2021 Wisconsin Field Crops Pathology Fungicide Test and Disease Management Summary

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Trial 1: Evaluation of in-furrow and foliar fungicides for control of tar spot of dent corn in Arlington, Wisconsin, 2021

DENT CORN (*Zea mays* 'CP3899VT2P/RIB') Tar spot: *Phyllachora maydis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'CP3899VT2P/RIB' was chosen for this trial. Soybean preceded this crop. Corn was planted into tilled ground (29 Apr) in a field consisting of a Plano silt loam soil (0 to 6% slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated check and eight fungicide treatments. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles on a 10-ft boom calibrated to deliver 20 GPA at 40 psi. One treatment was applied by conventional in-furrow at planting (29 Apr) and this equipment was calibrated to deliver 5 GPA at 18 psi. The other treatments were applied at growth stages V12 (16 Jul), and VT (22 Jul). Natural sources of pathogen inoculum were relied upon for disease. Plots were overhead 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. Greening was rated by assessing percent green foliage at R5 (8 Sep) growth stage. Tar spot severity were rated on 8 Aug, 26 Aug, and 7 Sep. Tar spot was visually assessed by estimating average severity (% ear leaf with symptoms) per plot with the aid of standardized area diagrams. Disease ratings were used to calculate area under disease progress curve (AUDPC). 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).

This trial experienced drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the spread of tar spot. All treatments had significantly higher canopy greening compared to the non-treated control except Xyway applied at plant (Table 1). All fungicide treatments resulted in significantly lower tar spot intensity compared to the non-treated check with Veltyma applied at VT having the lowest AUDPC score. There were no differences in yield among all treatments. Phytotoxicity was not observed for any treatment.

Table 1. Canopy greening, tar spot AUDPC, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2021.

Treatment and rate/A (growth stage at application)	Canopy Greening (%)[z,y]	Tar Spot AUDPC[x,y]	Yield (bu/A)
Non-treated check	31.3 c	321.6 a	247.8
Veltyma 3.34S 7.0 fl oz (VT)[w]	51.3 a	45.7 d	266.2
Xyway LFR 15.2 fl oz (In-furrow at plant)	38.8 bc	166.0 b	265.7
Miravis Neo 2.5SE 13.7 fl oz (VT)[w]	55.0 a	83.0 c	261.1
Trivapro 2.21SC 13.7 FL OZ/A (VT)[w]	46.3 ab	90.4 c	253.5
Delaro Complete 3.83SC 8.0 FL OZ/A (VT)[w]	56.3 a	75.8 cd	253.1
Lucento 4.17SC 5.0 FL OZ/A (VT)[w]	51.3 a	92.7 c	269.2
Miravis Neo 2.5SE 13.7 FL OZ/A (V12)	56.3 a	102.2 c	265.8
Veltyma 3.34S 7.0 FL OZ/A (V12)	56.3 a	46.9 d	260.0
P-value	<0.01	<0.01	ns[v]

[z]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer.
[y]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[x]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. Disease ratings were used to calculate area under disease progress curve (AUDPC).
[w]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to fungicide treatments.
[v]ns = not significant (α=0.05).

Trial 2: Evaluation of foliar fungicides for control of tar spot of dent corn in Arlington, Wisconsin, 2021

DENT CORN (*Zea mays* 'Jung 54SS528')   Tar spot: *Phyllachora maydis*

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 planted into tilled ground on 29 Apr in a field consisting of a Plano silt loam soil (0 to 6% slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated check and eight fungicide treatments. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles on a 10-ft boom calibrated to deliver 20 GPA at 40 psi. Treatments were applied at growth stages V5 (18 Jun), V12 (16 Jul), and R1 (22 Jul). Natural sources of pathogen inoculum were relied upon for disease. Plots were overhead 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. Greening was rated by assessing percent green foliage at R5 growth stage. Tar spot severity were rated on 10 Aug, 26 Aug, 7 Sep, and 16 Sep. Tar spot was visually assessed by estimating average severity (% ear leaf with symptoms) per plot with the aid of standardized area diagrams. Disease ratings were used to calculate area under disease progress curve (AUDPC). 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).

This trial experienced drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the infection and spread of tar spot. All fungicide treatments had significantly higher canopy greening compared to the non-treated check except Delaro Complete applied at V5 and Miravis Neo at V12 (Table 2). Similarly, all fungicide applications resulted in significantly lower tar spot AUDPC values and yield compared to the non-treated check except Delaro Complete at V5. Phytotoxicity was not observed for any treatment.

Table 2. Canopy greening, tar spot AUDPC, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2021.

Treatment and rate/A (growth stage at application)	Canopy Greening (%)[z,y]	Tar Spot AUDPC[x,y]	Yield (bu/A)[y]
Non-treated check	21.3 d	608.3 a	258.3 c
Delaro Complete 3.83SC 8.0 fl oz (V5)[w]	35.0 cd	437.3 a	250.6 c
Delaro Complete 3.83SC 8.0 fl oz (V12)	52.5 a-c	197.5 cd	285.2 ab
Delaro Complete 3.83SC 12.0 fl oz (V12)	42.5 bc	212.5 bc	272.7 b
Veltyma 3.34S 7.0 fl oz (V12)	42.5 bc	190.6 cd	292.3 a
Miravis Neo 2.5SE 13.0 fl oz (V12)	35.0 cd	247.6 bc	284.7 ab
Veltyma 3.34S 7.0 fl oz (R1)	55.0 ab	185.8 cd	287.4 ab
Delaro Complete 3.83SC 8.0 fl oz (R1)[w]	63.8 a	143.1 d	283.7 ab
Miravis Neo 2.5SE 13.0 fl oz (R1)	42.5 bc	282.3 bc	282.8 ab
P-value	<0.01	<0.01	<0.01[v]

[z]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer.
[y]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05).
[x]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. Disease ratings were used to calculate area under disease progress curve (AUDPC).
[w]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to fungicide treatments

Trial 3: Evaluation of in-furrow and foliar fungicides for control of tar spot of dent corn in Arlington, Wisconsin, 2021

DENT CORN (*Zea mays* 'CP3899VT2P/RIB') Tar spot: *Phyllachora maydis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The corn hybrid 'CP3899VT2P/RIB' was chosen for this trial. Soybean preceded this crop. Corn was planted into tilled ground (29 Apr) in a field consisting of a Plano silt loam soil (0 to 2% slopes) and Joy silt loam soil (0-4% slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard corn production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated check and 14 fungicide treatments. Foliar fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles on a 10-ft boom calibrated to deliver 20 GPA at 40 psi. At-plant equipment was calibrated to deliver 5 GPA at 18 psi. Some treatments were applied at-plant (29 Apr) and growth stages V10 (12 Jul), V12 (16 Jul), R1 (22 Jul), or R3 (5 Aug). One treatment was applied at V10 (12 Jul) and R2 (30 Jul) with guidance of the Tarspotter smartphone application. Natural sources of pathogen inoculum were relied upon for disease. Plots were overhead 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 12 Aug, 26 Aug, and 7 Sep. Tar spot was visually assessed by estimating average severity (% ear leaf with symptoms) per plot with the aid of standardized area diagrams. Disease ratings were used to calculate the area under disease progress curve (AUDPC). 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).

This trial experienced drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the infection and spread of tar spot. Applications of Xyway at plant followed by Topguard EQ at V10, Xyway at plant followed by Topguard EQ at R1, and Xyway at plant were not significantly different from the non-treated control in canopy greening (Table 3). Xyway applied at plant resulted in no significant differences in tar spot AUDPC and yield compared to the non-treated control, all other treatments had significantly lower AUDPC values and higher yields than not treating. Veltyma applied at V10 and R2 using Tarspotter application guidance had a significantly lower AUDPC values compared to all treatments. Veltyma applied at R1 had the highest yield among treatments. Phytotoxicity was not observed for any treatment.

Table 3. Canopy greening, tar spot AUDPC, and yield for dent corn treated with fungicide or not treated with fungicide in Wisconsin in 2021.

Treatment and rate/A (growth stage at application)	Canopy Greening (%)[z,y]	Tar Spot AUDPC[x,y]	Yield (bu/A)[y]
Non-treated check	24.9 f	302.6 a	257.4 e
Xyway LFR 10.5 fl oz (In-furrow at plant) / Topguard EQ 4.29SC 5.0 fl oz (V10)	29.6 ef	185.9 bc	273.5 cd
Xyway LFR 10.5 FL OZ/A (In-furrow at plant) / Topguard EQ 4.29SC 5.0 fl oz (R1)	31.0 d-f	153.9 b-d	281.1 a-d
Xyway LFR 10.5 fl oz (In-furrow at plant) / Topguard EQ 4.29SC 5.0 fl oz (R3)	37.2 b-e	183.0 bc	274.5 cd
Xyway LFR 15.2 fl oz (In-furrow at plant)/ Trivapro 2.21SC 13.7 fl oz (R1)	38.2 b-e	111.7 de	281.0 a-d
Xyway LFR 15.2 fl oz (In-furrow at plant)	30.5 d-f	217.3 ab	268.9 de
Veltyma 3.34S 7.0 fl oz (R1)	59.1 a	46.2 f	293.7 a
Lucento 4.17SC 5.0 fl oz (R1)	42.2 a-d	134.7 c-e	274.0 cd
Topguard EQ 4.29SC 5.0 fl oz (R1)	35.6 c-e	140.9 b-e	273.9 cd
Miravis Neo 2.5SE 13.7 fl oz (V12)	43.8 a-c	106.4 de	282.5 a-c
Trivapro 2.21SC 13.7 fl oz (R1)[w]	44.7 a-c	146.3 b-d	283.7 a-c
Miravis Neo 2.5SE 13.7 fl oz (R1)[w]	45.2 a-c	113.2 de	287.1 a-c
Miravis Neo 2.5SE 13.7 fl oz (R3)[w]	50.9 ab	91.0 e	283.3 a-c
Delaro Complete 3.83SC 8.0 fl oz (R1)[v]	48.3 a-c	54.9 f	275.4 cd
Veltyma 3.34S 7.0 fl oz (Model)[u]	54.7 a	26.1 g	285.6 a-c
P-value	<0.01	<0.01	<0.01

[z]Greening effect determined by rating the percentage green foliage still present in each plot at early black layer. [y]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05). [x]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. Disease ratings were used to calculate area under disease progress curve (AUDPC). [w]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to fungicide treatments [v]Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to fungicide treatments [u]Model application sprays were determined using the Tarspotter smartphone application which recommended applications at V10 and again at R2.

Trial 4: Evaluation of planting populations for control of tar spot and ear rot on silage corn in Arlington, Wisconsin, 2021

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. Corn preceded this crop. Corn was planted on 27 April in a field consisting of Plano silt loam (0 to 2% slopes) and Joy silt loam soil (0 to 4% slopes). The experimental design was a randomized complete block with four replicates. Hybrid and planting population 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 two silage hybrids and three planting population treatments for each hybrid. Plots were infested at a rate of 50 lbs/A of *Fusarium graminearum*-colonized corn grain at VT/R1 (24 Jul). Plots were overhead irrigated every other day with a linear irrigation system delivering 0.1 in. of water for two weeks during the V12-R2 growth stages to encourage disease development. Tar spot and ear rot were rated at the late R5 growth stage (15 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 in the center two rows with the aid of a standardized area diagram. 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, forage quality total-tract neutral detergent fiber digestibility (TTNDFD), and milk production per ton of feed estimate (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).

This trial experienced drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the infection and spread of tar spot. Regardless of hybrid, there were no significant differences in tar spot severity, yield, TTNDFD, DON, and milk production among any treatments (Table 4). Seeding rates of 25,000 and 45,000 for B10B77SX had significantly lower ear rot severity compared to all other seeding rates. Hybrid B08J81AMXT yielded significantly higher than Hybrid B10B77SX. Phytotoxicity was not observed for any treatment.

Table 4. Tar spot severity, ear rot severity, yield, TTNDFD, deoxynivalenol (DON), and Milk for two silage corn hybrids with three planting populations in Wisconsin, 2021.

Hybrid	Planting Rate (seeds/A)	Tar spot Severity (%)[z,u]	Ear rot Severity (%)[y,u]	Yield (tons dry matter/A)[u]	TTNDFD (%)[x]	DON (ppm)[w]	Milk Production (tons/A)[v]
B10B77SX	25,000	32.3	0.5 b	4.2 b	46.3	0.9	3202
	35,000	31.5	1.0 a	4.9 b	46.3	2.1	3288
	45,000	31.5	0.7 b	5.0 b	47.6	1.6	3352
B08J81AMXT	25,000	47.5	2.1 a	7.1 a	37.0	1.1	3267
	35,000	42.5	1.5 a	7.9 a	37.3	2.2	3185
	45,000	37.5	1.2 a	8.1 a	37.9	0.6	3124
	P-value	ns[s]	<0.05	<0.05	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 with the aid of a standardized area diagram. [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 (standard) 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 for each hybrid based on Fisher's Least Significant Difference (LSD; α=0.05). [t]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v [s]ns = not significant (α=0.05)

Trial 5: Evaluation of foliar fungicides for control of tar spot and ear rot on silage corn in Arlington, Wisconsin, 2021

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. Corn preceded this crop. Corn was planted on 27 April in a field consisting of Plano silt loam (0 to 2% slopes) and Joy silt loam soil (0 to 4% 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 check and six fungicide treatments for each hybrid. Fungicides were applied using a CO_2-pressurized backpack sprayer equipped with 8002XR TurboJet flat fan nozzles on a 10-ft boom calibrated to deliver 20 GPA at 40 psi. Treatments were applied at growth stages V12 (22 Jun) and R1 (28 Jul) or R1 alone. Plots were infested at a rate of 50 lbs/A of *Fusarium graminearum*-colonized corn grain at VT (24 Jul). Plots were overhead irrigated every other day with a linear irrigation system delivering 0.1 in. of water for two weeks during the V12-R2 growth stages to encourage disease development. Tar spot and ear rot were rated at the late R5 growth stage (15 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 in the center two rows with the aid of a standardized area diagram. 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, forage quality total-tract neutral detergent fiber digestibility (TTNDFD), and milk production per ton of feed estimate (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).

This trial had drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the infection and spread of tar spot. Applications of Headline AMP at R1, Miravis Neo at V12 followed by R1 for the B08J81AMXT hybrid and Miravis Neo applied at V12 followed by R1 and Proline at R1 for the B10B77SX hybrid significantly reduced tar spot severity compared to the non-treated checks (Table 5). Miravis Neo applied at R1, Miravis Neo applied at V12 followed by R1, and Miravis Neo at V12 had significantly lower yields compared to the non-treated check for the B08J81AMXT hybrid. Applications of Experimental 1 at R1, Miravis Neo at R1, and Miravis Neo at V12 followed by R1 had significantly lower yields than the non-treated check for the B10B77SX hybrid. Regardless of hybrid, there were no significant differences in ear rot severity, TTNDFD, DON, and milk production among any treatments. Phytotoxicity was not observed for any treatment.

Table 5. 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, 2021.

Hybrid	Treatment and rate/A (growth stage at application)	Tar spot Severity (%)[z,u]	Ear rot Severity (%)[y]	Yield (tons dry matter/A)[u]	TTNDFD (%)[x]	DON (ppm)[w]	Milk Production (tons/A)[v]
B08J81AMXT	Experimental 1 (R1)[t]	21.2 a	0.8	8.3 bc	42.1	0.5	3502
	Headline AMP 14.4 FL OZ/A (R1)[t]	12.5 b	0.2	11.3 a	41.4	1.0	3497
	Miravis Neo 13.7 FL OZ/A (R1)	16.4 ab	1.9	7.1 c	44.3	1.1	3496
	Miravis Neo 13.7 FL OZ/A (V12 + R1)	12.6 b	0.4	8.0 c	44.6	0.6	3601
	Miravis Neo 13.7 FL OZ/A (12)[t]	19.2 ab	0.4	7.6 c	44.5	0.5	3587
	Non-treated Check	22.7 a	0.0	10.0 ab	46.7	0.6	3634
	Proline 5.7 FL OZ/A (R1)[t]	16.5 ab	1.3	10.3 a	42.5	0.4	3530

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Hybrid	Treatment and rate/A (growth stage at application)	Tar spot Severity (%)[z,u]	Ear rot Severity (%)[y]	Yield (tons dry matter/A)[u]	TTNDFD (%)[x]	DON (ppm)[w]	Milk Production (tons/A)[v]
	Experimental 1 (R1)[t]	18.1 ab	4.0	5.6 cd	49.5	3.0	3452
	Headline AMP 14.4 FL OZ/A (R1)[t]	15.6 ac	1.2	7.1 a-c	53.0	1.9	3403
	Miravis Neo 13.7 FL OZ/A (R1)	22.6 a	4.8	5.1 d	53.2	0.7	3420
B10B77SX	Miravis Neo 13.7 FL OZ/A (V12 + R1)	10.8 c	2.4	5.9 b-d	53.2	0.7	3425
	Miravis Neo 13.7 FL OZ/A (12)[t]	16.2 c	3.7	5.5 cd	52.3	0.9	3516
	Non-treated Check	23.4 a	2.9	7.3 ab	52.2	2.2	3393
	Proline 5.7 FL OZ/A (R1)[t]	12.2 bc	3.4	8.3 a	51.9	2.4	3429
	P-value	<0.05	ns[s]	<0.05	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 with the aid of a standardized area diagram. [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 (standard) 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 for each hybrid based on Fisher's Least Significant Difference (LSD; α=0.05). [t]Treatments including the non-ionic surfactant Induce 90SL at 0.25 %v/v [s]ns = not significant (α=0.05)

Trial 6: Evaluation of foliar and in-furrow fungicides for control of tar spot and ear rot on silage corn in Arlington, Wisconsin, 2021

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. Corn preceded this crop. Corn was planted on 27 April in a field consisting of Plano silt loam (0 to 2% slopes) and Joy silt loam soil (0 to 4% 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 on a 10-ft boom calibrated to deliver 20 GPA at 40 psi. Some treatments were applied with conventional in-furrow at planting (27 Apr) with equipment calibrated to deliver 5 GPA at 18 psi. Other treatments were applied at the R1 (28 Jul) growth stage. Plots were infested at a rate of 50 lbs/A of *Fusarium graminearum*-colonized corn grain at VT (24 Jul). Plots were overhead irrigated every other day with a linear irrigation system delivering 0.25 in. of water for two weeks during the V12-R2 growth stages to encourage disease development. Tar spot and ear rot were rated at the R5 growth stage (15 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 in the center two rows with the aid of a standardized area diagram. 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, forage quality total-tract neutral detergent fiber digestibility (TTNDFD), and milk production per ton of feed estimate (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).

This trial had drier conditions earlier in the season, however, higher relative humidity and dew points later in the season promoted the infection and spread of tar spot. Experimental 1 applied at plant, Experimental 1 at plant followed by Proline at R1, Xyway at plant, and Xyway at plant followed by Proline at R1 resulted in significantly higher yields compared to the non-treated control for the B08J81AMXT and B10B77SX hybrids (Table 6). All treatments had significantly higher TTNDFD compared to the non-treated check except for Experimental 1 applied at plant and Experimental 1 at plant followed by Proline at R1 for the B08J81AMXT hybrid. Applications of Headline AMP at R1, Xyway at plant, and Xyway

at plant followed by Proline at R1 had significantly higher TTNDFD than the non-treated control for the B10B77SX hybrid. Headline AMP applied at R1, Xyway at plant, and Xyway at plant followed by Proline at R1 had no differences in DON levels to the non-treated control for the B08J81AMXT hybrid. All treatments had significantly lower DON levels compared to the non-treated check except for Headline AMP applied at R1 and Xyway at plant followed by Proline at R1 for B10B77SX hybrid. Regardless of hybrid, there were no significant differences in tar spot severity, ear rot severity, and milk production among all treatments. Phytotoxicity was not observed for any treatment.

Table 6. 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, 2021.

Hybrid	Treatment and rate/A (growth stage at application)	Tar Spot Severity (%)[z,t]	Ear Rot Severity (%)[y]	Yield (tons dry matter/A)[t]	TTNDFD (%)[x,s,t]	DON (ppm)[w,v,t]	Milk Production (tons/A)[u,t]
B08J81AMXT	Headline AMP 14.4 fl oz (R1)	22.1	1.75	7.5 d	41.6 a	0.9 c	3490
	Experimental 1 (In-furrow at plant)	33.0	0.75	10.2 ab	37.0 bc	3.8 a	3414
	Experimental 1 (In-furrow at plant) + Proline 5.7 fl oz (R1)	32.3	1.4	9.8 bc	36.9 bc	4.1 ab	3381
	Non-treated Check	29.0	5.4	8.7 cd	36.4 c	0.8 c	3410
	Proline 5.7 fl oz (R1)	26.6	0.75	8.3 cd	40.5 a	3.7 ab	3449
	Xyway 15.2 fl oz (In-furrow at plant)	25.6	0.5	10.6 ab	40.0 ab	0.7 c	3380
	Xyway 15.2 fl oz (In-furrow at plant) + Proline 5.7 fl oz (R1)	25.0	1.5	11.3 a	40.5 a	1.4 bc	3458
B10B77SX	Headline AMP 14.4 fl oz (R1)	31.0	4.3	4.8 b	52.6 ab	2.6 ab	3286
	Experimental 1 (In-furrow at plant)	31.0	5.05	6.9 a	48.8 c	1.7 b	3333
	Experimental 1 (In-furrow at plant) + Proline 5.7 fl oz (R1)	26.5	2.85	7.1 a	51.3 a-c	1.6 b	3211
	Non-treated Check	25.4	4.2	5.4 b	48.6 c	4.1 a	3444
	Proline 5.7 fl oz (R1)	21.2	1.85	5.4 b	49.7 bc	0.7 c	3399
	Xyway 15.2 fl oz (In-furrow at plant)	27.5	1.7	7.2 a	53.1 a	0.6 c	3323
	Xyway 15.2 fl oz (In-furrow at plant) + Proline 5.7 fl oz (R1)	22.5	3.75	7.4 a	52.4 ab	1.8 ab	3176
	P-value	ns	ns[s]	<0.05	<0.05	<0.05	ns

[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 with the aid of a standardized area diagram. [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 (standard) 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 for each hybrid based on Fisher's Least Significant Difference (LSD; α=0.05). [s]ns = not significant (α=0.05)

Trial 7: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Arlington, Wisconsin, 2021

SOYBEAN (*Glycine max* 'AG23XF0') Sclerotinia stem rot: *Sclerotinia sclerotiorum*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'AG23XF0' was chosen for this study. Soybeans were planted on 8 May in a field with a Joy silt loam (0 to 4 % slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 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 R1 (7 Jun) and R3 (23 Jul) or at both R1 and R3. Sclerotinia stem rot incidence and severity was rated at R5 on 18 Aug. Sclerotinia stem rot severity (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. 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).

Drier conditions during the flowering period led to very low levels of Sclerotinia stem rot. No treatments differed significantly from the non-treated control for disease incidence, DSI, and DIX with the exception of Miravis Neo applied at R3 (Table 7). No significant differences were observed for yield among all treatments. Phytotoxicity was not observed for any treatment.

Table 7. Sclerotinia stem rot disease incidence, Sclerotinia stem rot severity (DSI), Sclerotinia stem rot index (DIX), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment and rate/A (crop stage at application)[z]	Disease Incidence (%)[y,x]	Sclerotinia Stem Rot DSI (0-100)[w,x]	DIX[v,x]	Yield (bu/A)
Non-treated check	0.0 b	0.0 b	0.0 b	62.9
Miravis Neo 2.5SE 13.7 fl oz (R1+R3) +Endigo 2.06ZC 4.0 fl oz (R1 + R3)	0.0 b	0.0 b	0.0 b	64.8
Miravis Neo 2.5SE 13.7 fl oz (R3)	0.48 a	1.1 a	0.15 a	63.3
Miravis Neo 2.5SE 13.7 fl oz (R3) +Endigo 2.06ZC 4.0 fl oz (R3)	0.0 b	0.0 b	0.0 b	66.1
Miravis Top 1.67SC 13.7 fl oz (R3)	0.0 b	0.0 b	0.0 b	66.1
Topguard EQ 4.29SC 5.0 fl oz (R3)	0.0 b	0.0 b	0.0 b	64.7
Lucento 4.17SC 5.0 fl oz (R3)	0.0 b	0.0 b	0.0 b	63.8
Revytek 3.33LC 8.0 fl oz (R3)	0.0 b	0.0 b	0.0 b	63.6
Delaro Complete 3.83SC 8.0 fl oz (R3)	0.0 b	0.0 b	0.0 b	61.7
Proline 480SC 3 fl oz (R3)	0.0 b	0.0 b	0.0 b	60.8
P-value	<0.01	<0.01	<0.01	ns[t]

[z]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to all fungicide treatments [y]Percentage of symptomatic plants relative to the total stand. [x]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05). [w]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. [v]DIX=DI*(Average DSI/3) [u]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to all fungicide treatment [t]ns = not significant (α=0.05).

Trial 8: Evaluation of an herbicide and fungicides for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2021

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 21 May in a field with a Sparta loamy 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 13 fungicide or herbicide 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. Another treatment was applied with the same nozzles placed on a double swivel-drop line body angled up towards flowers. Pesticides were applied at the R1 (7 Jun), R2, and R3 (22 Jul) or both R1 and R3 growth stages. One treatment was

applied at R3 based on guidance from the Sporecaster smartphone application. Sclerotinia stem rot incidence and severity were rated at R6 (2 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. 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).

Applications of Endura applied at R1 + R3, Endura at R3, Omega at R3 with swivel body drop nozzles, Cobra applied at R1 followed by Domark at R3, Nanostress at R1 followed by Endura at R3, and Endura applied at R3 using the Sporecaster app significantly reduced Sclerotinia stem rot incidence and DSI compared to the non-treated check (Table 8). All treatments had significantly lower DIX compared to not treating except Omega applied at R1 followed by Miravis Neo at R3, Delaro complete at R2, Miravis Neo at R2, Experimental 1 at R2, and NanoStress applied at R1. There were no significant differences in yield among all 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 8. Sclerotinia stem rot disease incidence, Sclerotinia stem rot severity (DSI), Sclerotinia stem rot index (DIX), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment and rate/A (crop stage at application)	Disease Incidence (%)[z,y]	Sclerotinia Stem Rot DSI (0-100)[x,y]	DIX[w,y]	Yield (bu/A)
Non-Treated Check	35.3 a	76.7 a	32.5 a	63.9
Endura 70WDG 8.0 oz (R1+R3)[v]	1.2 e	8.5 d	1.1 e	56.1
Endura 70WDG 8.0 oz (R3)[v]	3.7 b-e	16.0 b-d	3.1 b-e	63.6
Omega 500F 16.0 oz (R3)[v,u]	3.2 c-e	17.4 b-d	2.7 c-e	63.6
Cobra 2.0EC 6.0 fl oz (R1)	7.6 a-d	31.9 a-c	6.1 b-d	58.5
Cobra 2.0EC 6.0 fl oz (R1) Domark 230ME, 5.0 fl oz (R3)[v]	2.0 de	11.4 cd	1.5 de	55.5
Omega 500F 16.0 oz (R1)[v] Miravis Neo 2.5SE 13.7 fl oz (R3)[v]	9.1 a-d	39.2 ab	8.0 a-c	60.8
Delaro Complete 3.83SC 8.0 fl oz (R2)[v]	13.1 a-c	48.1 ab	11.6 a-c	61.9
Propulse 3.34SC 6 fl oz (R1)[v] Delaro Complete 3.83SC 8.0 fl oz (R3)[v]	7.9 a-d	22.8 a-d	5.6 b-d	61.9
Miravis Neo 2.5SE 13.7 fl oz (R2)[v]	9.1 a-d	39.3 ab	7.7 a-c	59.8
Experimental 1 2.5SE 13.7 fl oz (R2)[v]	11.8 a-c	44.4 ab	11.2 a-c	62.0
NanoStress SC 6 fl oz (R1)[v]	15.8 ab	51.2 ab	14.6 ab	55.9
NanoStress SC 6 fl oz (R1)[v] Endura 70WDG 8.0 oz (R3)[v]	4.5 b-e	15.9 b-d	2.8 c-e	64.5
Endura 70WDG 8.0 oz (Model)[v,t]	1.1 e	7.7 d	1.0 e	59.5
P-value	<0.01	<0.01	<0.01	ns[s]

[z]Percentage of symptomatic plants relative to the total stand. [y]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05). [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]DIX=DI*(Average DSI/3) [v]Induce 90% SL (Non-ionic surfactant) at 0.25% v/v was added to fungicide treatments [u] Double swivel-drop nozzles were used to apply treatments at 20 GPA. [t]Model application sprays were determined using the Sporecaster smartphone application. [s]ns = not significant (α=0.05).

Trial 9: Evaluation of foliar fungicide treatments for control of Sclerotinia stem rot of soybean in Hancock, Wisconsin, 2021

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 21 May in a field with a Sparta loamy 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 six 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 R1 (8 Jun) and R3 (21 Jul) or at both R1 and R3. Sclerotinia stem rot incidence and severity were rated at R6 on 2 Sep. Sclerotinia stem rot severity (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. 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 history of severe Sclerotinia stem rot, conditions were favorable for disease development, and pressure was high in this trial. However, no significant differences were observed for Sclerotinia stem rot incidence, DSI, DIX, and yield among all treatments (Table 9). Phytotoxicity was not observed for any treatment.

Table 9. Sclerotinia stem rot disease incidence, Sclerotinia stem rot severity (DSI), Sclerotinia stem rot index (DIX), and yield for soybean treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment and rate/A (crop stage at application)	Disease Incidence (%)[z]	Sclerotinia Stem Rot DSI (0-100)[y]	DIX[x]	Yield (bu/A)
Non-treated check	21.9	69.2	21.6	54.9
Affiance 1.5SC, 10.0 fl oz (R1)	14.1	53.8	14.1	47.7
Domark 230ME, 5.0 fl oz (R1)	21.2	59.1	21.2	51.6
Affiance 1.5SC, 10.0 fl oz (R3)	10.4	34.3	9.9	50.2
Domark 230ME, 5.0 fl oz (R3)	8.3	32.1	7.1	45.9
Affiance 1.5SC, 10.0 fl oz (R1) Domark 230ME, 5.0 fl oz (R3)	5.0	27.7	4.7	43.3
Domark 230ME, 5.0 fl oz (R1) Affiance 1.5SC, 10.0 fl oz (R3)	11.1	38.2	10.8	50.8
P-value	ns[w]	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] ns = not significant (α=0.05).

Trial 10: Evaluation of fertilizer, seeding rate, herbicide, and fungicide treatments for control of Sclerotinia stem rot of soybean in Arlington, Wisconsin, 2021

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

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'AG20X7' was chosen for this study. Soybeans were planted on 8 May in a field with a Joy silt loam (0 to 4 % slopes). The experimental design was 2 x 2 x 4 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 implemented with or without fertilizer and two seeding rates each having three 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 (29 Jun), R2 (14 Jul) with guidance from the Sporecaster smartphone application, or R3 (22 Jul). Sclerotinia stem rot incidence and severity were rated at R6 (31 Aug). Disease index (DIX) was calculated by first determining the Sclerotinia stem rot severity score. Sclerotinia stem rot severity (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 and drier conditions for this growing region were observed during flowering. Very low levels of disease were observed (Table 10). Significant differences in DIX for fungicide treatments were observed only for soybeans seeded at 160,000 seeds/a and subjected to fertilizer at 150 lbs/a. Only Endura applied using the Sporecaster app or Cobra reduced DIX in this combination of treatments. No other differences in DIX were observed. No treatment had significant differences in yield when compared to the non-treated control, within each fertilizer and seeding rate combination. Only seeding rate influenced yield with the highest yields in plots seeded at 160,000 seeds/a. 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 10. Sclerotinia stem rot index (DIX) and yield for soybeans treated with fungicide, herbicide or not treated with fungicide on two seeding rates with or without fertilizer in Wisconsin, 2021.

Population (seeding rate/a)	Fertilizer (lbs/A)	Treatment and rate/A	DIX[z,y]	Yield (bu/A)[y]
100,000	None	Non-treated Check	0.2 a	64.0 a
		Endura 70WDG 8.0 oz (R3)	0.1 a	66.1 a
		Cobra 2.0EC 6.0 fl oz (V5)	0.1 a	68.8 a
		Endura 70WDG 8.0 oz (R2)[x]	0.2 a	65.3 a
100,000	150	Non-treated Check	0.2 a	68.0 a
		Endura 70WDG 8.0 oz (R3)	0.2 a	69.2 a
		Cobra 2.0EC 6.0 fl oz (V5)	0.2 a	66.4 a
		Endura 70WDG 8.0 oz (R2)[x]	0.3 a	68.6 a

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160,000	None	Non-treated Check	1.1 a	70.0 a
		Endura 70WDG 8.0 oz (R3)	0.6 a	70.6 a
		Cobra 2.0EC 6.0 fl oz (V5)	0.2 b	66.0 a
		Endura 70WDG 8.0 oz (R2)[x]	0.2 b	67.6 a
160,000	150	Non-Treated Check	0.1 a	69.1 a
		Endura 70WDG 8.0 oz (R3)	0.2 a	70.1 a
		Cobra 2.0EC 6.0 fl oz (V5)	0.2 a	71.0 a
		Endura 70WDG 8.0 oz (R2)[x]	0.1 a	70.1 a
P-value			<0.05	<0.05

[z]DIX=DI*(Average DSI/3) [y]Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference (LSD; α=0.05) within each seeding rate and fertilizer combination. [x]Model application sprays were determined using the Sporecaster smartphone application

Trial 11: Evaluation of foliar fungicide treatments for control of diseases of soybean in Arlington, Wisconsin, 2021

SOYBEAN (*Glycine max* 'AG23XF0')

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'AG23XF0' was chosen for this study. Soybeans were planted on 7 May in a field with a Joy silt loam (0 to 4 % slopes). The experimental design was a randomized complete block with four replicates. Plots consisted of four 30-in spaced rows, 20 ft long and 10 ft wide with 5-ft alleys between plots. Standard soybean production practices as described by the University of Wisconsin Cooperative Extension Service were followed. Treatments consisted of a non-treated control and 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 the growth stage R3 (23 Jul). 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).

No disease was observed for this trial due to hot and dry conditions. No significant differences were observed for yield among all treatments (Table 11). Phytotoxicity was not observed for any treatment.

Table 11. Yield for soybean treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment and rate/A (crop stage at application)	Yield (bu/A)
Non-treated check	73.8
NanoStress L 4 fl oz (R3)	75.2
NanoPak L 4 fl oz (R3)	74.0
NanoN L 4 fl oz (R3)	72.0
Miravis Neo 2.5SE 13.7 fl oz (R3)	75.2
Miravis Neo 2.5SE 13.7 fl oz (R3) NanoStress L 4 fl oz (R3)	78.2
Miravis Neo 2.5SE 13.7 fl oz (R3) NanoPak L 4 fl oz (R3)	75.6
Miravis Neo 2.5SE 13.7 fl oz (R3) NanoN L 4 fl oz (R3)	73.3
Miravis Neo 2.5SE 13.7 fl oz (R3) NanoPro L 4 fl oz (R3)	77.7
P-value	ns[z]

[z] ns = not significant (α=0.05).

Trial 12: Evaluation of foliar fungicide treatments and liquid compost (CX-1) for control of foliar diseases of soybean in Lancaster, Wisconsin, 2021

SOYBEAN: (*Glycine max* 'AG23XF0')

The trial was established at the Lancaster Agricultural Research Station located in Lancaster, WI. The soybean cultivar 'AG23XF0' was chosen for this study. Soybeans were planted on 11 May in a field with a Fayette silt loam (6 to 12 % slopes). 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 CO_2-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 (11 May) with equipment calibrated to deliver 5 GPA at 18 psi. Pesticides were applied at plant, V3 (17 Jun), R2 (16 Jul), and R3 (27 Jul). Other applications were at plant, V3, and R3 or growth stages R1 and R3. Root nodule counts were determined by counting nodules from 5 roots per plot and averaged. 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 counts 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).

No disease was observed for this trial due to hot and dry conditions. No significant differences were observed for root nodule counts and yield among all treatments (Table 12). Phytotoxicity was not observed for any treatment.

Table 12. Nodule counts and yield for soybean treated with fungicide and/or a compost amendment, or not treated in Lancaster, Wisconsin, 2021

Treatment and rate/A (crop stage at application)	Average Root Nodule Count[z]	Yield (bu/A)
Non-Treated Check	28.0	84.0
Endura 70 WDG 6.0 oz (R2) Priaxor 4.17 SC 4.0 fl oz (R3)	26.0	85.0
CX-1 5 gal (Infurrow + V3 + R3)[y]	24.0	83.0
CX-1 5 gal (Infurrow + V3)[y] Endura 70 WDG 6.0 oz (R2) Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[y]	25.0	82.0
P-value	ns[x]	ns

[z] Root nodule counts were determined by counting nodules from 5 roots per plot and averaged. [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).

Trial 13: Evaluation of foliar fungicide treatments and liquid compost (CX-1) for control of diseases of soybean in Arlington, Wisconsin, 2021

SOYBEAN: (*Glycine max* 'AG23XF0')

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soybean cultivar 'AG23XF0' was chosen for this study. Soybeans were planted on 7 May in a field with Plano silt loam and Joy silt loam (0 to 4 % slopes). 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 CO_2-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 (6 Jul), and R3 (23 Jul). Other applications were at plant, V3, and R3 or growth stages R1 and R3. Root nodule counts were determined by counting nodules from 5 roots per plot and averaged. 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 counts 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).

No disease was observed for this trial due to hot and dry conditions. No significant differences were observed for root nodule counts and yield among all treatments (Table 13). Phytotoxicity was not observed for any treatment.

Table 13. Nodule counts and yield for soybean treated with fungicide and/or a compost amendment, or not treated in Arlington, Wisconsin, 2021

Treatment and rate/A (crop stage at application)	Average Root Nodule Count[z]	Yield (bu/A)
Non-Treated Check	28.0	81.0
Endura 70 WDG 6.0 oz (R1) Priaxor 4.17 SC 4.0 fl oz (R3)	29.0	84.0
CX-1 5 gal (Infurrow + V3 + R3)[y]	31.0	78.0
CX-1 5 gal (Infurrow + V3)[y] Endura 70 WDG 6.0 oz (R1) Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[y]	36.0	80.0
P-value	ns[x]	ns

[z] Root nodule counts were determined by counting nodules from 5 roots per plot and averaged. [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).

Trial 14: Evaluation of in-furrow and foliar fungicide treatments for control of Sudden death syndrome of soybean in Brooklyn, Wisconsin, 2021

SOYBEAN (*Glycine max* 'AG23XF0') Sudden Death Syndrome (SDS): *Fusarium virguliforme*

The trial was established in Brooklyn, WI. The soybean cultivar 'AG23XF0' was chosen for this study. Soybeans were planted on 13 May in a field with a Hayfield silt loam (0-3 % slopes). 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 and three fungicide treatments. Some treatments were mixed with Activator; a dry soluble humate and kelp formula. Fungicides were applied using a CO_2-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. Fungicides were applied at plant, V3 (22 Jun), R1 (7 Jul), and R3 (27 Jul). Other applications were applied at plant, V3, and R3 or growth stages R1 and R3. Root nodules were counted at late R1 (15 Jul). Sudden death syndrome (SDS) was rated at R6 (8 Sep). Root nodule counts were determined by counting nodules from 5 roots per plot and averaged. SDS incidence (DI) was scored as a percentage of symptomatic plants relative to the total stand. Disease severity (DS) assessed % trifoliate with symptoms per plot using a rating scale (1-9). DI and DS were combined to calculate the Disease Index (DX). DX=DI*(DS/9). 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).

Moderate levels of disease were observed for this trial. However, no significant differences were observed for root nodule counts, SDS DX, and yield compared to the non-treated control (Table 14). Phytotoxicity was not observed for any treatment.

Table 14. Root nodule counts, SDS DX, and yield for soybean treated with fungicide and/or a compost amendment, or not treated in Arlington, Wisconsin, 2021

Treatment and rate/A (crop stage at application)	Average Root Nodule Count[z]	SDS DX (%)[y]	Yield (bu/A)
Non-Treated Check	20.6	47.2	65.4
Endura 70 WDG 6.0 oz (R1) Priaxor 4.17 SC 4.0 fl oz (R3)	19.7	31.5	69.0
CX-1 5 gal (Infurrow + V3 + R3)[x]	26.6	47.0	65.4
CX-1 5 gal (Infurrow + V3)[x] Endura 70 WDG 6.0 oz (R1) Priaxor 4.17 SC 4.0 fl oz + CX-1 5 gal (R3)[x]	23.0	31.0	70.6
P-value	ns[w]	ns	ns

[z] Root nodule counts were determined by counting nodules from 5 roots per plot and averaged.
[y] SDS DX. DX=DI*(DS/9).
[x] Activator (a dry soluble humate and kelp formula) at 50.5 g/a was added to treatments.
[w] ns = not significant (α=0.05).

Trial 15: Evaluation of foliar fungicides for control of Fusarium head blight of 'Kaskaskia' wheat in Wisconsin, 2021

WHEAT, SOFT WINTER (*Triticum aestivum* 'Kaskaskia')

Fusarium Head Blight: *Fusarium graminearum* Tan spot: *Pyrenophora tritici-repentis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soft red winter wheat cultivar 'Kaskaskia' was chosen for this study. Wheat was planted on 5 Oct 2020 in a field with Joy silt loam (0-4% slopes) soil. The experimental design was a randomized complete block with four 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 eight fungicide treatments. Some fungicide treatments were mixed with the non-ionic surfactant, Induce 90SL, at 0.125% 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 28 psi. Fungicides were applied at anthesis (Feekes 10.5.1) on 1 Jun, five days after anthesis had begun (5 days post-Feekes 10.5.1) on 4 Jun, or using a two-spray program with the first spray occurring at jointing (Feekes 6) on 4 May and the second spray applied at anthesis. Plots were infested with 25 lbs/A of *F. graminearum*-colonized corn grain on 18 May and 28 May. Plots were overhead irrigated daily with a linear irrigation system delivering 0.1 in. of water during the 10.5.1 growth stage to facilitate disease development. Tan spot was evaluated by visually estimating average severity (% flag leaf with symptoms) per plot with the aid of standardized area diagrams. Fusarium head blight (FHB) was evaluated by visually estimating average incidence (% plants with symptoms) and average severity (% area of heads with symptoms) per plot with the aid of standardized area diagrams. The 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 above average for the growing region with below average precipitation. Low levels of Fusarium head blight were observed in this trial (Table 15). All fungicide treatments had significantly lower tan spot severity and FHB Index compared to the non-treated check. All treatments resulted in a significant reduction in DON compared to the non-treated check, except for Trivapro applied at Feekes 6 followed by Miravis

Ace at Feekes 10.5.1 and Experimental 2 at Feekes 10.5.1. Applications of Trivapro applied at Feekes 6 followed by Miravis Ace at Feekes 10.5.1, Miravis Ace at Feekes 10.5.1 and 5 days post Feekes 10.5.1 had significantly higher test weight and yield compared to the non-treated check. Phytotoxicity was not observed for any treatment.

Table 15. Tan spot severity, Fusarium head blight (FHB) index, deoxynivalenol (DON) concentration, test weight, and yield for soft red winter wheat treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment, rate/A	Growth stage at application (Feekes)	Tan Spot Severity (%)[z,y]	FHB Index (%)[x,y]	DON (ppm)[y]	Test Weight (lbs/a)[y]	Yield (bu/a)[y]
Non-treated check	--	76.3 a	3.0 a	0.43 a	57.4 bc	70.5 d
Trivapro 2.21EC, 9.4 fl oz Miravis Ace 5.2SC, 13.7 fl oz[w]	6 fb 10.5.1	8.8 d	0.3 b	0.28 ab	58.6 a	92.4 a
Miravis Ace 5.2SC, 13.7 fl oz [w]	10.5.1	6.8 d	0.2 b	0.15 bc	58.7 a	82.5 b
Prosaro 421SC, 8.2 fl oz[w]	10.5.1	45.0 b	0.3 b	0.13 bc	57.2 c	74.9 b-d
Prosaro Pro 400SC, 10.3 fl oz[w]	10.5.1	38.8 bc	0.2 b	0.23 b	57.7 bc	75.3 b-d
Sphaerex 2.5SC 7.3 fl oz[w]	10.5.1	35.0 bc	0.2 b	0.05 c	57.5 bc	74.7 cd
Experimental 1 10.9 fl oz[w]	10.5.1	28.8 c	0.3 b	0.05 c	57.5 bc	76.2 b-d
Experimental 2 12.0 fl oz[w]	10.5.1	27.5 c	0.5 b	0.28 ab	57.9 b	73.6 cd
Miravis Ace 5.2SC, 13.7 fl oz[w]	5 days post-10.5.1	8.5 d	0.2 b	0.2 bc	58.9 a	78.7 bc
P-value		<0.01	<0.01	<0.01	<0.01	<0.01

[z]Tan spot severity was visually assessed as the average % flag leaf symptomatic per plot

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

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

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

Trial 16: Evaluation of foliar fungicides for control of Fusarium head blight of 'Harpoon' wheat in Wisconsin, 2021

WHEAT, SOFT WINTER (*Triticum aestivum* 'Harpoon')

Fusarium Head Blight: *Fusarium graminearum* Tan spot: *Pyrenophora tritici-repentis*

The trial was established at the Arlington Agricultural Research Station located in Arlington, WI. The soft red winter wheat cultivar 'Harpoon' was chosen for this study. Wheat was planted on 5 Oct 2020 in a field with Joy silt loam (0-4% slopes) soil. The experimental design was a randomized complete block with four 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 eight fungicide treatments. Some fungicide treatments were mixed with the non-ionic surfactant, Induce 90SL, at 0.125% 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 28 psi. Fungicides were applied at anthesis (Feekes 10.5.1) on 1 Jun, five days after anthesis had begun (5 days post-10.5.1) on 4 Jun, or using a two-spray program with the first spray occurring at jointing (Feekes 6) on 4 May and the second spray applied at anthesis. Plots were infested with 25 lbs/A of *F. graminearum*-colonized corn grain on 18 May and 28 May. Plots were overhead irrigated daily with a linear irrigation system delivering 0.1 in. of water during the 10.5.1 growth stage to facilitate disease development. Tan Spot was evaluated by visually estimating average severity (% flag leaf with symptoms) per plot with the aid of standardized area diagrams. Fusarium head blight (FHB) was evaluated by visually estimating average incidence (% plants with symptoms) and average severity (% area of heads with symptoms) per plot with the aid of standardized area diagrams. The 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 above average for the growing region with below average precipitation. Conditions for Fusarium head blight infection were not favorable, no visible FHB symptoms were observed, and DON levels were very low in this trial (Table 16). There were no significant differences among treatments for tan spot, FHB Index, DON, and yield. Miravis Ace applied at Feekes 10.5.1 and 5 days post 10.5.1 resulted in significantly higher test weight than the non-treated control. Phytotoxicity was not observed for any treatment.

Table 16. Tan spot severity, Fusarium head blight (FHB) index, deoxynivalenol (DON) concentration, test weight, and yield for soft red winter wheat treated with fungicide or not treated with fungicide in Wisconsin, 2021.

Treatment, rate/A	Growth stage at application (Feekes)	Tan Spot Severity (%)[z]	FHB Index (%)[y]	DON (ppm)	Test Weight (lbs/a)[x]	Yield (bu/a)
Non-treated check	--	8.5	0.0	0.1	54.9 cd	93.8
Trivapro 2.21EC, 9.4 fl oz Miravis Ace 5.2SC, 13.7 fl oz [w]	6 fb 10.5.1	1.0	0.0	0.1	55.3 a-c	94.7
Miravis Ace 5.2SC, 13.7 fl oz [w]	10.5.1	1.3	0.0	0.2	55.8 a	103.9
Prosaro 421SC, 8.2 fl oz [w]	10.5.1	4.8	0.0	0.0	54.6 d	94.4
Prosaro Pro 400SC, 10.3 fl oz [w]	10.5.1	4.1	0.0	0.0	54.9 cd	96.0
Sphaerex 2.5SC 7.3 fl oz [w]	10.5.1	2.9	0.0	0.1	54.9 cd	95.7
Experimental 2 10.9 fl oz [w]	10.5.1	4.8	0.0	0.1	55.1 c	101.3
Experimental 3 12.0 fl oz [w]	10.5.1	2.0	0.0	0.0	55.2 bc	98.0
Miravis Ace 5.2SC, 13.7 fl oz [w]	5 days post-10.5.1	3.0	0.0	0.1	55.6 ab	96.2
P-value		ns[v]	ns	ns	<0.01	ns

[z]Tan spot severity was visually assessed as the average % flag leaf symptomatic per plot [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) [w]Induce 90% SL (Non-ionic surfactant) at 0.125% v/v was added to all fungicide treatments, fb = followed by. [v]ns = not significant (α=0.05).