Applied Research in Field Crop Pathology for Indiana - 2023

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SUMMARY OF 2023 FIELD CROP DISEASE SEASON

CORN

In 2023, there was moderate disease on corn in Indiana across the state, details of major issues listed below. Gray leaf spot, northern corn leaf blight, northern corn leaf spot and southern rust were found in pockets. Tar spot and southern rust were two diseases that were closely monitored this season. In addition, at the conclusion of the season were numerous reports on issues with mycotoxins in corn. For more information about mycotoxins and resources available on management, storage, testing see the following resources:
https://cropprotectionnetwork.org/publications/mycotoxin-faqs

Tar spot:

Tar spot of corn was a concern due to previous epidemics. In 2023, moderate levels of tar spot occurred in northern Indiana and in pockets in other areas of the state. The environmental conditions are key in determining field risk year to year with favorable weather conditions of extended periods (30 days) of mild temperature 64-73°F and relative humidity under 90% over 2-3 week span increase tar spot disease development (Webster et al. CPN doi.org/10.31274/cpn-20231220-1). The fifth year of tar spot-directed research has been completed here in Indiana. As a cautionary note, it is still important to have multiple years of data for verification, but the initial results do serve as a good starting point for making future management decisions.

We continue to scout for tar spot across the state. One new county was confirmed with tar spot in 2023, making 87 counties total in Indiana to date. It is important to document tar spot movement in the state, so that when favorable conditions arise, increased tar spot disease risk can be more accurately assessed across the remainder of the state.

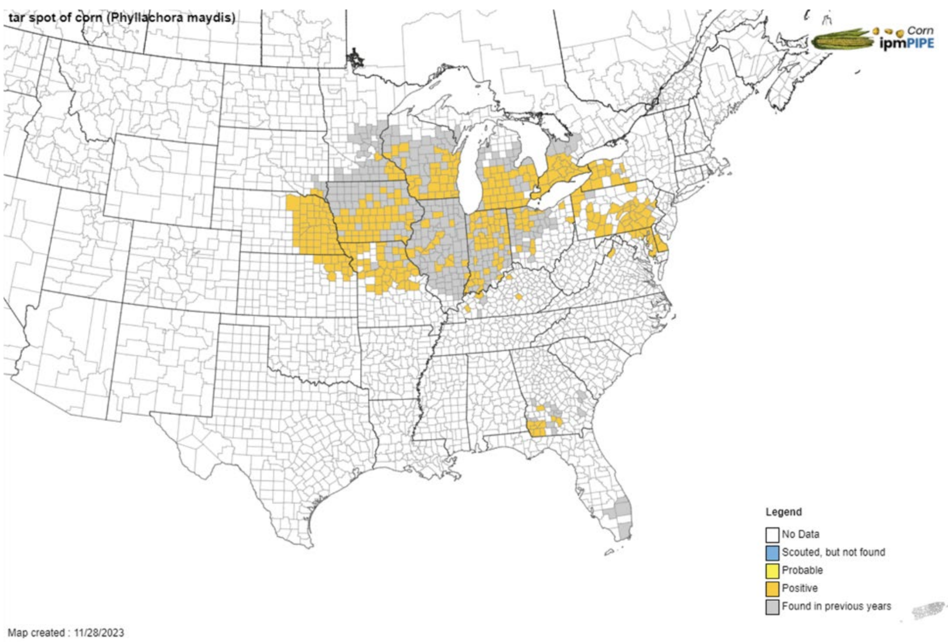

Figure 1. 2023 tar spot tracking across the United States and Canada. Yellow indicates a positive sample was collected from that county during the 2023 season, gray indicates that tar spot has been found previously. Image source: IPM Pipe https://corn.ipmpipe.org/tarspot/ on 11/28/2023.

SUMMARY OF 2023 FIELD CROP DISEASE SEASON

Southern corn rust:

Southern corn rust was first found in Indiana in the 2023 season on August 25, and by the end of the season, a total of 7 counties were confirmed to have the disease present (Fig 2.). Southern rust pustules generally tend to occur on the upper surface of the leaf and produce chlorotic symptoms on the underside of the leaf (Fig. 2). These pustules rupture the leaf surface and are orange to tan in color. They are circular to oval in shape. Common rust was also widespread and both diseases could be present on a leaf and easily mistaken for each other. It is important to send a sample to the Purdue Plant Pest Diagnostic Lab (PPDL) for confirmation if southern rust is suspected. There is an increased risk for yield impact if southern rust is identified early in the season.

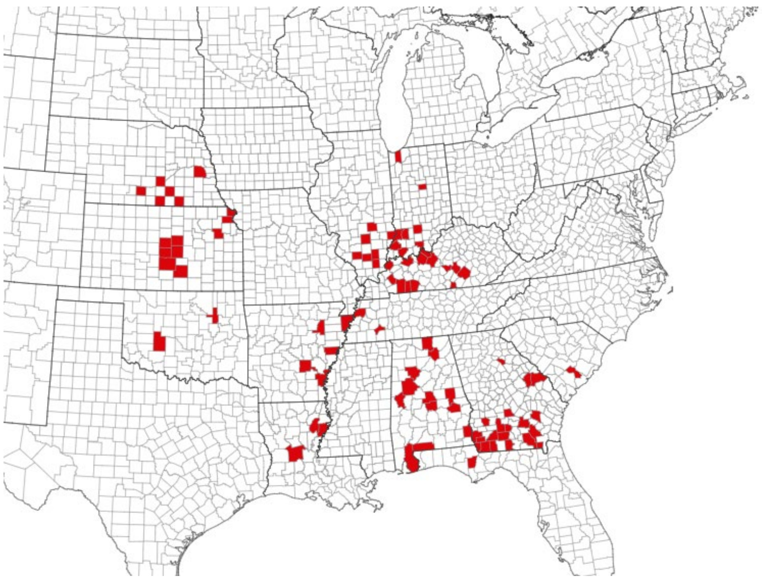
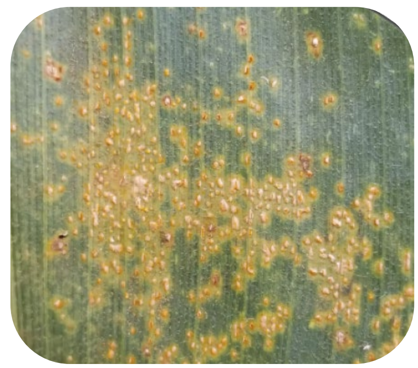

Figure 2. Southern corn rust map of confirmed (red) counties that had southern corn rust in 2023 and a corn leaf with southern rust infection. Photo credit: D. Telenko, Map source: https://corn.ipmpipe.org/southerncornrust/

SOYBEAN

Diseases in soybeans remained relatively low throughout the season for much of the state, except for areas with white mold. These areas experienced high levels of disease this season due to optiumum conditions for disease infection and development. Our research sites and sentinel plots across the state saw low levels of frogeye leaf spot, Cercospora leaf blight, and Septoria brown spot. There were also pockets where sudden death syndrome caused issues in fields and we had new reports of red crown rot which has now been confirmed in four counties (Adams, Decatur, Rush, and Spencer).

WHEAT

Fusarium head blight (FHB) or scab is one of the most impactful diseases of wheat and among most challenging to prevent. In addition, FHB infection can cause the production of a mycotoxin called deoxynivalenol (DON or vomitoxin). The conditions in 2023 were not conducive to FHB development. Our research sites in both West Lafayette and Vincennes had extremely low levels of FHB develop in our nontreated susceptible cultivar checks and little to no DON detected in our grain. Fusarium head blight management requires an integrated approach, including selection of cultivars with moderate resistance and timely fungicide application at flowering. Very few other diseases observed in our wheat trials.

CORN (*Zea mays* 'P0574AM')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of fungicides for foliar diseases in corn in central Indiana, 2023 (COR23-01.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The field was no-till and has been continuous corn for over five years. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in a no-till field in 30-inch row spacing at a rate of 2 seeds/ft on 11 May. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Fungicides were applied on 31 Jul at tassel/silk (VT/R1) growth stage. Disease ratings were assessed on 21 Sep at physiological maturity (R6) growth stage. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) severity visually assessed as a percentage (0-100%) of symptomatic leaf area on ear leaf and five plants were assessed per plot and averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at physiological maturity (R6) growth stage on 22 Sep. The two center rows of each plot were harvested on 17 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were moderately favorable for disease development. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) were the most prominent diseases in the trial. All fungicide treatments reduced tar spot severity and GLS over the nontreated control (Table 1). All fungicides treatments reduced NCLB severity over the nontreated control, except Delaro Complete. Veltyma, Delaro Complete, Adastrio, Miravis Neo, Proline, and Quadris significantly increased canopy greenness over nontreated control on 22 Sep. No significant differences were detected for yield of corn.

Table 1. Effect of treatment on foliar disease severity, canopy greenness, and yield of corn.

Treatment, and rate/A[z]	Tar spot %[y]	GLS % severity[y]	NCLB % severity[y]	Canopy % green[x]	Yield[w] bu/A
Nontreated control	0.43 a	1.4 a	6.9 a	70.0 c	198.3
Veltyma 3.34 S 7.0 fl oz	0.05 b	0.1 c	1.0 bcd	78.8 ab	203.3
Delaro Complete 458 SC 8.0 fl oz	0.08 b	0.2 c	3.9 ab	82.5 a	200.5
Aproach Prima 2.34 SC 6.8 fl oz	0.13 b	0.4 bc	2.5 bcd	70.0 c	201.7
Adastrio 4.0 SC 8.0 fl oz	0.08 b	0.2 c	0.4 d	81.3 ab	200.6
Miravis Neo 2.5 SE 13.7 fl oz	0.10 b	0.2 c	0.9 bcd	73.8 bc	199.0
Trivapro 2.21 SE 13.7 fl oz	0.18 b	0.1 c	0.6 cd	77.5 abc	215.9
Headline AMP 1.68 SC 10 fl oz	0.13 b	0.4 bc	3.6 bc	73.8 bc	198.8
Proline 480 SC 5.7 fl oz	0.08 b	0.2 c	1.4 bcd	78.8 ab	203.1
Quadris 2.08 SC 6.0 fl oz	0.08 b	0.7 b	3.3 bcd	81.3 ab	207.6
Tilt 3.6 EC 4.0 fl oz	0.18 b	0.2 c	2.0 bcd	76.3 abc	203.4
P-value[v]	*0.0040*	*0.0001*	*0.0073*	*0.0264*	*0.3524*

[z] Fungicide treatments were applied on 31 Jul at tassel/silk (VT/R1) growth stage.
[y] Foliar disease severity visually assessed as percentage (0-100%) of symptomatic leaf area on ear leaf, with five plants were assessed per plot and averaged before analysis on 21 Sep at physiological maturity (R6) growth stage. GLS = gray leaf spot; NCLB = northern corn leaf blight.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 22 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 17 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

CORN (*Zea mays* 'W2585SSRIB', 'P0589AMXT')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of tillage, hybrid, and fungicide efficacy for diseases in corn in central Indiana, 2023 (COR23-06.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a split-plot design with six replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated grain corn production in Indiana were followed. Two-tillage block of no-till and standard tillage was main effect. Corn hybrid 'W2585SSRIB (tar spot susceptible) and P0589AMXT (tar spot moderate resistant)' were planted in 30-inch row spacing at a rate of 2 seeds/ft on 5 May. Veltyma fungicide was applied at blister (R2) growth stage. Disease severity was rated by visually assessing the percentage of symptomatic leaf area per ear leaf on ten plants in each plot and averaged before analysis. Tar spot severity was visually assessed on 26 Sep at maturity (R6) growth stage. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) severity visually assessed as a percentage (0-100%) of symptomatic leaf area on ear leaf on 12 Sep at dent/maturity (R5/R6). The two center rows of each plot were harvested on 18 Oct and yields were adjusted to 15.5% moisture All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were moderately favorable for disease. Gray leaf spot (GLS), and northern corn leaf blight (NCLB) were the most prominent diseases in the trial and reached low severity. When no significant interactions between tillage, hybrid and fungicide treatments were detected the main effects were separated (Table 2). For tar spot and yield there was a significant interaction between tillage and hybrid so means were separated for that effect. There was no significant effect on Veltyma application for tar spot severity compared to the nontreated control. Tar spot was significantly reduced by W2585SSRIB planted in a tilled low residue or when P0589AMXT was planted as compared to W2585SSRIB in no-till. GLS severity was significantly reduced in no-till (high residue) vs. tillage (low-residue), with Veltyma fungicide application as compared to the nontreated control, and in the W2585SSRIB as compared to P0589AMXT. There were no significant differences between hybrids for NCLB. NCLB was lower in the tilled plot verses no-till plot and was significantly reduced by Veltyma over nontreated. Grain harvest moistures was higher in the no-till, on W2585SSRIB, and with fungicide treatment. Test weight was singificantly higher under tillage and with the P0589AMXT. Both hybrids planted into tilled plots increased yield, while W2585SSRIB resulted in the highest grain yield in the low residue plots.

Table 2. Effect of tillage, hybrid and fungicide for foliar disease risk in corn and yield of corn.

Tillage, hybrid, treatment, and timing[z]	Tar spot % [y]		GLS %[y]	NCLB %[y]		Harvest % moisture	Test weight lb/bu	Yield[x] bu/A	
No-tillage (high residue)	0.3		0.8 b	2.9		19.3 a	55.2 b	184.7	
Yes-tillage (low residue)	0.0		1.7 a	2.1		17.0 b	56.3 a	208.7	
	No-till	Tilled						No-till	Tilled
W25855SSRIB (tar spot susceptible)	0.5 a	0.0 b	0.8 b	2.7		18.6 a	54.9 b	190.6 b	220.9 a
P0589AMXT (tar spot moderate resistant)	0.1 b	0.0 b	1.7 a	2.3		17.7 b	56.6 a	178.7 c	195.4 b
				No-till	Tilled				
Nontreated control	0.2		1.6 a	5.4 a	3.1 b	17.8 b	55.9	194.4	
Veltyma 3.34 SC 7.0 fl oz/A	0.1		0.9 b	0.4 c	1.2 c	18.5 a	55.5	198.4	
P-value *tillage*[w]	*0.0001*		***0.0001***	*0.1856*		***0.0001***	***0.0102***	*0.0001*	
P-value *hybrid*	*0.0003*		***0.0005***	*0.4334*		***0.0075***	***0.0007***	*0.0001*	
P-value *fungicide*	*0.1888*		***0.0057***	*0.0001*		***0.0342***	*0.3518*	*0.2068*	
P-value *tillage*hybrid*	***0.0005***		*0.1823*	*0.3394*		*0.3554*	*0.9087*	***0.0376***	
P-value *tillage*fungicide*	*0.1406*		*0.1502*	***0.0079***		*0.1018*	*0.4026*	*0.7028*	
P-value *hybrid*fungicide*	*0.1888*		*0.3641*	*0.2369*		*0.5128*	*0.6647*	*0.9070*	
P-value *tillage*hybrid*fungicide*	*0.1406*		*0.2330*	*0.6625*		*0.3989*	*0.4132*	*0.6177*	

[z] Veltyma application was applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Veltyma was applied on 2 Aug at blister (R2) growth stage. [y] Foliar disease severity visually assessed as percentage (0-100%) of symptomatic leaf area on ear leaf, with ten plants were assessed per plot and averaged before analysis on 26 Sep at physiological maturity (R6) for tar spot and on 12 Sep at dent/maturity (R5/R6) for GLS and NCLB. GLS = gray leaf spot; NCLB = northern corn leaf blight. [x] Yields were adjusted to 15.5% moisture and harvested on 18 Oct. [w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

CORN (*Zea mays* 'P0574AM')
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Evaluation of fungicides for foliar diseases in corn in central Indiana, 2023 (COR23-15.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The field was no-till and has been continuous corn for over five years. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 2 seeds/ft on 11 May. Fungicide treatments were made on 1 Aug at blister (R2) growth stage. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 18 Sep at dent (R5) growth stage. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) severity visually assessed as a percentage (0-100%) of symptomatic leaf area on ear leaf and five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 17 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were moderately favorable for disease. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) were the most prominent diseases in the trial. No significant differences between treatments and the nontreated control were detected for tar spot and GLS (Table 3). All foliar fungicides significantly reduced NCLB symptoms over the nontreated control. All fungicides reduced lodging over nontreated control, except Soratel 5.0 fl oz + Aproach 4.75 fl oz, Soratel at 2.5 fl oz and 5.0 fl oz, and Aproach at 3.5 and 6.75 fl oz. No significant differences between treatments and the nontreated control were detected for test weight and yield of corn.

Table 3. Effect of treatments on foliar disease severity, lodging, and yield of corn.

Treatment and rate/A[z]	Tar spot[y] %	GLS severity[y] %	NCLB severity[y] %	Lodging[x] %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.00	2.2	8.4 a	15.0 a	55.9	186.4
Soratel 250 EC 2.5 fl oz + Aproach 2.08 SC 3.5 fl oz	0.00	1.7	1.4 b	0.0 d	53.8	195.7
Soratel 250 EC 3.5 fl oz + Aproach 2.08 SC 4.75 fl oz	0.00	1.0	0.9 b	2.5 cd	55.3	189.4
Soratel 250 EC 5.0 fl oz + Aproach 2.08 SC 6.75 fl oz	0.03	1.4	3.0 b	7.5 a-d	54.9	195.9
Stratego 2.08 SC 4.0 fl oz	0.00	0.8	2.0 b	5.0 bcd	54.1	196.7
Stratego 2.08 SC 5.0 fl oz	0.00	0.7	3.6 b	2.5 cd	59.0	195.9
Soratel 250 EC 2.5 fl oz	0.00	1.2	2.8 b	10.0 abc	54.4	190.2
Soratel 250 EC 5.0 fl oz	0.03	1.3	3.0 b	7.5 a-d	54.1	191.9
Aproach 2.08 SC 3.5 fl oz	0.00	1.8	1.9 b	12.5 ab	54.0	191.9
Aproach 2.08 SC 6.75 fl oz	0.00	1.1	2.1 b	12.5 ab	54.6	186.1
Maxentis 2.92 SC 8.0 fl oz	0.00	1.1	2.1 b	2.5 cd	54.6	192.9
Quadris 2.08 SC 3.5 fl oz	0.03	1.6	1.1 b	0.0 d	54.7	192.5
Quadris 2.08 SC 6.75 fl oz	0.00	1.7	2.2 b	2.5 cd	54.5	196.1
Flint Extra 4.08 SC 1.8 fl oz	0.00	0.5	3.3 b	0.0 d	54.4	188.6
Flint Extra 4.05 SC 3.45 fl oz	0.00	0.6	2.1 b	0.0 d	53.6	187.7
Aproach Prima 2.34 SC 6.4 fl oz	0.00	1.1	1.7 b	0.0 d	55.2	188.9
Veltyma 3.34 SC 7.0 fl oz	0.00	1.5	0.8 b	4.2 bcd	54.9	195.2
P-value[v]	*0.6066*	*0.2931*	*0.0091*	*0.0132*	*0.1390*	*0.7008*

[z] Fungicide treatments were applied on 1 Aug at blister (R2) growth stage.
[y] Foliar disease severity visually assessed as percentage (0-100%) of symptomatic leaf area on ear leaf, with five plants were assessed per plot and averaged before analysis on 18 Sep at dent (R5) growth stage. GLS = gray leaf spot; NCLB = northern corn leaf blight
[x] Lodging = percentage of lodged stalks when pushed from shoulder height to 45-degree from vertical on 18 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 17 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

CORN (*Zea mays* 'P0574AM')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of fungicides and applications for foliar diseases in corn in central Indiana, 2023 (COR23-25.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The field was no-till and has been continuous corn for over five years. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid P0574AM was planted in 30-in row spacing at a rate of 2 seeds/ft on 5 May. Xyway 2x2 applications were applied at planting in 10 gal/A. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Fungicides were applied on 1 Aug, 18 Aug, and 25 Aug at blister (R2), early dough (R4), and late dough (R4) growth stages, respectively. Disease ratings were assessed on 14 Sep at dent (R5) growth stage. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) severity visually assessed as a percentage (0-100%) of symptomatic leaf area on the ear leaf and five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 18 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

In 2023, weather conditions were unfavorable for disease development. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) were present in the trial, but only reached low levels. Xyway fb Adastrio 7.0 fl oz at late R4, Adastrio 8.0 fl oz at early R4, and Adastrio 8.0 fl oz at late R4 significantly reduced tar spot over nontreated control (Table 4). All treatments reduced GLS over nontreated control on 14 Sep, except Xyway LFR 9.5 fl oz and Xyway LFR 15.2 fl oz. No significant differences between fungicide treatments and the nontreated control were found for NCLB severity, harvest moisture, test weight, and yield of corn.

Table 4. Effect of treatment on foliar disease severity and yield of corn.

Treatment, rate/A, and timing[z]	Tar spot %[y]	GLS % severity[y]	NCLB % severity[y]	Harvest % moisture	Test weight lb/bu	Yield[x] bu/a
Nontreated control	0.13 ab	0.9 a	4.4	19.5	55.4	175.5
Xyway LFR 1.92 SC 9.5 fl oz 2x2	0.11 ab	1.1 a	2.4	18.2	56.0	190.3
Xyway LFR 1.92 SC 15.2 fl oz 2x2	0.08 abc	0.7 ab	2.4	18.8	54.9	187.4
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 9.5 fl oz R2	0.16 a	0.3 bc	0.6	19.5	55.0	190.3
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz R2	0.05 bc	0.1 c	0.7	19.0	56.1	199.9
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz early R4	0.04 bc	0.3 bc	2.0	19.5	55.7	182.7
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz late R4	0.00 c	0.4 bc	0.6	19.0	56.0	184.1
Adastrio 4.0 SC 8.0 fl oz R2	0.06 bc	0.1 c	0.2	18.8	55.4	198.4
Adastrio 4.0 SC 8.0 fl oz R2	0.09 abc	0.3 bc	0.3	18.8	55.7	190.4
Adastrio 4.0 SC 8.0 fl oz early R4	0.02 c	0.3 bc	0.0	19.3	55.9	189.9
Adastrio 4.0 SC 8.0 fl oz late R4	0.02 c	0.4 bc	1.2	18.9	55.3	195.2
P-value[w]	*0.0287*	*0.0006*	*0.1302*	*0.8650*	*0.5175*	*0.2295*

[z] Xyway 2x2 applications were applied at planting in 10 gal/A. Fungicides were applied on 1 Aug, 18 Aug, and 25 Aug at blister (R2), early dough (R4), and late dough (R4) growth stages, respectively. All foliar fungicide applications were applied at 15 gal/A.

[y] Foliar disease severity visually assessed as percentage (0-100%) of symptomatic leaf area on ear leaf, with five plants were assessed per plot and averaged before analysis on 14 Sep at dent (R5) growth stage. GLS = gray leaf spot; NCLB = northern corn leaf blight

[x] Yields were adjusted to 15.5% moisture and harvested on 18 Oct.

[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

CORN (*Zea mays,* 'P0574AM')
Seedling disease; *Fusarium graminearum*

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Evaluation of in-furrow treatments for *Fusarium graminearum* in corn in central Indiana, 2023 (COR23-40.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows were used for evaluation. The field was no-till and has been continuous corn for over five years. Standard practices for non-irrigated corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch rows spacing at a rate of 2 seeds/ft on 5 May. Inoculum of *Fusarium graminearum* was applied within the seedbed at 1.25 g/ft at planting. In-furrow applications were applied at planting at 10 gal/A. The two central rows of each plot were used for the stand counts on 24 May, 30 May, 28 Jun at first trifoliolate (V1), second trifoliolate (V2), and fourth trifoliolate (V4) growth stages, respectively. Plant phytotoxicity (yellowing) was visually rated as a percentage (0-100%) per plot on 30 May. The two center rows of each plot were harvested on 18 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, cool and wet conditions occurred after planting which encouraged soil-borne disease to develop. No significant differences were detected between treatments for stand and phytotoxicity (Table 5). No significant differences between treatments and nontreated control for harvest moisture, test weight, and yield of corn.

Table 5. Effect of in-furrow treatments on stand, phytotoxicity, and yield of corn.

Treatment, and rate/A[z]	**Stand count #/A**[y] **24 May**	**Stand count #/A**[y] **30 May**	**Stand count #/A**[y] **28 Jun**	**Phyto**[x] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	31363	35864	38478	25.0	21.6	53.3	175.6
W8S11-R003 117 SC 6.0 fl oz in-furrow	31145	37752	37026	10.0	20.6	55.0	180.3
Zironar 7.5 SC 6.0 fl oz in-furrow	32525	38115	36808	13.8	19.1	55.9	183.4
XSK03 1.98 SC 4.0 fl oz in-furrow	30056	37171	37825	8.8	20.4	54.1	180.8
Ethos XB 1.5 SC 4.0 fl oz in-furrow	30565	35647	38405	11.8	20.2	55.4	180.4
P-value[v]	*0.5082*	*0.0929*	*0.5507*	*0.1845*	*0.1544*	*0.3396*	*0.4177*

[z] All plots were inoculated with *F. graminearum* 1.25 g/ft within the seedbed at planting. In-furrow treatments applied at 10 gal/A.
[y] Stand counts were taken at on 24 May, 30 May, 28 Jun at first trifoliolate (V1), second trifoliolate (V2), and fourth trifoliolate (V4) growth stages, respectively.
[x] Plant phytotoxicity (yellowing) was visually rated as a percentage (0-100%) per plot on 30 May.
[w] Yields were adjusted to 15.5% moisture and harvested on 18 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

CORN (*Zea mays* 'P0574AM')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of fungicides for foliar diseases in corn in central Indiana, 2023 (COR23-42.ACRE)

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The field was no-till and has been continuous corn for over five years. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 2 seeds/ft on 11 May. Foliar applications were made at V10 on 19 Jul and silk (R1) growth stage on 1 Aug. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 14 Sep at R5 (dent) growth stage. Tar spot, gray leaf spot (GLS), northern corn leaf blight (NCLB) severity visually assessed as a percentage (0-100%) of symptomatic leaf area on ear leaf of five plants per plot and averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at dent (R5) growth stage on 14 Sep. The two center rows of each plot were harvested on 18 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were unfavorable for disease development. Gray leaf spot (GLS), tar spot, and northern corn leaf blight (NCLB) were present in the trial and reached low levels. All foliar treatments significantly reduced tar spot on the ear leaf over the nontreated control, except Toguard at R1 (Table 6). All treatments reduced GLS over the nontreated control, except Lucento at R1 (Table 6). All fungicide programs increased canopy greenness significantly over the nontreated control, except Lucento at R1 and Topguard at V10 fb Adastrio at R1. No significant differences between fungicide treatments and the nontreated control were detected for NCLB, moisture, test weight, and yield of corn.

Table 6. Effect of fungicide on foliar disease severity, canopy greenness, and yield of corn.

Treatment, rate/A and timing[z]	Tar spot[y] %	GLS[y] %	NCLB[y] %	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.13 a	0.8 a	2.2	86.3 c	21.2	53.4	192.0
Lucento 4.17 SC 5.0 fl oz at R1	0.05 bc	0.6 ab	1.2	87.5 bc	21.2	54.1	191.2
Adastrio 4.0 SC 8.0 fl oz at R1	0.03 bc	0.2 c	0.7	91.3 a	21.5	54.0	194.3
Topguard EQ 4.29 SC 5.0 fl oz at R1	0.08 ab	0.3 bc	1.6	90.0 ab	22.1	53.1	193.5
Topguard EQ 4.29 SC 10.0 fl oz at V10 fb Adastrio 4.0 SC 8.0 fl oz at R1	0.00 c	0.1 c	0.8	88.8 abc	21.8	53.4	193.8
Veltyma 3.34 SC 7.0 fl oz at R1	0.03 bc	0.1 c	0.2	90.0 ab	22.5	53.3	187.2
Delaro Complete 458 SC 8.0 fl oz at R1	0.03 bc	0.2 bc	0.3	91.3 a	21.8	53.9	198.2
Trivapro 2.21 SE 13.7 fl oz at R1	0.00 c	0.2 bc	1.8	91.3 a	22.4	53.1	197.0
P-value[v]	*0.0141*	*0.0175*	*0.5775*	*0.0290*	*0.2872*	*0.2822*	*0.4768*

[z] Foliar applications were made at V10 on 19 Jul and silk (R1) growth stage on 1 Aug. All foliar applications were applied at 15 gal/A and all applications at R1 contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease severity visually assessed as percentage (0-100%) of symptomatic leaf area on ear leaf, with five plants were assessed per plot and averaged before analysis on 14 Sep at dent (R5) growth stage. GLS = gray leaf spot; NCLB = northern corn leaf blight.
[x] Canopy greenness was visually assessed as a percentage (0-100%) of crop canopy green on 14 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 18 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora spp.*

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Comparison of fungicides for foliar diseases of soybeans in central Indiana, 2023 (SOY23-01.ACRE).

A trial was conducted at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows were utilized for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicide applications were applied on 19 July at beginning pod (R3) growth stage and were applied at 15 gal/A at 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated by visually assessing the percentage of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. Percent canopy green was visually assessed percentage (0-100%) on 11 Sep. The two center rows of each plot were harvested on 3 Oct, and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

In 2023, weather conditions were unfavorable for disease development. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were present in the trial, but only reached low levels. There was no significant difference between treatments compared to the nontreated control for FLS, SBS and CLB severity (Table 7). Applications of Revytek resulted in significantly higher canopy greenness than the nontreated control. There was no significant difference between fungicide applications and the nontreated control for yield of soybean.

Table 7. Effect of treatment on foliar disease incidence, canopy greenness, and yield of soybean.

Treatment and rate/A[z]	**FLS % severity**[y]	**SBS % severity**[y]	**CLB % severity**[y]	**Canopy % green**[x]	**Yield**[w] **bu/A**
Nontreated control	0.3	2.5	0.3	40.0 bcd	53.5
Topguard EQ 4.29 SC 5.0 fl oz	0.6	1.0	0.0	33.8 d	50.4
Lucento 4.17 SC 5.0 fl oz	0.6	1.8	0.0	47.5 a-d	58.3
Trivapro 2.21 SE 13.7 fl oz	0.6	1.0	0.5	52.5 abc	53.5
Quadris 2.08 SC 6.0 fl oz	0.8	2.8	0.0	41.3 bcd	50.5
Veltyma 3.34 SC 7.0 fl oz	0.3	1.8	0.0	50.0 abc	54.7
Revytek 3.33 LC 8.0 fl oz	1.1	1.8	0.3	62.5 a	54.7
Echo 2.21 SE 36.0 fl oz + Folicur 3.6 F 4.0 fl oz + Topsin 4.5 FL 20.0 fl oz	0.8	2.3	0.0	55.0 ab	53.8
Delaro Complete 458 SC 8.0 fl oz	0.6	1.8	0.3	37.5 cd	50.2
Miravis Neo 2.5 SE 13.7 fl oz	1.0	3.0	0.0	47.5 a-d	53.8
Topsin 4.5 FL 20.0 fl oz	0.6	1.8	0.3	40.0 bcd	55.0
P-value[v]	*0.6422*	*0.0846*	*0.7000*	*0.0327*	*0.7721*

[z] Fungicide applications were made on 19 Jul at beginning pod/full pod (R3/R4) growth stage and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.

[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight.

[x] Canopy greenness was visually rated on a scale of 0-100% on 11 Sep.

[w] Yields were adjusted to 13% moisture and harvested on 3 Oct.

[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Fungicide comparison in soybean in central Indiana, 2023 (SOY23-03.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicide applications were applied on 21 Jul and 1 Aug at beginning pod (R3) and beginning seed (R5) growth stages, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 22 Aug at full seed (R6) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated by visually assessing the percentage of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. The two center rows of each plot were harvested on 3 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

In 2023, weather conditions were not favorable for the diseases. Frogeye leaf spot (FLS), Cercospora leaf blight (CLB) and Septoria brown spot (SBS) were present in the trial, but only reached low levels. There was no significant effect of treatment on FLS, CLB, and SBS severity (Table 8). There was no significant effect of treatment on canopy greenness, test weight and yield of soybean.

Table 8. Effect of fungicide on foliar disease severity, canopy greenness, and yield of soybean.

Treatment, rate/A and timing[z]	FLS % severity[y]	CLB % severity[y]	SBS % severity[y]	Canopy % green[x]	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.00	0.00	0.18	58.8	57.0	58.1
Delaro Complete 458 SC 8.0 fl oz at R3	0.03	0.00	0.13	52.5	56.5	57.5
Lucento 4.17 SC 5.0 fl oz at R3	0.00	0.00	0.15	58.8	56.7	57.3
Trivapro 2.21 SE 13.7 fl oz at R3	0.00	0.00	0.45	46.3	56.5	56.9
Miravis Neo 2.5 SE 13.7 fl oz at R3	0.00	0.00	0.10	44.2	56.6	55.8
Revytek 3.33 LC 8.0 fl oz at R3	0.00	0.00	0.10	66.3	56.6	59.4
Delaro Complete 458 SC 8.0 fl oz at R5	0.00	0.00	0.13	76.3	56.7	55.4
Lucento 4.17 SC 5.0 fl oz at R5	0.01	0.00	0.15	47.5	56.3	58.7
Trivapro 2.21 SE 13.7 fl oz at R5	0.25	0.00	0.13	45.0	56.8	54.6
Miravis Neo 2.5 SE 13.7 fl oz at R5	0.03	0.00	0.10	56.3	56.4	61.4
Revytek 3.33 LC 8.0 fl oz at R5	0.01	0.01	0.18	72.5	56.5	59.5
Nontreated control	0.03	0.03	0.18	55.0	56.5	59.3
P-value[v]	*0.5284*	*0.5735*	*0.6386*	*0.7400*	*0.5744*	*0.4403*

[z] Fungicide applications were made on 21 Jul and 1 Aug at beginning pod (R3) and beginning seed (R5) growth stages, respectively. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 22 Aug at full seed (R6) growth stage. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight.
[x] Canopy greenness visually assessed on scale of 0-100% green within a plot on 22 Aug.
[w] Yields were adjusted to 13% moisture and harvested on 3 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

SOYBEAN (*Glycine* maxI '25E334N')
Sudden death syndrome; *Fusarium virguliforme*

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Comparison of planting dates and seed treatment on soybean in central Indiana, 2023 (SOY23-10.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 25E334N was planted in 30-inch row spacing at a rate of 140,000 seeds/A. Treatments were a factorial arrangement of four planting dates by four seed treatments. Soybeans were planted on 14 Apr (planting date 1), 27 Apr (planting date 2), 11 May (planting date 3) and on 31 May (planting date 4). Stand counts were assessed at cotyledons expanded/first-node stage (VC/V1) growth stage for each planting date. Disease ratings were assessed on 22 Aug at beginning seed (R5) growth stage. Sudden death syndrome (SDS) was rated for disease severity by visually assessing the percentage of canopy with symptoms. Ten roots were sampled from outer rows of each plot on 8 Sep and rated for root rot severity on a scale of 0-100% and averaged before analysis. The two center rows of each plot were harvested on 3 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letter are significantly different based on a least square difference test (α=0.05).

In 2023, very little disease developed in plots. Sudden death syndrome (SDS) present in the trial and reached low severity. No significant interactions between planting dates and seed treatments were detected, therefore, main effects of planting dates and seed treatments are presented (Table 9). Soybean stands were the highest at planting dates on 14 Apr and 11 May as compared to 27 Apr and 31 May. Planting soybean on 14 Apr resulted in the highest incidence on SDS compared to later planting dates. Root rot severity was significantly lower at the planting on 31 May compared to all the other planting dates. No differences were detected between planting dates and seed treatments on root weight. Planting on 11 May had the highest test weight. Soybean yield was significantly higher for planting dates on 14 Apr and 27 Apr compared to 11 May and 31 May. No significant differences were detected between seed treatments for stand count, SDS % incidence, root rot, root dry weight, test weight or soybean yield.

Table 9. Effect of planting dates and seed treatments on stand count, SDS, root rot, root weight and yield of soybean.

Planting dates and seed treatments[z]	**Stand Count #/A**	**SDS %[y]**	**Root rot %[x]**	**Root dry weight[w] g**	**Test weight lb/bu**	**Yield[v] bu/A**
Planting date 1 (14 Apr)	98,337 a	5.0 a	0.3 a	27.0	56.0 b	69.2 a
Planting date 2 (27 Apr)	79,933 b	1.2 b	0.2 a	27.6	56.0 b	71.6 a
Planting date 3 (11 May)	99,698 a	0.3 b	0.2 a	27.4	56.6 a	63.3 b
Planting date 4 (31 May)	75,958 b	0.0 b	0.1 b	25.6	56.1 b	56.6 c
Nontreated control	88,917	1.1	0.2	26.6	56.2	65.5
CruiserMaxx APX (with Thiamethoxam)	91,639	2.2	0.2	27.7	56.1	65.1
Thiamethoxam	80,041	1.2	0.2	28.4	56.0	66.9
CruiserMaxx APX (without Thiamethoxam)	93,327	2.1	0.2	24.9	56.4	63.1
P-value *planting date[u]*	*0.0001*	*0.0049*	*0.0163*	*0.6030*	*0.0063*	*0.0001*
P-value *seed treatment*	*0.0511*	*0.8141*	*0.5660*	*0.1766*	*0.1714*	*0.4386*
P-value *planting date*seed treatment*	*0.4390*	*0.9701*	*0.9610*	*0.1728*	*0.7819*	*0.4004*

[z] Seed treatments applied prior to planting at 10 g AI/100 kg seed.
[y] Disease incidence visually assessed as a percentage (0-100%) of canopy with disease symptoms on 22 Aug. SDS = sudden death syndrome.
[x] Root rot visually assessed as a percentage (0-100%) of dark discoloration on roots on 8 Sep.
[w] Root dry weight = weight of 10 dried root samples in grams (g) on 21 Sep.
[v] Yields were adjusted to 13% moisture and harvested on 3 Oct.
[u] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Cercospora leaf blight; *Cercospora kikuchii*
Septoria brown spot; *Septoria glycines*

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Evaluation of fungicides for soybean foliar diseases in central Indiana, 2023 (SOY23-16.ACRE).

A trial was established at the Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicides were applied on 21 Jul at beginning pod (R3) growth stage. All fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated by visually assessing the percentage of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. Percent canopy green was visually assessed percentage (0-100%) of crop canopy green on 14 Sep. The two center rows of each plot were harvested on 3 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were not favorable for diseases. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were present in the trial, but only reached low levels. There was no significant effect on treatments on FLS and CLB severities compared to the nontreated control (Table 10). All fungicide applications significantly reduced SBS severity in the lower canopy when compared to the nontreated control. Quadris Top resulted in the lowest severity of SBS, but it was not significantly different from other fungicide applications except for ADM.03509.F.1.A at 4.8 fl oz, ADM.03509.F.1.A at 8.0 fl oz, and Stratego. There was no significant difference between all fungicide applications and the nontreated control for canopy greenness, test weight, and yield of soybean.

Table 10. Effect of treatment on foliar disease severity, canopy greenness, and yield of soybean.

Treatment and rate/A[z]	FLS %[y]	SBS %[y]	CLB %[y]	Canopy % green[x]	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.3	5.5 a	0.3	52.5	56.5	53.5
ADM.03509.F.3.B 1.75 EC 8.0 fl oz	0.1	2.0 cd	0.0	57.5	56.1	54.5
ADM.03509.F.3.B 1.75 EC 16.0 fl oz	0.2	1.8 cd	0.1	55.0	56.9	53.3
ADM.03509.F.1.A 2.92 SC 4.8 fl oz	0.2	2.8 bc	0.1	52.5	56.5	52.7
ADM.03509.F.1.A 2.92 SC 9.6 fl oz	0.1	2.3 cd	0.0	57.5	56.3	56.4
ADM.03509.F.1.A 2.92 SC 8.0 fl oz	0.1	3.0 bc	0.3	57.5	56.6	53.1
ADM.03509.F.1.A 2.92 SC 8.0 fl oz + Liberate 0.25% v/v	0.1	2.5 bcd	0.0	58.8	56.2	56.7
Custodia 2.67 SC 6.8 fl oz	0.3	2.6 bcd	0.3	61.3	56.2	56.5
Mattock 50 WP 6.8 fl oz	0.2	2.6 cd	0.0	55.0	56.6	55.1
Stratego 2.08 SC 4.0 fl oz	0.1	3.6 b	0.0	58.8	56.2	56.7
Quadris Top 1.67 SC 9.0 fl oz	0.1	1.4 d	0.2	50.0	56.7	53.2
P-value[v]	*0.3367*	*0.0001*	*0.7156*	*0.7101*	*0.4360*	*0.8556*

[z] Fungicides were applied on 21 Jul at beginning pod (R3) growth stage.
[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies at full seed/beginning maturity (R6/R7) growth stage on 11 Sep. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight.
[x] Canopy greenness was visually assessed as percentage (0-100%) of crop canopy green on 11 Sep.
[w] Yields were adjusted to 13% moisture and harvested on 3 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Sudden death syndrome; *Fusarium virguliforme*
Soybean cyst nematode; *Heterodera glycines*

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Evaluation of in-furrow fungicide efficacy for soybean cyst nematodes in central Indiana, 2023 (SOY23-18.ACRE).

A trial was established at the Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 31 May. In-furrow applications were applied at planting in 10 gal/A. Disease ratings were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Sudden death syndrome (SDS) in each plot was rated for disease incidence (DI) as percentage of plants with disease symptoms (0-100%) and disease severity (DS) on a scale of 1-9 where 1 refers to low disease pressure and 9 refers to premature death of the plant. SDS Index (DX) was calculated using the equation: DX = (DI*DS)/9. Soil samples were taken on 8 Jun at 9 weeks after planting (9 WAP) and 29 Sep at harvest for soybean cyst nematode (SCN) egg count and processed by SCN Diagnostics, Columbia, MO. The two center rows of each plot were harvested on 4 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were unfavorable for disease development. Sudden death syndrome (SDS) and soybean cyst nematodes (SCN) were present in the trial. There was no significant effect of treatment on SDS (Table 11). There was no significant effect of treatment on SCN egg counts, test weight, and yield of soybean.

Table 11. Effect of treatment on SDS, soybean cyst nematode (SCN) eggs and yield of soybean.

Treatment and rate/A[z]	**SDS DI**[y]	**SDS DS**[x]	**SDS Index**[w]	**SCN eggs**[v] **9 WAP**	**SCN eggs**[v] **Harvest**	**Test weight lb/bu**	**Yield**[u] **bu/A**
Nontreated control	1.0	3.3	0.4	213	350	54.6	64.3
AMV1310 0.3 EC 14.1 fl oz	0.8	1.0	0.2	100	600	55.4	63.4
AMV1584 4.16 SC 6.84 fl oz	0.3	0.5	0.1	825	725	55.2	61.2
AMV1984 0.08 L 16.0 fl oz	0.3	1.0	0.1	188	475	55.7	64.8
AMV2185 0.037 D 6.0 oz	0.8	1.0	0.2	650	500	55.2	61.8
AMV1306 2.55 L 20.0 fl oz	0.8	3.3	0.4	175	875	55.6	63.5
P-value[t]	*0.6645*	*0.0843*	*0.3921*	*0.1387*	*0.8408*	*0.2533*	*0.5383*

[z] In-furrow treatments applied at planting at 10 gal/A.
[y] SDS in each plot was rated for disease incidence (DI) as a percentage of plants with disease symptoms (0-100%) on 11 Sep.
[x] SDS disease severity (DS) on a scale of 1-9 where 1 refers to low disease pressure and 9 refers to premature death of the plant on 11 Sep.
[w] SDS Index (DX) calculated using the equation: DX= (DI*DS/9). SDS = sudden death syndrome.
[v] SCN counts determined in 100 cc soil and processed by SCN Diagnostics, Columbia, MO on 18 Jul at 9 WAP (weeks after planting) and 29 Sep at harvest. https://scndiagnostics.com/. SCN = soybean cyst nematode.
[u] Yields were adjusted to 13% moisture and harvested on 4 Oct.
[t] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Evaluation of fungicides for soybean foliar diseases in central Indiana, 2023 (SOY23-23.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicide applications were applied on 28 Jun at fourth trifoliate (V4) and on 19 Jul at beginning pod (R3) growth stages. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated by visually assessing the percentage of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. The two center rows of each plot were harvested on 3 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

In 2023, weather conditions were unfavorable for disease development. Frogeye leaf spot (FLS), Septoria brown spot (SBS), Cercospora leaf blight (CLB) were present in the trial, but only reached low levels. There was no significant effect of foliar fungicide treatments on FLS, CLB, and SBS severities (Table 12). There was no significant effect of treatment compared to nontreated control on harvest moisture, test weight, and yield of soybean.

Table 12. Effect of treatment on foliar diseases and yield of soybean.

Treatment and rate/A[z]	FLS % severity[y]	SBS % severity[y]	CLB % severity[y]	Harvest % moisture	Test weight lb/bu	Yield[x] bu/A
Nontreated control	0.7	3.1	0.0	9.8	56.9	58.2
Topguard 1.04 SC 7.0 fl oz at V4 fb Lucento 4.17 SC 5.0 fl oz at R3	0.2	2.0	0.2	9.9	56.8	62.2
Adastrio 4.0 SC 7.0 fl oz at R3	0.2	1.5	0.0	9.9	57.0	58.7
Miravis Top 1.67 SC 13.7 fl oz at R3	0.2	1.7	0.0	9.9	56.8	58.5
Revytek 3.33 LC 8.0 fl oz at R3	0.1	0.9	0.0	10.0	57.0	57.3
Lucento 4.17 SC 5.0 fl oz at R3	0.1	1.2	0.0	9.8	56.9	57.7
P-value[w]	*0.3289*	*0. 4726*	*0.3511*	*0.1543*	*0.9619*	*0.5271*

[z] Fungicide applications were made on 28 Jun at fourth trifoliate (V4) and on 21 Jul at beginning pod (R3) growth stages. All applications contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 11 Sep at full seed/beginning (R6/R7) growth stage. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight.
[x] Yields were adjusted to 13% moisture and harvested on 4 Oct.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Fungicide comparison in soybean in central Indiana, 2023 (SOY23-28.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicide applications were applied on 21 Jul at beginning pod (R3) growth stage. All foliar fungicides were applied at 15 gal/A at 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated for disease severity by visually assessing the percentage of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. The two center rows of each plot were harvested on 25 Sep and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were unfavorable for disease development. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were present in the trial, but only reached low levels. There was no significant effect of treatment on FLS and CLB severity (Table 13). All fungicide applications significantly reduced SBS over the nontreated control on 11 Sep. There was no significant effect of treatment on harvest moisture and test weight. Miravis Neo + Endigo and Miravis Top + Endigo significantly increased yield over the nontreated control, but were not significantly different from Miravis Top and Revytek.

Table 13. Effect of treatment on foliar disease severity and yield of soybean.

Treatment and rate/A[z]	FLS % severity[y]	SBS % severity[y]	CLB % severity[y]	Harvest % moisture	Test weight lb/bu	Yield[x] bu/A
Nontreated control	1.3	5.5 a	0.1	11.1	56.6	59.7 b
Miravis Neo 2.5 SE 13.7 fl oz	0.1	1.0 b	0.1	11.5	56.4	59.4 b
Miravis Top 1.67 SC 13.7 fl oz	0.1	0.8 b	0.0	11.0	56.5	62.2 ab
Miravis Neo 2.5 SE 13.7 fl oz + Endigo ZC 2.06 SC 4.0 fl oz	0.2	0.8 b	0.1	11.7	56.5	63.9 a
Miravis Top 1.67 SC 13.7 fl oz + Endigo ZC 2.06 SC 4.0 fl oz	0.1	1.4 b	0.0	11.2	56.7	64.8 a
Miravis Neo 2.5 SE 13.7 fl oz + Warrior II 2.08 CS 1.6 fl oz	0.1	0.9 b	0.0	10.9	56.8	58.6 b
Revytek 3.33 LC 8.0 fl oz	0.1	1.5 b	0.2	11.4	56.2	61.0 ab
P-value[w]	*0.4788*	*0.0010*	*0.5405*	*0.3435*	*0.8133*	*0.0422*

[z] Fungicide applications were made on 21 Jul at beginning pod (R3) growth stage and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB =Cercospora leaf blight.
[x] Yields were adjusted to 13% moisture and harvested on 25 Sep.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*

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Frogeye leaf spot model evaluation for fungicide application in soybean in central Indiana, 2023 (SOY23-34.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 11 May. Fungicide applications were applied on 19 Jul at beginning pod (R3) growth stage, model applications were not made as it remained below all thresholds. All applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease rating were assessed on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were rated for disease severity by visually assessing the percentage (0-100%) of symptomatic leaf area. FLS and SBS were rated only in the upper and lower canopies, respectively. The two center rows of each plot were harvested on 4 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

In 2023, weather conditions were unfavorable for disease development. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were present in the trial, but only reached low levels. There was no significant effect of treatment on FLS severity compared to the nontreated control (Table 14). Revytek applied at R3 reduced SBS severity, increased canopy greenness, and increased harvest moisture over the nontreated control. There was no significant effect of treatment on test weight and yield of soybean.

Table 14. Effect of treatment on foliar diseases and yield of soybean.

Treatment, rate/A, and timing[z]	**FLS severity**[y] **%**	**SBS severity**[y] **%**	**Canopy green**[x] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	0.08	5.8 a	41.3 b	9.3 b	55.8	45.7
Revytek 3.33 LC 8.0 fl oz at R3	0.05	0.2 c	56.3 a	9.5 a	55.8	47.1
Revytek 3.33 LC 8.0 fl oz at threshold 1: 50% no application	0.00	5.0 ab	43.8 b	9.3 b	56.0	45.4
Revytek 3.33 LC 8.0 fl oz at threshold 2: 60% no application	0.00	3.0 b	46.3 b	9.4 ab	55.7	44.5
Revytek 3.33 LC 8.0 fl oz at threshold 3: 70% no application	0.03	4.8 ab	47.5 b	9.4 ab	55.7	46.1
P-value[v]	*0.1283*	*0.0028*	*0.0160*	*0.0291*	*0.8074*	*0.7411*

[z] Fungicide applications were made on 19 Jul at beginning pod (R3) growth stage. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. Model never reached any of the three thresholds (50%, 60%, 70%) so only the R3 treatment was applied.
[y] Foliar disease severities were rated by visually assessing the percentage (0-100%) of symptomatic leaf area in the upper and lower canopies, respectively, on 11 Sep at full seed/beginning maturity (R6/R7) growth stage. FLS was only rated in the upper canopy and SBS was rated only in the lower canopy. FLS = frogeye leaf spot; SBS = Septoria brown spot.
[x] Canopy greenness was visually assessed on a scale of 0-100% green within a plot on 11 Sep.
[w] Yields were adjusted to 13% moisture and harvested on 4 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, $\alpha = 0.05$).

WHEAT (*Triticum aestivum 'Harpoon' and 'Kaskaskia'*)
Fusarium head blight (Scab); *Fusarium graminearum*

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Evaluation of products and cultivars for scab management for organic wheat in Indiana, 2023 (WHT23-01.ACRE).

A trial was established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The experiment was a randomized complete block design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. Organic wheat cultivars 'Harpoon' and 'Kaskaskia' were planted in 7.5-inch row spacing using a drill on 18 Oct, 2022. All fungicide applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart and directed forward and backward at 45-degree angle. Fungicides were applied on 22 May at the Feekes growth stage 10.5.1. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 23 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 10 Jun. Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage. FHB severity was rated by visually assessing the percentage (0-100%) of the infected heads. The FHB index was calculated as: (% FHB incidence multiplied by %FHB severity)/100 per plot. The eight center rows of each plot were harvested with a Kincaid small-plot combine on 10 Jul and yields were adjusted to 13.5% moisture for comparison. A subsample of grain was taken from each plot and partitioned for DON (deoxynivalenol) analysis completed by the University of Minnesota DON testing lab and to determine Fusarium damage kernels (FDK) by visually assessing the percentage (0-100%) of the infected heads. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for Fusarium head blight (FHB). Low level of FHB was detected in the trial. There were no significant interactions between cultivar and fungicide treatments; therefore, main effects of each are presented (Table 15). In the cultivar Harpoon, FHB incidence and severity were reduced significantly when compared to Kaskaskia. No significant difference was detected for FHB Index between the cultivars. There were no significant differences in treatments from the nontreated control for FHB incidence, FHB severity, and FHB Index and % FDK. The concentration of deoxynivalenol (DON) was not detected in grain subsample from the trial. The cultivar Kaskaskia had significantly higher grain yield than Kaskaskia, but no significant differences were detected between the treatments and nontreated conrol.

Table 15. Effect of cultivar and fungicide on Fusarium head blight, DON, Fusarium damaged kernels (FDK), and yield of wheat.

Treatment[z]	FHB % incidence[y]	FHB % severity[x]	FHB Index[w]	DON[v] (ppm)	FDK[u] %	Yield[t] bu/A
Cultivar						
Harpoon	0.7 b	0.5 b	0.0	nd	0.0	82.4 b
Kaskaskia	4.3 a	6.8 a	0.3	nd	0.0	89.1 a
Fungicide rate/A						
Nontreated control	2.3	1.9	0.1	nd	0.0	85.3
Prosaro 421 SC 8.2 fl oz	2.5	1.5	0.1	nd	0.0	88.1
ChampION 50 WP 1.5 lb	2.1	0.8	0.0	nd	0.0	84.7
Pacesetter WS 13.0 fl oz	2.3	5.4	0.3	nd	0.0	85.5
Sonata SC 1.0 qt	2.3	0.8	0.0	nd	0.0	84.8
Actinovate AG 12.0 fl oz	3.3	11.5	0.5	nd	0.0	86.2
P-value *cultivar*[s]	*0.0001*	*0.0130*	*0.0509*	.	.	*0.0001*
P -value *fungicide*	*0.8036*	*0.0960*	*0.0041*	.	.	*0.7860*
P -value *cultivar*fungicide*	*0.2238*	*0.1238*	*0.0562*	.	.	*0.9111*

[z] Fungicides were applied on 22 May at the Feekes growth stage 10.5.1. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 24 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot with CO_2 handheld sprayer on 23 May.

[y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage on 10 Jun.

[x] FHB severity was rated by visually assessing the percentage of the infected head.

[w] FHB index was calculated as: (% FHB incidence multiplied by % FHB severity)/100 per plot. FHB = fusarium head blight.

[v] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab on 17 Aug. nd = not detected, DON <0.05 ppm.

[u] FDK = percentage of Fusarium damaged kernels.

[t] Yields were adjusted to 13.5% moisture and harvested on 10 Jul.

[s] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α= 0.05).

WHEAT (*Triticum aestivum* 'P25R40')
Fusarium head blight; *Fusarium graminearum*

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Evaluation of foliar fungicides for scab management in central Indiana (WHT23-02.ACRE).

Plots were established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. On 18 Nov 2022 wheat cultivar 'P25R40'was drilled at 7.5 in. spacing. All fungicide applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart and directed forward and backward at 45-degree angle. Fungicides were applied on 22 May and 27 May at the Feekes growth stage 10.5.1 and 10.5.1 + 5 days, respectively. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 23 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 backpack sprayer. Disease ratings were assessed on 10 Jun. Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage. FHB severity was rated by visually assessing the percentage of the infected head, FHB index was calculated as: (% FHB incidence multiplied by % FHB severity)/100 per plot. The eight center rows of each plot were harvested with a Kincaid plot combine on 10 Jul and yields were adjusted to 13.5% moisture. A subsample of grain was taken from each plot and partitioned for DON (deoxynivalenol) analysis completed by the University of Minnesota DON testing lab and to determine Fusarium damage kernels (FDK) by visually assessing the percentage (0-100%) of the infected heads. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were not favorable for Fusarium head blight (FHB). No FHB, DON or FDK were detected in the trial. Harvest moisture was highest in plots with applications of Miravis Ace applied at 10.5.1 alone or fb either Prosaro Pro, Sphaerex, or tebuconazole as compared to nontreated control (Table 16). Prosaro Pro had significantly higher test weight than Sphaerex or Miravis Ace fb tebuconazole, but no treatments were significantly differente from nontreated control. No differences were detected between treatments for grain yield.

Table 16. Effect of fungicide on leaf blotch, Fusarium head blight, DON, Fusarium damaged kernels (FDK), and yield of wheat.

Treatment and rate/A[z]	DON[y] (ppm)	FDK[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	nd	0.0	14.6 d	55.7 abc	83.5
Prosaro 421 SC 6.5 fl oz at 10.5.1	nd	0.0	14.7 cd	55.7 abc	83.9
Caramba 90 EC 13.5 fl oz at 10.5.1	nd	0.0	14.6 cd	55.5 abc	84.7
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1	nd	0.0	15.5 ab	55.9 ab	82.1
Prosaro Pro 400 SC 10.3 fl oz at 10.5.1	nd	0.0	14.9 bcd	56.0 a	82.8
Sphaerex 2.50 SC 7.3 fl oz at 10.5.1	nd	0.0	14.9 bcd	55.2 c	82.4
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Prosaro Pro 400 SC 10.3 fl oz at 10.5.1 + 5 days	nd	0.0	15.7 a	55.4 bc	84.2
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Sphaerex 2.50 SC 7.3 fl oz at 10.5.1 + 5 days	nd	0.0	15.6 a	55.7 abc	79.5
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Tebuconazole 4.0 fl oz at 10.5.1 + 5 days	nd	0.0	15.3 abc	55.2 c	77.0
P-value[v]	.	.	*0.0071*	*0.0430*	*0.4076*

[z] Fungicide treatments applied on 22 May and 27 May at Feekes growth stage 10.5.1 and 10.5.1 f + 5 days, respectively. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 23 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot with CO_2 handheld sprayer on 23 May.
[y] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab on 17 Aug. Nd = not detected, DON <0.05 ppm.
[x] FDK = percentage of Fusarium damaged kernels.
[w] Yields were adjusted to 13.5% moisture and harvested on 10 Jul.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α= 0.05).

WHEAT (*Triticum aestivum* 'P25R40' and 'P25R61')
Fusarium head blight; *Fusarium graminearum*

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Evaluation of foliar fungicides and cultivars for scab management in central Indiana, 2023 (WHT23-03.ACRE).

Plots were established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. On 18 Nov 2022 wheat cultivar 'P25R40' and 'P25R61' were drilled at 7.5 in. spacing. All fungicide applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart and directed forward and backward at 45-degree angle. Fungicides were applied on 22 May and 23 May at the Feekes growth stage 10.5.1. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 23 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 backpack sprayer. Disease ratings were assessed on 10 Jun. Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage. FHB severity was rated by visually assessing the percentage of the infected head, FHB index was calculated as: (% FHB incidence multiplied by % FHB severity)/100 per plot. The eight center rows of each plot were harvested with a Kincaid plot combine on 10 Jul and yields were adjusted to 13.5% moisture. A subsample of grain was taken from each plot and partitioned for DON (deoxynivalenol) analysis completed by the University of Minnesota DON testing lab and to determine Fusarium damage kernels (FDK) by visually assessing the percentage (0-100%) of the infected kernels. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were not favorable for Fusarium head blight (FHB). No FHB or FDK was detected in the trial. Harvest moisture were highest when Miravis Ace was applied compared to nontreated control (Table 17). The cultivar P25R61 had reduced harvest moisture, test weight, and yield as compared to P25R40. No significant differences were detected between treatments for test wight and yield.

Table 17. Effect of fungicide and cultivar on leaf blotch, DON, FDK, and yield of wheat.

Treatment and rate/A[z]	DON[y] (ppm)	FDK[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
P25R40 (scab susceptible)	nd	0.0	16.3 a	54.2 a	88.5 a
P25R61 (scab resistant)	nd	0.0	16.2 b	52.9 b	80.6 b
Nontreated control	nd	0.0	16.0 c	53.6	85.8
Nontreated, noninoculated control	nd	0.0	16.0 c	53.3	79.7
Prosaro 421 SC 6.5 fl oz	nd	0.0	16.3 b	53.6	83.1
Miravis Ace 5.2 SC 13.7 fl oz	nd	0.0	16.6 a	53.8	83.9
Prosaro Pro 400 SC 10.3 fl oz	nd	0.0	16.3 b	53.7	87.3
Sphaerex 2.50 SC 7.3 fl oz	nd	0.0	16.3 b	53.4	87.5
P-value *cultivar*[v]	.	.	*0.0079*	*0.0001*	*0.0475*
P-value *treatment*	.	.	*0.0001*	*0.8363*	*0.8389*
P-value *cultivar*treatment*	.	.	*0.5668*	*0.9489*	*0.9564*

[z] Fungicide treatments applied on 22 May and 23 May at Feekes growth stage 10.5.1. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.125% v/v. All plots inoculated with *Fusarium graminearum* spore suspension (50,000 spores/ml) 24 h after the treatment at Feekes 10.5.1. Spore suspension applied at 300 ml/plot with CO_2 handheld sprayer on 23 May.
[y] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab on 17 Aug. Nd = not detected, DON <0.05 ppm.
[x] FDK = percentage of Fusarium damaged kernels.
[w] Yields were adjusted to 13.5% moisture and harvested on 10 Jul.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α= 0.05).

WHEAT (*Triticum aestivum* 'P25R40')
Leaf blotch; *Septoria tritici/Stagnospora nodorum*

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Evaluation of foliar fungicides for wheat disease management in central Indiana, 2021 (WHT23-07.ACRE).

Plots were established at the Purdue Agronomy Center for Research and Education (ACRE) in Tippecanoe County, IN. The trial was a randomized complete block design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. On 18 Nov 2022 wheat cultivar 'P25R40' was drilled at 7.5 in spacing. Foliar fungicides were applied on 26 Apr at the Feekes growth stage 8 and 23 May for Feekes 10.5.1 treatment. All fungicide applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Foliar disease severity was rated by visually assessing the percentage of symptomatic leaf tissue on five flag leaves per plot for leaf blotch. Values for each plot were averaged before analysis. The eight center rows of each plot were harvested with a Kincaid small-plot combine on 10 Jul and yields were adjusted to 13.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

In 2023, weather conditions were unfavorable for leaf blotch diseases. Low levels of leaf blotch was detected. Priaxor treatment had the lowest test weight when compared to the nontreated control and all other treatments, except Tilt (Table 18). There was no significant effect on treatments for leaf blotch severity, harvest moisture, and yield of wheat.

Table 18. Effect of fungicide on leaf blotch and yield of wheat.

Treatment and rate/A[z]	**Leaf blotch % severity**[y]	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[x] **bu/A**
Nontreated control	0.0	13.8	55.3 ab	91.0
Nexicor Xemium 2.96 EC 7.0 fl oz at Feekes 8	0.1	13.9	56.3 a	93.5
Topguard 1.04 SC 10.0 fl oz at Feekes 8	0.0	13.7	55.0 ab	82.8
Priaxor 4.17 SC 4.0 fl oz at Feekes 8	0.1	13.6	53.5 c	77.9
Trivapro 2.21 SE 9.4 fl oz at Feekes 8	0.0	13.8	55.5 ab	83.1
Delaro 325 SC 8.0 fl oz at Feekes 8	0.0	14.0	55.9 ab	91.4
Quilt Xcel 2.2 SE 10.5 fl oz at Feekes 8	0.0	13.9	55.8 ab	89.2
Tilt 3.6 EC 4.0 fl oz at Feekes 8	0.2	13.7	54.4 bc	75.8
Headline 2.09 SC 6.0 fl oz at Feekes 8	0.1	13.8	55.5 ab	86.5
Adastrio 4.0 SC 6.0 fl oz at Feekes 8	0.1	13.7	55.4 ab	84.8
Prosaro 421 SC 6.5 fl oz at Feekes 10.5.1	0.1	14.0	55.5 ab	87.3
P-value[w]	*0.3205*	*0.5689*	*0.0458*	*0.0559*

[z] Fungicides were applied on 26 Apr at the Feekes growth stage 8 and 23 May at the Feekes 10.5.1. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.125% v/v.
[y] Disease severity of leaf blotch was rated by visually assessing the percentage (0-100%) of symptomatic leaf tissue on five flag leaves per plot on 10 Jun, and then averaged before analysis.
[x] Yields were adjusted to 13.5% moisture and harvested on 10 Jul.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α = 0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Uniform fungicide comparison for tar spot in corn in northwestern Indiana, 2023 (COR23-02.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 22 May. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Fungicides were applied on 3 Aug at blister (R2) growth stage and three weeks after treatments (WAT) on 22 Aug at dough (R4) growth stage. Disease ratings were assessed on 6 Sep, 19 Sep, and 16 Oct at dough (R4) and early dent (R5), and late dent (R5) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf (0-100%) on five plants in each plot at the ear leaf. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at dent (R5) growth stage. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at dent (R5) growth stage. The two center rows of each plot were harvested on 7 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. All treatments significantly reduced tar spot severity compared to the nontreated control on 6 Sep and 19 Sep (Table 19). On 6 Sep, Veltyma followed by (fb) Headline AMP and Headline AMP fb Aproach Prima were the treatments that showed the greatest reduction in the severity of tar spot stromata, but were not significantly different from Delaro Complete, Aproach Prima fb Headline AMP, Miravis Neo fb Headline AMP, and Headline AMP fb Veltyma or Delaro Complete or Headline AMP. On 19 Sep, no significant difference was detected between fungicide programs. On 16 Oct, only Veltyma fb Headline AMP, Aproach Prima fb Headline AMP, Miravis Neo fb Headline AMP, Headline AMP fb Veltyma, and Headline AMP fb Aproach Prima reduced tar spot severity over the nontreated control. Veltyma fb Headline AMP and Aproach Prima fb Headline AMP, and Headline APM fb Veltyma programs significantly increased canopy greenness over nontreated control. There was no significant effect of treatment on yield of corn.

Table 19. Effect of fungicide programs on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A and timing[z]	Tar spot %[y] 6 Sep	Tar spot %[y] 19 Sep	Tar spot %[y] 16 Oct	Canopy green[x] %	Yield[w] bu/A
Nontreated control	2.3 a	12.8 a	19.6 a	0.3 d	194.2
Veltyma 3.34 S 7 fl oz at R2	0.9 b-e	3.0 b	17.1 abc	1.5 d	213.6
Aproach Prima 2.34 SC 6.8 fl oz at R2	1.2 b	3.8 b	17.6 ab	2.8 d	186.6
Miravis Neo 2.5 SE 13.7 fl oz at R2	1.0 bc	4.8 b	18.9 ab	3.8 d	193.6
Delaro Complete 458 SC 8 fl oz at R2	0.7 c-f	1.7 b	16.0 a-d	15.0 bcd	220.7
Headline AMP 1.68 SC 10 fl oz at R2	1.1 bc	3.3 b	16.5 a-d	2.5 d	194.4
Veltyma 3.34 S 7 fl oz at R1 fb Headline AMP 1.68 SC 10 fl oz at 3 WAT	0.4 f	1.1 b	8.2 f	31.3 a	221.0
Aproach Prima 2.34 SC 6.8 fl oz at R2 fb Headline AMP 1.68 SC 10 fl oz at 3 WAT	0.5 def	2.5 b	11.8 def	22.5 abc	214.5
Miravis Neo 2.5 SE 13.7 fl oz at R2 fb Headline AMP 1.68 SC 10 fl oz at 3 WAT	0.7 c-f	2.5 b	12.2 c-f	6.5 d	211.2
Delaro Complete 458 SC 8 fl oz at R2 fb Headline AMP 1.68 SC 10 fl oz at 3 WAT	1.0 bcd	3.9 b	16.0 a-d	3.8 d	216.9
Headline AMP 1.68 SC 10 fl oz at R2 fb Veltyma 3.34 S 7 fl oz at 3 WAT	0.6 c-f	1.1 b	10.1 ef	27.5 ab	230.9
Headline AMP 1.68 SC 10 fl oz at R2 fb Aproach Prima 2.34 SC 6.8 fl oz at 3 WAT	0.4 ef	0.8 b	14.4 b-e	12.5 bcd	185.6
Headline AMP 1.68 SC 10 fl oz at R2 fb Miravis Neo 2.5 SE 13.7 fl oz at 3 WAT	0.9 b-e	3.0 b	14.7 a-e	1.5 d	212.5
Headline AMP 1.68 SC 10 fl oz at R2 fb Delaro Complete 458 SC 8 fl oz at 3 WAT	0.8 b-f	2.0 b	14.7 a-e	14.5 bcd	191.3
Headline AMP 1.68 SC 10 fl oz at R2 fb Headline AMP 1.68 SC 10 fl oz at 3 WAT	0.8 b-f	2.4 b	14.8 a-e	11.5 cd	192.5
P-value[v]	*0.0001*	*0.0001*	*0.0015*	*0.0006*	*0.1607*

[z] Fungicides were applied on 3 Aug at blister (R2) and on 22 Aug, 3 weeks after treatment (WAT) at dough (R4) growth stage. All treatments applied contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. fb= followed by.

[y] Tar spot severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 6 Sep, 19 Sep, and 16 Oct at dough (R4) and early dent (R5), and late dent (R5) growth stages, respectively.

[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 16 Oct at late dent (R5) growth stage.

[w] Yields were adjusted to 15.5% moisture and harvested on 7 Nov.

[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB' and 'P0589AMXT')
Tar spot; *Phyllachora maydis*

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Evaluation of hybrid and fungicide timing for tar spot in corn in northwestern Indiana, 2023 (COR23-03.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows were used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrids 'W2585VT2PRIB' (tar spot susceptible) and 'P0589AMXT' (tar spot resistant) were planted in 30-inch row spacing at a rate of 34,000 seeds/A on 18 May. All fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Delaro Complete 458 SC at 8 fl oz/A fungicide was applied on 25 Jul, 3 Aug, 22 Aug, and 29 Aug at the 10-leaf (V10), tassel/silk (VT/R1), blister (R2), and dough (R4) growth stages, respectively. A weather-based prediction model, Tarspotter (https://ipcm.wisc.edu/apps/tarspotter/) was used and applications were made on 17 Aug and 29 Aug at the blister (R2) and dough (R4) growth stages, respectively. Disease ratings were assessed on 21 Sep at dent (R5) and 10 Oct at maturity (R6) growth stage. Tar spot was rated by visually assessing the percentage of stromata (0-100%) per leaf on five plants in each plot at the ear leaf. Values for the five leaves were averaged before analysis. Percentage canopy greenness was rated by visually assessing the percentage (0-100%) of the whole plot crop canopy that remained green at maturity (R6) growth stage. The two center rows of each plot were harvested on 6 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. There was significant interaction between hybrid and fungicide, therefore treatment affect is evaluated across each hybrid (Table 20). For the susceptible hybrid (TS), all treatments significantly reduced tar spot stromata compared to the nontreated control for all three disease ratings. For the moderately resistant hybrid (TMR), all treatments applied except for tenth-leaf (V10) for the 7 Sep and 21 Sep ratings and treatments applied at tenth-leaf (V10), tassel/silk (VT/R1), and dough (R4) growth stage for 10 Oct rating, significantly reduced tar spot stromata compared to the nontreated control. No significant treatment differences were detected for canopy greenness for either hybrid. Only the Tarspotter application significantly increased yield compared to the nontreated control for the susceptible hybrid (TS). There was no significant effect on corn yield for the resistant hybrid (TMR).

Table 20. Effect of fungicide on tar spot severity, canopy greenness, and yield of corn.

	Tar spot % [y] 21 Sep		Tar spot % [y] 10 Oct		Canopy green[x] %		Test weight lb/bu		Yield[w] bu/A	
Treatment, rate/A, and timing[z]	**TS[u]**	**TMR[u]**	**TS**	**TMR**	**TS**	**TMR**	**TS**	**TMR**	**TS**	**TMR**
Nontreated control	1.1 a	0.5 a	2.2 a	0.6 a	11.5 a	5.4 a	37.5	31.3	212.6 b	211.7
Delaro Complete 458 SC at V10	0.5 bc	0.3 ab	1.1 b	0.5 ab	7.5 b	4.8 a	43.8	53.8	230.5 b	212.7
Delaro Complete 458 SC at VT/R1	0.3 bc	0.2 bc	0.6 bc	0.3 b	5.4 b	4.3 ab	61.3	43.8	226.4 b	209.0
Delaro Complete 458 SC at R2	0.5 b	0.2 bc	1.0 b	0.4 b	4.7 bc	1.7 bc	56.3	52.5	226.3 b	225.9
Delaro Complete 458 SC at R4	0.5 b	0.3 bc	1.2 b	0.3 bc	5.1 bc	2.8 abc	60.0	55.0	218.5 b	223.4
Delaro Complete 458 SC based on Tarspotter (R2 fb R4)	0.2 c	0.2 c	0.2 c	0.1 c	2.2 c	1.0 c	68.8	55.0	256.4 a	235.2
P-value[u]	*0.0003*	*0.0082*	*0.0002*	*0.0027*	*0.0003*	*0.0144*	*0.0589*	*0.1437*	*0.0062*	*0.2025*

[z] Fungicide treatments were applied on 25 Jul, 3 Aug, 17 Aug, 22 Aug, and 29 Aug at tenth-leaf (V10), tassel/silk (VT/R1), blister (R2), and dough (R4) growth stages, respectively. Tarspotter applications were made on 17 Aug and 29 Aug at the blister (R2) and dough (R4) growth stages, respectively. fb = followed by.

[y] Tar spot stromata visually assessed as the percentage (0-100%) of affected leaf area on five plants in each plot at the ear leaf on 21 Sep and 10 Oct.

[w] Canopy greenness visually assessed percentage (0-100%) green of the plot as a whole on 10 Oct.

[v] Yields were adjusted to 15.5% moisture and harvested on 6 Nov.

[u] TS = tar spot susceptible ('W2585VT2PRIB') and 'TMR = tar spot moderately resistant ('P0589AMXT').

[t] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* '0.52-96' and '0.51-95')
Tar spot; *Phyllachora maydis*

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Evaluation of tar spot management programs for organic corn in northwestern Indiana, 2023 (COR23-04.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn organic hybrids '0.52-96' and '0.51-95' were planted in 30-inch row spacing at a rate of 34,000 seeds/A on 18 May. The field was overhead irrigated weekly at 1 in., unless weekly rainfall was 1 in. or higher, to encourage disease. All fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart at 3.6 mph. Fungicide treatments were applied on 3 Aug at silk (R1) growth stage. Disease ratings were assessed on 9 Sept and 15 Sep at dough (R4) and dent (R5) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata (0-100%) per leaf on five plants in each plot at the ear leaf. Values for the five leaves were averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at dent (R5) growth stage. The two center rows of each plot were harvested on 7 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. There was no significant interaction between hybrid and fungicide for disease and yield; therefore, main effects of hybrid and fungicide were evaluated. No differences between hybrids were observed for tar spot severity and yield (Table 21). Tar spot severity was significantly reduced over nontreated control by Headline AMP and Badge X2 on 9 Sep and 15 Sep, but were not significantly different from Serifel and Actinovate on 15 Sep. The percentage of canopy green was highest in the hybrid 0.51-95 and when treated with Headline AMP, but not significantly different from Badge X2. There was no significant differences in treatments and nontreated control for grain yield.

Table 21. Effect of hybrid and fungicide on tar spot severity, canopy greenness, and yield of corn.

Treatment and rate/A[z]	**Tar spot %[y] 9 Sep**	**Tar spot %[y] 15 Sep**	**Canopy green[x] %**	**Yield[w] bu/A**
Hybrids				
0.52-96	3.1	10.7	53.1 b	198.5
0.51-95	2.9	10.7	60.6 a	197.7
Fungicide programs				
Nontreated control	4.2 a	18.1 a	51.3 b	199.1
Headline AMP 1.68 SE 10 fl oz	0.9 b	2.4 b	68.8 a	204.3
Serifel WP 16 fl oz	3.7 a	10.6 ab	51.3 b	195.8
Actinovate AG 12 ox	3.7 a	11.1 ab	57.5 b	198.9
Badge X2 SC 1.8 lb	1.3 b	6.0 b	60.0 ab	193.3
OxiDate 5.0 128 fl oz	4.3 a	15.8 a	52.5 b	197.2
P-value *hybrid*[v]	*0.0061*	*0.9967*	*0.0187*	*0.2518*
P-value *fungicide*	*0.7740*	*0.0147*	*0.0141*	*0.7756*
P-value *hybrid*fungicide*	*0.1068*	*0.0859*	*0.0476*	*0.1061*

[z] Fungicide treatments were applied at on 3 Aug at silk (R1) growth stage.
[y] Tar spot stromata severity visually assessed as percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 9 Sept and 15 Sep at dough (R4) and dent (R5) growth stages, respectively.
[x] Canopy greenness visually assessed percentage (0-100%) green of the plot as a whole on 15 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 7 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585SSRIB, P0589AMXT ')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation tillage, hybrid, and fungicide efficacy for diseases in corn in northwestern Indiana, 2023 (COR23-05.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The trial was a split-plot design with six replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'W2585SSRIB' (tar spot susceptible), 'P0589AMXT' (tar spot moderate resistant) was planted in 30-inch row spacing at a rate of 34,000 seeds/ft on 18 May. Veltyma application was applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Fungicide was applied on 2 Aug at R2 (full bloom). Tar spot was rated by visually assessing the percentage of stroma per leaf on ten plants in each plot at the ear leaf (EL) on 28 Sep at maturity (R6) growth stage. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) were rated by visually assessing the percentage severity on ear leaf on ten plants on 7 Sep at dough/dent (R4/R5) growth stage. Values for each plot were averaged before analysis. The two center rows of each plot were harvested on 7 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. There was no significant interaction between tillage and hybrid and fungicide, therefore main effects of tillage are presented. There was a significant interaction between hybrid and fungicide for tar spot severity, therefore data presented for that interaction. No significant differences were detected between no-till and tillage main effects for tar spot, GLS, NCLB and grain yield (Table 22). Harvest moisture was reduced under tillage veres no-tillage, while test weight was highest in the tillage verses no-till treatments. Tar spot severity was highest in the susceptible hybrid with no fungicide application. Veltyma fungicide application significantly reduced tar spot severity compared to nontreated susceptible hybrid, but no significant differences were detected in the moderately resistant hybrid. There were no significant differences between hybrid and funigicide programs nn GLS and NCLB severity, harvest moisture, test weight and yield.

Table 22. Effect of tillage, hybrid and fungicide for foliar diseases in corn and yield of corn.

Tillage, hybrid, treatment, and timing[z]	Tar spot % [y]	GLS %[x]	NCLB %[x]	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
No tillage (high residue)	12.9	0.16	0.03	22.4 a	47.4 b	214.3
Tillage (low residue)	12.2	0.03	0.12	20.1 b	50.1 a	229.9
Susceptible; Nontreated control	23.1 a	0.06	0.14	21.4	46.9	215.5
Susceptible; Veltyma 7.0 fl oz/A	10.0 b	0.02	0.16	22.7	53.2	237.8
Moderatley resistant; Nontreated control	10.4 b	0.00	0.00	20.0	46.3	211.8
Moderatley resistant; Veltyma 7.0 fl oz/A	6.8 b	0.31	0.01	20.7	48.6	223.4
P-value *tillage*[v]	*0.7464*	*0.2661*	*0.4989*	*0.0003*	*0.0060*	*0.0004*
P -value *hybrid*	*0.0024*	*0.3019*	*0.3822*	*0.0090*	*0.0066*	*0.0199*
P -value *fungicide*	*0.0013*	*0.2152*	*0.8756*	*0.0277*	*0.0001*	*0.0002*
P -value *tillage*hybrid*	*0.7030*	*0.2439*	*0.3822*	*0.4437*	*0.7392*	*0.3051*
P -value *tillage*fungicide*	*0.1141*	*0.4880*	*0.8756*	*0.1958*	*0.0723*	*0.1692*
P -value *hybrid*fungicide*	***0.0453***	*0.1802*	*0.9675*	*0.5000*	***0.0342***	*0.1570*
P -value *tillage*hybrid*fungicide*	*0.6830*	*0.3101*	*0.9675*	*0.1845*	*0.7922*	*0.5632*

[z] Veltyma application was applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Veltyma was applied on 2 Aug at blister (R2).
[y] Tar spot stroma visually assessed percentage (0-100%) of ear leaf on ten plants in each plot on 28 Sep at maturity (R6) growth stage.
[x] GLS and NCLB severity visually assessed as percentage (0-100%) of leaf area on ten plants in each plot on 7 Sep at dough/dent (R4/R5) growth stage. GLS = gray leaf spot; NCLB = northern corn leaf blight.
[w] Yields were adjusted to 15.5% moisture and harvested on 7 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea maydis* 'P9608Q' and 'P1099Q')
Tar spot; *Phyllachora maydis*

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Comparison of hybrid maturity, planting, and fungicide for tar spot in corn (COR23-07.PPAC)

A trial was established at the Pinney Purdue Ag Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrids 'P9608Q' and 'P1099Q' were planted in 30-inch row spacing at a rate of 34,000 seeds/A on 18 May and 26 May. P9608Q is a 96-day hybrid and P1099Q is a 110-day hybrid. Foliar fungicide applications were made at the tassel/silk (VT/R1) growth stage on 3 Aug for 18 May planting and 10 Aug for 26 May planting plots. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 20 Sep and 10 Oct at dough (R4) and physiological maturity (R6), respectively. Tar spot severity visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. The two center rows of each plot were harvested on 6 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. On 20 Sep, hybrid P9608Q has significantly more tar spot than P1099Q, and a Veltyma fungicide application significantly reduced the severity of tar spot stromata in P9608Q, but not P1099Q (Table 23). On 10 Oct severity of tar spot was significantly reduced in Hybrid P1099Q compared to P9608Q and with Veltyma 3.34 S compared to nontreated control. Canopy greenness on 3 Oct was significantly higher at planting date B over planting date A, in hybrid P1099Q as compared to P9608Q, and increased with Veltyma over nontreated. Yield was highest for P9608Q planted on 26 May (planting date B) verses at planting date of 18 May (planting date B), but was not significantly more than P1099Q at the same planting dates.

Table 23. Effect of treatments on foliar disease severity in corn and yield of corn.

Treatment and rate/A[z]	Tar spot % [y] 20 Sep		Tar spot % [y] 10 Oct	Canopy[x] green %	Harvest moisture %	Test weight lb/bu	Yield[w] Bu/A	
Planting Date A	2.4		3.0	42.2 a	22.9 a	53.2		
Planting Date B	2.0		3.0	57.8 b	24.8 b	52.1		
							PD A	PD B
Hybrid P9608Q			3.7 a	23.4 a	20.0 a	54.6 a	182.6 c	222.5 a
Hybrid P1099Q			2.2 b	76.6 b	27.6 b	50.7 b	197.8 bc	204.2 ab
	P9608Q	P1099Q						
Nontreated control	6.4 a	0.8 b	4.2 a	45.6 a	23.5	52.7	199.6	
Veltyma 3.34 S 7.0 fl oz	1.2 b	0.3 b	1.8 b	54.4 b	24.1	52.6	204.0	
P-value date[v]	*0.6233*		*0.9979*	***0.0001***	***0.0003***	***0.0600***	*0.8042*	
P-value hybrid	*0.0002*		***0.0039***	***0.0001***	***0.0001***	***0.0001***	*0.0013*	
P-value fungicide	*0.0006*		***0.0001***	***0.0066***	*0.1590*	*0.8202*	*0.4849*	
*P-value planting date*hybrid*	*0.9378*		*0.8739*	*0.6708*	*0.0627*	*0.6500*	***0.0142***	
*P-value planting date*fungicide*	*0.9630*		*0.7289*	*0.8314*	*0.4090*	*0.8686*	*0.8213*	
*P-value hybrid*fungicide*	***0.0034***		*0.1056*	*0.0659*	*0.8029*	*0.6798*	*0.3237*	
*P-value planting date*hybrid*fungicide*	*0.8490*		*0.1802*	*0.0429*	*0.4903*	*0.6063*	*0.2555*	

[z] Foliar applications were made at the tassel/silk (VT/R1) growth stage on 3 Aug for 18 May planting plots and 10 Aug for 26 May planting plots.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 20 Sep and 10 Oct.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 3 Oct.
[w] Yields were adjusted to 15.5% moisture and harvested on 6 Nov. PD = planting date.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicides for foliar diseases in corn in northwestern Indiana, 2023 (COR23-13.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 25 May. Foliar applications were made at V6/V7, V10, and blister (R2) growth stages on 5 Jul, 17 Jul, and 2 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 28 Aug, 8 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6) growth stages, respectively. Tar spot severity was visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for tar spot. Tar spot was the most prominent disease in the trial and reached a moderate level. All fungicide programs significantly reduced tar spot on the ear leaf on 28 Aug over the nontreated control, except Lucento at R2, Topguard at V6/V7 fb Adastrio at R2, and ALB4003B 14.0 oz + ALB5018 0.10% at V6 fb ALB4003B 14.0 oz + ALB5018 0.10% at R2 (Table 24). All fungicide programs reduced tar spot on EL on 8 Sep over nontreated control. There was no significant difference between treatments and nontreated control for tar spot on 3 Oct. Trivapro, Delaro Complete, Veltyma, and ALB4003B 14.0 oz + ALB5018 0.10% at V6 fb ALB4016 14.4 oz + ALB5018 0.10% + ALB4021B 32.0 oz at R2 had significantly higher canopy greenness on 3 Oct as compared to nontreated control. Adastrio had the highest harvest moisture, but was not significant from nontreated control. There were no significant differences between treatments and nontreated control for test weight and yield of corn.

Table 24. Effect of fungicide on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A, and timing[z]	Tar spot %[y] 28 Aug	Tar spot %[y] 8 Sep	Tar spot %[y] 3 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.4 a	1.8 a	27.5	32.5 e	22.4 a-d	52.5	235.8
Trivapro 2.21 SE 13.7 fl oz at R2	0.2 d	0.8 bcd	25.5	55.0 abc	23.2 a-d	52.0	243.0
Delaro Complete 458 SC 8.0 fl oz at R2	0.1 d	0.4 cd	20.4	70.0 a	22.9 abc	51.7	243.0
Veltyma 3.34 S 7.0 fl oz at R2	0.2 bcd	0.2 d	21.5	60.0 ab	23.0 ab	51.1	243.5
Lucento 7.17 SC 5.0 fl oz at R2	0.4 abc	0.9 bc	26.0	32.5 e	21.7 d	52.8	232.6
Adastrio 4.0 SC 8.0 fl oz at R2	0.2 cd	0.5 bcd	21.8	47.5 b-e	23.1 a	51.7	241.7
Topguard EQ 4.29 SC 5.0 fl oz at R2	0.2 d	0.5 bcd	18.0	42.5 cde	22.1 cd	52.4	240.2
Topguard 1.04 SC 10.0 fl oz at V6/V7 fb Adastrio 4.0 SC 8.0 fl oz at R2	0.4 ab	0.6 bcd	24.5	43.8 b-e	21.8 d	51.8	243.4
OR-009EPA 0.40% v/v + Delaro Complete 458 SC 8.0 fl oz at R2	0.1 d	0.3 cd	19.8	47.5 b-e	22.5 a-d	55.4	245.1
OR-009EPA 0.40% v/v + Trivapro 2.21 SE 13.7 fl oz at R2	0.2 bcd	1.0 bc	26.0	46.3 b-e	22.8 abc	51.7	242.3
ALB4003B 14.0 oz + ALB5018 0.10% at V6 fb ALB4016 14.4 oz + ALB5018 0.10% + ALB4021B 32.0 oz at R2	0.2 d	0.4 cd	20.8	52.5 bcd	22.2 bcd	52.4	243.9
ALB4003B 14.0 oz + ALB5018 0.10% at V6 fb ALB4003B 14.0 oz + ALB5018 0.10% at R2	0.4 ab	1.1 b	26.5	36.3 de	21.7 d	53.2	240.8
P-value[v]	*0.0006*	*0.0013*	*0.0746*	*0.0013*	*0.0088*	*0.5528*	*0.8920*

[z] Fungicide treatments were applied at V6/V7, V10, and blister (R2) growth stages on 5 Jul, 17 Jul, and 2 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A. R2 treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Tar spot stromata visually assessed as a percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 28 Aug, 8 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6) growth stages, respectively.
[x] Canopy greenness was visually assessed as a percentage (0-100%) of crop canopy on 3 Oct.
[w] Yields were adjusted to 15.5% moisture and harvested on 3 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of drone applications for tar spot in corn in northwestern Indiana, 2023 (COR23-16.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 22 May. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. Veltyma 3.34 S 7.0 fl oz/A was applied on 21 Aug at silk (R1) growth stage using three different applicators, a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart at 3.6 mph; a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with four TJ-VS 8002 nozzles spaced 20-in. apart, at 3.1 mph, both applied at 15 gal/A and 40 psi; and a DJI Agras T10 drone equipped 2.1-gal spray tank with spray pattern using four TJ-VS 8002 nozzles spaced apart at 3.1 mph and applied at 1.65 gal/A and 40 psi. Disease ratings were assessed on 6 Sep, 29 Sep, and 16 Oct at early dent (R5) and late dent (R5) growth stages, respectively. Tar spot stroma severity was rated by visually assessing the percentage (0-100%) per leaf on five plants in each plot at the ear leaf. Values for the five leaves were averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at late dent (R5) growth stage. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot was the most prominent disease in the trial and reached moderate severity. Veltyma sprayed with the CO_2 backpack and ground rig reduced tar spot severity over nontreated control on 6 Sep (Table 25). Veltyma sprayed with the ground-rig, CO_2 backpack, and drone significantly reduced tar spot severity over nontreated control, but there was no difference between application type, on 29 Sep and 16 Oct. There was not significant difference in treatments for canopy greenness and yield of corn.

Table 25. Fungicide application effect on tar spot severity, canopy greenness, and yield of corn.

Application equipment and GPA[z]	**Tar spot % [y] 6 Sep**	**Tar spot % [y] 29 Sep**	**Tar spot % [y] 16 Oct**	**Canopy % green[x]**	**Yield[w] bu/A**
Nontreated control	1.1 a	2.2 a	8.2 a	38.8	190.4
Ground-rig at 15 GPA	0.8 b	1.2 b	3.2 b	52.6	215.7
CO_2 backpack at 15 GPA	0.8 b	1.2 b	2.3 b	51.3	217.9
DJI Agras T10 Drone at 1.65 GPA	1.1 a	1.6 b	3.4 b	51.3	214.4
P-value[v]	*0.0026*	*0.0013*	*0.0028*	*0.1433*	*0.1429*

[z] Veltyma 3.34 S at 7.0 fl oz/A was applied on 21 Aug at silk (R1) growth stage using ground-rig, CO_2 backpack, and drone. All foliar treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Tar spot severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 6 Sep, 29 Sep, and 16 Oct at early dent (R5) and late dent (R5) growth stages.
[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 16 Oct at late dent (R5) growth stage.
[w] Yields were adjusted to 15.5% moisture and harvested on 3 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of foliar fungicides in corn in northwestern Indiana, 2023 (COR23-23.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 22 May. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Fungicides were applied on 5 Jul and 2 Aug at V6/V7 and blister (R2) growth stages, respectively. Disease ratings were assessed on 12 Sep and 9 Oct at dough (R4) and dent/maturity (R5/R6) growth stages, respectively. Tar spot was rated by visually assessing the percentage (0-100%) of symptomatic leaf area on ear leaf and five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were moderately favorable for tar spot disease. Tar spot was the most prominent disease in the trial and reached moderate severity. Tar spot severity was significantly reduced over nontreated control by Affiance + GWN 10337 at V6/V7, Affiance at R2, Affiance + GWN 10337 at R2, Affiance at V6/V7 fb Veltyma at R2, Domark at V6/V7 fb Veltyma at R2, and GWN 10337 + GWN 14510.00001 40.0 fl oz at R2 on 12 Sep (Table 26). No differences between treatments and nontreated control were detected for tar spt on 9 Oct. Affiance at V6/V7, Affiance at R2, Affiance + GWN 10337 at R2, Affiance at V6/V7 fb Veltyma at R2, Domark at V6/V7 fb Veltyma at R2, and GWN 10337 + GWN 14510.00001 4.0 fl oz at R2 significantly increased canopy greenness over nontreated control. There was no significant effect of treatment on harvest moisture, test weight, and yield of corn.

Table 26. Effect of treatments on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A, and timing[z]	Tar spot %[y] 12 Sep	Tar spot %[y] 9 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] Bu/A
Nontreated control	1.3 a	15.6	35.0 de	23.8	52.3	204.2
Affiance 1.5 SC 10.0 fl oz at V6/V7	1.2 ab	17.5	45.0 abc	24.1	51.7	203.5
Affiance 1.5 SC 10.0 fl oz + GWN 10337 2.5 fl oz at V6/V7	0.8 bcd	17.3	43.8 bcd	24.8	51.3	193.1
Affiance 1.5 SC 10.0 fl oz at R2	0.8 bcd	17.1	46.3 abc	23.2	52.4	200.2
Affiance 1.5 SC 10.0 fl oz + GWN 10337 2.5 fl oz at R2	0.5 cd	11.0	50.0 ab	24.9	51.6	205.1
Affiance 1.5 SC 10.0 fl oz at V6/V7 fb Veltyma 3.34 S 7.0 fl oz at R2	0.4 d	12.6	53.8 a	24.0	51.7	215.5
Domark 230 ME 4.0 fl oz at V6/V7 fb Veltyma 3.34 S 7.0 fl oz at R2	0.5 cd	11.7	48.8 ab	24.5	51.5	211.8
Domark 230 ME 4.0 fl oz at + Siapton 24.0 fl oz + Veltyma 3.34 S 7.0 fl oz at V6/V7	0.9 abc	11.6	42.5 bcd	23.7	51.5	208.9
GWN 10337 6.0 fl oz + GWN 14510.00001 4.0 fl oz at R2	0.5 cd	8.1	48.8 ab	24.0	51.6	212.3
GWN 10337 6.0 fl oz + GWN 14510.00001 6.0 fl oz at R2	1.3 ab	14.5	37.5 cde	24.2	53.4	206.5
Affiance 1.5 SC 10.0 fl oz + Badge X2 SC 32.0 fl oz at V6/V7	1.0 ab	19.0	32.5 e	23.5	51.5	200.6
P-value[v]	*0.0012*	*0.3066*	*0.0018*	*0.6354*	*0.8317*	*0.3810*

[z] Foliar fungicides were applied on 5 July and 2 Aug at V6/V7 and blister (R2) growth stages, respectively.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 12 Sep and 9 Oct at dough (R4) and dent/maturity (R5/R6) growth stages, respectively.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 9 Oct.
[w] Yields were adjusted to 15.5% moisture and harvest on 3 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicides for foliar diseases in corn in northwestern Indiana, 2023 (COR23-24.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000/A on 18 May. 2x2 applications were made at planting in 10 gal/A. Foliar applications were made at blister (R2a/R2b), early dough (R4), and late dough (R4) growth stages on 2 Aug, 3 Aug, 22 Aug, and 29 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 2 Sep, 14 Sep, and 3 Oct at dough (R4), late dough/early dent (R4/R5), and full dent (R5) growth stages, respectively. Tar spot severity were visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. Percent canopy greenness was visually assessed percentage (0-100%) of canopy green on 3 Oct. The two center rows of each plot were harvested on 3 Nov and yield were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease development. Tar spot was the most prominent disease in the plot and reached moderate severity. Xyway followed by (fb) Adastrio at R2a or R2b, and Adastrio at R2a, R2b and early R4 significantly reduced tar spot severity on 2 Sep over nontreated control (Table 27). All programs reduced tar spot severity over nontreated control on 14 Sep. Xyway fb Adastrio at R2a, R2b, or early R4; and Adastrio at R2a and early R4 reduced tar spot severity as compared to nontreated control on 3 Oct. Canopy greenness was greatest when Adastrio was applied at early R4. No differences were detected for lodging, moisture, and test weight. Xyway 9.5 fl oz; Xyway fb Adastrio at R2a, early R4 and late R4; and Adastrio at R2b and early R4 significantly increased yield over nontreated control (p=0.10).

Table 27. Effect of fungicide on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A and timing[z]	**Tar spot %** [y] **2 sep**	**Tar spot %** [y] **14 Sep**	**Tar spot %** [y] **3 Oct**	**Canopy green**[x] **%**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	2.3 a	11.2 a	36.3 a	1.3 c	53.3	190.9 c
Xyway LFR 1.92 SC 9.5 fl oz 2x2	1.5 abc	7.0 b	34.5 ab	4.0 bc	53.4	220.8 a
Xyway LFR 1.92 SC 15.2 fl oz 2x2	1.4 a-d	5.2 b-e	34.6 ab	4.4 bc	53.7	198.2 bc
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 9.5 fl oz at R2a	0.5 d	3.6 ef	30.0 cd	4.5 bc	53.5	210.2 ab
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz at R2b	0.8 bcd	4.5 c-f	32.3 bc	7.3 bc	53.3	196.7 bc
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz at early R4	1.8 ab	2.7 f	27.0 de	13.0 b	52.6	210.0 ab
Xyway LFR 1.92 SC 9.5 fl oz 2x2 fb Adastrio 4.0 SC 7.0 fl oz at late R4	1.7 ab	6.9 bc	34.5 ab	2.5 bc	53.1	211.7 ab
Adastrio 4.0 SC 8.0 fl oz at R2a	0.6 cd	4.2 def	32.0 bc	9.5 bc	52.7	208.3 abc
Adastrio 4.0 SC 8.0 fl oz at R2b	1.0 bcd	4.7 c-f	34.3 ab	7.8 bc	52.7	219.7 a
Adastrio 4.0 SC 8.0 fl oz at early R4	1.0 bcd	2.8 f	25.3 e	25.0 a	52.7	212.1 ab
Adastrio 4.0 SC 8.0 fl oz at late R4	1.5 abc	5.9 bcd	34.0 ab	2.0 bc	51.7	200.7 bc
P-value[v]	*0.0385*	*0.0001*	*0.0001*	*0.0121*	*0.3145*	*0.0684*

[z] Xyway applications were applied at 2x2 at 10 gal/A on 18 May. Foliar applications were made at blister (R2a/R2b), early dough (R4), and late dough (R4) growth stages on 2 Aug, 3 Aug, 22 Aug, and 29 Aug, respectively

[y] Tar spot severity were visually assessed as percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 2 Sep, 14 Sep, and 3 Oct at dough (R4), late dough/early dent (R4/R5), and full dent (R5) growth stages, respectively.

[x] Canopy greenness was visually assessed as percentage (0-100%) of crop canopy green on 3 Oct.

[w] Yields were adjusted to 15.5% moisture and harvested on 3 Nov.

[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea maydis* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicide programs for foliar diseases in corn in northwestern Indiana, 2023 (COR23-36.PPAC)

A trial was established at the Pinney Purdue Ag Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for no-till corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 22 May. Foliar applications were made at V9/V10 and tassel/silk (VT/R1) growth stages on 7 Jul and 3 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. Disease ratings were assessed on 14 Sep, and 9 Oct at dent (R5), and physiological maturity (R6) growth stages, respectively. Tar spot severity were visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. Percent canopy greenness visually assessed percentage (0-100%) of crop canopy green on 17 Oct. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for tar spot disease. Tar spot was the most prominent disease in the trial and reached moderate level. All fungicide programs significantly reduced tar spot severity compared to the nontreated control on 14 Sep and Oct 9 (Table 28). All fungicide programs significantly increased canopy greenness over the nontreated control (Table 28). There was no significant effect of treatments for moisture and test weight. Veltyma + OR-009E 0.4 % v/v at VT/R1, and Quadris at V9/V10 fb Veltyma at VT/R1 and Veltyma + OR-296 at VT/R1 programs significantly increased yield over nontreated control, but was not significantly different from Veltyma at VT/R1.

Table 28. Effect of treatments on foliar disease severity, canopy greenness, and yield of corn.

Treatment, rate/A and timing[z]	Tar spot %[y] 14 Sep	Tar spot %[y] 9 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	3.3 a	26.5 a	30.0 b	24.0	51.9	199.0 c
Veltyma 3.34 S 7.0 fl oz at VT/R1	0.5 b	6.3 b	58.8 a	24.5	52.1	214.3 abc
Veltyma 3.34 S 7.0 fl oz + OR-009E 0.4% v/v at VT/R1	0.3 b	3.0 bc	56.3 a	24.3	52.0	226.3 a
Quadris 2.08 SC 6.0 fl oz at V9/V10 fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.2 b	3.7 bc	56.3 a	24.4	51.3	224.2 a
Quadris 2.08 SC 6.0 fl oz + OR-484 5.5 fl oz + OR-009E 0.4%v/v at V9/V10 fb Veltyma 3.34 S 7.0 fl oz + OR-009E 0.40%v/v at VT/R1	0.2 b	1.8 c	61.3 a	25.3	51.5	197.9 cd
Quadris 2.08 SC 6.0 fl oz + OR-009E 0.40% v/v at V9/V10 fb Veltyma 3.34 S 7.0 fl oz + OR-009E 0.40% v/v at VT/R1	0.1 b	2.5 bc	57.5 a	24.5	53.0	200.2 bc
Quadris 2.08 SC 6.0 fl oz + OR-599 +329 0.625% v/v at V9/V10 fb Veltyma 3.34 S 7.0 fl oz + OR-009E 0.40% v/v at VT/R1	0.2 b	2.8 bc	65.0 a	25.5	52.3	181.0 d
Veltyma 3.34 S7.0 fl oz + OR-296 at VT/R1	0.3 b	2.7 bc	60.0 a	25.0	51.8	217.9 ab
P-value[v]	*0.0075*	*0.0001*	*0.0083*	*0.0731*	*0.1743*	*0.0004*

[z] Foliar applications were made at V9/V10 and tassel/silk (VT/R1) growth stages on 7 Jul and 3 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 29 Jul, 14 Sep, and 9 Oct at milk (R3), dent (R5), and physiological maturity (R6) growth stages, respectively.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 17 Oct.
[w] Yields were adjusted to 15.5% moisture and harvest on 3 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicide programs for foliar diseases in corn in northwestern Indiana, 2023 (COR23-39.PPAC)

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 18 May. In-furrow applications made at planting in 10 gal/A. Foliar applications were made at silk (R1) and blister (R2) growth stages on 2 Aug and 3 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 28 Aug, 13 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6), respectively. Tar spot severity was visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for tar spot development. Tar spot was the prominent disease in the trial and reached moderate severity in the trial. Delaro Complete at R1 significantly reduced tar spot over nontreated control on 28 Aug (Table 29). No significant differences were found between fungicide treatments and the nontreated control for tar spot on 13 Sep and 3 Oct. There were no significant differences for canopy greenness, harvest moisture, test weight, and yield of corn.

Table 29. Effect of fungicide on tar spot severity, canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	**Tar spot %**[y] **28 Aug**	**Tar spot %**[y] **13 Sep**	**Tar spot %**[y] **3 Oct**	**Canopy green**[x] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	0.7 ab	5.0	10.0	28.8	21.6	53.0	212.5
Tepera Plus HD LFC 439 L 5.4 fl oz in-furrow	0.8 a	5.0	11.4	20.0	21.4	53.0	206.8
Zolera FX 400 SE 5.0 fl oz at R1	0.7 ab	5.8	10.2	26.3	20.9	53.6	201.5
Zolera FX 400 SE 5.0 fl oz at R2	0.8 a	4.9	12.2	21.3	21.3	53.3	212.9
Tepera Plus HD LFC 439 L 5.4 fl oz in-furrow fb Zolera FX 400 SE 5.0 fl oz at R1	0.6 ab	4.9	10.7	27.5	21.8	52.1	211.9
Tepera Plus HD LFC 439 L 5.4 fl oz in-furrow fb Zolera FX 400 SE 5.0 fl oz at R2	0.4 bc	3.5	9.3	27.5	22.0	52.8	217.0
Delaro Complete 458 SC 8.0 fl oz at R1	0.2 c	2.8	8.3	42.5	22.5	52.6	220.0
P-value[v]	*0.0189*	*0.2765*	*0.5870*	*0.4290*	*0.6707*	*0.7967*	*0.3747*

[z] In-furrow applications made at planting in 10 gal/A. Foliar applications were made at silk (R1) and blister (R2) growth stages on 2 Aug and 3 Aug, respectively.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 28 Aug, 13 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6), respectively.
[x] Canopy greenness was visually assessed percentage (0-100%) of crop canopy on 3 Oct.
[w] Yields were adjusted to 15.5% moisture and harvested on 3 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

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Evaluation of fungicides for foliar diseases in corn in northwestern Indiana, 2023 (COR23-41.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2385VT2PRIB' was planted in 30-inch row spacing at a rate of 2 seed/ft on 18 May. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1. in or higher to encourage disease. Foliar applications were made at V10, blister (R2), and dough (R4) growth stages on 17 Jul, 2 Aug, and 22 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 30 Aug, 14 Sep, and 9 Oct at dough (R4), early dent (R5), and late dent (R5) growth stages, respectively. Tar spot severity were visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. Percent canopy greenness was visually assessed percentage (0-100%) of crop canopy green on 9 Oct. The two center rows of each plot were harvested on 3 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease development. Tar spot was the most prominent disease and reached moderate severity. No significant differences were detected for tar spot severity on 30 Aug (Table 30). Xyway 9.5 fl oz 2x2 fb Veltyma at R4 and Veltyma at R2 significantly reduced tar spot over the nontreated control on 14 Sep. All fungicide programs significantly reduced tar spot over nontreated control on 9 Oct. Veltyma at R2 significantly increased canopy greenness compared to the nontreated control on 9 Oct. No differences between fungicide programs and the nontreated control were detected for test weight and yield of corn.

Table 30. Effect of fungicide treatment on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A, and timing[z]	Tar spot %[y] 30 Aug	Tar spot %[y] 14 Sep	Tar spot %[y] 9 Oct	Canopy green[x] %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.15	0.8 ab	19.3 a	36.3 bc	60.7	201.9
Xyway LFR 1.92 SC 9.5 fl oz in 2x2	0.11	0.8 ab	7.9 b	33.3 bc	51.5	204.9
Xyway LFR 1.92 SC 15.2 fl oz in 2x2	0.11	1.0 a	8.1 b	28.8 c	52.1	206.6
Xyway LFR 1.92 SC 9.5 fl oz in 2x2 fb Adastrio 4.0 SC 7.0 fl oz at R2	0.06	0.7 abc	8.9 b	37.5 bc	52.0	213.8
Xyway LFR 1.92 SC 9.5 fl oz in 2x2 fb Adastrio 4.0 SC 7.0 fl oz at R4	0.05	0.5 bc	6.9 b	33.8 bc	51.9	219.7
Xyway LFR 1.92 SC 9.5 fl oz in 2x2 fb Veltyma 3.34 S 7.0 fl oz at R4	0.13	0.4 c	4.3 b	41.7 ab	50.9	210.5
Topguard 1.04 SC10.0 fl oz at V10 fb Adastrio 4.0 SC 8.0 fl oz at R4	0.09	0.6 bc	7.7 b	33.4 bc	52.5	214.7
Adastrio 8.0 fl oz at R2	0.09	0.6 abc	7.4 b	40.0 bc	50.4	208.9
Delaro 325 SC 5.0 fl oz at V10 fb Delaro Complete 458 SC 8.0 fl oz at R4	0.06	0.6 bc	3.9 b	45.0 ab	51.7	206.5
Veltyma 3.34 S 7.0 fl oz at R2	0.04	0.3 c	4.7 b	52.5 a	60.6	218.7
P-value[v]	*0.0975*	*0.0331*	*0.0009*	*0.0147*	*0.5688*	*0.4305*

[z] Foliar applications were made at V10, blister (R2), and dough (R4) growth stages on 17 Jul, 2 Aug, and 22 Aug, respectively. All foliar fungicide treatments at blister (R2) and dough (R4) contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.

[y] Tar spot stromata was visually assessed as a percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 30 Aug, 14 Sep, and 9 Oct at dough (R4), early dent (R5), and late dent (R5) growth stages, respectively.

[x] Canopy greenness was visually assessed percentage (0-100%) of crop canopy green on 9 Oct.

[w] Yields were adjusted to 15.5% moisture and harvest on 3 Nov.

[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'W2585VT2PRIB')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicides for foliar diseases in corn in northwestern Indiana, 2023 (COR23-44.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2585VT2PRIB' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 25 May. Foliar applications were made at V12, blister (R2), and dough (R4) growth stages on 25 Jul, 2 Aug, and 22 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Disease ratings were assessed on 28 Aug, 12 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6), respectively. Tar spot severity were visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot and averaged before analysis. Percent canopy greenness was visually assessed as a percentage (0-100%) of crop canopy green on 3 Oct. The two center rows of each plot were harvested on 6 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease development. Tar spot was the most prominent disease in the trial and reached moderate severity. All fungicides significantly reduced tar spot on 28 Aug over nontreated control, except Miravis Neo at R4 (Table 31). All fungicide applications reduced tar spot on 12 Sep over nontreated control. Miravis Neo applied at R2 fb Miravis Neo at R4, and Miravis Neo at R2 fb Quilt Xcel at R4 resulted in the lowest level of tar spot on 12 Sep. On 3 Oct all fungicide programs reduced tar spot stromata over the nontreated control. Canopy greenness was significantly higher than the nontreated control with Veltyma at V12 and at R2, Delaro Complete at R2, and Miravis Neo at R2 fb either Miravis Neo or Quilt Xcel at R4 (Table 31). No significant differences were detected for test weight and yield of corn.

Table 31. Effect of fungicide treatment on tar spot severity, canopy greenness, and yield of corn.

Treatment, rate/A, and timing[z]	Tar spot %[y] 28 Aug	Tar spot %[y] 12 Sep	Tar spot %[y] 3 Oct	Canopy green[x] %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.23 a	0.80 a	3.9 a	56.3 b	54.8	234.9
Miravis Neo 2.5 EC 13.7 fl oz at V12	0.05 bc	0.51 bc	2.3 bc	65.7 ab	51.8	231.6
Veltyma 3.34 S 7.0 fl oz at V12	0.00 c	0.39 bc	1.5 bcd	80.0 a	51.7	243.6
Miravis Neo 2.5 EC 13.7 fl oz at R2	0.04 c	0.53 b	2.5 b	71.3 ab	52.6	240.8
Adastrio 4.0 SC 7.0 fl oz at R2	0.02 c	0.43 bc	2.0 bc	68.8 ab	52.8	247.8
Veltyma 3.34 S 7.0 fl oz at R2	0.01 c	0.37 bc	1.4 bcd	75.0 a	51.4	238.6
Delaro Complete 458 SC 8.0 fl oz at R2	0.00 c	0.43 bc	1.6 bcd	80.0 a	52.0	252.1
Miravis Neo 2.5 EC 13.7 fl oz at R4	0.14 ab	0.26 cd	0.9 cde	65.0 ab	52.0	240.7
Miravis Neo 2.5 EC 13.7 fl oz at R2 fb Miravis Neo 2.5 EC 13.7 fl oz at R4	0.00 c	0.04 d	0.3 e	80.0 a	52.7	239.4
Miravis Neo 2.5 EC 13.7 fl oz at R2 fb Quilt Xcel 2.2 SE 10.5 fl oz at R4	0.00 c	0.09 d	0.6 de	75.0 a	52.1	244.9
P-value[v]	*0.0001*	*0.0002*	*0.0001*	*0.0482*	*0.4949*	*0.2591*

[z] Foliar fungicide applications were made at V12, blister (R2), and dough (R4) growth stages on 25 Jul, 2 Aug, and 22 Aug, respectively. All foliar fungicide applications were applied at 15 gal/A and applications made after VT/R1 contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.

[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 28 Aug, 12 Sep, and 3 Oct at dough (R4), dent (R5), and physiological maturity (R6), respectively.

[x] Canopy greenness was visually assessed percentage (0-100%) of crop canopy green on 3 Oct.

[w] Yields were adjusted to 15.5% moisture and harvest on 6 Nov.

[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* '25E334N')
Septoria brown spot; *Septoria glycines*

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Evaluation of planting dates and seed treatments on soybean in northwestern Indiana, 2023 (SOY23-11.PPAC).

A trial was established at Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 40-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar '25E334N' was planted in 30-inch row spacing at a rate of 140,000 seeds/A. Treatments were a factorial arrangement of four planting dates by four seed treatments. Soybeans were planted on 13 Apr, 27 Apr, 11 May, and 31 May. Stand counts were assessed at cotyledons expanded/first-node stage (VC/V1) growth stage for each planting date. Disease ratings were assessed on 6 Sep at full seed/beginning maturity (R6/R7) growth stage. Septoria brown spot (SBS) was rated for disease severity by visually assessing the percentage (0-100%) of canopy disease symptoms in each plot. Ten roots were sampled from outer rows of each plot and rated for root rot severity on a scale of (0-100%) and averaged before analysis. Root dry weight was calculated from the ten root samples. The two center rows of each plot were harvested on 9 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letter are significantly different based on a least square difference test (α=0.05).

In 2023, weather conditions were not favorable for the disease. Septoria brown spot (SBS) was the most prominent disease and reached low severity. There was a significant interaction between planting date and seed treatment for stand count, but no interactions were detected for other variables, therefore only main effects are presented. Soybean stand counts were the highest in the 31 May planting date with nontreated control and CruiserMaxx APX without thiamethoxam seed treatments, whereas the planting dates on 13 Apr and 27 Apr results in the lowest stand across all seed treatments (data not shown). Planting on 13 April resulted on the highest incidence of SBS as compared to later planting dates (Table 32). There were no significant differences between planting dates for root rot severity. Root dry weight was highest at planting dates on 13 Apr and 27 Apr as compared to 11 May and 31 May. CruiserMaxx APX with thiamethoxam seed treatment also significantly increased root weight compared to all the other seed treatments and nontreated control. Test weight was significantly higher at planting on 31 May compared to other planting dates. Soybean yield was significantly reduced on the last planting date, 31 May, as compared to earlier planting dates. No significant differences were detected between seed treatments for SBS, root rot, test weight and yield of soybean.

Table 32. Effect of planting dates and seed treatments on stand, SBS severity, root rot, root weight and soybean yield.

Planting dates and seed treatment[z]	Stand Count #/A	SBS %[y]	Root rot[x] %	Root dry weight[w] g	Test weight lb/bu	Yield[v] bu/A
Planting date (13 Apr)	85,105	17.5 a	0.5	31.5 a	55.5 b	73.6 a
Planting date (27 Apr)	89,135	14.1 b	0.3	33.2 a	55.5 b	72.8 a
Planting date (11 May)	138,848	9.4 c	0.2	26.6 b	55.6 b	71.0 a
Planting date (31 May)	152,514	5.3 d	0.3	26.9 b	56.1 a	65.3 b
Nontreated control	119,899	11.6	0.3	28.2 b	55.6	70.8
CruiserMaxx APX with thiamethoxam	111,514	11.3	0.5	33.1 a	55.8	70.6
Thiamethoxam	114,345	11.3	0.2	29.9 b	55.6	71.1
CruiserMaxx APX without thiamethoxam	119,844	12.2	0.4	27.0 b	55.6	70.0
P-value *planting date*[u]	*0.0001*	*0.0001*	*0.4654*	*0.0001*	*0.0023*	*0.0001*
P-value *seed treatment*	*0.0413*	*0.7880*	*0.4267*	*0.0019*	*0.7905*	*0.8905*
P-value *planting date*seed treatment*	*0.0060*	*0.1756*	*0.6512*	*0.1594*	*0.8616*	*0.8611*

[z] Seed treatments applied prior to planting at 10 g AI/100 kg seed.
[y] Disease severity visually assessed as a percentage (0-100%) of canopy within a plot with symptoms on 6 Sep at full seed/beginning maturity (R6/R7) growth stage. SBS = Septoria brown spot.
[x] Ten roots per plot were sampled from border rows, gently washed and root rot visually assessed as a percentage (0-100%) of dark discoloration on roots on 8 Sep.
[w] Root dry weight = weight of 10 dried root samples.
[v] Yields were adjusted to 13% moisture and harvested on 9 Oct.
[u] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
White mold; *Sclerotinia sclerotiorum*

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Evaluation of fungicides for white mold in soybean in northwestern Indiana, 2023 (SOY23-17.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 22 May. Inoculum of *Sclerotinia sclerotiorum* was applied on the seedbed at 1.25 g/ft at planting. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. All fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Fungicides were applied on 17 Jul and 25 Jul at beginning bloom (R1) and beginning pod (R3) growth stages, respectively. White mold disease incidence assessed by counting the number of plants in each plot with symptoms (DI). For disease severity, each plant that is observed rated according to the following disease category: 0 = no disease; 1 = lateral branches with white mycelium and lesions; 2 = main stem with white mycelium and sclerotia present; 3 = entire plant wilted/plant death. The disease severity index (DSI) is calculated by multiplying the average number of plants in each severity category by the incidence: DSI = [sum (disease severity score × number of plants)]/[(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 9 Oct and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were moderately favorable for disease. White mold was the most prominent disease and reached moderate severity. There were no significant differences between fungicide treatments and nontreated control for disease ratings on 14 Sep (Table 33). Delaro Complete applied at R1 fb R3 significantly reduced white mold DSI when compared only with nontreated control, but was not significantly different for all other treatments. There was no significant effect of treatment on canopy greenness and soybean yield.

Table 33. Effect of fungicide on white mold, canopy greenness, and yield of soybean.

Treatment and rate/A[z]	White mold[y] DI %	White mold[y] DSI %	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	34.3	21.6	58.8	12.5	57.2	51.3
Delaro Complete 458 SC 8.0 fl oz R1	24.3	11.4	68.8	12.5	57.2	53.2
Delaro Complete 458 SC 8.0 fl oz at R1 fb Delaro Complete 458 SC 8.0 fl oz at R3	18.3	9.1	67.5	12.7	56.9	53.3
Miravis Neo 2.5 SE 13.7 fl oz R1	23.8	11.8	65.0	12.7	56.8	53.5
Endura 70 WDG 6.0 oz R1	28.0	15.4	55.0	12.9	57.3	52.8
Revytek 3.33 LC 8.0 oz R1	25.3	13.1	65.0	12.8	56.9	52.1
Omega 500 F 16.0 fl oz R1	27.8	14.9	61.3	12.6	57.2	52.9
P-value[v]	*0.7638*	*0.5512*	*0.7076*	*0.6628*	*0.5732*	*0.8990*
P-value NTC vs. R1 fb R3 program	*0.1038*	*0.0388*	*0.3349*	*0.3222*	*0.2160*	*0.2929*

[z] Fungicides were applied on 17 Jul and 25 Jul at beginning bloom (R1) and beginning pod (R3) growth stages, respectively. All plots inoculated with *S. sclerotiorum*.
[y] White mold DI – disease incidence % per plot. White mold disease severity index (DSI) is calculated by multiplying the average number of plants in each severity category by the incidence: DSI = [sum (disease severity score × number of plants)]/[(maximum disease score) × (disease incidence)] × 100.
[x] Canopy greenness was visually assessed percent (0-100%) on 14 Sep.
[w] Yields were adjusted to 13% moisture and harvest on 9 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
White mold; *Sclerotinia sclerotiorum*

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Uniform fungicide trials for white mold in soybean in northwestern Indiana, 2023 (SOY23-25.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows were used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 22 May. Inoculum of *Sclerotinia sclerotiorum* was applied on the seedbed at 1.25 g/ft at planting. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. Treatments were applied using a Lee self-propelled sprayer with a 10-ft boom, using six TJ-VS 8002 nozzles spaced 20 in. apart, applying at 15 gal/A at 40 psi. In addition, 360 undercover treatments were applied using a CO_2 backpack sprayer with a 10-ft boom, using four 360 nozzles spaced 30 in. apart in 15 gal/A at 40 psi. Fungicides were applied on 6 Jul, 17 Jul, and 25 Jul at the V4, beginning bloom (R1), and beginning pod (R3) growth stages, respectively. Sporecaster applications occurred on 19 Jul at full bloom (R2) growth stage. Disease rating was assessed on 15 Sep at full seed (R6) growth stage. White mold disease incidence was assessed by counting the number of plants in each plot with symptoms. For disease severity, each plant observed was rated according to the following disease category: 0 = no disease; 1 = lateral branches with white mycelium and lesions; 2 = main stem with white mycelium and sclerotia present; 3 = entire plant wilted/plant death. The disease severity index (DIX) was calculated by multiplying the average number of plants in each severity category by the incidence: DIX = [sum (disease severity score × number of plants)] / [(maximum disease score) × (disease incidence)] × 100. Canopy greenness was visually assessed percentage (0-100%) of canopy green on 15 Sep. The two center rows of each plot were harvested on 9 Oct and yields were adjusted to 13% moisture. All disease and yield data were analyzed using a generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. White mold was present in the trial and reached a moderate level. Programs of Endura applied at R1 followed by (fb) R3, Omega at R1 fb Miravis Neo at R3, Delaro Completed at R3, and Omega at Sporecaster undercover reduced white mold disease incidenece and index over non-treated control (P=0.10) (Table 34). No significant differences were detected between treatments and nontreated control for canopy greenness and yield of soybean.

Table 34. Effect of fungicide on white mold incidence, canopy greenness, and yield of soybean.

Treatment, rate/A and timing[z]	White mold[y] DI %	White mold[y] Index	Canopy[x] % green	Yield[w] bu/A
Nontreated control	37.5 abc	12.5 abc	84.5	59.6
Endura 70 WDG 8.0 oz at R1 and R3	5.0 d	1.7 d	88.5	62.0
Endura 70 WDG 8.0 oz at R3	21.0 bcd	7.0 bcd	82.0	62.6
Omega 500 F 16.0 fl oz at R3 by 360 under cover	28.5 a-d	9.5 a-d	73.8	60.2
Omega 500 F 16.0 fl oz at R3	24.3 a-d	8.1 a-d	90.0	64.1
Cobra 2 EC 8.0 fl oz at V4	27.8 a-d	9.3 a-d	80.0	59.0
Cobra 2 EC 8.0 fl oz at V4 fb Domark 230 ME 5.0 fl oz at R3	25.3 a-d	8.4 a-d	86.3	60.5
Omega 500 F 12.0 fl oz at R1 fb Miravis Neo 2.5 SE 13.7 fl oz at R3	10.5 d	3.5 d	87.5	62.2
Delaro Complete 458 SC 8.0 fl oz at R3	12.0 d	4.0 d	83.3	62.6
Delaro Complete 458 SC 8.0 fl oz at R3 by 360 under cover	26.8 a-d	8.9 a-d	80.0	58.0
Headsup Seed Treatment	21.8 a-d	7.3 a-d	80.0	60.6
Headsup Seed Treatment fb Domark 203 ME 5.0 fl oz at R3	43.5 ab	14.5 ab	82.5	58.9
Miravis Neo 2.5 SE 16.0 fl oz at R3	46.0 a	15.3 a	90.8	61.0
Phostrol 6.26 SL 4.0 pt + Topsin 4.5 FL 20.0 fl oz at R3	25.0 a-d	8.3 a-d	78.8	59.7
Omega 500 F 16.0 fl oz with Sporecaster 360 under cover at R2	11.8 d	3.9 d	81.3	63.4
Endura 70 WDG 8.0 oz at Sporecaster at R2	15.5 cd	5.2 cd	83.8	61.7
P-value[v]	*0.0621*	*0.0622*	*0.4691*	*0.2559*

[z] Fungicides were applied on 6 Jul, 17 Jul, 19 Jul, and 25 Jul at the V4, beginning bloom (R1), full bloom (R2) at Sporecaster, and beginning pod (R3) growth stages, respectively. All fungicide treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v, except Cobra. All plots were inoculated with *S. sclerotiorum* at 1.25 g/ft within the seedbed at planting.

[y] White mold disease incidences assessed by counting the number of plants/plots with symptoms on 15 Sep. Disease severity index (INDEX)= [sum (disease severity score × number of plants)]/[(maximum disease score) × (disease incidence)] × 100.

[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 15 Sep.

[w] Yields were adjusted to 13% moisture and harvested on 9 Oct.

[v] All disease and yield data were analyzed using a generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.10 for white mold).

SOYBEAN (*Glycine max* 'Dwight' and 'MN1410')
White mold; *Sclerotinia sclerotiorum*

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Evaluation of white mold management programs for organic soybean in northwestern Indiana, 2023 (SOY23-26.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a split-plot design with four replications. Main plots were cover crop termination (full tillage vs. roller-crimped rye). Sub-plots were cultivar by fungicide program and were 6.7-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was sunflower. Cereal rye was planted on 17 Sep 2022 at a rate of 150 lbs/A. On 25 May the cover crop was terminated using either tillage or roller-crimping. Standard practices for soybean organic production in Indiana were followed. Organic soybean cultivars 'Dwight' and 'MN1410' were planted in 20-inch row spacing at a rate of 8 seeds/ft on 25 May. Inoculum of *Sclerotinia sclerotiorum* was applied within the seedbed at 1.25 g/ft at planting and 60 sclerotia per plot were spread between the middle two rows after tillage and before roller-crimping. The field was overhead irrigated weekly at 1 in. unless weekly rainfall was 1 in. or higher to encourage disease. All fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. Fungicides were applied on 25 Jul at full bloom (R2) growth stage. Disease ratings were assessed on 18 Sep at full seed (R6) growth stage. White mold disease incidence assessed by counting the number of plants in each plot with symptoms. For disease severity, each plant was rated according to the following disease category: 0 = no disease; 1 = lateral branches with white mycelium and lesions; 2 = main stem with white mycelium and sclerotia present; 3 = entire plant wilted/plant death. The disease severity index (DIX) is calculated by multiplying the average number of plants in each severity category by the incidence: DIX = [sum (disease severity score ×number of plants)]/[(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 10 Oct and yields were adjusted to 13% moisture. All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, low disease developed in plots. White mold was the most prominent disease in the trial but only reached low severity. The main effects of cultivar, cover crop termination, and fungicide treatments are presented where there were no significant interactions, and simple effects where an interaction was detected (Table 35). Full tillage reduced white mold disease severity index (DIX) when compared to roller-crimped rye (RCR). White mold was lowest in the nontreated Dwight and MN11410 treated with Actinovate, but these were not significant from MN1410 nontreated. The percentage of green canopy was highest when treated with Endura in roller-crimped rye, but this was not significantly different from full-till + Actinovate. There was no significant difference in treatements for white mold disease incidence, defoliation, and soybean yield.

Table 35. Effect of fungicide on white mold incidence, index, canopy greenness, defoliation, and yield of soybean.

Treatment[z]	**White mold % incidence**[y]	**White mold % DIX**[x]		**Canopy % green**[w]		**Defoliation**[v] **%**	**Yield**[u] **bu/A**
Cover crop termination							
Full tillage	2.2	2.0 b				68.6	52.0
Roller-crimped rye (RCR)	3.5	3.3 a				76.8	52.4
Cultivar							
Dwight	3.0			9.0		76.7	52.3
MN1410	2.7			13.0		68.8	52.1
Fungicide programs and rate/A		**Dwight**	**MN1410**	**Full till**	**RCR**		
Nontreated control	2.4	0.7 c	3.9 abc	5.4 c	5.2 c	76.7	51.3
Endura 70 WDG 8.0 fl oz	2.2	2.5 abc	1.5 bc	12.6 bc	34.3 a	57.2	50.6
Double Nickel 55 DWG 2 qt	3.6	6.0 a	1.0 bc	5.4 c	2.6 c	85.4	54.1
Serifel WP 16 fl oz	3.7	1.8 bc	4.7 ab	22.5 ab	4.9 c	62.9	51.2
Actinovate AG 12 oz	2.6	4.0 abc	0.6 c	4.1 c	16.6 bc	82.7	53.6
BotryStop 2 lb	2.7	2.0 bc	2.9 abc	14.4 bc	4.1 c	71.4	52.4
P-value till[t]	*0.0542*	***0.0397***		*0.7881*		*0.3279*	*0.5269*
P -value cultivar	*0.6979*	*0.6358*		*0.2476*		*0.2137*	*0.8635*
P-value fungicide	*0.8795*	*0.8656*		*0.0242*		*0.0816*	*0.1829*
*P-value till*cultivar*	*0.5781*	*0.6146*		*0.9575*		*0.6461*	*0.2624*
*P-value till*fungicide*	*0.5396*	*0.5360*		***0.0182***		*0.1560*	*0.2713*
*P-value cultivar*fungicide*	*0.0259*	***0.0193***		*0.6173*		*0.8520*	*0.9800*
*P-value till*cultivar*fungicide*	*0.5375*	*0.4413*		*0.4274*		*0.4213*	*0.7638*

[z] Fungicide applications were made on 25 Jul at full bloom (R2) growth stage. All plots were inoculated with *S. sclerotiorum* at 1.25 g/ft within the seedbed at planting and 60 sclerotia per plot were spread between the middle two rows before roller-crimped and after tillage. [y] White mold disease incidence assessed by counting the number of plants in each plot with symptoms. [x] The disease severity index (DIX) is calculated by multiplying the average number of plants in each severity category by the incidence: DIX = [sum (disease severity score X number of plants)]/[(maximum disease score) ×(disease incidence)] × 100. [w] Canopy greenness visually assessed percentage (0-100%) green of the two center rows on 29 Sep. [v] Defoliation = percentage of leaf loss in plot. [u] Yields were adjusted to 13% moisture and harvest on 10 Oct. [t] All disease and yield data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'P0574AM')
Gray leaf spot; *Cercospora zeae-maydis*

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Fungicide comparison for foliar diseases in corn in southern Indiana, 2023 (COR23-11.SWPAC).

A trial was established at the Southwest Purdue Agricultural Center (SWPAC) in Knox County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 27,000 seeds/A on 11 Apr. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart at 3.6 mph. Fungicides were applied on 24 Jul at silk/blister (R1/R2) growth stage. Disease ratings were assessed on 18 Aug at dent (R5) growth stage. Gray leaf spot (GLS) was rated by visually assessing the percentage (0-100%) of symptomatic leaf area on ear leaf and five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 16 Oct and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for disease development. Gray leaf spot (GLS) was present in the trial, but only reached low severity. No significant differences between treatments and nontreated control were detected for GLS severity, harvest moisture, test weight and yield of corn.

Table 36. Effect of treatment on foliar disease and yield of corn.

Treatment and rate/A[z]	GLS severity[y] %	Harvest moisture %	Test weight lb/bu	Yield[x] bu/A
Nontreated control	0.16	16.4	58.0	163.7
Veltyma 3.34 SC 7.0 fl oz	0.02	16.0	58.6	160.9
Delaro Complete 458 SC 8.0 fl oz	0.00	15.8	58.3	156.0
Aproach Prima 2.34 SC 6.8 fl oz	0.05	16.5	58.2	164.3
Adastrio 4.0 SC 8.0 fl oz	0.05	16.2	58.3	155.5
Miravis Neo 2.5 EC 13.7 fl oz	0.02	15.9	58.5	164.2
Trivapro 2.21 SE 13.7 fl oz	0.01	15.9	58.5	159.5
Headline AMP 1.68 SC 10.0 fl oz	0.03	15.9	58.9	161.2
Proline 480 SC 5.7 fl oz	0.07	17.0	57.6	161.2
Quadris 2.08 SC 6.0 fl oz	0.08	16.0	58.5	147.9
Tilt 3.6 EG 4.0 fl oz	0.08	16.9	57.6	167.5
P-value[w]	*0.1312*	*0.6041*	*0.5041*	*0.6833*

[z] Fungicide treatments applied on 24 Jul at silk/blister (R1/R2) growth stage.
[y] Gray leaf spot (GLS) was visually assessed as percentage (0-100%) of leaf area on five plants in each plot and averaged before ana on 18 Aug at dent (R5) growth stage.
[x] Yields were adjusted to 15.5% moisture and harvested on 16 Oct.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Evaluation of fungicides for foliar diseases on soybean in southwestern Indiana, 2023 (SOY23-02.SWPAC).

A trial was established at the Southwest Purdue Agricultural Center (SWPAC) in Knox County, IN. The trial was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 135,000 seed/A on 11 Apr. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Fungicides were applied on 14 Jul at beginning pod (R3) growth stage. Disease ratings were assessed on 18 Sep at full seed (R6). Frogeye leaf spot (FLS), Septoria brown spot (SBS), Cercospora leaf blight (CLB) were rated by visually assessing a percentage (0-100%) of symptomatic leaf area in the upper and lower canopies on 18 Aug. The two center rows of each plot were harvested on 22 Sep and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for disease development. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were present in the trial, but only reached low levels. There was no significant difference between treatments for all diseases (Table 37). No significant differences were detected for harvest moisture, test weight, and yield of soybean.

Table 37. Effect of treatment on foliar disease severity and yield of soybean.

Treatment, rate/A, and timing[z]	FLS severity[y] %	SBS lower canopy[y] %	CLB upper canopy[y] %	Harvest moisture %	Test weight lb/bu	Yield[x] bu/A
Nontreated control	0.4	0.5	2.5	12.8	55.9	75.6
Topguard EQ 4.29 SC 5.0 fl oz	0.0	0.4	0.8	12.6	56.4	73.9
Lucento 4.17 SC 5.0 fl oz	0.2	0.4	0.8	12.7	56.6	69.1
Trivapro 2.21 SE 13.7 fl oz	0.3	0.3	1.5	12.8	56.1	68.3
Quadris 2.08 SC 6.0 fl oz	0.3	0.6	1.8	12.9	56.2	73.7
Veltyma 3.34 SC 7.0 fl oz	0.2	0.5	0.9	12.9	55.7	76.9
Revytek 3.33 LC 8.0 fl oz	0.1	0.4	0.8	12.9	56.1	73.4
Echo 720 SE 36.0 fl oz + Folicur 3.6 F 4.0 fl oz + Topsin 4.5 FL 4.5 fl oz	0.4	0.4	0.5	12.8	56.1	67.4
Delaro Complete 458 SC 8.0 fl oz	0.3	0.3	0.5	12.8	56.1	71.9
Miravis Neo 2.5 SE 13.7 fl oz	0.2	0.4	0.6	13.1	56.4	68.2
P-value[w]	*0.0801*	*0.4579*	*0.1287*	*0.7655*	*0.5439*	*0.5025*

[z] Fungicide treatments were applied on 14 Jul at beginning pod (R3) growth stage, and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease incidence rated on scale of 0-100% of plants within a plot with disease symptoms on 18 Aug. FLS=frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight.
[x] Yields were adjusted to 13% moisture and harvested on 22 Sep.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Fungicide evaluation for foliar diseases in soybean in southwestern Indiana, 2023 (SOY23-04.SWPAC).

A trial was established at the Southwest Purdue Agricultural Center (SWPAC) in Knox County, IN. The experiment was a randomized complete block design with four replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 135,000 seed/A on 11 Apr. Fungicides were applied on 14 Jul and 24 Jul at beginning pod (R3) and beginning seed (R5) growth stages, respectively. All foliar fungicide applications were applied at 15 gal/A and 40 psi using a Lee self-propelled sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were rated for disease severity by visually assessing the percentage of symptomatic leaf area on 18 Aug. The two center rows of each plot were harvested on 22 Sep and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were unfavorable for disease development. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight were present in the trial but only reached low levels. There was no significant effect of fungicide treatment on FLS, CLB, and SBS severity (Table 38). There was no significant difference between fungicide treatments and the nontreated control for test weight and yield of soybean.

Table 38. Effect of treatment on foliar disease severity and yield of soybean.

Treatment, rate/A, and timing[z]	FLS % severity[y]	SBS % severity[y]	CLB % severity[y]	Test Weight lb/bu	Yield[x] bu/A
Nontreated control	0.18	0.2	1.0	56.2	77.7
Delaro Complete 458 SC 8.0 fl oz at R3	0.40	0.1	0.4	55.3	87.4
Lucento 4.17 SC 5.0 fl oz at R3	0.20	0.1	0.9	56.1	81.1
Trivapro 2.21 SE 13.7 fl oz at R3	0.20	0.1	0.8	56.0	85.5
Miravis Neo 2.5 SE 13.7 fl oz at R3	0.05	0.1	0.4	55.6	84.0
Revytek 3.33 LC 8.0 fl oz at R3	0.18	0.1	1.0	55.9	84.6
Delaro Complete 458 SC 8.0 fl oz at R5	0.05	0.1	0.4	56.3	79.9
Lucento 4.17 SC 5.0 fl oz at R5	0.08	0.1	1.1	56.0	83.3
Trivapro 2.21 SE 13.7 fl oz at R5	0.10	0.1	0.9	56.0	80.1
Miravis Neo 2.5 SE 13.7 fl oz at R5	0.05	0.1	0.8	55.5	86.9
Revytek 3.33 LC 8.0 fl oz at R5	0.03	0.1	1.1	56.0	83.7
Nontreated control	0.20	0.1	1.1	56.1	81.6
P-value[w]	*0.2640*	*0.4671*	*0.5900*	*0.3375*	*0.2709*

[z] Fungicides were applied on 14 Jul and 24 Jul at the at beginning pod (R3) and beginning seed (R5) growth stages. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease severities were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 18 Aug. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB = Cercospora leaf blight
[x] Yields were adjusted to 13% moisture and harvest on 22 Sep.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

WHEAT (*Triticum aestivum* 'P25R40')
Fusarium head blight; *Fusarium graminearum*

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Evaluation of fungicide efficacy for scab management in southwestern Indiana, 2023 (WHT23-04.SWPAC).

Plots were established at the Southwest Purdue Agricultural Center (SWPAC) in Knox County, IN. The experiment was a randomized complete block design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. Wheat cultivar 'P25R40' was drilled at 7.5 in. spacing on 17 Oct 2022. All fungicide applications were applied at 15 gal/A and 40 psi using a CO2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart and directed forward and backward at 45-degree angle. Fungicides were applied on 10 May at the Feekes growth stage 10.5.1 and 5 days after on 15 May. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 10 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 30 May. Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage. FHB severity was rated by visually assessing the percentage (0-100%) of the infected heads. The FHB index was calculated as: (% FHB incidence multiplied by average FHB severity)/100 per plot. The eight center rows of each plot were harvested with a Kincaid plot combine on 21 Jun and yields were adjusted to 13.5% moisture for comparison. A subsample of grain was taken from each plot and partitioned for DON (deoxynivalenol) analysis completed by the University of Minnesota DON testing lab and to determine Fusarium damage kernels (FDK) by visually assessing the percentage (0-100%) of the infected heads. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for Fusarium head blight (FHB). A low level of FHB was detected in the trial. FHB incidence and index were significantly reduced by all fungicide applications except Caramba when compared to the nontreated control (Table 39). The concentration of deoxynivalenol (DON) was significantly reduced by all fungicide applications. There were no significant differences between fungicide applications and nontreated control for FHB severity, percentage Fusarium damaged kernels (FDK), and yield.

Table 39. Effect of fungicide on Fusarium head blight, DON, Fusarium damaged kernels (FDK), and yield of wheat.

Treatment and rate/A[z]	**FHB % incidence**[y]	**FHB % severity**[x]	**FHB Index**[w]	**FDK**[v] **%**	**DON**[u] **(ppm)**	**Yield**[t] **bu/A**
Nontreated control	10.4 a	7.0	0.7 a	8.0	0.29 a	71.1
Prosaro 421 SC 6.5 fl oz at 10.5.1	3.8 bc	1.2	0.1 b	7.0	0.10 b	72.9
Caramba 90 EC 13.5 fl oz at 10.5.1	7.5 ab	3.3	0.3 ab	6.6	0.05 bc	71.8
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1	2.1 c	4.1	0.3 b	10.5	0.05 bc	70.5
Prosaro Pro 400 SC 10.3 fl oz at 10.5.1	1.7 c	2.3	0.1 b	8.9	0.00 c	77.0
Sphaerex 300 EC (BAS 84000F) 7.3 fl oz at 10.5.1	1.7 c	1.9	0.1 b	7.6	0.04 bc	71.0
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Prosaro Pro 400 SC 6.5 fl oz at 10.5.1 + 5 days	2.5 c	1.6	0.1 b	11.0	0.11 b	71.6
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Sphaerex 300 EC (BAS 84000F) 7.3 fl oz 10.5.1 + 5 days	4.6 bc	1.5	0.1 b	8.8	0.00 c	66.9
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Tebuconazole 3.6 SC 4.0 fl oz at 10.51 + 5 days	1.7 c	1.8	0.0 b	9.4	0.04 bc	71.0
P-value[s]	*0.0093*	*0.3066*	*0.0379*	*0.2335*	*0.0001*	*0.7155*

[z] Fungicide treatments applied on 10 May and 15 May at the Feekes growth stage 10.5.1 and 10.5.1 + 5 days, respectively. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.125% v/v. All plots inoculated with *Fusarium graminearum* spore suspension (50,000 spores/ml) after the treatment at Feekes 10.5.1. Spore suspension applied at 300 ml/plot with handheld sprayer.
[y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage on 30 May.
[x] FHB severity was rated by visually assessing the percentage of the infected head. FHB = Fusarium head blight on 30 May.
[w] FHB index was calculated as: (FHB incidence multiplied by average FHB severity)/100 per plot.
[v] FDK = percentage of Fusarium damaged kernels.
[u] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab on 17 Aug.
[t] Yields were adjusted to 13.5% moisture and harvested on 21 Jun.
[s] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

WHEAT (*Triticum aestivum* 'P25R40' and 'P25R61')
Fusarium head blight; *Fusarium graminearum*

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Evaluation of foliar fungicides and cultivars for scab management in southern Indiana, 2023 (WHT23-05.SWPAC).

Plots were established at the Southwest Purdue Agricultural Center (SWPAC) in Knox County, IN. The experiment was a strip-plot design with four replications. Plots were 7.5-ft wide and 20-ft long, consisted of 12 rows spaced 7.5 in. apart, and the center of each plot was used for evaluation. The previous crop was corn. On 17 Oct 2022 wheat cultivars 'P25R40' and 'P25R61' were drilled at 7.5 in. spacing. Fungicides were applied on 10 May at the Feekes growth stage 10.5.1. All fungicide applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in apart and directed forward and backward at 45-degree angle. Plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 10 May. Disease ratings were assessed on 30 May. Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage (0-100%). FHB severity was rated by visually assessing the percentage (0-100%) of the infected head. The FHB index was calculated as: (% FHB incidence multiplied by average FHB severity)/100 per plot. The eight center rows of each plot were harvested with a Kincaid 8XP combine on 21 Jun and yields were adjusted to 13.5% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for Fusarium head blight (FHB). A low level of FHB was detected in the trial. FHB incidence was significantly reduced by Miravis Ace, Prosaro Pro, and Sphaerex compared to both the inoculated and non-inoculated, nontreated controls (Table 40). FHB severity and FHB Index were significantly higher in the non-inoculated, nontreated control than any of the other treatments and the inoculated, nontreated control. The concentration of deoxynivalenol (DON) was significantly reduced by planting scab-resistant wheat cultivar 'P25R61' verses the scab-susceptible wheat cultivar 'P25R40'. The concentration of DON was significantly reduced by the application of Prosaro and Sphaerex over both nontreated controls. There were no significant differences between cultivars for FHB incidence, FHB severity, FHB index, and yield of wheat. There was no significant difference between treatmeents for wheat yield.

Table 40. Effect of fungicide on Fusarium head blight, DON, Fusarium damaged kernels (FDK), and yield of wheat.

Cultivar or treatment and rate/A[z]	FHB % incidence[y]	FHB % severity[x]	FHB Index[w]	DON[v] (ppm)	Yield[u] bu/A
P25R40 (scab susceptible)	3.6	4.4	0.3	0.12 a	69.1
P25R61 (scab resistant)	2.6	3.6	0.2	0.03 b	66.4
Nontreated control, inoculated control	4.8 ab	5.6 b	0.4 ab	0.22 a	69.6
Nontreated, noninoculated control	6.3 a	11.7 a	1.0 a	0.12 b	64.9
Prosaro 421 SC 6.5 fl oz	2.3 bc	1.5 b	0.0 b	0.01 c	63.9
Miravis Ace 5.2 SC 13.7 fl oz	1.9 c	1.4 b	0.0 b	0.05 bc	68.7
Prosaro Pro 400 SC 10.3 fl oz	1.9 c	2.0 b	0.1 b	0.05 bc	71.2
Sphaerex 300 EC 7.3 fl oz	1.7 c	1.8 b	0.1 b	0.00 c	68.3
P-value *cultivar*[t]	*0.2117*	*0.6425*	*0.7875*	*0.0029*	*0.1660*
P-value *fungicide*	*0.0046*	*0.0049*	*0.0373*	*0.0003*	*0.2454*
P-value *cultivar*fungicide*	*0.5150*	*0.9917*	*0.8796*	*0.2103*	*0.1941*

[z] Fungicide treatments were applied on 11 May at Feekes growth stage 10.5.1. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.125% v/v. All plots inoculated with *Fusarium graminearum* spore suspension (50,000 spores/ml) after the treatment at Feekes 10.5.1. Spore suspension applied at 300 ml/plot with handheld sprayer on 10 May.
[y] Fusarium head blight (FHB) incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage (0-100%) on 30 May.
[x] FHB severity was rated by visually assessing the percentage (0-100%) of the infected head on 30 May.
[w] FHB index was calculated as: (FHB incidence multiplied by average FHB severity)/100 per plot.
[v] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab.
[u] Yields were adjusted to 13.5% moisture and harvested on 21 Jun
[t] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'P0574AM')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*

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Field-scale evaluation of drone vs. ground equipment on corn diseases in central Indiana, 2023 (COR23-08.DPAC).

A trial was established at the Davis Purdue Agricultural Center (DPAC) in Randolph County, IN. The experiment was a randomized complete block design with three replications. Plots were 30-ft wide and 465-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'P0574AMXT' was planted in 30-inch row spacing at a rate of 32,000 seeds/A on 19 May. Veltyma 3.34 S 7.0 fl oz/A was applied on 1 Aug at silk (R1) and 23 Aug at milk (R3) growth stages using two different applicators: a CaseIH sprayer equipped with a 30-ft boom, fitted with eighteen AIC110006 nozzles spaced 20-in. apart at 10 mph, and a DJI Agras T30 drone with spray pattern using sixteen XRTTeeJet 11001VS nozzles spaced apart at 47.0 mph, applied at 2 gal/A and at 11.6 mph, applied at 5 gal/A. Disease ratings were assessed on 20 Sep at dent (R5) growth stage. Tar spot severity and gray leaf spot were visually assessed as a percentage (0-100%) of symptomatic leaf area on five plants per plot at three locations in each plot and averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of canopy green on 20 Sep at dent (R5) growth stage. The trial was harvested on 1 Nov and yields were adjusted to 15.5% moisture. Data were averaged before analysis and subjected to mixed model analysis of variance in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot and gray leaf spot (GLS) were the most prominent disease in the trial and reached low severity. Tar spot severity was significantly reduced over the nontreated control by all applications type and rate, except drone at 2 GPA and 5 GPA applied at R3. There was no significant effect of treatment for GLS severity. There was not significant difference in treatments for percentage of canopy green, harvest moisture, and corn yield.

Table 41. Effect of different application type on foliar disease severity, canopy greenness, and yield of corn.

Application equipment, GPA and timing[z]	Tar spot % [y]	GLS % severity[y]	Canopy % green[x]	Harvest % moisture	Yield[w] bu/A
Nontreated control	0.53 a	0.2	90.5	25.0	194.3
DJI Agras T30 Drone, 2 GPA at R1	0.05 d	0.0	80.0	24.7	188.1
DJI Agras T30 Drone, 5 GPA at R1	0.28 b	0.0	80.9	24.6	188.5
Ground-rig, 20 GPA at R1	0.20 bc	0.0	88.9	24.4	192.3
DJI Agras T30 Drone, 2 GPA at R3	0.43 ab	0.0	90.1	24.7	184.9
DJI Agras T30 Drone, 5 GPA at R3	0.37 ab	0.1	79.8	25.4	187.4
Ground-rig, 20 GPA at R3	0.09 c	0.0	89.8	24.5	191.0
P-value[v]	*0.0145*	*0.2466*	*0.6576*	*0.7094*	*0.9586*

[z] Fungicide applications of Veltyma 3.34 S at 7.0 fl oz were made on 1 Aug at silk (R1) and 23 Aug at milk (R3) growth stages, and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. GPA = gallons per acre.
[y] Foliar disease severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 20 Sep at dent (R5) growth stage. GLS = gray leaf spot
[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 20 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 1 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; Cercospora sojina
Septoria brown spot; *Septoria glycines*

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Field-scale evaluation of drone vs. ground equipment on soybean diseases in east central, Indiana (SOY23-07.DPAC).

A trial was established at the Davis Purdue Agricultural Center (DPAC) in Randolph County, IN. The experiment was a randomized complete block design with three replications. Plots were 30-ft wide and 460-ft long, consisted of twenty-four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 7.5-inch row spacing at a rate of 150,000 seeds/A on 17 May. Delaro Complete 458 SC 8.0 fl oz/A was applied on 1 Aug at beginning pod (R3) and 23 Aug at beginning seed (R5) growth stages using two different applicators: a CaseIH sprayer equipped with a 30-ft boom, fitted with eighteen AIC110006 nozzles spaced 20-in. apart at 10 mph, and a DJI Agras T30 drone with spray pattern using sixteen XRTTeeJet 11001VS nozzles spaced apart at 47.0 mph, applied at 2 gal/A and at 11.6 mph, applied at 5 gal/A. Disease ratings were assessed on 7 Sep at full seed (R6) growth stage. Frogeye leaf spot (FLS) was rated in the upper and lower canopies and Septoria brown spot (SBS) was rated in the lower canopy. Disease severity of each disease was visually assessing the percentage (0-100%) of symptomatic in three locations each plot. All ratings were averaged in each plot before analysis. Soybean plots were harvested on 12 Oct and yields were adjusted to 13% moisture. 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).

In 2023, very little disease developed in plots. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were the most prominent diseases in the trial and reached low severity. There was no significant effect between application type and nontreated control for FLS upper and lower canopy, and SBS on 7 Sep (Table 42). There was no difference between application type for soybean yield.

Table 42. Effect of different application type on disease severity in soybean and yield of corn.

Application equipment and treatment GPA and timing[z]	FLS[y] Upper canopy %	FLS[y] Lower canopy %	SBS[y] %	Yield[x] bu/A
Nontreated control	1.6	0.1	2.8	51.3
DJI Agras T30 Drone, 2 GPA at R3	1.1	0.2	1.1	53.7
DJI Agras T30 Drone, 5 GPA at R3	0.5	0.0	1.7	53.3
Ground-rig, 20 GPA at R3	0.4	0.0	2.6	56.3
DJI Agras T30 Drone, 2 GPA at R5	0.6	0.3	1.2	49.4
DJI Agras T30 Drone, 5 GPA at R5	0.6	0.1	1.8	51.6
Ground-rig, 20 GPA at R5	1.4	0.4	3.0	51.8
P-value[w]	*0.2438*	*0.3355*	*0.5328*	*0.3613*

[z] Fungicide applications of Delaro Completed 485 SC at 8.0 fl oz/A were made on 1 Aug at beginning pod (R3), and 23 Aug at beginning seed (R5) growth stages and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. GPA = gallons per acre.
[y] Foliar disease incidence rated on scale of 0-100% of plants with disease symptoms on 7 Sep at full seed (R6) growth stage. FLS = frogeye leaf spot in upper and lower canopy; SBS = Septoria brown spot in lower canopy.
[x] Yields were adjusted to 13% moisture and harvested on 12 Oct.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'P0574AM')
Tar spot; *Phyllachora maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Field-scale evaluation of drone vs. ground equipment on corn diseases in northeast Indiana, 2023 (COR23-09.NEPAC).

A trial was established at the Northeast Purdue Agricultural Center (NEPAC) in Whitley County, IN. The experiment was a randomized complete block design with six replications. Plots were 30-ft wide and 400-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 32,000 seeds/A on 26 May. Veltyma 3.34 S 7 fl oz/A was applied on 8 Aug at silk (R1) growth stage growth stage using two different applicators: a Case IH 2250 Patriot sprayer equipped with a 30-ft boom, fitted with eighteen AITTJ60-11008VP nozzles spaced 20-in. apart, at 8 mph and applied at 15 gal/A and 60 psi; and a DJI Agras T10 drone equipped 2.1-gal spray tank with spray pattern using four TJ-VS 8002 nozzles spaced apart applied at 2 and 5 gal/A and 40 psi. Disease rating was assessed on 2 Oct at dent (R5) growth stage. Tar spot severity and northern corn leaf blight (NCLB) were visually assessed as a percentage (0-100%) of symptomatic leaf area on five plants per plot at three locations in each plot and averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of canopy green on 2 Oct at dent (R5) growth stage. The trial was harvested on 2 Nov and yields were adjusted to 15.5% moisture. Data were averaged before analysis and subjected to mixed model analysis of variance in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were favorable for disease. Tar spot and northern corn leaf blight (NCLB) were the most prominent disease in the trial and reached low severity. All application type reduced tar spot severity over nontreated control on 2 Oct, with application using the DJI at 5 GPA resulting in the lowest level of tar spot (Table 43). There was no significant effect of application on NCLB severity on 2 Oct. There was not significant difference in treatments for canopy greenness, harvest moisture, and corn yield.

Table 43. Effect of different application type on foliar disease severity, canopy greenness, and yield of corn.

Application equipment and GPA[z]	Tar spot[y] %	NCLB[y] %	Canopy green[x] %	Harvest moisture %	Yield[w] bu/A
Nontreated control	1.4 a	1.0	68.6	32.3	190.3
DJI Agras T10 Drone, 2 GPA	0.9 b	0.4	63.3	32.3	191.5
DJI Agras T10 Drone, 5 GPA	0.7 c	0.0	69.2	33.2	189.8
Ground-rig, 20 GPA	0.9 b	0.2	72.2	32.6	195.8
P-value[v]	*0.0001*	*0.1907*	*0.4289*	*0.2200*	*0.6930*

[z] Fungicide treatment of Veltyma 3.34 S 7.0 fl oz/A was applied on 8 Aug at silk (R1) growth stage using ground-rig at 15GPA, and drone at 2 GPA and 5 GPA. All foliar treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. GPA = gallons per acre.
[y] Foliar disease severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 2 Oct at dent (R5) growth stage. NCLB = northern corn leaf blight.
[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 2 Oct.
[w] Yields were adjusted to 15.5% moisture and harvested on 2 Nov.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*

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Field-scale evaluation of drone vs. ground equipment on soybean diseases in northeast Indiana, 2023 (SOY23-09.NEPAC).

A trial was established at the Northeast Purdue Agricultural Center (NEPAC) in Whitley County, IN. The experiment was a randomized complete block design with six replications. Plots were 30-ft wide and 360-ft long, consisted of forty-eight rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 7.5-inch row spacing at a rate of 200,000 seeds/A on 17 May. Delaro Complete 458 SC 8.0 fl oz/A was applied on 8 Aug at beginning pod (R3) growth stage using two different applicators: a Case IH 2250 Patriot sprayer equipped with a 30-ft boom, fitted with eighteen AITTJ60-11008VP nozzles spaced 20-in. apart, at 8 mph and applied at 15 gal/A and 60 psi; and a DJI Agras T10 drone equipped with 2.1-gal spray tank with spray pattern using four TJ-VS 8002 nozzles spaced apart and applied at 2 and 5 gal/A, and 40 psi. Disease ratings were assessed on 7 Sep at full seed (R6) growth stage. Frogeye leaf spot (FLS) was rated in the upper and lower canopies and Septoria brown spot (SBS) was rated in the lower canopy. Disease severity of each disease was visually assessing the percentage (0-100%) of symptomatic in three locations each plot. All ratings were averaged in each plot before analysis. Soybean plots were harvested on 3 Oct and yields were adjusted to 13% moisture. 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).

In 2023, weather conditions were not favorable for diseases and very little disease developed in plots. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were the most prominent disease in the trial and reached low severity. There was no significant effect between application type and nontreated control for FLS upper and lower canopy and SBS severity on 7 Sep (Table 44). There was no difference between application type for soybean yield.

Table 44. Effect of different application type on disease severity and yield of soybean.

Application equipment and GPA[z]	**FLS**[y] **Upper canopy %**	**FLS**[y] **Lower canopy %**	**SBS**[y] **%**	**Yield**[x] **bu/A**
Nontreated control	0.4	0.9	1.6	48.1
DJI Agras T10, 2 GPA	0.5	1.0	2.2	48.1
DJI Agras T10, 5 GPA	0.4	0.6	1.9	46.4
Ground-rig, 20 GPA	0.3	0.4	1.8	47.2
P-value[w]	*0.8613*	*0.1846*	*0.8383*	*0.4011*

[z] Fungicide applications of Delaro Completed 458 SC at 8.0 fl oz/A were made on 8 Aug at beginning pod (R3) growth stage and contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v.
[y] Foliar disease incidence rated on scale of 0-100% of plants with disease symptoms on 7 Sep at full seed (R6) growth stage. FLS = frogeye leaf spot in upper and lower canopy; SBS = Septoria brown spot in lower canopy.
[x] Yields were adjusted to 13% moisture and harvested on 3 Oct.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

CORN (*Zea mays* 'P1077AM')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*

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Field-scale evaluation of drone vs. ground equipment on corn diseases in southeastern Indiana, 2023 (COR23-10.SEPAC).

A trial was established at the Southeast Purdue Agricultural Center (SEPAC) in Jennings County, IN. The experiment was a randomized complete block design with four replications. Plots were 30-ft wide and 1,794-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'P1077AM' was planted in 30-inch row spacing at a rate of 30,378 seeds/A on 18 May. Veltyma 3.34 S 7.0 fl oz/A was applied on 27 Jul at silk (R1) growth stage using two different applicators: an Apache AS720 sprayer equipped with a 30-ft boom, fitted with six TTJ60-11005 nozzles spaced 15-in. apart at 12 mph and applied at 20 gal/A and 60 psi and a DJI Agras T30 drone with spray pattern using sixteen XRTTeeJet 11001VS nozzles spaced apart at 47.0 mph, applied at 2 gal/A; and at 11.6 mph, applied at 5 gal/A. Disease ratings were assessed on 14 Sep at dent (R5) growth stage. Tar spot severity and gray leaf spot (GLS) were visually assessed as a percentage (0-100%) of symptomatic leaf area at ear leaf on five plants per plot at three locations in each plot and averaged before analysis. Percent canopy green was rated by visually assessing the percentage (0-100%) of canopy green on 5 Sep at dent (R5) growth stage. The trial was harvested on 31 Oct and yields were adjusted to 15.5% moisture. Data were averaged before analysis and subjected to mixed model analysis of variance in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for diseases. Tar spot and gray leaf spot (GLS) were the most prominent diseases in the trial and reached low severity. There was no significant effect of application type on tar spot stroma severity on 14 Sep (Table 45). All applications significantly reduced GLS severity over nontreated control on 14 Sep, but there was no difference between application type. There was not significant difference in treatments for percentage of canopy green, harvest moisture, and harvest moisture. Veltyma sprayed with drone at 2 GPA and ground-rig significantly increased yield over the nontreated control.

Table 45. Effect of different application types on foliar disease severity, canopy greenness, and yield of corn.

Application equipment and rate[z]	Tar spot[y] %	GLS[y] %	Canopy green[x] %	Harvest moisture %	Yield[w] bu/A
Nontreated control	2.0	1.5 a	69.6	18.5	228.1 b
DJI Agras T30 Drone, 2 GPA	0.0	0.4 b	77.5	19.1	235.4 a
DJI Agras T30 Drone, 5 GPA	0.1	0.1 b	70.8	18.7	229.9 b
Ground-rig, 20 GPA	0.4	0.7 b	69.2	19.2	237.0 a
P-value[v]	*0.3987*	*0.0473*	*0.2704*	*0.1111*	*0.0136*

[z] Fungicide treatment with Veltyma 3.34 S at 7.0 fl oz/A was applied on 27 Jul at silk (R1) growth stage using ground-rig and drone with 2 GPA and 5 GPA. All foliar treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v using ground-rig and Maaytx 1 oz/A. GPA = gallons per acre.
[y] Tar spot stroma severity and gray leaf spot (GLS) severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 14 Sep at dent (R5) growth stage.
[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 5 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 31 Oct.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* ‘P29A19E’)
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Cercospora leaf blight; *Cercospora kikuchii*

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Field-scale evaluation of drone vs. ground equipment on soybean in southeastern Indiana, 2023 (SOY23-08.SEPAC).

A trial was established at the Southeast Purdue Agricultural Center (SEPAC) in Jennings County, IN. The experiment was a randomized complete block design with five replications. Plots were 30-ft wide and 650-ft long, consisted of twenty-four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar ‘P29A19E’ was drilled in 15-inch row spacing at a rate of 129,000 seeds/A on 11 May. Delaro complete 458 SC 8.0 fl oz/A was applied on 24 Jul and 27 Jul at beginning pod (R3), and 17 Aug at beginning seed (R5) growth stages using two different applicators an Apache AS720 sprayer equipped with a 30-ft boom, fitted with six TTJ60-11005 nozzles spaced 15-in. apart at 12 mph and applied at 20 gal/A and 60 psi and a DJI Agras T30 drone with spray pattern using sixteen XRTTeeJet 11001VS nozzles spaced apart at 47.0 mph, applied at 2 gal/A and at 11.6 mph, applied at 5 gal/A. Disease rating was assessed on 14 Sep at beginning maturity (R7) growth stage. Frogeye leaf spot (FLS) was rated in the upper and lower canopies, Septoria brown spot (SBS) was rated in the lower canopy and Cercospora leaf blight (CLB) in the upper canopy. Disease severity of each disease was visually assessing the percentage (0-100%) of symptomatic in three locations each plot. Soybean plots were harvested on 25 Sep and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least square means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

In 2023, weather conditions were not favorable for diseases and very little disease developed in plots. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf blight (CLB) were the most prominent diseases in the trial and reached low severity. No significant differences were detected for the applications compared to the nontreated control, except the application with the ground-rig at R3 had higher severity of FLS in the upper canopy on 14 Sep (Table 46). There was no significant effect between application type and nontreated control for FLS lower canopy, DM, and CLB severity. Septoria brown spot (SBS) was reduced by all applications and timings of comparted to the nontreated control, but there was no difference between application type or timing. There was no significant differences between application type or timing for soybean yield.

Table 45. Effect of different application type on disease severity and yield of soybean.

Application equipment, GPA, and timing[z]	**FLS[y] Upper canopy %**	**FLS[y] Lower canopy %**	**SBS severity[y] %**	**CLB severity[y] %**	**Yield[x] bu/A**
Nontreated control	1.1 b	0.1	46.3 a	0.2	62.9
DJI Agras T30 Drone, 2 GPA at R3	0.6 b	0.0	6.1 b	0.0	65.4
DJI Agras T30 Drone, 5 GPA at R3	0.7 b	0.1	5.0 b	0.4	67.3
Ground-rig, 20 GPA at R3	1.8 a	0.0	7.5 b	0.5	65.7
DJI Agras T30 Drone, 2 GPA at R5	0.8 b	0.1	12.0 b	0.3	64.6
DJI Agras T30 Drone, 5 GPA at R5	0.7 b	0.0	3.9 b	0.2	63.7
Ground-rig, 20 GPA	1.0 b	0.0	12.9 b	0.2	62.1
P-value[w]	*0.0082*	*0.5364*	*0.0001*	*0.5906*	*0.0518*

[z] Fungicide treatment of Delaro Complete 458 SC at 8.0 fl oz/A was applied on 27 Jul at silk (R1) growth stage using ground-rig and drone with 2 GPA and 5 GPA. All foliar treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v using ground-rig and Maaytx 1 oz/A. GPA = gallons per acre.
[y] Foliar disease incidence rated on scale of 0-100% of plants with disease symptoms on 14 Sep at beginning maturity (R7) growth stage. FLS = frogeye leaf spot in upper and lower canopy; SBS = Septoria brown spot in lower canopy; CLB = Cercospora leaf blight.
[x] Yields were adjusted to 13% moisture and harvested on 25 Sep.
[w] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

SOYBEAN (*Glycine max* '25E334N')

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Comparison of planting dates and seed treatments on soybean in southeastern Indiana. (SOY23-12.SEPAC).

A trial was established at Southeast Purdue Agricultural Center (SEPAC) in Butlerville, IN. The experiment was a randomized complete block design with three replications. Plots were 15-ft wide and 900+ ft long, consisted of six rows, and the two center rows were used for evaluation. The previous crop was corn. Standard practices for soybean production in Indiana were followed. Soybean cultivar 25E33N was planted in 30-inch row spacing at a rate of 130,000 seeds/A. Treatments were a factorial arrangement of four planting dates by four seed treatments. Soybeans were planted on 12 Apr (planting date 1), 26 Apr (planting date 2), 10 May (planting date 3) and 25 May (planting date 4). Stand counts were assessed at cotyledons expanded/first-node stage (VC/V1) growth stage for each planting date. Ten roots were sampled from outer rows of each plot and rated for root rot severity on a scale of 0-100% and averaged before analysis. Root dry weight was calculated from the 10 sampled roots. Each plot was harvested on 30 Sep and yields were adjusted to 13% moisture. All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letter are significantly different based on a least square difference test (α=0.05).

In 2023, very little disease developed in plots, low levels of Septora brown spot was detected. There was no significant interaction between planting data and seed treatment for root rot, root dry weight and yield, therefore main effects are presented. There was a significant interaction between planting date and seed treatment for soybean stand count (data not shown). Looking at only the main effects, soybean stand was the highest at planting on 10 May as compared to all the other planting dates, also, treatment CruiserMaxx APX with thiamethoxam and thiamethoxam alone resulted on the greatest stand counts compared to nontreated and CruiserMaxx without thiamethoxam (Table 46). Root rot severity was significantly higher at planting on 26 Apr as compared to all the other planting dates, there was not significant differences between seed treatments for root rot. There were no significant differences between planting dates or seed treatments for root weight. Soybean yield was significantly reduced at planting 4 on 25 May as compared to earlier planting dates. No significant differences were detected between seed treatments and soybean yield.

Table 46. Effect of planting dates and seed treatments on stand, root rot, root weight and soybean yield.

Planting dates and seed treatments[z]	**Stand Count** #/A	**Root rot** %[y]	**Root dry weight** g[x]	**Yield** bu/A[w]
Planting date 1 (12 Apr)	54250 d	6.9 ab	26.2	71.7 a
Planting date 2 (26 Apr)	69642 b	9.2 a	24.4	68.2 b
Planting date 3 (10 May)	88336 a	4.0 bc	27.4	67.3 b
Planting date 4 (25 May)	62636 c	0.4 c	29.0	58.0 c
Nontreated control	61783 b	5.7	25.2	65.4
CruiserMaxx APX with thiamethoxam	75776 a	6.1	27.9	65.9
Thiamethoxam	71620 a	4.1	28.2	66.6
CruiserMaxx APX without thiamethoxam	65685 b	4.8	25.6	67.5
P-value *planting date*[v]	*0.0001*	*0.0011*	*0.1898*	*0.0001*
P-value *seed treatment*	*0.0001*	*0.7544*	*0.3755*	*0.1931*
P-value *planting date*seed treatment*	*0.0001*	*0.9363*	*0.7300*	*0.4865*

[z] Seed treatments applied prior to planting at 10 g AI/100 kg seed.
[y] Root rot visually assessed as a percentage (0-100%) of dark discoloration on roots on 12 Sep.
[x] Root dry weight of 10 dried root samples in grams (g).
[w] Yields were adjusted to 13% moisture and harvested on 30 Sep.
[v] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α=0.05).

APPENDIX –WEATHER DATA

Table 47. Average monthly conditions at the Purdue Agronomy Center for Research and Education (ACRE), Pinney Purdue Agricultural Center (PPAC), Southwest Purdue Agricutlural Center (SWPAC), Davis Purdue Agricutlural Center (DPAC), Northeast Purdue Agricutlural Center (NEPAC), and Southeast Purdue Agricutlural Center (SEPAC) in Indiana, 2023[z].

Months	ACRE				PPAC				SWPAC			
	Tempurature			Total	Tempurature			Total	Temperature			Total
	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)
January	34.34	38.94	29.45	0.71	31.46	37.15	26.65	1.68	39.11	46.53	32.98	3.84
February	37.27	47.93	26.99	3.86	32.95	42.27	24.04	3.52	42.78	53.83	32.68	2.76
March	40.00	49.69	31.27	4.50	35.83	44.19	27.96	4.90	44.72	54.38	35.73	6.60
April	52.95	66.02	40.07	1.26	49.14	61.12	36.16	1.32	56.13	68.15	45.09	2.89
May	65.22	77.72	52.93	2.72	60.29	73.05	47.50	2.37	66.46	78.70	54.97	2.05
June	70.22	83.59	56.86	1.03	66.62	78.10	55.39	3.39	73.02	84.91	62.14	4.52
July	73.89	85.08	62.96	6.04	70.24	81.67	58.77	4.65	77.46	87.89	68.52	2.98
August	71.65	82.53	61.42	4.34	68.48	79.32	58.12	3.93	74.92	85.60	66.07	4.98
September	66.10	80.43	53.26	0.33	63.38	75.25	52.16	1.97	69.81	84.19	58.71	0.45
October	55.57	66.53	45.56	2.81	52.71	62.28	43.62	6.17	58.40	69.77	48.99	2.25
November	42.93	54.61	31.87	0.49	39.78	50.32	29.66	0.68	47.59	59.59	37.04	0.67
December	39.50	46.92	33.25	2.48	37.35	43.07	31.83	2.58	42.18	50.68	35.28	2.56
Annual	***54.14***	***65.00***	***43.82***	***30.57***	***50.69***	***60.65***	***40.99***	***37.16***	***57.71***	***68.69***	***48.18***	***36.55***

Months	DPAC				NEPAC				SEPAC			
	Tempurature			Total	Tempurature			Total	Temperature			Total
	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)	Ave[y] °F	Max[y] °F	Min[y] °F	precipit.[x] (in)
January	34.70	41.27	28.10	3.26	33.16	38.87	27.76	4.22	38.78	46.35	30.72	1.81
February	37.16	48.84	26.13	2.60	34.89	44.12	26.26	3.02	42.53	54.27	30.82	4.00
March	39.41	49.45	30.67	4.49	37.52	46.45	29.27	8.04	43.43	54.66	33.00	5.27
April	50.98	63.22	38.49	2.43	50.36	61.83	38.75	4.26	54.11	67.92	41.50	2.29
May	60.99	73.42	47.97	2.55	61.09	72.74	48.84	1.11	63.80	76.68	51.05	3.14
June	67.75	79.47	52.37	3.33	68.41	79.96	56.78	2.62	69.81	83.02	57.40	3.40
July	73.17	84.24	62.59	3.90	72.68	82.73	63.05	7.05	74.72	86.52	64.93	5.97
August	69.75	80.53	58.93	3.20	69.23	79.55	59.36	3.26	72.69	85.76	61.94	3.16
September	64.86	78.56	52.33	0.99	65.02	76.69	54.55	0.28	67.32	83.52	54.69	1.18
October	54.50	65.50	44.27	3.24	53.80	63.08	45.37	3.15	56.47	68.78	45.29	3.69
November	42.03	54.49	29.83	0.98	41.26	51.06	31.56	0.93	45.70	59.22	33.72	0.72
December	39.05	46.84	32.05	1.17	38.75	44.80	33.15	2.23	40.95	50.55	32.19	2.21
Annual	***52.86***	***63.82***	***41.98***	***32.14***	***52.18***	***61.82***	***42.89***	***40.17***	***55.86***	***68.10***	***44.77***	***36.84***

[z] Data courtesy of Indiana State Climate Office. Beth Hall, Jonathan Weaver and Austin Pearson. https://ag.purdue.edu/indiana-state-climate/. Taken from Purdue Mesonet stations

[y] Average minimum and maximum temperatures for each month.

[x] Total precipitation for each month.

TELENKO FIELD CROP PATHOLOGY

https://indianafieldcroppathology.com/

Febrary 2024