsin, 2019

SILAGE CORN: *Zea mays* 'P0956AMX' **Southern rust:** *Puccinia polysora*
Tar spot: *Phyllachora maydis* **Ear rot:** *Gibberella zeae*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'P0956AMX' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 14 May in a field consisting of a Joy silt loam soil (0 to 4% slopes) with a Plano silt loam intrusion (0 to 2% slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of six 30-in spaced rows, 20 ft long and 15 ft wide with 5-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of one non-treated control and 11 fungicide treatments. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Pesticides were applied at growth stages V6 (1 Jul), V12 (26 Jul), and R1 (30 Jul), and R2 (13 Aug). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated during the V12-R2 growth stage to encourage foliar disease. Tar spot was rated on 16 Sep. Southern rust and ear rot were rated on 18 Sep. Southern rust and tar spot were visually assessed by estimating average severity (% ear leaf with symptoms) on 5 leaves per plot with the aid of standardized area diagrams. Ear rot severity was assessed by visually rating five ears per plot at the late R5 growth stage. Yield was determined by harvesting the center two rows of each plot using a small plot silage chopper with an onboard platform weigh system. Chopped sub-samples were collected from each plot and analyzed for deoxynivalenol (DON) content and forage quality total-tract neutral detergent fiber digestibility (TTNDFD). Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

The cool spring and early summer delayed crop maturity by about two weeks compared to an average year. Average to above average precipitation was observed throughout the growing season. Miravis Neo applied at V6, Delaro and Lucento applied at R1 led to a signif-

icant reduction in southern rust compared to the non-treated check. Miravis Neo applied at V6 led to significantly higher tar spot severity than not treating, there were no other significant differences in treatments compared to the non-treated check (Table 4). Applications of Miravis Neo at V12 and Delaro at R1 significantly reduced DON content compared to the non-treated checks. There were no significant differences in ear rot severity, yield, and TTNDFD among all treatments. Phytotoxicity was not observed for any treatment.

Table 4. Southern rust severity, tar spot severity, ear rot severity, dry matter yield, TTNDFD, and deoxynivalenol (DON) for silage corn treated with fungicide or not treated with fungicide in Wisconsin, 2019.

Treatment and rate/a (growth stage at application)	Southern Rust Severity (%)[z, u]	Tar Spot Severity (%)[y, u]	Ear Rot Severity (%)[x]	Yield (tons dry matter/a)	TTNDFD (%)[w]	DON (ppm)[v,u]
Miravis Neo 2.5SE 13.7 fl oz (V6)[t] Miravis Neo 2.5SE 13.7 fl oz (R1)	2.1 ab	0.9 b	1.2	10.3	45.3	2.2 a
Non-treated check	2.8 a	0.8 b	1.5	10.0	43.6	1.6 a
Miravis Neo 2.5SE 13.7 fl oz (R2)	2.0 ab	0.6 b	1.1	9.8	45.8	1.6 a
Miravis Neo 2.5SE 13.7 fl oz (V6)[t]	1.4 bc	2.2 a	10.3	9.1	46.1	1.3 ab
Topguard 1.04SC 10 fl oz (R1)	2.9 a	0.8 b	1.1	10.2	46.3	1.3 ab
Lucento 4.17SC 5.0 fl oz (R1)	0.8 c	0.6 b	0.6	9.4	46.4	1.0 a-c
Miravis Ace 5.2SC 13.7 fl oz (R1)	1.8 ab	1.0 b	1.3	9.5	45.1	0.6 a-d
Miravis Neo 2.5SE 13.7 fl oz (R1)	2.1 ab	0.8 b	2.7	10.3	46.1	0.6 a-d
Proline 480SC 5.7 fl oz (R1)	1.9 ab	0.6 b	0.3	9.7	47.1	0.5 a-d
Delaro 325SC 8.0 fl oz (R1)	1.2 bc	0.7 b	1.5	10.2	44.0	0.3 b-d
Miravis Neo 2.5SE 13.7 fl oz (V14)	2.2 ab	0.9 b	3.3	9.0	47.0	0.2 d
Headline AMP 1.68SC 14.4 fl oz (R1)	2.4 ab	0.7 b	0.7	10.5	46.1	0.2 cd
P-value	<0.05	<0.05	ns[s]	ns[s]	ns[s]	<0.05

[z]Southern rust severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.
[y]Tar spot severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.
[x]Ear rot severity assessed visually on 5 ears per plot.
[w]Total-Tract Neutral Detergent Fiber Digestibility
[v]Deoxynivalenol (DON) content were analyzed for each plot; means for each plot were used in the analysis.
[u]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[t]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v
[s]ns = not significant (α=0.05)

Trial 5: Evaluation of foliar fungicides for control of diseases on F2F627 silage corn in Wisconsin, 2019

SILAGE CORN: *Zea mays* 'F2F627' **Southern rust:** *Puccinia polysora*
Tar spot: *Phyllachora maydis* **Ear rot:** *Gibberella zeae*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'F2F627' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 14 May in a field consisting of a Joy silt loam soil (0 to 4% slopes) with a Plano silt loam intrusion (0 to 2% slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of six 30-in spaced rows, 20 ft long and 15 ft wide with 5-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of one non-treated control and 11 fungicide treatments. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Pesticides were applied at growth stages V6 (1 Jul), V12 (26 Jul), R1 (30 Jul), and R2 (13 Aug). Natural sources of pathogen inoculum were

relied upon for disease. Plots were over-head irrigated during the V12-R2 growth stages to encourage foliar disease. Tar spot was rated on 16 Sep. Southern rust and ear rot were rated on 18 Sep. Southern rust and tar spot were visually assessed by estimating average severity (% ear leaf with symptoms) on five leaves per plot with the aid of standardized area diagrams. Ear rot severity was assessed by visually rating five ears per plot at the late R5 growth stage. Yield was determined by harvesting the center two rows of each plot using a small plot silage chopper with an onboard platform weigh system. Chopped sub-samples were collected from each plot and analyzed for deoxynivalenol (DON) content and forage quality total-tract neutral detergent fiber digestibility (TTNDFD). Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

The cool spring and early summer delayed crop maturity by about two weeks compared to an average year. Average to above average precipitation was observed throughout the growing season. Lucento applied at R1 significantly decreased southern rust compared to all other treatments (Table 5). However, Miravis Neo applied at V12 and R1, Proline, and Delaro applied at R1 significantly reduced southern rust compared to non-treated plots. There were no differences in tar spot severity, ear rot severity, yield, TTNDFD, and DON content among all treatments. Phytotoxicity was not observed for any treatment.

Table 5. Southern rust severity, tar spot severity, ear rot severity, dry matter yield, TTNDFD, and deoxynivalenol (DON) for silage corn treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (growth stage at application)	**Southern Rust Severity** (%)[z, u]	**Tar Spot Severity** (%)[y]	**Ear Rot Severity** (%)[x]	**Yield** (tons dry matter/a)	**TTNDFD** (%)[w]	**DON** (ppm)[v]
Topguard 1.04SC 10 fl oz (R1)	9.72 a	0.65	0.05	8.57	47.21	0.09
Non-treated check	9.25 ab	0.91	0.05	9.09	47.32	0.12
Miravis Neo 2.5SE 13.7 fl oz (V6)[t]	7.60 a-c	0.82	0.05	8.24	46.37	0.20
Miravis Ace 5.2SC 13.7 fl oz (R1)	6.58 a-c	0.79	0.00	9.05	48.22	0.07
Miravis Neo 2.5SE 13.7 fl oz (R2)	5.24 a-d	0.67	0.50	8.58	48.94	0.08
Headline AMP 1.68SC 14.4 fl oz (R1)	5.10 a-d	0.79	0.30	9.70	47.02	0.02
Miravis Neo 2.5SE 13.7 fl oz (V6)[t] Miravis Neo 2.5SE 13.7 fl oz (R1)	4.61 b-d	0.83	0.05	8.80	47.77	0.08
Proline 480SC 5.7 fl oz (R1)	3.97 cd	1.08	0.25	8.67	48.96	0.05
Delaro 325SC 8.0 fl oz (R1)	3.91 cd	0.95	0.30	7.91	49.46	0.01
Miravis Neo 2.5SE 13.7 fl oz (V14)	3.08 d	0.85	0.00	8.79	47.88	0.02
Miravis Neo 2.5SE 13.7 fl oz (R1)	2.94 d	0.99	0.25	9.24	45.72	0.08
Lucento 4.17SC 5.0 fl oz (R1)	0.84 e	0.87	0.50	8.75	48.37	0.22
P-value	<0.0001	ns[s]	ns[s]	ns[s]	ns[s]	ns[s]

[z]Southern rust severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.
[y]Tar spot severity was visually assessed as the average % ear leaf symptomatic per plot with the aid of a standard area diagram; means for each plot were used in the analysis.
[x]Ear rot severity assessed visually on 5 ears per plot.
[w]Total-Tract Neutral Detergent Fiber Digestibility
[v]Deoxynivalenol (DON) content were analyzed for each plot; means for each plot were used in the analysis.
[u]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[t]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v
[s]ns = not significant (α=0.05)

Trial 6: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2019

SOYBEAN: *Glycine max* 'AG20X7' **Sclerotinia stem rot:** *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 10 May in a field with a Plainfield sand (0 to 2 % slopes). The trial was planted in a field with history of severe Sclerotinia stem rot. The field was overhead irrigated as needed to prevent drought stress. 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 four fungicide treatments. Pesticides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Pesticides were applied at stages R1 (6 Jun) and R3 (23 Jul) or at R1, R2 (16 Jun), and R3. Additionally, some treatments were applied based on the Sporecaster smartphone application at the medium risk threshold (23 Jul). Sclerotinia stem rot incidence and severity was rated at R6 on 12 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. Disease incidence was scored as percentage of symptomatic plants relative to the total stand. Yield (corrected to 13% moisture) 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 (α=0.05).

Soybean canopy closure and cooler temperatures were observed late in the flowering period at this location. Due to overhead irrigation throughout the season and reasonably cool temperatures, conditions were favorable for disease development and pressure was very high in this trial. However, no significant differences were observed for Sclerotinia stem rot incidence, DSI, and yield among all treatments. Phytotoxicity was not observed for any treatment (Table 6).

Table 6. Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (crop stage at application)	**Disease Incidence** (%)[z]	**Sclerotinia Stem Rot DSI** (0-100)[y]	**Yield** (bu/a)
Non-treated check	43.4	87.8	40.0
OxiDate 2.0L 2% v/v (Model)[x]	34.7	71.1	47.4
OxiDate 2.0L 1% v/v (Model)[x]	34.1	76.7	43.2
OxiDate 5.0L 1% v/v (R1 + R2 +R3)	43.1	83.4	44.0
OxiDate 2.0L 1.5% v/v (R1) Aproach 2.08SC 9 fl oz (R3)	36.1	80.3	41.8
P-value	ns[w]	ns[w]	ns[w]

[z]Percentage of symptomatic plants relative to the total stand.
[y]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.
[x]Model application sprays were determined using the Sporecaster smartphone application at the medium risk threshold.
[w]ns = not significant (α=0.05).

Trial 7: Evaluation of an herbicide and fungicides for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2019

SOYBEAN: *Glycine max* 'AG20X7' **Sclerotinia stem rot:** *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 10 May in a field with a Sparta loamy sand soil (0 to 2 % slopes). The trial was planted in a field with history of severe Sclerotinia stem rot. The field was overhead irrigated as needed to prevent drought stress. 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 17 fungicide treatments. Pesticides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Treatments were also applied with the same nozzles placed on a TeeJet Y-drop line. Pesticides were applied at growth stages R1 (6 Jul) or both R1 and R3 (23 Jul) or R1 and R4 (6 Aug). Sclerotinia stem rot incidence and severity was rated at R6 (11 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. Disease incidence was scored as percentage of symptomatic plants relative to the total stand. Yield (corrected to 13% moisture) 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 (α=0.05).

Soybean canopy closure and cooler temperatures were observed late in the flowering period at this location. Due to overhead irrigation throughout the season and reasonably cool temperatures, conditions were favorable for disease development and pressure was very high in this trial. Lektivar applied at R1 + R3 and Cobra applied at R1 with drop nozzles significantly reduced Sclerotinia stem rot incidence compared to the non-treated control (Table 7). Cobra applied with drop nozzles at R1 resulted in a significant reduction in DSI compared to not treating. All other treatments resulted in comparable DSI levels to the non-treated check. No significant differences in yield were observed among the treatments. Phytotoxicity was observed in plots where Cobra 2EC was applied and lasted approximately two weeks after application. Phytotoxicity was not observed in any other treatments.

Table 7. Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/A (crop stage at application)	**Disease Incidence** (%) [z,x]	**Sclerotinia Stem Rot DSI** (0-100) [y,x]	**Yield** (bu/a)
Endura 70WDG 6 oz (R1)	24.8 a-d	76.4 a	39.8
Endura 70WDG 6 oz (R1) Revytek 3.33LC 8 fl oz (R3)	22.8 a-c	72.2 a	43.3
Priaxor 4.17SC 4 fl oz (R1)	18.7 a-d	71.4 ab	39.1
Peroxi Oxy Blast (R1+R3)[w]	17.2 a-e	69.7 ab	43.7
Domark 230ME 5 fl oz (R1)	22.0 ab	67.8 a-d	41.3
Affiance 1.5SC 10 fl oz (R1)	21.7 ab	65.3 a-c	45.0
Oxidate 2.0 2.5% v/v (R1+R3)	18.2 a-d	64.4 a-c	39.6
Non-treated check	18.8 a-d	59.7 a-e	44.5
Endura 70WDG 6 oz (R1) Priaxor 4.17SC 4 fl oz (R3)	12.9 b-f	55.6 a-f	45.0
Endrua 70WDG 6 oz (R1) Priaxor 4.17SC 4 flo oz (R3)	15.3 a-f	55.0 a-f	42.3

Aproach 2.08SC 9 fl oz (R1 + R3)	17.5 a-e	54.2 a-f	44.6
Cobra 2.0EC 6 fl oz (R1)	13.7 b-f	48.1 a-f	39.8
Procidic 3.5L 3 fl oz (R1) Procidic 3.5L 6 fl oz (R4)	10.1 d-f	43.3 b-f	40.1
Topsin-M 4.5F 20 fl oz (R1+R3)[v]	10.4 d-f	43.1 b-f	43.5
Endura 70WDG 8 oz (R1)[v]	14.0 b-f	40.9 c-f	43.5
Aproach 2.08SC 9 fl oz (R1 + R3)[v]	10.1 d-f	39.2 c-f	45.0
Lektivar 40SC 16 fl oz (R1+R3)	7.8 ef	32.8 ef	44.3
Cobra 2.0EC 6 fl oz (R1)[v]	7.2 f	28.3 f	39.7
P-value	<0.01	<0.05	ns[u]

[z]Percentage of symptomatic plants relative to the total stand.
[y]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.
[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[w]Molasses, sulfuric acid to bring pH to 6, and CSP softener compound were added to treatment.
[v]TeeJet Y-drop nozzles were used to apply treatments.
[u]ns = not significant (α=0.05).

Trial 8: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2019

SOYBEAN: *Glycine max* 'AG20X7' **Sclerotinia stem rot:** *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 10 May in a field with a Sparta loamy sand soil (0 to 2 % slopes). The trial was planted in a field with history of severe Sclerotinia stem rot. The field was overhead irrigated as needed to prevent drought stress. 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 five fungicide treatments. All fungicide treatments were mixed with the non-ionic surfactant Induce 90SL at 0.125% v/v. Pesticides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Pesticides were applied at growth stages R1 (6 Jul) or both R1 and R3 (23 Jul). Sclerotinia stem rot incidence and severity was rated at R6 (11 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. Disease incidence was scored as percentage of symptomatic plants relative to the total stand. Yield (corrected to 13% moisture) 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 (α=0.05).

Soybean canopy closure and cooler temperatures were observed late in the flowering period at this location. Due to overhead irrigation throughout the season and reasonably cool temperatures, conditions were favorable for disease development and pressure was very high in this trial. Proline applied at R1 had the highest DSI among treatments, all other treatments were not significantly different compared to the non-treated check (Table 8). No significant differences in Sclerotinia stem rot incidence and yield were observed among the treatments. Phytotoxicity was not observed in any treatments.

Table 8. Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (crop stage at application)[z]	Disease Incidence (%)[y]	Sclerotinia Stem Rot DSI (0-100)[x,w]	Yield (bu/a)
Proline 480SC 3 fl oz (R1)	22.4	74.5 a	51.1
Delaro 325SC 8 fl oz (R1) Delaro 325SC 8 fl oz (R3)	24.2	70.6 ab	48.3
Non-treated check	18.7	63.4 bc	48.4
Delaro 325SC 8 fl oz (R1)	22.7	58.6 c	49.7
Experimental 1 8 fl oz (R1)	21.3	58.6 c	49.4
Experimental 1 8 fl oz (R1) Experimental 1 8 fl oz (R3)	19.5	56.4 c	52.9
P-value	ns[v]	<0.01	ns[v]

[z]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to all fungicide treatments

[y]Percentage of symptomatic plants relative to the total stand.

[x]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.

[w]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).

[v]ns = not significant (α=0.05).

Trial 9: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2019

SOYBEAN: *Glycine max* 'AG20X7', 'Channel 1818R2X', 'AG19X8'

Sclerotinia stem rot: *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivars chosen for this study were 'AG20X7' (Susceptible), 'Channel 1818R2X' (Moderately Susceptible), and 'AG19X8' (Moderately Resistant). Soybeans were planted on 10 May in a field with a Sparta loamy sand soil (0 to 2 % slopes). The trial was planted in a field with history of severe Sclerotinia stem rot. The field was overhead irrigated as needed to prevent drought stress. The experimental design was a randomized complete block with four replicates. Cultivars and fungicide treatments were randomized together within each replicate (block). 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 five fungicide treatments for each cultivar. Pesticides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Pesticides were applied at growth stages R1 (6 Jul) or both R1 and R3 (23 Jul). Sclerotinia stem rot incidence and severity was rated at R6 (11 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. Disease incidence was scored as percentage of symptomatic plants relative to the total stand. Yield (corrected to 13% moisture) 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 (α=0.05).

Soybean canopy closure and cooler temperatures were observed late in the flowering period at this location. Due to overhead irrigation throughout the season and reasonably cool temperatures, conditions were favorable for disease development and pressure was very high in this trial. Sclerotinia stem rot disease incidence and DSI had a significant variety by fungicide interaction and treatment differences will be compared to their respective cultivar. For cultivar Channel 1818R2X, there was no significant differences in disease incidence among treatments (Table 9). Delaro applied at R1 resulted in significantly lower DSI

compared to its non-treated check. Delaro applied to AG19X8 at R1 resulted in significant reductions for disease incidence and DSI compared to its non-treated check. There were no significant differences in disease incidence and DSI among treatments applied to AG20X7. Yield had a significant variety and treatment interaction. Cultivar AG19X8 had significantly higher yields compared to Channel 1818R2X and AG20X7 (Figure 1). Regardless of cultivar, no treatments significantly differed in yield compared to the non-treated check (Figure 2). Phytotoxicity was not observed in any other treatments.

Table 9. Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Cultivar	Treatment and rate/a (crop stage at application)	Disease Incidence (%) [z,x]	Sclerotinia Stem Rot DSI (0-100) [y,x]
Channel 1818R2X	Non-treated check	11.6 a	46.8 a
	Delaro 325 SC 8 fl oz (R1)	6.4 a	26.5 b
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1)	8.6 a	34.1 ab
	Delaro 325SC 8 fl oz (R1) fb Delaro 325SC 8 fl oz (R3)	9.2 a	30.0 ab
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3) + Experimental 1 2 fl oz (R3)	7.9 a	28.6 ab
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3)	11.8 a	47.7 a
AG19X8	Non-treated check	8.7 a	35.2 a
	Delaro 325 SC 8 fl oz (R1)	2.5 b	12.5 b
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1)	7.3 a	28.8 a
	Delaro 325SC 8 fl oz (R1) Delaro 325SC 8 fl oz (R3)	7.6 a	32.9 a
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3) + Experimental 1 2 fl oz (R3)	11.1 a	42.1 a
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3)	11.2 a	38.6 a
AG20X7	Non-treated check	19.1 a	63.9 a
	Delaro 325 SC 8 fl oz (R1)	27.3 a	73.5 a
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1)	22.8 a	71.8 a
	Delaro 325SC 8 fl oz (R1) Delaro 325SC 8 fl oz (R3)	28.7 a	78.3 a
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3) + Experimental 1 2 fl oz (R3)	20.9 a	70.1 a
	Delaro 325SC 8 fl oz (R1) + Experimental 1 2 fl oz (R1) Delaro 325SC 8 fl oz (R3)	22.5 a	74.0 a
P-value		<0.05	<0.05

[z]Percentage of symptomatic plants relative to the total stand.

[y]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.

[x]Means followed by the same letter are not significantly different (for each variety) based on Fisher's Least Significant Difference (LSD; α=0.05).

[u]ns = not significant (α=0.05).

Figure 1. Yield (bu/a) vs. Cultivar

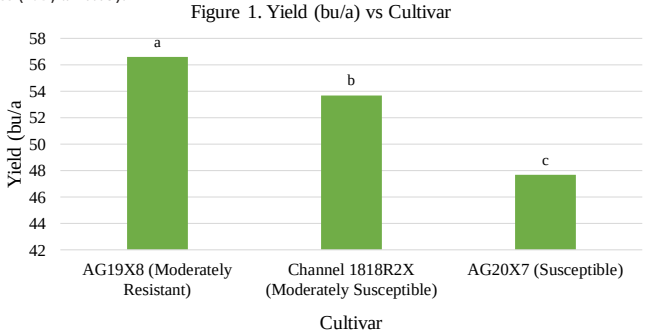
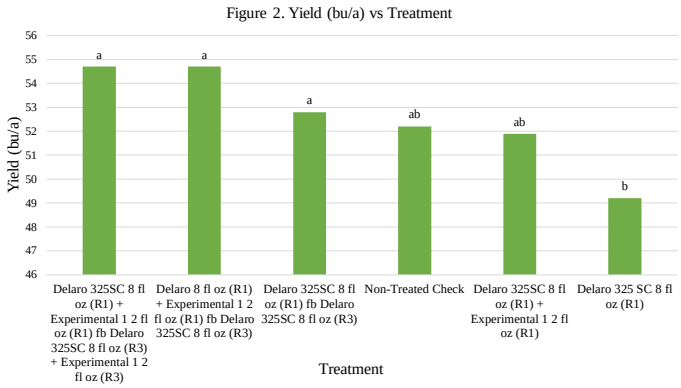


Figure 2.
Yield (bu/a) vs. Treatment



Trial 10: Evaluation of foliar fungicides for control of Fusarium head blight of wheat in Wisconsin, 2019

WHEAT, SOFT WINTER: *Triticum aestivum* 'Kaskaskia' **Fusarium Head Blight:** *Fusarium graminearum* **Tan spot:** *Pyrenophora tritici-repentis*

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 25 Sep 2018 in a field with a Plano silt loam soil (0 to 2% slopes). The experimental design was a randomized complete block with six replicates. Plots were 20 ft long and 7.5 ft wide with 5-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 14 fungicide treatments. All fungicide treatments were mixed with the non-ionic surfactant Induce 90SL at 0.25% v/v. Fungicides were applied using a CO_2 pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 25 psi. Fungicides were applied at jointing (Feekes 6) on 13 May, emerging flag leaf (Feekes 8) on 26 May, emerged head (Feekes 10.5) 7 Jun, anthesis (Feekes 10.5.1) on 9 Jun, five days after anthesis had begun (5 days post-10.5.1) on 14 Jun, or alternatively, using a two-spray program with the first spray occurring at jointing or emerging flag leaf and the second spray being applied at anthesis . Plots were infested with *F. graminearum* with a 50 lbs/A rate of *F. graminearum*-colonized corn grain on 23 May and 7 Jun. Plots were over-head irrigated with a linear irrigation system every day with 0.1 in. of water during the 10.5.1 growth stage to encourage disease. Tan Spot was evaluated by visually estimating average severity (% flag leaf with symptoms) per plot with the aid of standardized area diagrams. Fusarium head blight (FHB) was evaluated by visually estimating average incidence (% plants with symptoms) and average severity (% head infected) per plot with the aid of standardized area diagrams. Concentration of deoxynivalenol (DON) was also evaluated in grain harvested from each treatment. Test weight and yield (corrected to 13.5% moisture) were determined by harvesting the center 5 ft 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 (α=0.05).

Temperatures during the trial were moderate for the growing region with adequate precipitation. Moderate to high levels of Fusarium head blight were observed in this trial as overhead irrigation and frequent rain during anthesis promoted inoculum dispersal and infection. All treatments resulted in a significant reduction in tan spot severity compared to the non-treated check except Headline applied at Feekes 6, Prosaro applied 5 days post-10.5.1 and Caramba applied 5 days post-10.5.1. All fungicide treatments significantly reduced FHB incidence compared to not treating except Headline applied at Feekes 6 and 8. Applications of Trivapro at Feekes 6 followed by Miravis Ace at Feekes 10.5.1, Tilt at Feekes 8 followed by Prosaro at Feekes 10.5.1, Tilt at Feekes 8 followed by Experimental 1 at 10.5.1, Miravis Ace at 10.5, Miravis Ace at 10.5.1, Prosaro at 10.5.1, Prosaro 5 days post-10.5.1 and Miravis Ace 5 days post 10.5.1 resulted in significant reductions in DON content compared to the non-treated check. Trivapro at Feekes 6 followed by Miravis Ace at Feekes 10.5.1, Miravis Ace at Feekes 10.5, Miravis Ace at Feekes 10.5.1 and 5 days post-10.5.1 resulted in significantly greater test weight than all other treatments. All treatments resulted in significantly higher yield than the non-treated control except for Headline at Feekes 6, Caramba at Feekes 10.5.1, and Caramba applied 5 days post-10.5.1. Phytotoxicity was non observed for any treatment.

Table 10. Tan spot severity, Fusarium head blight (FHB) disease incidence, FHB disease severity, deoxynivalenol (DON), test weight, and yield for soft red winter wheat treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (Feekes stage at application)[z]	Tan Spot Severity (%)[y,v]	FHB Disease Incidence (%)[x,v]	FHB Disease Severity (%)[w,v]	DON (ppm)[v]	Test Weight (lbs/a)[v]	Yield (bu/a)[v]
Non-treated check	54.9 a	55.0 a	32.5 a	2.0 a	56.6 g	55.3 f
Headline 2.08SC, 6.0 fl oz (6)	49.0 ab	46.7 ab	25.8 b-d	2.0 a	56.9 fg	58.3 ef
Caramba 90EC, 13.5 fl oz (5 days post-10.5.1)	35.0 a-c	24.2 d-f	15.8 e-g	1.5 a-c	57.4 ef	59.0 ef
Caramba 90EC, 13.5 fl oz (10.5.1)	30.6 b-d	40.8 bc	25.0 b-d	1.6 ab	57.7 c-e	59.6 ef
Prosaro 421SC, 6.5 fl oz (5 days post-10.5.1)	32.9 a-c	29.2 c-e	17.5 e-g	1.3 b-e	57.5 de	61.3 de
Prosaro 421SC, 6.5 fl oz (10.5.1)	27.0 c-e	39.2 bc	24.2 b-d	1.3 b-e	57.4 ef	65.4 cd
Tilt 3.6EC, 4.0 fl oz (8) fb Prosaro 421SC, 8.2 fl oz (10.5.1)	24.0 c-e	20.0 ef	14.2 fg	1.2 b-e	58.2 b-d	65.5 cd
Miravis Ace 5.2SC, 13.7 fl oz (5 days post-10.5.1)	16.0 e-g	14.2 f	14.2 fg	1.0 e	59.5 a	66.0 cd
Headline 2.08SC, 6.0 fl oz (8)	27.3 c-e	56.7 a	28.3 ab	2.0 a	56.8 g	66.3 cd
Tilt 3.6EC, 4.0 fl oz (8) fb Experimental 1 (10.5.1)	20.2 c-f	16.7 f	19.2 d-f	1.2 b-e	58.3 b	66.7 bc
Miravis Ace 5.2SC, 13.7 fl oz (10.5.1)	11.0 g	16.7 f	15.8 e-g	1.0 de	59.7 a	66.8 bc
Headline 2.08SC, 6.0 fl oz (6) fb Prosaro 421SC, 6.5 fl oz (10.5.1)	22.5 c-e	37.5 bc	21.7 c-e	1.5 a-c	57.7 b-e	66.9 bc
Headline 2.08SC, 6.0 fl oz (8) fb Prosaro 421SC, 6.5 fl oz (10.5.1)	15.8 e-g	35.0 b-d	20.0 c-f	1.4 a-d	58.1 b-d	69.0 a-c
Miravis Ace 5.2SC, 13.7 fl oz (10.5)	12.0 fg	15.8 f	12.5 g	1.1 c-e	59.7 a	71.2 ab
TrivaPro 2.21SC, 9.4 fl oz (6) fb Miravis Ace 5.2SC, 13.7 fl oz (10.5.1)	17.7 d-g	12.5 f	11.7 g	1.2 b-e	60.0 a	73.1 a
P-value	<0.0001	<0.0001	<0.0001	<0.001	<0.0001	<0.0001

[z]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to all fungicide treatments, fb = followed by
[y]Tan spot severity was visually assessed as the average % flag leaf symptomatic per plot
[x]Fusarium head blight incidence was visually assessed as the % plants symptomatic per plot
[w]Fusarium head blight severity was visually assessed as the average % flag leaf symptomatic per plot
[v]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).

Trial 11: Evaluation of foliar fungicides for control of Fusarium head blight of wheat in Wisconsin, 2019

WHEAT, SOFT WINTER: *Triticum aestivum* 'Hopewell' **Fusarium Head Blight**: *Fusarium graminearum* **Tan spot:** *Pyrenophora tritici-repentis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soft red winter wheat cultivar 'Hopewell' was chosen for this study. Wheat was planted on 25 Sep 2018 in a field with a Plano silt loam soil (0 to 2% slopes). The experimental design was a randomized complete block with six replicates. Plots were 20 ft long and 7.5 ft wide with 5-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. Fungicides were applied using a CO_2 pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 25 psi. Fungicides were applied at emerging flag leaf (Feekes 8) on 26 May, half head emergence (Feekes 10.3) on 6 Jun, anthesis (Feekes 10.5.1) on 11 Jun, and five days after anthesis had begun (5 days post-10.5.1) on 16 Jun, or alternatively, using a two-spray program with the first spray occurring at emerging flag leaf or anthesis and the second spray being applied at half head emergence,

anthesis, or 5 days post-10.5.1. Plots were infested with F. graminearum with a 50 lbs/A rate of F. graminearum-colonized corn grain on 23 May and 7 Jun. Plots were over-head irrigated with a linear irrigation system every day with 0.1 in. of water during the 10.5.1 growth stage to encourage disease. Tan Spot was evaluated by visually estimating average severity (% flag leaf with symptoms) per plot with the aid of standardized area diagrams. Fusarium head blight (FHB) was evaluated by visually estimating average incidence (% plants with symptoms) and average severity (% head infected) per plot with the aid of standardized area diagrams. Concentration of deoxynivalenol (DON) was also evaluated in grain harvested from each treatment. Test weight and yield (corrected to 13.5% moisture) were determined by harvesting the center 5 ft 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 (α=0.05).

Temperatures during the trial were moderate for the growing region with adequate precipitation. Moderate to high levels of Fusarium head blight were observed in this trial as overhead irrigation and frequent rain during anthesis promoted inoculum dispersal and infection. All treatments resulted in a significant reduction in tan spot severity compared to the non-treated check except for headline applied at Feekes 8, Caramba applied at Feekes 10.5.1, and Prosaro applied at Feekes 10.5.1. Applications of Miravis Ace at Feekes 10.5.1, Headline at Feekes 8 followed by Miravis Ace at Feekes 10.5.1, Miravis Ace at Feekes 10.5.1 followed by Prosaro 5 days post-10.5.1, and Miravis Ace at Feekes 10.5.1 followed by Caramba 5 days post-10.5.1 resulted in a significant reduction in FHB disease incidence compared to the non-treated check. Miravis Ace applied at Feekes 10.5.1 followed by Prosaro 5 days post-10.5.1 and Miravis Ace applied at Feekes 10.5.1 followed by Caramba 5 days post-10.5.1 significantly reduced FHB disease severity compared to not treating. Miravis Ace applied at Feekes 10.5.1 followed by Prosaro 5 days post-10.5.1 and Miravis Ace applied at Feekes 10.5.1 followed by Caramba 5 days post-10.5.1 significantly reduced DON content compared to all other treatments. No significant differences in test weight and yield were observed among treatments. Phytotoxicity was not observed for any treatment.

Table 11. Tan spot severity, Fusarium head blight (FHB) disease incidence, FHB disease severity, deoxynivalenol (DON), test weight, and yield for soft red winter wheat treated with fungicide or not treated with fungicide in Wisconsin in 2019.

Treatment and rate/a (Feekes stage at application)	Tan Spot Severity (%)[z,w]	FHB Disease Incidence (%)[y,w]	FHB Disease Severity (%)[x,w]	DON (ppm)[w]	Test Weight (lbs/a)	Yield (bu/a)
Non-treated check	81.7 a	52.5 a	20.8 ab	4.1 a	53.4	43.6
Miravis Ace 5.2SC 13.7 fl oz (10.3)	58.3 b	37.5 a-c	20.8 ab	3.8 ab	54.7	42.8
Headline 2.08SC 6.0 fl oz (8) fb Miravis Ace 5.2SC 13.7 fl oz (10.3)	53.3 b	42.5 a-c	15.8 a-c	3.8 ab	55.5	50.1
Caramba 90EC 13.5 fl oz (10.5.1)	81.7 a	35.0 a-c	23.6 a	3.5 ab	49.2	35.8
Headline 2.08SC 6.0 fl oz (8)	80.0 a	46.7 a	16.7 a-c	3.5 ab	54.0	36.1
Miravis Ace 5.2SC 13.7 fl oz (10.5.1)	58.3 b	24.2 cd	13.3 bc	3.1 b	56.3	43.6
Prosaro 421SC 6.5 fl oz (10.5.1)	85.0 a	51.7 a	17.5 a-c	3.0 b	54.7	45.2
Headline 2.08SC 6.0 fl oz (8) fb Miravis Ace 5.2SC 13.7 fl oz (10.5.1)	51.7 b	26.7 b-d	13.3 bc	3.0 b	56.7	53.6
Miravis Ace 5.2SC 13.7 fl oz (10.5.1) fb Prosaro 421SC 6.5 fl oz (5 days post- 10.5.1)	63.3 b	14.8 d	11.1 c	1.9 c	51.6	34.6
Miravis Ace 5.2SC 13.7 fl oz (10.5.1) fb Caramba 90EC 13.5 fl oz (5 days post- 10.5.1)	51.7 b	15.0 d	10.0 c	1.5 c	56.5	49.3
P-value	<0.0001	<0.0001	<0.01	<0.0001	ns[v]	ns[v]

[z]Tan spot severity was visually assessed as the average % flag leaf symptomatic per plot
[y]Fusarium head blight incidence was visually assessed as the % plants symptomatic per plot
[x]Fusarium head blight severity was visually assessed as the average % flag leaf symptomatic per plot
[w]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[v]ns = not significant (α=0.05).