# 2020

# Wisconsin Field Crops Pathology Fungicide Tests Summary

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## Trial 1: Evaluation of fungicides for control of foliar diseases of alfalfa in Wisconsin, 2020

**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 to 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. Dates of fungicide application were 1 May, 9 Jun, and 13 Jul. 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 2 Jun, 1 Jul, 29 Jul, and 27 Aug. Disease data was rated for the most common diseases at each cutting. Relative forage quality (RFQ) was calculated by estimating the digestibility of the forage dry matter. Milk/ton was calculated using the Milk 2006 model. Disease, defoliation, milk/acre, 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, RFQ, yield, and milk data were analyzed using a mixed model analysis of variance (P=0.05).

Optimal growing conditions were observed for this trial, average to above average temperatures with adequate precipitation were observed throughout the growing season. Relative forage quality and average milk per ton were significantly different among cultivars, but not between treatments within cultivar. There were no significant differences among treatments in average disease severity, defoliation, total dry matter yield, and average milk per acre. Phytotoxicity was not observed for any treatment.

**Table 1.** Common leaf spot average severity, average defoliation, RFQ, dry matter yield, average milk/ton, and average milk/acre for alfalfa treated with fungicide or not treated with fungicide on three cultivars in Wisconsin in 2020.

| Cultivar | Treatment and Rate/a[z] | Common Leaf Spot Average Severity (%)[y] | Average Defoliation (%)[y] | Relative Forage Quality[u, w] | Dry Matter Yield (tons/a)[v] | Average Milk/Ton (lbs)[u, w] | Average Milk/Acre (lbs)[u] |
|---|---|---|---|---|---|---|---|
| DKA40-21HVXRR | Non-treated check | 6.6 | 2.1 | 144.0 | 5.4 | 2384.8 | 12731.0 |
| | Priaxor 4.17SC 4.00 fl oz | 6.6 | 2.8 | 140.0 | 5.1 | 2343.4 | 11926.0 |
| Hybriforce-3430 | Non-treated check | 8.3 | 2.6 | 151.8 | 5.2 | 2456.6 | 12475.0 |
| | Priaxor 4.17SC 4.00 fl oz | 7.3 | 2.4 | 150.8 | 5.3 | 2442.6 | 12899.0 |
| DKA40-51RR | Non-treated check | 6.9 | 2.4 | 138.6 | 4.9 | 2330.1 | 11488.0 |
| | Priaxor 4.17SC 4.00 fl oz | 6.7 | 2.1 | 138.2 | 5.6 | 2313.6 | 12963.0 |
| *P*-value | | ns[t] | ns | <0.01 | ns | <0.01 | ns |

[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 1 Jun, 30 Jun, 28 Jul, and 26 Aug.
[x]Relative forage quality (RFQ) was calculated by estimating the digestibility of the forage dry matter.
[w]Significantly different based on cultivar effect.
[v]Total annual yield based on harvests on 2 Jun, 1 Jul, 29 Jul, and 27 Aug.
[u]Values calculated from milk 2006 model.
[t]ns = no least significant difference (α=0.05).

## Trial 2: Evaluation of in-furrow and foliar fungicides for control of diseases of dent corn in Wisconsin, 2020

**DENT CORN:** *Zea mays* 'Jung 54SS528' **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 'Jung 54SS528' was chosen for this trial. Corn preceded this crop. Corn was no-till planted on 1 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 Co-operative Extension Service were followed. Treatments consisted of a non-treated control and 18 fungicide treatments. Fungicides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. One treatment was applied by in-furrow (Furrow Jets®) and this equipment was calibrated to deliver 5 GPA at 18 psi. The other treatments were applied at plant (1 May) and growth stages R1 (24 Jul), and R3 (11 Aug). Natural sources of pathogen inoculum were relied upon for disease. Plots were over-head irrigated every other day with a linear irrigation system delivering 0.2 in. of water for two weeks during the V12-R2 growth stages to encourage foliar disease. Tar spot severity were rated on 19 Sep, and stalk rot was rated on 19 Oct. Tar spot was visually assessed by estimating average severity (% ear leaf with symp-toms) per plot with the aid of standardized area diagrams. Stalk rot severity was rated by the stalk push test on 10 plants per plot and converted to a percentage of snapped 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).

Optimal growing conditions were observed for this trial, average to above average temperatures with adequate precipitation were observed throughout the growing season. Applications of Revytek at R1 and Headline AMP and Delaro applied at R3 significantly reduced tar spot severity compared to the non-treated check. There were no significant differences in stalk rot severity and yield among all treatments. Phytotoxicity was not observed for any treatment.

**Table 2.** Tar spot severity, stalk rot severity, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin, 2020

| **Treatment and rate/a** (growth stage at application) | **Tar Spot Severity** (%)[z, y] | **Stalk Rot Severity** (%)[x] | **Yield** (bu/a) |
|---|---|---|---|
| Miravis Neo 2.5SE 13.7 FL OZ/A (R3) | 0.4 c-e | 15.0 | 320.1 |
| Delaro 325SC 8.0 FL OZ/A (R1) | 0.3 c-e | 10.0 | 317.2 |
| Miravis Neo 2.5SE 13.7 FL OZ/A (R1) | 0.7 b-e | 7.5 | 317.1 |
| Revytek 3.33LC 8.0 FL OZ/A (R1) | 0.2 de | 5.0 | 309.7 |
| Lucento 4.17SC 5.0 FL OZ/A (R3) | 1.0 ab | 2.5 | 309.2 |
| Revytek 3.33LC 8.0 FL OZ/A (R3) | 0.4 b-e | 10.0 | 308.3 |
| Trivapro 2.21EC 13.7 FL OZ/A (R1) | 0.5 b-e | 5.0 | 306.5 |
| Quilt Xcel 2.2SE 10.5 FL OZ/A (R3) | 0.3 c-e | 2.5 | 303.4 |
| Delaro 325SC 8.0 FL OZ/A (R3) | 0.3 de | 7.5 | 302.2 |
| Xyway LFR 15.2 FL OZ/A (In-furrow at plant) | 0.8 b-d | 10.0 | 294.4 |
| Non-treated check | 0.8 bc | 7.5 | 290.4 |
| Veltyma 3.34S 7.0 FL OZ/A (R3) | 0.3 c-e | 2.5 | 289.0 |
| Headline AMP 1.68SC 10.0 FL OZ/A (R1) | 0.5 b-e | 10.0 | 288.0 |
| Headline AMP 1.68SC 10.0 FL OZ/A (R3) | 0.2 e | 5.0 | 287.9 |
| Veltyma 3.34S 7.0 FL OZ/A (R1) | 0.4 b-e | 2.5 | 286.6 |

| | | | |
|---|---|---|---|
| Trivapro 2.21EC 13.7 FL OZ/A (R3) | 0.4 c-e | 5.0 | 285.4 |
| Xyway LFR 8.35 FL OZ/A (In-furrow at plant) fb Lucento 4.17SC 5.0 FL OZ/A (R1) | 0.8 b-d | 10.0 | 283.5 |
| Quilt Xcel 2.2SE 10.5 FL OZ/A (R1) | 1.6 a | 5.0 | 280.2 |
| Lucento 4.17SC 5.0 FL OZ/A (R1) | 0.4 b-e | 7.5 | 268.7 |
| *P*-value | <0.01 | ns[w] | ns[w] |

[z]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.

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

[x]Stalk rot severity was rated by the stalk push test on 10 plants per plot and converted to a percentage of snapped stalks.

[w]ns = not significant (α=0.05).

## Trial 3: Evaluation of foliar fungicides for control of diseases on silage corn in Wisconsin, 2020

**SILAGE CORN:** *Zea mays 'B10B77SX', 'B08J81AMXT'*
**Tar spot:** *Phyllachora maydis* **Ear rot:** *Gibberella zeae*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrids 'B10B77SX' (110-day relative maturity brown midrib hybrid) and 'B08J81AMXT' (108-day relative maturity non-brown midrib, dual-purpose hybrid) were chosen for this trial. Spring wheat preceded this crop. Corn was planted on 2 May in a field consisting of Joy silt loam soil (0 to 4% slopes) and Plano silt loam intrusion (0 to 2% slopes). The experimental design was a randomized complete block with four replicates. Hybrid and fungicide treatment combinations were randomized together within each replicate (block). Plots consisted of four 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 six fungicide treatments for each hybrid. Fungicides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Treatments were applied at growth stages V6 (22 Jun) and VT/R1 (24 Jul). Plots were infested at a rate of 50 lbs/A of *Fusarium graminearum*-colonized corn grain on 24 Jul. Plots were over-head irrigated every other day with a linear irrigation system delivering 0.2 in. of water for two weeks during the V12-R2 growth stage to encourage disease. Tar spot and ear rot were rated at the late R5 growth stage (22 Sep). Tar spot was visually assessed by estimating average severity (% ear leaf with symptoms) on 5 leaves per plot with the aid of a standardized area diagram. 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 plat-form weigh system. Chopped sub-samples were collected from each plot and analyzed for deoxynivalenol (DON) content, forage quality total-tract neutral detergent fiber digestibil-ity (TTNDFD), and milk production per ton of feed (Milk 2006). Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Signifi-cant Difference (LSD; α=0.05).

Average temperature and adequate precipitation were observed throughout the growing season. All treatments resulted in significantly lower tar spot severity than compared to the non-treated check for the B08J81AMXT hybrid. No treatments resulted in significantly different tar spot severity compared to the non-treated check for the B10B77SX hybrid. Regardless of hybrid, there were no significant differences in ear rot severity, yield, TTNDFD, DON, and milk production among any treatments. Phytotoxicity was not observed for any treatment.

**Table 3.** Tar spot severity, ear rot severity, yield, TTNDFD, deoxynivalenol (DON), and Milk for silage corn treated with fungicide or not treated with fungicide in Wisconsin, 2020.

| Hybrid | Treatment and rate/a (growth stage at application) | Tar Spot Severity (%)[z,u] | Ear Rot Severity (%)[y] | Yield (tons dry matter/a) | TTNDFD (%)[x] | DON (ppm)[w] | Milk 2006 (tons/a)[v] |
|---|---|---|---|---|---|---|---|
| B10B77SX | Non-treated check | 1.0 a | 0.9 | 11.1 | 45.1 | 1.2 | 3516.0 |
| | Proline 5.7 FL OZ/A (R1)[t] | 0.7 a | 1.1 | 11.0 | 44.5 | 0.9 | 3492.1 |
| | Headline AMP 14.4 FL OZ/A (R1)[t] | 0.1 a | 0.8 | 11.6 | 44.9 | 1.2 | 3657.1 |
| | Miravis Neo 13.7 FL OZ/A (V12) | 0.3 a | 0.6 | 10.5 | 44.9 | 0.0 | 3538.8 |
| | Miravis Neo 13.7 FL OZ/A (R1)[t] | 0.3 a | 0.5 | 11.0 | 43.9 | 1.7 | 3538.9 |
| | Experimental 1 13.7 FL OZ/A (R1)[t] | 0.3 a | 1.0 | 11.1 | 45.3 | 0.3 | 3624.3 |
| | Miravis Neo 13.7 FL OZ/A (V6)[t] | 0.3 a | 0.7 | 11.0 | 44.8 | 0.4 | 3398.8 |
| B08J81AMXT | Non-treated check | 3.0 a | 2.1 | 12.6 | 40.2 | 0.4 | 3514.9 |
| | Proline 5.7 FL OZ/A (R1)[t] | 0.6 b | 1.5 | 12.9 | 39.2 | 0.1 | 3527.6 |
| | Headline AMP 14.4 FL OZ/A (R1)[t] | 0.2 b | 1.2 | 11.6 | 38.1 | 0.3 | 3513.6 |
| | Miravis Neo 13.7 FL OZ/A (V12) | 0.5 b | 1.4 | 13.1 | 38.4 | 0.6 | 3627.1 |
| | Miravis Neo 13.7 FL OZ/A (R1)[t] | 1.3 b | 1.4 | 12.0 | 38.9 | 0.4 | 3675.2 |
| | Experimental 1 13.7 FL OZ/A (R1)[t] | 0.3 b | 0.6 | 12.1 | 38.4 | 2.4 | 3645.0 |
| | Miravis Neo 13.7 FL OZ/A (V6)[t] | 0.3 b | 1.6 | 12.4 | 38.1 | 0.6 | 3614.6 |
| | *P*-value | <0.05 | ns[s] | ns[s] | ns[s] | ns[s] | ns[s] |

[z] 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.
[y] Ear rot severity assessed visually on 5 ears per plot.
[x] Total-Tract Neutral Detergent Fiber Digestibility.
[w] Deoxynivalenol (DON) content were analyzed for each plot; means for each plot were used in the analysis.
[v] Tons of milk produced per acre of feed consumed as calculated by the Milk 2006 index of forage quality.
[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 4: Evaluation of foliar and in-furrow fungicides for control of diseases on silage corn in Wisconsin, 2020

**SILAGE CORN:** *Zea mays* 'B10B77SX', 'B08J81AMXT'
**Tar spot:** *Phyllachora maydis* **Ear rot:** *Gibberella zeae*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrids 'B10B77SX' (110-day relative maturity brown midrib hybrid) and 'B08J81AMXT' (108-day relative maturity non-brown midrib, dual-purpose hybrid) were chosen for this trial. Spring wheat preceded this crop. Corn was planted on 2 May in a field consisting of Joy silt loam soil (0 to 4% slopes) and Plano silt loam intrusion (0 to 2% slopes). The experimental design was a randomized complete block with four replicates. Hybrid and fungicide treatment combinations were randomized 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 corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of one non-treated check and six fungicide treatments for each hybrid. Foliar fungicides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 40 psi. Some treatments were applied in-furrow at plant (2 May) with equipment calibrated to deliver 5 GPA at 18 psi. Other treatments were applied at growth stages VT/R1 (24 Jul). Plots were infested at a rate of 50 lbs/A of Fusarium graminearum-colonized corn grain on 24 Jul. Plots were over-head irrigated every other day with a linear irrigation system delivering 0.2 in. of water for two weeks during the V12-R2 growth stage to encourage disease. Tar spot and ear rot were rated at the late R5 growth stage (22 Sep). Tar spot was visually assessed by estimating average severity (% ear leaf with symptoms) on 5 leaves per plot with the aid of a standardized area diagram. 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 subsamples were collected from each plot and analyzed for deoxynivalenol (DON) content, forage quality total-tract neutral detergent fiber digest-ibility (TTNDFD), and milk production per ton of feed (Milk 2006). Data were analyzed using a mixed model analysis of variance and means were separated using Fisher's Least Significant Difference (LSD; α=0.05).

Average temperature and adequate precipitation were observed throughout the growing season. For the B08J81AMXT hybrid, tar spot severity was significantly lower for plots treated with Headline AMP applied at R1 and for Miravis 200 SC applied in-furrow + Proline applied at R1, compared to the non-treated check. No treatments resulted in a significantly different tar spot severity for the B10B77SX hybrid. For the B10B77SX hybrid, Miravis 200 SC applied in-furrow resulted in a significantly lower yield than the non-treated check. No treatments resulted in a significantly different yield compared to the non-treated check for the B08J81AMXT hybrid. No treatments had significantly different DON concentrations compared to the non-treated check for the B10B77SX hybrid. For the B08J81AMXT hybrid, the use of Miravis 200 SC applied in-furrow + Proline applied at R1 as well as Proline applied at R1 resulted in significantly lower DON concentrations than the non-treated check. For the B10B77SX hybrid, the Miravis 200 SC applied in-furrow resulted in a significantly lower milk score than the non-treated check. For the B08J81AMXT hybrid, the Miravis 200 SC applied in-furrow with Proline applied at R1 resulted in a significantly lower milk score than the non-treated check. Regardless of hybrid, there were no significant differences in ear rot severity and TTNDFD among any treatments. Phytotoxicity was not observed for any treatment. **A final note, Miravis 200 SC is not labeled for use in-furrow. Treatments using this product were for research purposes only.**

**Table 4.** Tar spot severity, ear rot severity, yield, TTNDFD, deoxynivalenol (DON), and Milk for silage corn treated with fungicide or not treated with fungicide in Wisconsin, 2020.

| **Hybrid** | **Treatment and rate/acre** (growth stage at application) | **Tar Spot Severity** (%)[z,t] | **Ear Rot Severity** (%)[y] | **Yield** (tons dry matter/a)[t] | **TTNDFD** (%)[x,s] | **DON** (ppm)[w,v,t] | **Milk 2006** (tons/a)[u,t] |
|---|---|---|---|---|---|---|---|
| B10B77SX | Non-treated Check | 0.7 ab | 0.6 | 10.3 ab | 43.2 | 0.5 ab | 3694.6 a |
| | Headline AMP 14.4 FL OZ/A (R1) | 0.4 b | 0.9 | 10.6 a | 43.5 | 0.5 ab | 3712.4 a |
| | Proline 5.7 FL OZ/A (R1) | 0.5 b | 0.9 | 10.4 a | 45.6 | 0.4 b | 3590.3 ab |
| | Miravis 200 SC 10.3 FL OZ/A (In-furrow at plant) | 0.9 ab | 0.6 | 8.6 c | 43.3 | 1.2 a | 3438.4 b |
| | Miravis 200 SC 10.3 FL OZ/A (In-furrow at plant) + Proline 5.7 FL OZ/A (R1) | 0.7 ab | 1.3 | 11.1 a | 44.7 | 0.6 ab | 3536.6 ab |
| | Xyway 15.2 FL OZ/A (In-furrow at plant) | 1.8 a | 0.6 | 9.3 bc | 43.8 | 0.7 ab | 3634.5 a |
| | Xyway 15.2 FL OZ/A (In-furrow at plant)+ Proline 5.7 FL OZ/A (R1) | 1.0 ab | 0.9 | 10.3 ab | 44.3 | 0.9 ab | 3595.1 ab |
| B08J81AMXT | Non-treated Check | 3.5 a | 1.0 | 11.3 a | 37.5 | 0.9 ab | 3665.7 a |
| | Headline AMP 14.4 FL OZ/A (R1) | 0.3 c | 0.9 | 11.5 a | 37.4 | 0.3 bc | 3666.7 a |
| | Proline 5.7 FL OZ/A (R1) | 1.0 a-c | 1.2 | 11.4 a | 37.4 | 0.2 c | 3564.4 ab |
| | Miravis 200 SC 10.3 FL OZ/A (In-furrow at plant) | 3.1 a | 0.7 | 10.6 a | 39.5 | 1.5 a | 3585.5 ab |
| | Miravis 200 SC 10.3 FL OZ/A (In-furrow at plant) + Proline 5.7 FL OZ/A (R1) | 0.8 bc | 1.2 | 11.1 a | 38.4 | 0.2 c | 3441.4 b |
| | Xyway 15.2 FL OZ/A (In-furrow at plant) | 3.2 a | 1.2 | 11.1 a | 38.6 | 0.4 bc | 3699.7 a |
| | Xyway 15.2 FL OZ/A (In-furrow at plant)+ Proline 5.7 FL OZ/A (R1) | 2.0 ab | 0.6 | 11.3 a | 38.8 | 0.3 bc | 3672.0 a |
| | *P*-value | $<0.05$ | ns[s] | $<0.05$ | ns[s] | $<0.05$ | $<0.05$ |

[z] 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.
[y] Ear rot severity assessed visually on 5 ears per plot.
[x] Total-Tract Neutral Detergent Fiber Digestibility.
[w] Deoxynivalenol (DON) content were analyzed for each plot; means for each plot were used in the analysis.
[v] Values are back-transformed means from the lognormal distribution.
[u] Tons of milk produced per acre of feed consumed as calculated by the Milk 2006 index of forage quality.
[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).

## Trial 5: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2020

**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 15 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 five fungicide treatments. Pesticides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Pesticides were applied at the R1 (7 Jun), R3 (22 Jul) growth stages or based on the Sporecaster smartphone application at the medium risk threshold (22 Jul). Sclerotinia stem rot incidence and severity was rated at R6 on 10 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).

Due to overhead irrigation throughout the season and full canopy closure near the R3 growth stage, 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 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, 2020.

| **Treatment and rate/a** (crop stage at application) | **Disease Incidence** (%)[z] | **Sclerotinia Stem Rot DSI** (0-100)[y] | **Yield** (bu/a) |
|---|---|---|---|
| Domark 230ME, 7.5 fl oz (Model)[x] | 34.5 | 70.0 | 64.6 |
| Non-treated check | 34.8 | 73.6 | 59.7 |
| Domark 230ME, 10.0 fl oz (Model)[x] | 36.0 | 63.1 | 59.4 |
| Domark 230ME 5.0 fl oz (R1 + R3)<br>Badge 2.27SC 2 pt (R1 + R3) | 40.8 | 75.8 | 54.1 |
| Domark 230ME, 5.0 fl oz (Model)[x] | 42.6 | 74.4 | 51.9 |
| Domark 230ME, 5.0 fl oz<br>Badge 2.27SC 2 PT/A (Model)[x] | 47.0 | 77.0 | 49.4 |
| *P*-value | ns[w] | ns | ns |

[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 6: Evaluation of herbicide and fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2020

**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 15 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 16 fungicide or herbicide treatments. Pesticides were applied using a CO2-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, T-band applications with 8001XR TurboJet flat fan nozzles calibrated to deliver 5 GPA at 25 psi, and in-furrow (Furrow Jet®) application with equipment calibrated to deliver 5 GPA at 18 psi. Pesticides were applied at-plant (15 May) and growth stages V3 (18 Jun), V5 (30 Jun) or both V5 and R3 (22 Jul), R1 (7 Jul), R3, or both R1 and R3, and an application at R1, R3, and R4 (4 Aug). Sclerotinia stem rot incidence and severity were rated at R6 (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).

Average to above average temperatures for this growing region were observed during flowering. Due to overhead irrigation throughout the season, conditions were favorable for disease development and pressure was very high in this trial. Applications of Endura at R1 + R3, Endura at R3, Cobra at V5 followed by Endura at R3, Cobra at V5, Endura at R3 with drop nozzles, Lektivar at R3 with drop nozzles, Cobra at V5 followed by Oxidate at R3, and Lektivar at R1 + R3 significantly reduced Sclerotinia stem rot incidence compared to the non-treated check. Endura applied at R1 + R3, Endura at R3, Cobra at V5 followed by Endura at R3, Endura at R1 followed by Priaxor at R3, Cobra at V5, Endura at R3 with drop nozzles, Cobra at V5 followed by Oxidate at R3, and Lektivar applied at R1 + R3 resulted in significant reduction in DSI compared to the non-treated check. Applications of Endura at R1 + R3 and Endura at R3 had significantly higher yields than all other 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 6.** Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), and yield for soybeans treated with pesticides or not treated with pesticides in Wisconsin, 2020.

| **Treatment and rate/acre** (crop stage at application) | **Application Method** | **Disease Incidence** (%)[z,x] | **Sclerotinia Stem Rot DSI** (0-100)[y,x] | **Yield** (bu/a)[x] |
|---|---|---|---|---|
| Endura 70WDG 8.0 oz (R1+R3) | Broadcast[w] | 3.8 f | 14.5 h | 83.9 a |
| Endura 70WDG 8.0 oz (R3) | Broadcast[w] | 8.4 ef | 30.9 gh | 83.4 a |
| Cobra 2.0EC 6.0 fl oz (V5)<br>Endura 70WDG 8.0 oz (R3) | Broadcast[w] | 2.7 f | 12.5 h | 75.7 b |
| Endura 6.0 oz (R1)<br>Priaxor 4.0 fl oz (R3) | Broadcast[w] | 25.8 b-d | 56.1 ef | 74.1 b |
| Cobra 2.0EC 6.0 fl oz (V5) | Broadcast[w] | 21.9 cd | 59.5 d-f | 72.5 b |
| Endura 70WDG 8.0 oz (R3) | Drop nozzle[v] | 16.9 de | 43.6 fg | 72.0 bc |

| | | | | |
|---|---|---|---|---|
| Lektivar 40S 16.0 fl oz (R3) | Drop nozzle[v] | 22.2 cd | 62.5 c-f | 71.6 b-d |
| Cobra 70WDG 6.0 fl oz (V5) Oxidate 5.0L 1.0 % v/v (R3) | Broadcast[w] | 17.6 de | 50.9 fg | 70.2 b-e |
| Cobra 2.0EC 6.0 fl oz (R1) | Broadcast[w] | 25.3 b-d | 71.9 a-e | 64.5 c-f |
| Oxidate 5.0L 1.0 % v/v (R1+R3+R4) | Drop nozzle[v] | 35.1 ab | 79.8 a-d | 64.1 d-f |
| Xyway LFR 15.2 fl oz (At plant) | In-furrow[u] | 35.2 ab | 74.5 a-e | 63.7 ef |
| Lektivar 40S 16.0 fl oz (R1+R3) | Broadcast[w] | 21.2 cd | 56.4 ef | 63.6 ef |
| Endrua 70WDG 11.0 oz (V3) | Broadcast[w] | 36.1 ab | 84.4 ab | 63.1 ef |
| Xyway LFR 15.2 fl oz (At Plant) | T-band[t] | 33.7 a-c | 64.4 b-f | 61.2 f |
| Non-treated check | - | 35.3 ab | 78.1 a-c | 60.8 f |
| Lucento 4.17SC 5.5 fl oz (V5) | Broadcast[w] | 40.0 a | 79.5 a-d | 59.7 f |
| Endura 70WDG 11.0 oz (At plant) | Broadcast[w] | 40.0 a | 91.1 a | 58.3 f |
| *P*-value | | <0.01 | <0.01 | <0.01 |

[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]Broadcast application were used to apply treatments at 20 GPA.

[v]TeeJet Y-drop nozzles were used to apply treatments at 20 GPA.

[u]In-furrow (Furrow Jets®) were used to apply the treatment at 5 GPA.

[t]T-Band was used to apply the treatment at 5 GPA.

## Trial 7: Evaluation of fertilizer, seeding rate, herbicide, and fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2020

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

TThe 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 15 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 2 x 2 x 2 factorial arranged in a randomized complete block with six 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. Plots were applied with or without fertilizer and two seeding rates each having two fungicide or herbicide treatments and a non-treated control. Plots that were fertilized received a rate of 150 lbs of nitrogen per acre. 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 V5 (30 Jun) or R3 (22 Jul). Sclerotinia stem rot incidence and severity were rated at R6 (12 Sep). Disease index (DIX) was calculated by first determining the Sclerotinia stem rot severity index score. 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 then averaged for the plot. Next, disease incidence was scored as percentage of symptomatic plants relative to the total stand. The DI and DSI were then combined to calculate the DIX where DIX=DI*(Average DSI/3). 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).

Average to above average temperatures for this growing region were observed during flowering. Due to overhead irrigation throughout the season, conditions were favorable for disease development and pressure was very high in this trial. Fertilizer had limited impact on disease levels. Planting at 100,000 seeds/acre significantly reducing DIX compared to 160,000 seeds/acre. Effect of pesticide treatment was also significant with Endura being the most effective treatment in reducing DIX (Figure 1 and 2). Overall, seeding rate of 100,000 seeds/acre had significantly higher yields than seeding rate of 160,000 seeds/acre (P-value < 0.05). Regardless of seeding rate, Endura applied at R3 had significantly higher yield compared to Cobra at V5 and the non-treated control (Figure 3). 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.

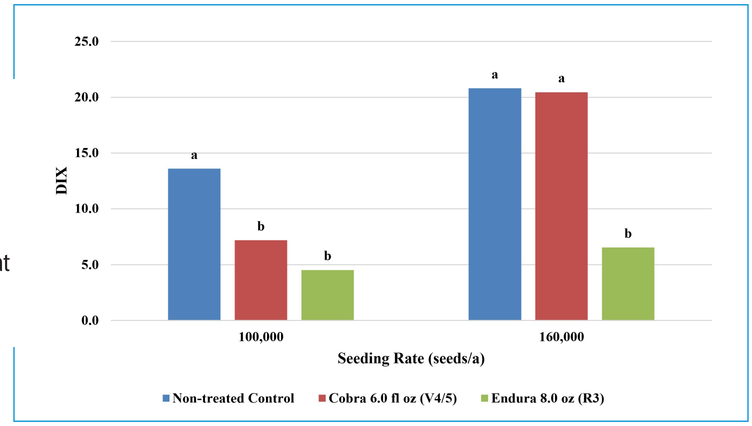


Figure 1. Average disease index (DIX) where soybeans were planted at 100,000 seeds/a or 160,000 seeds/a and fertilized with 150 lbs of actual nitrogen at planting time.

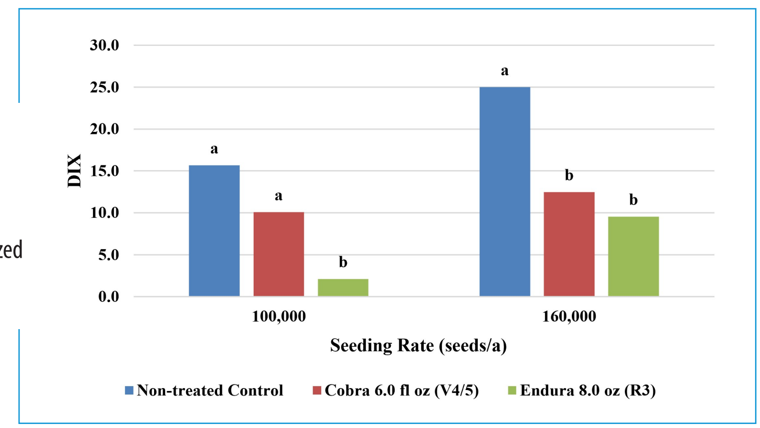


Figure 2. Average disease index (DIX) where soybeans were planted at 100,000 seeds/a or 160,000 seeds/a and not fertilized at planting time.

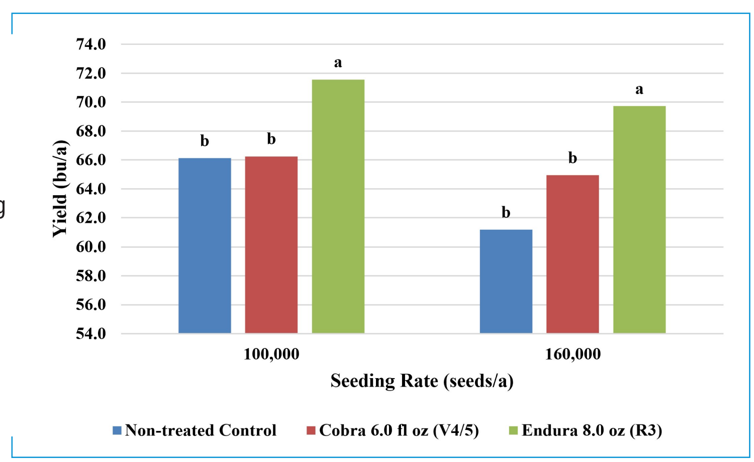


Figure 3. Average Yield (bu/a) where soybeans were planted at 100,000 seeds/a or 160,000 seeds/a and fertilized with 150 lbs of actual nitrogen at planting time or not fertilized at planting time. Yield was statistically similar for fertilizer treatments at α=0.05. Therefore, the analysis was combined for fertilizer treatment.

## Trial 8: Evaluation of foliar fungicide treatments and liquid compost (CX-1) for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2020

**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 15 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 six 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 a fungicide treatment (Endura and Priaxor) and/or a compost amendment (CX-1). Compost treatments were mixed with Activator; a dry soluble humate and kelp formula. Pesticides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Some treatments were applied in-furrow at plant (15 May) with equipment calibrated to deliver 5 GPA at 18 psi. Pesticides were applied at plant, V3 (18 Jun), R1 (7 Jul), and R3 (22 Jul). Other applications were at plant, V3, and R3 or growth stages R1 and R3. Disease index (DIX) was calculated by first determining the Sclerotinia stem rot severity index score. 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 then averaged for the plot. Next, disease incidence was scored as percentage of symptomatic plants relative to the total stand. The DI and DSI were then combined to calculate the DIX where DIX=DI*(Average DSI/3). 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).

Due to overhead irrigation throughout the season and full canopy closure near the R3 growth stage, conditions were favorable for disease development, and pressure was very high in this trial. Endura applied at R1 followed by Priaxor at R3 resulted in a significant reduction in DIX compared to the non-treated control. 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), DIX, and yield for soybean treated with fungicide and/or a compost amendment, or not treated in Hancock, Wisconsin, 2020.

| **Treatment and rate/acre** (crop stage at application)[z] | **Disease Incidence** (%)[z] | **Sclerotinia Stem Rot DSI** (0-100)[y] | **DIX**[x] | **Yield** (bu/a) |
|---|---|---|---|---|
| Non-treated check | 32.9 a | 70.4 | 29.7 a | 75.2 |
| Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz (R3) | 22.4 b | 55.6 | 19.1 b | 80.2 |
| CX-1 5 gal (Infurrow + V3 + R3)[w] | 33.4 a | 77.1 | 31.4 a | 69.7 |
| CX-1 5 gal (Infurrow + V3)[w]<br>Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[w] | 26.4 ab | 62.4 | 24.2 ab | 72.6 |
| *P*-value | <0.05[v] | ns[u] | <0.05 | ns |

[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]DIX=DI*(Average DSI/3).

[w]Activator (a dry soluble humate and kelp formula) at 50.5 g/a was added to treatments.

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

[u]ns = not significant (α=0.05).

# Trial 9: Evaluation of foliar fungicide treatments and liquid compost (CX-1) for control of Sclerotinia stem rot of soybean in Wausau, Wisconsin, 2020

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

The trial was established at a grower's farm located in Wausau, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 13 May in a field with a Rietbrock silt loam (1 to 8 % slopes). The trial was planted in a field with history of Sclerotinia stem rot. The experimental design was a randomized complete block with six 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 a fungicide treatment (Endura and Priaxor) and/or a compost amendment (CX-1). Compost treatments were mixed with Activator; a dry soluble humate and kelp formula. Pesticides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Some treatments were applied in-furrow at plant (13 May) with equipment calibrated to deliver 5 GPA at 18 psi. Pesticides were applied at plant, V3 (18 Jun), R1 (16 Jul), and R3 (29 Jul). Other applications were at plant, V3, and R3 or growth stages R1 and R3. Sclerotinia stem rot incidence and severity was rated at R6 on 11 Sep. Disease index (DIX) was calculated by first determining the Sclerotinia stem rot severity index score. 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 then averaged for the plot. Next, disease incidence was scored as percentage of symptomatic plants relative to the total stand. The DI and DSI were then combined to calculate the DIX where DIX=DI*(Average DSI/3). 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).

Average to above average temperatures with adequate precipitation were observed throughout the growing season, however low levels of disease pressure was seen in this trial. No significant differences were observed for Sclerotinia stem rot incidence, DSI, DIX, and yield among all treatments. Phytotoxicity was not observed for any treatment.

**Table 8.** Sclerotinia stem rot disease incidence, Sclerotinia stem rot disease severity index (DSI), DIX, and yield for soybean treated with fungicide and/or a compost amendment, or not treated in Wausau, Wisconsin, 2020

| **Treatment and rate/acre** (crop stage at application)[z] | **Disease Incidence** (%)[z] | **Sclerotinia Stem Rot DSI** (0-100)[y] | **DIX**[x] | **Yield** (bu/a) |
|---|---|---|---|---|
| Non-treated check | 8.1 | 29.3 | 6.9 | 59.5 |
| Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz (R3) | 5.9 | 24.8 | 4.9 | 62.0 |
| CX-1 5 gal (Infurrow + V3 + R3)[w] | 7.9 | 30.4 | 7.1 | 60.2 |
| CX-1 5 gal (Infurrow + V3)[w]<br>Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[w] | 5.9 | 22.4 | 5.0 | 60.7 |
| *P*-value | ns[v] | ns | ns | ns |

[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]DIX=DI*(Average DSI/3).

[w]Activator (a dry soluble humate and kelp formula) at 50.5 g/a was added to treatments.

[v]ns = not significant (α=0.05).

## Trial 10: Evaluation of foliar fungicide treatments and liquid compost (CX-1) for control of Frogeye leaf spot of soybean in Lancaster, Wisconsin, 2020

The trial was established at the Lancaster Agricultural Research Station located in Lancaster, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 7 May in a field with a Fayette silt loam (6 to 12 % slopes). The experimental design was a randomized complete block with five 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 a fungicide treatment (Endura and Priaxor) and/or a compost amendment (CX-1). Compost treatments were mixed with Activator; a dry soluble humate and kelp formula. Pesticides were applied using a CO2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles calibrated to deliver 20 GPA at 30 psi. Some treatments were applied in-furrow at plant (7 May) with equipment calibrated to deliver 5 GPA at 18 psi. Pesticides were applied at plant, V3 (18 Jun), R1 (9 Jul), and R3 (23 Jul). Other applications were applied at plant, V3, and R3 or growth stages R1 and R3. Frogeye leaf spot were rated at R6 (3 Sep). Frogeye leaf spot was visually assessed by estimating average severity (% trifoliate with symptoms) on 5 upper trifoliates per plot with the aid of a standardized area diagram. 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).

Average to above average temperatures with drier conditions were observed later in the growing season. Low disease pressure was observed in this trial. No significant differences were observed for Frogeye leaf spot among all treatments. Yield was significant affected by treatment, but no treatment was different from the non-treated control. Phytotoxicity was not observed for any treatment.

**Table 9.** Frogeye leaf spot and yield for soybean treated with fungicide and/or a compost amendment, or not treated with fungicide in Wisconsin, 2020.

| **Treatment and rate/acre** (crop stage at application)[z] | **Frogeye leaf spot** (%)[z] | **Yield** (bu/a) |
|---|---|---|
| Non-treated check | 0.4 | 78.88 ab |
| Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz (R3) | 0.04 | 81.84 a |
| CX-1 5 gal (Infurrow + V3 + R3)[w] | 0.38 | 76.58 b |
| CX-1 5 gal (Infurrow + V3)[w]<br>Endura 70 WDG 6.0 oz (R1)<br>Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[w] | 0.08 | 83.66 ab |
| *P*-value | ns[x] | <0.05[w] |

[z] Frogeye leaf spot was visually assessed by estimating average severity (% trifoliate with symptoms) on 5 upper trifoliates per plot with the aid of a standardized area diagram.
[y] Activator (a dry soluble humate and kelp formula) at 50.5 g/a was added to treatments.
[x] ns = not significant (α=0.05).
[w] 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 'Kaskaskia' wheat in Wisconsin, 2020

**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 16 Oct 2019 in a field with Plano silt loam (0 to 2% slopes) and Joy silt loam (0-4% slopes) soil. 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 11 fungicide treatments. Some fungicide treatments were mixed with the non-ionic surfactant, Induce 90SL, at 0.125% v/v. Fungicides were applied using a CO2 pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 25 psi. Fungicides were applied at anthesis (Feekes 10.5.1) on 7 Jun, five days after anthesis had begun (5 days post-Feekes 10.5.1) on 12 Jun, or using a two-spray program with the first spray occurring at jointing (Feekes 6) on 21 May and the second spray applied at anthesis . Plots were infested with 50 lbs/A of *F. graminearum*-colonized corn grain on 25 May and 5 Jun. Plots were over-head irrigated daily with a linear irrigation system delivering 0.1 in. of water during the 10.5.1 growth stage to facilitate disease development. 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. FHB Index was calculated by multiplying % disease incidence (DI) by % disease severity (DS) divided by 100 (FHB Index=DI x DS/100). 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 average to above average for the growing region with adequate precipitation. Moderate levels of Fusarium head blight were observed in this trial as overhead irrigation and rainfall promoted inoculum dispersal and infection. All fungicide treatments had a significantly lower FHB Index compared to the non-treated check. All treatments resulted in a significant reduction in DON compared to the non-treated check, except Prosaro (6.5 fl oz) at Feekes 10.5.1 and Prosaro (8.2 fl oz) at 5 days post-10.5.1 and Sphaerex at 5 days post-10.5.1. Applications of Trivapro at Feekes 6 followed by Miravis Ace at Feekes 10.5.1, Tilt at Feekes 6 followed by Miravis Ace at Feekes 10.5.1, Miravis Ace at 10.5.1, and Miravis Ace applied 5 days post-10.5.1 had significantly higher test weight compared to not treating. Trivapro applied at Feekes 6 followed by Miravis Ace at Feekes 10.5.1 and Tilt applied at Feekes 6 followed by Miravis Ace at Feekes 10.5.1 resulted in significantly higher yield compared to the non-treated check. Phytotoxicity was not observed for any treatment.

**Table 10.** Fusarium head blight (FHB) disease index, deoxynivalenol (DON), test weight, and yield for the soft red winter wheat variety 'Kaskaskia' treated with fungicide or not treated with fungicide in Wisconsin, 2020.

| **Treatment** (rate/acre) | **Growth stage at application** (Feekes) | **FHB Disease Index** (%)[y,x] | **DON** (ppm)[x] | **Test Weight** (lbs/a)[x] | **Yield** (bu/a)[x] |
|---|---|---|---|---|---|
| Non-treated check | | 10.8 a | 1.2 a | 58.6 d | 73.0 c |
| Trivapro 2.21EC, 9.4 fl oz<br>Miravis Ace 5.2SC, 13.7 fl oz[z] | 6 fb 10.5.1 | 1.3 c | 0.7 c-e | 59.3 ab | 81.4 ab |
| Tilt 4.0, 3.6EC fl oz<br>Miravis Ace 5.2SC, 13.7 fl oz[z] | 6 fb 10.5.1 | 1.1 c | 0.7 de | 59.6 a | 85.3 a |
| Miravis Ace 5.2SC, 13.7 fl oz[z] | 10.5.1 | 1.5 c | 0.9 b-d | 59.1 a-c | 79.5 a-c |
| Prosaro 421SC, 8.2 fl oz[z] | 10.5.1 | 1.0 c | 0.6 e | 58.7 cd | 75.2 bc |
| Experimental 1, 10.3 fl oz[z] | 10.5.1 | 1.4 c | 0.7 c-e | 58.8 b-d | 73.8 c |
| Prosaro 421SC, 6.5 fl oz[z] | 10.5.1 | 3.4 b | 1.0 a-c | 58.3 d | 75.9 bc |
| Sphaerex, 7.3 fl oz[z] | 10.5.1 | 1.4 c | 0.6 e | 58.7 cd | 77.4 bc |
| Miravis Ace 5.2SC, 13.7 fl oz[z] | 5 days post-10.5.1 | 1.7 c | 0.7 c-e | 59.5 a | 77.0 bc |
| Prosaro 421SC, 8.2 fl oz[z] | 5 days post-10.5.1 | 1.1 c | 1.0 a-d | 58.7 cd | 75.3 bc |
| Experimental 1, 10.3 fl oz[z] | 5 days post-10.5.1 | 1.9 c | 0.7 c-e | 58.7 cd | 79.0 a-c |
| Sphaerex, 7.3 fl oz[z] | 5 days post-10.5.1 | 1.2 c | 1.1 ab | 58.7 cd | 77.0 bc |
| *P*-value | | <0.01 | <0.01 | <0.01 | <0.05 |

[z]Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to all fungicide treatments, fb = followed by.

[y]FHB Index was calculated by multiplying % disease incidence (DI) by % disease severity (DS) divided by 100 (FHB Index=DI x DS/100).

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

## Trial 12: Evaluation of foliar fungicides for control of Fusarium head blight of 'Harpoon' wheat in Wisconsin, 2020

**WHEAT, SOFT WINTER:** *Triticum aestivum* 'Harpoon' **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 'Harpoon' was chosen for this study. Wheat was planted on 16 Oct 2019 in a field with Plano silt loam (0 to 2% slopes) and Joy silt loam (0-4% slopes) soil. 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 11 fungicide treatments. Some fungicide treatments were mixed with the non-ionic surfactant, Induce 90SL, at 0.125% v/v. Fungicides were applied using a CO2 pressurized backpack sprayer equipped with TTJ60-11002 Turbo TwinJet flat fan nozzles calibrated to deliver 20 GPA at 25 psi. Fungicides were applied at anthesis (Feekes 10.5.1) on 7 Jun, five days after anthesis had begun (5 days post-10.5.1) on 12 Jun, or using a two-spray program with the first spray occurring at jointing (Feekes 6) on 21 May and the second spray applied at anthesis. Plots were infested with 50 lbs/A of F. graminearum-colonized corn grain on 25 May and 5 Jun. Plots were over-head irrigated daily with a linear irrigation system delivering 0.1 in. of water during the 10.5.1 growth stage to facilitate disease development. 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. FHB Index was calculated by multiplying % disease incidence (DI) by % disease severity (DS) divided by 100 (FHB Index=DI x DS/100). 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 average to above average for the growing region with adequate precipitation. Conditions for Fusarium head blight infection were favorable, however an FHB-resistant cultivar was used, and no visible FHB symptoms were observed, with DON levels very low in this trial. There were no significant differences among treatments for FHB Disease Index, DON, and yield. Phytotoxicity was not observed for any treatment.

**Table 11.** Fusarium head blight (FHB) disease index, deoxynivalenol (DON), test weight, and yield for soft red winter wheat variety 'Harpoon' treated with fungicide or not treated with fungicide in Wisconsin, 2020.

| **Treatment** (rate/acre) | **Growth stage at application** (Feekes) | **FHB Disease Index** (%)[y] | **DON** (ppm) | **Test Weight** (lbs/a) | **Yield** (bu/a) |
|---|---|---|---|---|---|
| Non-treated check | - | 0.0 | 0.3 | 56.5 | 80.1 |
| Trivapro 2.21EC, 9.4 fl oz<br>Miravis Ace 5.2SC, 13.7 fl oz[z] | 6 fb 10.5.1 | 0.0 | 0.2 | 57.1 | 84.7 |
| Tilt 3.6EC, 4.0 fl oz<br>Miravis Ace 5.2SC, 13.7 fl oz[z] | 6 fb 10.5.1 | 0.0 | 0.3 | 57.4 | 81.2 |
| Miravis Ace 5.2SC, 13.7 fl oz[z] | 10.5.1 | 0.0 | 0.2 | 57.4 | 85.4 |
| Prosaro 421SC, 8.2 fl oz[z] | 10.5.1 | 0.0 | 0.2 | 56.0 | 75.7 |
| Experimental 1, 10.3 fl oz[z] | 10.5.1 | 0.0 | 0.1 | 56.3 | 79.4 |
| Prosaro 421SC, 6.5 fl oz[z] | 10.5.1 | 0.0 | 0.2 | 56.8 | 82.9 |
| Sphaerex, 7.3 fl oz[z] | 10.5.1 | 0.0 | 0.1 | 56.4 | 86.4 |
| Miravis Ace 5.2SC, 13.7 fl oz[z] | 5 days post-10.5.1 | 0.0 | 0.1 | 46.1 | 67.5 |
| Prosaro 421SC, 8.2 fl oz[z] | 5 days post-10.5.1 | 0.0 | 0.2 | 57.1 | 84.5 |
| Experimental 1, 10.3 fl oz[z] | 5 days post-10.5.1 | 0.0 | 0.2 | 57.1 | 84.8 |
| Sphaerex, 7.3 fl oz[z] | 5 days post-10.5.1 | 0.0 | 0.1 | 56.5 | 78.4 |
| *P*-value | | ns[x] | ns | ns | ns |

[z]Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to all fungicide treatments, fb = followed by.
[y]FHB Index was calculated by multiplying % disease incidence (DI) by % disease severity (DS) divided by 100 (FHB Index=DI x DS/100).
[x]ns = not significant (α=0.05).