Wisconsin Field Crops Pathology Fungicide Tests Summary

2018

Brian Mueller, Assistant Researcher, UW-Madison, Plant Pathology
Damon Smith, Associate Professor and Extension Specialist, UW-Madison, Plant Pathology

BADGER Crop Doc

Acknowledgements

This report is a concise summary of pesticide related research trials conducted in 2018 under the direction of the Wisconsin Field Crops Pathology program in the Department of Plant Pathology at the University of Wisconsin-Madison. We thank many summer hourlies and research interns for assisting in conducting these trials. We would also like to thank Scott Chapman, Carol Groves, Wade Webster, Megan McCaghey, Cristina Zambrana-Echevarria, Bryan Jensen, John Gaska, Adam Roth and Shawn Conley for technical support.

The authors would also like to thank the following for their support in 2018:

AMVAC Chemical Corporation
BASF
Bayer CropScience
Corteva Agriscience
FMC
Gowan
North Central Soybean Research Program
Syngenta
Valent
Wisconsin Soybean Marketing Board

Disclaimer

Mention of specific products in this publication are for your convenience and do not represent an endorsement or criticism. This by no means is a complete test of all products available. You are responsible for using pesticides according to the manufacturers current label. Some products listed in this report may not actually have an approved Wisconsin pesticide label. Be sure to check with your local extension office or agricultural chemical supplier to be sure the product you would like to use has an approved label. Follow all label instructions when using any pesticide. Remember the label is the law!

Table of Contents

Evaluation of fungicides for control of foliar diseases of alfalfa in Wisconsin, 2018

ALFALFA (*Medicago sativa* 'Pioneer 55VR08')
Common leaf spot; *Pseudopeziza medicaginis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The alfalfa cultivar 'Pioneer 55VR08' was seeded on 25 Apr 2017 in a field with a Saybrook silt loam (2 to 6% slopes) and Joy silt loam (0-4% 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 seven fungicide treatments. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8001 TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Fungicides were applied after each cutting of alfalfa once plants had reached a height of 6-8 in of growth. Dates of fungicide application were 7 May, 7 Jun, and 9 Jul. 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 29 May, 28 Jun, and 30 Jul. Disease data was rated for the most common diseases from each cutting. Milk/ton was calculated using the Milk 2006 model. Disease, defoliation, and milk/ton data were converted to average values across all three cuttings. Dry matter yield was converted to total for all three cuttings. Yield was reported as the total annual yield from three 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 above average temperatures with cooler temperatures in late summer. Average to above average precipitation was observed throughout the growing season. Plots treated with Headline + Warrior II had leaf spot severity levels comparable to the non-treated control (Table 1). All other treatments had significantly lower average leaf spot severity. All treatments had significantly less defoliation compared to not treating except plots treated with Aproach + Warrior II. There were no differences among treatments in total dry matter yield and average milk/ton. 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/insecticide or not treated with fungicide/insecticide in Wisconsin in 2018.

Treatment and rate/A [z]	Common Leaf Spot Average Severity (%) [y, x]	Average Defoliation (%) [y, x]	Dry Matter Yield (Tons/a) [w]	Average Milk/Ton (lbs) [v]
Non-treated Check	7.1 a	6.1 a	3.3	2449.9
Headline 2.09SC 6.00 fl oz + Warrior II 2.08CS 1.28 fl oz	6.1 ab	4.0 bc	3.1	2367.5
Aproach 2.08SC 6.00 fl oz	5.1 bc	3.8 bc	3.3	2378.7
Headline 2.09SC 6.00 fl oz	4.9 cd	3.8 bc	3.3	2362.9
Aproach 2.08SC 6.00 fl oz + Warrior II 2.08CS 1.28 fl oz	4.3 cd	4.6 ab	3.5	2419.9
Aproach 2.08SC 6.00 fl oz + Fontelis 1.67SC 6.00 fl oz	4.3 cd	2.7 bc	3.3	2407.0
Priaxor 4.17SC 4.00 fl oz	4.0 cd	2.9 bc	3.6	2431.8
Priaxor 4.17SC 4.00 fl oz + Warrior II 2.08CS 1.28 fl oz	3.5 d	2.5 c	3.6	2367.0
Fisher's LSD (α=0.05)	1.2	1.9	ns[u]	ns[u]

[z]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to the fungicide treatment
[y]Values are based on the average disease severity or defoliation prior to harvest on 29 May, 28 Jun, and 30 Jul
[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05)
[w]Total annual yield based on harvests on 29 May, 28 Jun, and 30 Jul
[v]Values calculated from Milk 2006 model
[u]ns = no least significant difference (α=0.05)

Evaluation of foliar fungicides for control of diseases of dent corn in Wisconsin, 2018

DENT CORN (*Zea mays* 'DKC 45-65RIB')
Gray leaf spot; *Cercospora zeae-maydis*
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 45-65RIB' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 1 May in a field consisting of a Plano silt loam soil (0 to 2% 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 one non-treated control and 13 fungicide treatments. Some fungicide treatments were mixed with non-ionic surfactant Induce 90SL at 0.125% or 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 (15 Jun), V12 (11 Jul), and R1 (16 Jul). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated every other day with 0.5 in. of water during the V12-R2 growth stage to encourage foliar disease. Gray leaf spot, tar spot, and greening severity were rated on 10 Sep and stalk rot was rated on 3 Oct. Gray leaf spot 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 the R6 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 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).

Spring and early summer had above average temperatures with cooler temperatures in late summer. Average to above average precipitation was observed throughout the growing season. All treatments except Miravis Neo applied at R1 had significantly lower gray leaf spot severity compared to non-treated plots (Table 2). All treatments had significantly lower tar spot severity compared to not treating. Delaro applied at V6 and Miravis Neo applied at V12 had stalk rot severities comparable to the non-treated control. Plots treated with all other products had significantly lower stalk rot severities than the non-treated plots. Delaro applied at V6 had no differences in canopy greening compared to not treating, while all other treatments had significantly higher levels of canopy greening. There were no differences in yield among all treatments. Phytotoxicity was not observed for any treatment.

Table 2. Gray leaf spot severity, tar spot severity, stalk rot severity, canopy greening, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2018.

Treatment and rate/A (growth stage at application)	Gray Leaf Spot Severity (%)[z, t]	Tar Spot Severity (%)[y, t]	Stalk Rot Severity (%)[x, t]	Canopy Greening (%)[w, t]	Yield (bu/a)
Miravis Neo 2.5SE 13.7 fl oz (R1)	0.5 ab	5.4 b-d	27.5 ef	47.5 bc	262.8
TrivaPro 2.21SC 13.7 fl oz (V12)	0.0 c	3.8 b-d	37.5 d-f	35.0 c	258.4
Delaro 325SC 8 fl oz (R1)[v]	0.0 c	2.8 cd	30.0 d-f	47.5 bc	256.4
Experimental #1 7 fl oz (R1)[u]	0.0 c	2.1 d	27.5 ef	61.3 ab	254.4
TrivaPro 2.21SC 13.7 fl oz (R1)	0.0 c	2.8 cd	30.0 d-f	56.3 ab	251.8
Headline AMP 1.68SC 10 fl oz (R1)[u]	0.0 c	3.4 b-d	17.5 f	72.5 a	251.6
Proline 480SC 5.7 fl oz (R1)	0.0 c	4.9 b-d	37.5 d-f	33.8 c	250.9
Quilt Xcel 2.2SE 10.5 fl oz (R1)	0.0 c	3.4 b-d	27.5 ef	48.8 bc	250.7
Quadris 2.08SC 6 fl oz (R1)	0.3 bc	5.6 bc	32.5 d-f	45.0 bc	249.7
Delaro 325SC 4 fl oz (V6)[v]	0.3 bc	6.1 b	75.0 ab	32.5 cd	248.0
Experimental #2 8 fl oz (V12)	0.0 c	2.1 d	50.0 c-e	45.0 bc	245.8
Miravis Neo 2.5SE 13.7 fl oz (V12)	0.0 c	4.9 b-d	65.0 a-c	33.8 c	241.4
Priaxor 4.17SC 4 fl oz (V12)	0.0 c	4.9 b-d	52.5 b-d	43.8 bc	240.6
Non-Treated Check	0.8 a	11.3 a	87.5 a	12.5 d	239.7
Fisher's LSD (α=0.05)	0.4	3.0	24.1	21.0	ns[s]

[z]Gray leaf 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
[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]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
[w]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer.
[v]Treatments including the non-ionic surfactant Induce 90SL at 0.125 %v/v
[u]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v
[t]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05)
[s]ns = not significant (α=0.05)

Evaluation of foliar fungicides for control of diseases on P0956AMX silage corn in Wisconsin, 2018

SILAGE CORN (*Zea mays* 'PO956AMX')
Northern corn leaf blight; *Setosphaeria turcica*
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 'P0956AMX' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 1 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 13 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 (15 Jun), V12 (11 Jul), and R1 (18 Jul), and R2 (1 Aug). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated every other day with 0.5 in. of water during the V12-R2 growth stage to encourage foliar disease. Northern corn leaf blight and tar spot were rated on 10 Sep and ear rot was rated on 12 Sep. 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. Ear rot severity was assessed by visually rating five ears per plot at the R6 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. Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

Spring and early summer had above average temperatures with cooler temperatures in late summer. Average to above average precipitation was observed throughout the growing season. All fungicide treatments resulted in a reduction of Northern corn leaf blight severity and tar spot severity compared to not treating (Table 3). There were no differences in ear rot severity, yield, TTNDFD, and DON content among all treatments. Phytotoxicity was not observed for any treatment.

Table 3. Northern corn leaf blight 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, 2018

Treatment and rate/A (growth stage at application)	Northern Corn Leaf Blight Severity(%)[z, u]	Tar Spot Severity (%)[y, u]	Ear Rot Severity (%)[x]	Yield (tons dry matter/a)	TTNDFD (%)[w]	DON (ppm)[v]
Non-Treated Check	25.0 a	3.8 a	2.1	12.9	34.9	9.4
Miravis Neo 2.5SE 13.7 fl oz (V12)	16.3 bc	2.1 b-d	2.9	13.6	36.2	7.7
Miravis Neo 2.5SE 13.7 fl oz (V6)[t]	17.5 c-e	1.8 b-d	1.4	12.6	37.3	8.4
Topguard 1.04SC 10 fl oz (R1)	6.1 e	1.4 b-d	4.9	11.9	38.5	12.9
Proline 480SC 5.7 fl oz (R1)	14.3 b-d	1.2 b-d	3.1	11.8	36.8	8.5
Miravis Neo 2.5SE 13.7 fl oz (R2)	8.1 de	1.2 b-d	1.6	12.1	36.7	9.8
Miravis Ace 5.2SC 13.7 fl oz (R1)	11.3 c-e	1.0 cd	3.3	12.2	37.8	9.8
Proline 480SC 5.7 fl oz (R2)	11.3 c-e	1.0 cd	1.4	12.8	36.3	10.0
Delaro 325SC 8 fl oz (R1)	11.8 c-e	1.0 cd	2.1	11.9	36.7	10.5
Lucento 4.17SC 5 fl oz (R1)	8.0 de	0.8 cd	1.5	11.8	37.1	8.5
Headline AMP 1.68SC 14.4 fl oz (R1)	14.3 b-d	0.8 cd	1.4	13.0	35.9	11.9
Delaro 325SC 8 fl oz (R2)	10.5 c-e	0.6 d	2.1	11.7	38.5	8.2
Headline AMP 1.68SC 14.4 fl oz (R2)	13.0 c-e	0.6 d	1.0	12.0	37.1	11.9
Miravis Neo 2.5SE 13.7 fl oz (R1)	9.8 b-e	0.6 d	1.0	12.5	36.4	17.9
Fisher's LSD (α=0.05)	7.4	1.1	ns[s]	ns[s]	ns[s]	ns[s]

[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]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)

Evaluation of foliar fungicides for control of diseases on F2F627 silage corn in Wisconsin, 2018

SILAGE CORN (*Zea mays* 'F2F627')
Northern corn leaf blight; *Setosphaeria turcica*
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 'F2F627' was chosen for this trial. Soybeans preceded this crop. Corn was planted on 1 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 13 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 (15 Jun), V12 (11 Jul), and R1 (18 Jul), and R2 (1 Aug). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated every other day with 0.5 in. of water during the V12-R2 growth stage to encourage foliar disease. Northern corn leaf blight and tar spot were rated on 10 Sep and ear rot was rated on 12 Sep. 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. Ear rot severity was assessed by visually rating five ears per plot at the R6 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. Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

Spring and early summer had above average temperatures with cooler temperatures in late summer. Average to above average precipitation was observed throughout the growing season. All treatments except Miravis Neo applied at V6 resulted in significantly lower northern corn leaf blight severity compared to non-treated plots (Table 4). Headline AMP, Delaro, and Miravis NEO applied at R2, Headline AMP, Delaro, and Topguard applied at R1 and Miravis Neo applied at V6 resulted in lower tar spot severity compared to not treating. There were no differences in ear rot severity, yield, TTNDFD, and DON content among all treatments. Phytotoxicity was not observed for any treatment.

Table 4. Northern corn leaf blight 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 2018.

Treatment and rate/A (growth stage at application)	Northern Corn Leaf Blight Severity (%)[z, u]	Tar Spot Severity (%)[y, u]	Ear Rot Severity (%)[x]	Yield (tons dry matter/a)	TTNDFD (%)[w]	DON (ppm)[v]
Miravis Neo 2.5SE 13.7 fl oz (V12)	27.5 c-e	11.3 a	4.6	11.6	36.2	18.6
Non-Treated Check	62.5 a	10.5 ab	8.8	11.0	38.7	21.2
Proline 480SC 5.7 fl oz (R2)	27.5 c-e	8.6 a-c	6.5	10.4	39.4	10.7
Proline 480SC 5.7 fl oz (R1)	31.3 c-f	7.4 a-d	10.4	11.0	38.5	13.2
Miravis Neo 2.5SE 13.7 fl oz (R1)	21.3 de	6.9 a-d	11.1	11.1	39.5	17.2
Miravis Ace 5.2SC 13.7 fl oz (R1)	42.5 bc	6.3 b-f	7.7	11.7	39.7	15.7
Lucento 4.17SC 5 fl oz (R1)	18.8 ef	5.8 b-e	4.5	12.2	37.5	18.0
Topguard 1.04SC 10 fl oz (R1)	23.8 de	5.6 c-e	4.8	10.7	38.1	15.1
Miravis Neo 2.5SE 13.7 fl oz (R2)	15.0 e	5.5 c-e	7.9	10.7	39.9	30.3
Miravis Neo 2.5SE 13.7 fl oz (V6)[t]	50.0 ab	4.9 c-e	10.0	11.0	37.0	12.0
Delaro 325SC 8 fl oz (R1)	22.5 de	4.3 c-e	12.9	11.2	37.8	17.7
Headline AMP 1.68SC 14.4 fl oz (R1)	36.3 b-d	2.8 d-f	14.2	10.6	38.7	18.7
Delaro 325SC 8 fl oz (R2)	28.8 c-e	2.0 ef	9.7	10.5	37.1	12.7
Headline AMP 1.68SC 14.4 fl oz (R2)	17.5 ef	1.4 e	18.4	11.5	40.9	14.9
Fisher's LSD (α=0.05)	15.9	4.8	ns[s]	ns[s]	ns[s]	ns[s]

[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]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)

Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2018 – Trial #1

SOYBEAN (*Glycine max* 'AG2035')
Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2035' was chosen for this study. Soybeans were planted on 14 May in a field with a Plainfield sand (0 to 2 % slopes). The trial was planted in 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. 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 (28 Jun) or both R1 and R3 (28 Jul). Sclerotinia stem rot incidence and severity was rated at R6 on 22 Aug. 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).

Spring and early summer had above average temperatures with cooler temperatures in late summer at this location. Low to moderate disease levels were observed in this trial. However, no significant differences were observed for Sclerotinia stem rot incidence, DSI, and yield among all treatments (Table 5). Phytotoxicity was not observed for any treatment.

Table 5. 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 2018.

Treatment and rate/A (crop growth stage at application)[z]	Disease Incidence (%)[y]	Sclerotinia Stem Rot DSI (0-100)[x]	Yield (bu/a)
Non-Treated Check	5.2	20.0	71.8
Proline 480SC 3 fl oz (R1)	5.3	17.2	71.4
Delaro 325SC 8 fl oz (R1)	3.7	12.2	71.8
Delaro 325SC 8 fl oz (R1 + R3)	5.6	11.4	72.2
Propulse 3.34SC 6 fl oz (R1) Delaro 325SC 8 fl oz (R3)	6.4	20.3	70.1
Fisher's LSD (α=0.05)	ns[w]	ns[w]	ns[w]

[z]Induce 90SL (Non-ionic surfactant) at 0.125% v/v was added to the fungicide treatment
[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]ns = not significant (α=0.05)

Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2018 – Trial #2

SOYBEAN (*Glycine max* 'AG2035')
Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2035' was chosen for this study. Soybeans were planted on 14 May in a field with a Plainfield sand soil (0 to 2 % slopes). The trial was planted in 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 0.25% 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 (28 Jun), R3 (12 Jul), or both R1 and R3. Sclerotinia stem rot incidence and severity was rated at R6 (22 Aug). 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).

Spring and early summer had above average temperatures with cooler temperatures in late summer at this location. High temperatures during the flowering period hindered apothecial development leading to low levels of infection throughout this trial. There were no significant differences in Sclerotinia stem rot incidence, DSI, and yield among all treatments (Table 6). Phytotoxicity was not observed for any treatment.

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 2018.

Treatment and rate/A (crop growth stage at application)[z]	Disease Incidence (%)[y]	Sclerotinia Stem Rot DSI (0-100)[x]	Yield (bu/a)
Non-Treated	5.7	23.3	74.9
Endura 70WDG 6 oz (R1)	3.7	16.7	76.8
Endura 70WDG 8 oz (R1)	2.9	11.7	77.9
Endura 70WDG 6 oz (R1) Priaxor 4 fl oz (R3)	3.3	12.2	77.9
Propulse 3.34SC 8 fl oz (R3)	3.2	12.0	75.6
Acropolis 2.37LC 23 fl oz (R1 + R3)	5.2	22.5	78.9
Fisher's LSD (α=0.05)	ns[w]	ns[w]	ns[w]

[z]Induce 90SL (Non-ionic surfactant) at 0.25% v/v was added to the fungicide treatment
[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]ns = not significant (α=0.05)

Evaluation of foliar fungicide treatments applied prior to row closure or at R1 for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2018

SOYBEAN (*Glycine max* 'AG2035')
Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2035' was chosen for this study. Soybeans were planted on 14 May in a field with a Plainfield sand soil (0 to 2 % slopes). The trial was planted in 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 11 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 prior to row closure (25 Jun) or at R1 (29 Jun). Sclerotinia stem rot incidence and severity was rated at R6 on 22 Aug. 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).

Spring and early summer had above average temperatures with cooler temperatures in late summer at this location. Low to moderate disease levels were observed in this trial (Table 7). 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 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 2018.

Treatment and rate/A (crop growth stage at application)	Disease Incidence (%)[z]	Sclerotinia Stem Rot DSI (0-100)[y]	Yield (bu/a)
Non-Treated	6.6	17.0	72.8
Affiance 1.5SC 10 fl oz (Prior to row closure)	8.7	28.4	66.8
Domark 230ME 5 fl oz (Prior to row closure)	5.6	20.6	71.5
Badge 2.27SC 2 PT/A (Prior to row closure)	6.3	20.6	68.7
Affiance 1.5SC 10 fl oz Badge 2.27SC 2 pt (Prior to row closure)	6.7	18.1	71.5
Domark 230ME 5 fl oz Badge 2.27SC 2 pt (Prior to row closure)	7.0	27.2	71.6
Affiance 1.5SC 10 fl oz (R1)	6.0	24.7	68.7
Domark 230ME 5 fl oz (R1)	7.3	22.0	69.4
Badge 2.27SC 2 pt (R1)	5.4	14.2	71.1
Affiance 1.5SC 10 fl oz Badge 2.27SC 2 pt (R1)	6.4	29.7	68.1
Domark 230ME 5 fl oz Badge 2.27SC 2 pt (R1)	5.5	23.9	69.5
Endura 70WDG 8 oz (R1)	5.4	16.1	69.9
Fisher's LSD (α=0.05)	ns[x]	ns[x]	ns[x]

[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]ns = not significant (α=0.05)

Evaluation of herbicides, fungicides, and alternative treatments for control of Sclerotinia stem rot of soybean in Hancock Wisconsin, 2018

SOYBEAN (*Glycine max* 'AG2035')
Sclerotinia stem rot; *Sclerotinia sclerotiorum*

The trial was established at the Hancock Agricultural Research Station located in Hancock, WI. The soybean cultivar 'AG2035' was chosen for this study. Soybeans were planted on 14 May in a field with a Plainfield sand soil (0 to 2 % slopes). The trial was planted in 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 nine 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 growth stages V2 (6 Jun) and V4 (19 Jun), R1 (29 Jun) or both R1 and R3 (12 Jul) or R1 and R4 (30 Jul). Sclerotinia stem rot incidence and severity was rated at R6 (22 Aug). 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).

Spring and early summer had above average temperatures with cooler temperatures in late summer at this location. High temperatures during the flowering period hindered apothecial development leading to low levels of incidence (Table 8). There were no significant differences in Sclerotinia stem rot incidence, DSI, and yield among all treatments. Phytotoxicity was observed in plots where Cobra 2EC and Cadet 0.91EC were applied and lasted approximately two weeks after application. Phytotoxicity was not observed for all other 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 2018.

Treatment and rate/A (crop growth stage at application)	Disease Incidence (%) [z]	Sclerotinia Stem Rot DSI (0-100) [y]	Yield (bu/a)
Non-Treated	2.1	11.7	76.6
Cobra 2.0EC 6 fl oz (R1)[x]	2.2	11.4	75.9
Domark 230ME 4 fl oz (R1) Priaxor 4.17SC 4 fl oz (R1)	3.8	20.0	80.5
Aproach 2.08SC 8 fl oz (R1)	5.3	33.6	74.1
Cadet 0.91EC 0.5 fl oz (R1) [x]	2.1	12.2	77.2
P3 (foliar calcium) 5.0L 0.25 L (V2 + V4)	4.5	25.3	75.3
Super Mn 9.7L 2.0 L (R1)	2.7	6.1	76.8
Peroxi Oxy Blast 8 oz (R1)[w]	2.4	8.6	75.3
Aproach 2.08SC 9 fl oz (R1+R3)	2.9	10.3	79.0
Procidic 3.5L 3 fl oz (R1) Procidic 3.5L 6 fl oz (R4)	3.5	14.2	79.5
Fisher's LSD (α=0.05)	ns[v]	ns[v]	ns[v]

[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]COC at 1.0 pt/a was added to the herbicide treatment
[w]Molasses, sulfuric acid to bring pH to 6, and CSP softener compound were added to treatment.
[v]ns = not significant (α=0.05)

Evaluation of foliar fungicides for control of Fusarium head blight of wheat in Wisconsin, 2018

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 20 Sep in a field with a Joy silt loam soil (0 to 4% slopes). The experimental design was a randomized complete block with five 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 12 fungicide treatments. All fungicide treatments were mixed with the non-ionic surfactant Induce 90SL at 0.125% or 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 10 May, emerging flag leaf (Feekes 8) on 25 May, emerged head (Feekes 10.5) 31 May, anthesis (Feekes 10.5.1) on 1 Jun, five days after anthesis had begun (5 days post-10.5.1) on 6 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 inoculated at a rate of 100 lbs/A of *Fusarium graminearum*-colonized corn grain on 23 May and 30 May. 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. Level of deoxynivalenol (DON) was also evaluated in grain harvested from each treatment. Test weight and yield (corrected to 13.5% moisture) was 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 above average 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 fungicide treatments resulted in a significant reduction in FHB disease incidence compared to the non-treated control, except for Headline applied at Feekes 6 and Absolute MAXX applied at Feekes 8 (Table 9). All treatments had lower FHB disease severity compared to the non-treated plots, except for Headline applied at Feekes 6 and 8 and Absolute MAXX applied at Feekes 8. Miravis Ace applied at Feekes 10.5, Feekes 10.5.1, as well as Miravis Ace, Caramba, and Prosaro applied five days post Feekes 10.5.1 had significantly lower DON levels compared to not treating. Headline applied at Feekes 6 resulted in significantly higher DON content than the non-treated control. Miravis Ace applied at Feekes 10.5, Feekes 10.5.1 and five days post Feekes 10.5.1 had significantly higher test weight than all other treatments. All fungicide treatments except Caramba applied at Feekes 10.5.1 and five days post Feekes 10.5.1 resulted in significantly higher yield compared to not treating. Phytotoxicity was not observed for any treatment.

Table 9. 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 2018.

Treatment and rate/A[z]	Growth stage at application (Feekes)	FHB Disease Incidence (%)[z, x]	FHB Disease Severity (%)[y, x]	DON (ppm)[x]	Test Weight (lbs/a)[x]	Yield (bu/a)[x]
Non-treated control		40.0 a	23.0 a	1.4 bc	57.7 e	57.2 f
Headline 2.08SC 6.0 fl oz[w]	6	38.0 ab	23.0 a	1.9 a	58.6 b-d	63.3 de
Headline 2.08SC 6.0 fl oz fb Prosaro 421SC 6.5 fl oz[w]	6 fb 10.5.1	17.0 d	10.4 c	1.1 cd	59.1 b	68.7 c
Absolute MAXX 2.18SC 5.0 fl oz[v]	8	37.0 ab	21.0 a	1.6 ab	59.0 b	69.1 bc
Headline 2.08SC 6.0 fl oz[w]	8	33.0 b	19.0 ab	1.6 ab	58.7 b-d	68.3 c
Headline 2.08SC 6.0 fl oz fb Prosaro 421SC 6.5 fl oz[w]	8 fb 10.5.1	19.0 cd	12.0 c	1.0 cd	59.1 b	71.0 a-c
Miravis Ace 5.2SC 13.7 fl oz[w]	10.5	23.0 c	10.0 c	0.7 de	60.0 a	73.9 ab
Miravis Ace 5.2 SC 13.7 fl oz[w]	10.5.1	16.0 d	11.0 c	0.5 e	60.2 a	74.4 a
Prosaro 421SC 6.5 fl oz[v]	10.5.1	23.0 c	14.0 bc	1.5 b	59.2 b	67.2 cd
Caramba 90EC 13.5 fl oz[w]	10.5.1	19.0 cd	14.0 bc	1.4 bc	58.3 cd	59.8 ef
Prosaro 421SC 6.5 fl oz[w]	5 days post-10.5.1	20.0 cd	13.0 c	0.8 de	58.9 bc	63.3 de
Caramba 90EC 13.5 fl oz[w]	5 days post-10.5.1	15.0 d	9.0 c	0.8 de	58.2 de	58.1 f
Miravis Ace 5.2SC 13.7 fl oz[w]	5 days post-10.5.1	15.0 d	10.0 c	0.4 e	60.1 a	71.8 a-c
Fisher's LSD (α=0.05)	--	5.8	5.4	0.4	0.6	4.9

[z]Fusarium head blight incidence was visually assessed as the % plants symptomatic per plot
[y]Fusarium head blight severity was visually assessed as the average % flag leaf symptomatic per plot
[x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05)
[w]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v
[v]Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to all fungicide treatments, fb = followed by