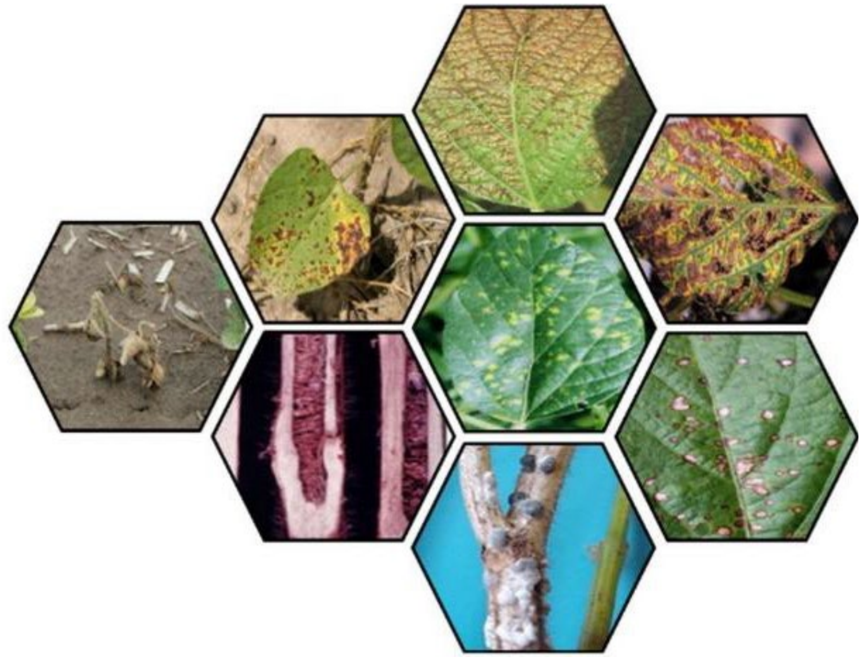

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Applied Research in Field Crop Pathology for Indiana - 2022

ACKNOWLEGEMENTS

This report is a summary of applied field crop pathology research trials conducted in 2022 under the direction of the Purdue Field Crop Pathology program in the Department of Botany and Plant Pathology at Purdue University. The authors wish to thank the Purdue Agronomy Research and Education Center, the Purdue Agricultural Centers, and the many cooperators and contributors who provided the resources needed to support the applied field crop pathology research program in Indiana. Special recognition is extended to Stephen Brand and Su Shim for technical skills in managing field trials, data organization and processing, and help preparing this report; Mariama Brown, Camila Da Silva, Monica Mizuno, and Kaitlin Waibel, graduate students and visiting scholars who assisted with field trial data collection and analysis; Emily Duncan, Lindsey Berebitsky, and Ryan Gray, undergraduate student interns that assisted with field trial data collection and scouting; Dr. Tom Creswell, Dr. John Bonkowski, and Todd Abrahamson with the Purdue Plant Pest Diagnostic Laboratory (PPDL) for assistance in pathogen surveys and diagnosis. Collectively, the contributions of colleagues, professionals, students, and growers were responsible for a highly successful and productive program to evaluate products and practices for disease management in field crops.

The authors would also like to thank the following for their support in 2022:

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SUMMARY OF 2022 FIELD CROP DISEASE SEASON

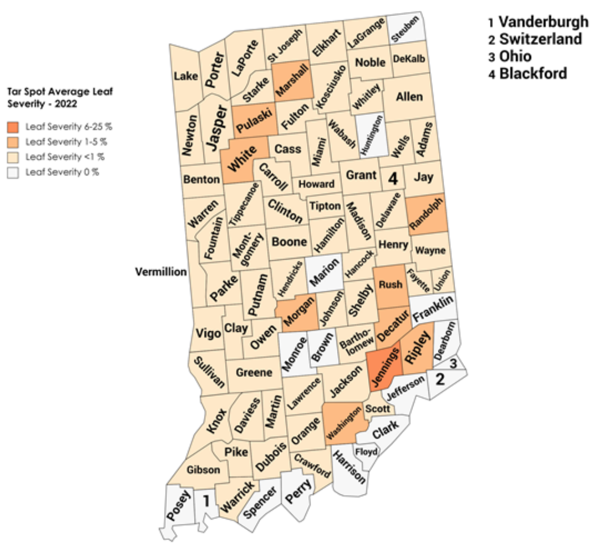
CORN

In 2022, there was low 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. There were also numerous reports of Physoderma brown spot and stalk rot. Tar spot and southern rust were two diseases that were closely monitored this season.

Tar spot:

Tar spot of corn was a concern in 2022 due to previous epidemics. In 2022, very low 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 as leaf wetness plays an important role in tar spot disease development. The fourth 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.

The field crop pathology team made a large effort at the end of the season to scout for tar spot across the state. Four new counties were confirmed with tar spot in 2022, making 86 counties total in Indiana to date. Out of the 201 fields scouted, 121 were positive for tar spot (60.2%). In addition, incidence and severity were rated (examples of severity in Fig. 1) and used to severity map below – with increasing severity indicated by the darkness of the orange color of the county. The map demonstrates how tar spot development in 2022 was much lower than previous years. The map also parallels the weather conditions and reports during the season. 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.



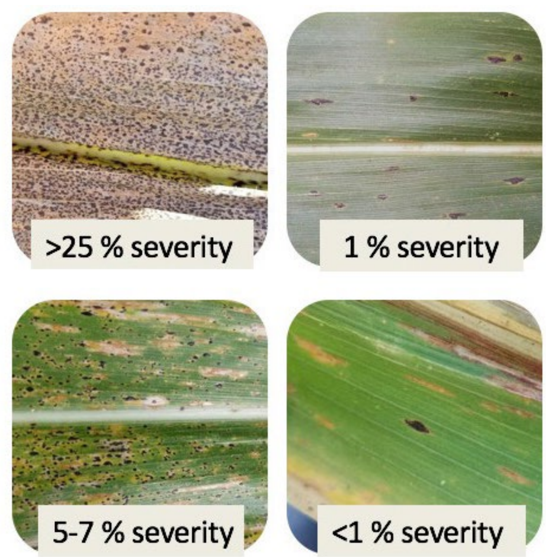
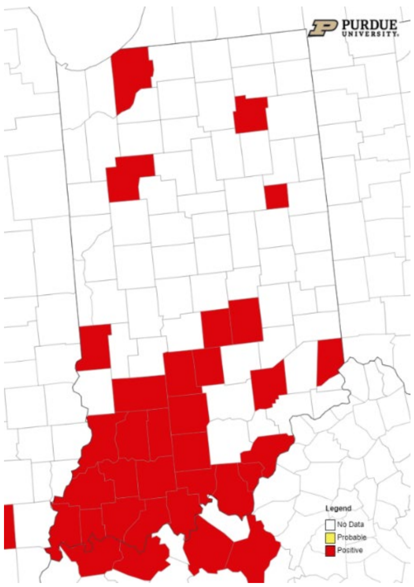


Figure 1. 2022 tar spot severity for Indiana. The darker orange the county, the greater the severity of tar spot in the fields in which it was found. The range of tar spot severity on leaves >25%, 5-7%, 1% and <1%. Photo credit: D. Telenko.

SUMMARY OF 2022 FIELD CROP DISEASE SEASON

Southern corn rust:

Southern corn rust was first found in Indiana in the 2022 season on August 12, and by the end of the season, a total of 29 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.



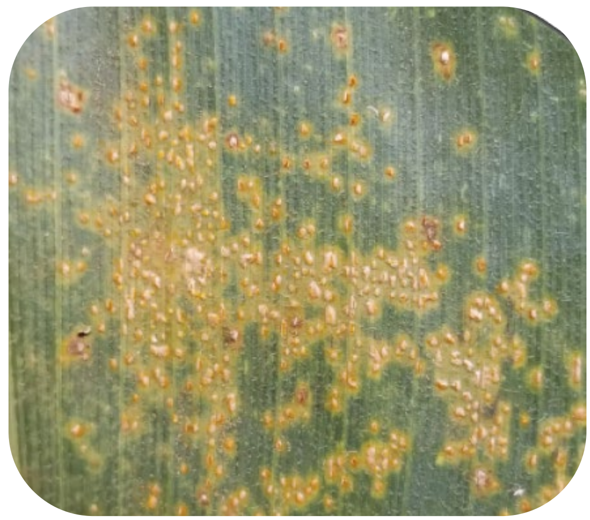


Figure 2. Southern corn rust map of confirmed (red) counties that had southern corn rust in Indiana in 2022 and a corn leaf with southern rust infection. Photos credit: D. Telenko, Map source: https://corn.ipmpipe.org/southerncornrust/

Due to the need to monitor both southern rust and tar spot in Indiana, there will be **no charge for Indiana growers to submit southern rust and tar spot samples to the PPDL for diagnostic confirmation again in 2023.** This service is made possible through research supported by the Indiana Corn Marketing Council.

SOYBEAN

Diseases in soybeans remained relatively low throughout the season for much of the state. 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 pockets where sudden death syndrome and white mold caused issues in fields. In general, it was a quiet year for foliar diseases in soybean.

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 2022 were moderately conducive to FHB development. Our research sites in both West Lafayette and Vincennes had low levels of FHB develop in our nontreated susceptible cultivar checks and initial DON testing was approximately 1 ppm. 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*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of fungicides for foliar disease in corn in central Indiana, 2022 (COR22-01.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 six replications. Plots were 10-ft wide and 30-ft long, consisted of four rows, with 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 'P0574AM' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 22 Jul at V10 and 5 Aug at VT/R1 (tassel/silk) growth stages. Disease ratings were assessed on 19 Sep at R5 (dent) growth stage. Tar spot and northern corn leaf blight (NCLB) were 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 R5 (dent) growth stage. The two center rows of each plot were harvested on 19 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Tar spot and northern corn leaf blight (NCLB) were present but only remained at low levels. Veltyma and Trivapro applied at V10 and all treatments at VT/R1, except Headline AMP, significantly reduced NCLB severity over the nontreated controls (Table 1). Veltyma applied at VT/R1 significantly reduced tar spot stromata severity over the nontreated controls. No significant differences were observed for canopy greenness, harvest moisture, test weight, and yield of corn.

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

Treatment, rate/A, and timing[z]	NCLB severity[y] %	Tar spot stromata[y] %	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control 1	0.08 ab	0.14 abc	80.8	24.5	52.3	200.2
Headline AMP 1.68 SC 10.0 fl oz at V10	0.03 bcd	0.13 abc	82.5	24.8	52.8	208.0
Veltyma 3.34 S 7.0 fl oz at V10	0.01 cd	0.17 ab	87.5	24.9	52.3	201.7
Trivapro 2.21 SE 13.7 fl oz at V10	0.03 cd	0.12 a-d	87.5	24.8	52.5	206.0
Delaro Complete 458 SC 8.0 fl oz at V10	0.04 bc	0.11 a-d	81.7	24.4	54.2	201.6
Lucento 4.17 SC 5.0 fl oz at V10	0.04 bcd	0.19 a	85.8	23.0	53.0	206.4
Nontreated control 2	0.10 a	0.09 bcd	81.7	23.8	52.4	195.3
Headline AMP 1.68 SC 10.0 fl oz at VT/R1	0.04 bcd	0.09 b-e	87.5	24.4	52.6	210.4
Veltyma 3.34 S 7.0 fl oz at VT/R1	0.00 d	0.01 e	85.8	24.5	52.3	209.9
Trivapro 2.21 SE 13.7 fl oz at VT/R1	0.02 cd	0.10 bcd	85.8	25.1	52.5	207.3
Delaro Complete 458 SC 8.0 fl oz at VT/R1	0.03 cd	0.03 de	85.8	25.3	51.8	201.8
Lucento 4.17 SC 5.0 fl oz at VT/R1	0.01 cd	0.06 cde	87.5	25.1	52.3	208.4
P-value[v]	*0.0006*	*0.0034*	*0.0636*	*0.2568*	*0.5795*	*0.1045*

[z] Fungicide treatments applied on 22 Jul at V10 and 5 Aug at VT/R1 (tassel/silk) growth stages.
[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 19 Sep. NCLB = northern corn leaf blight.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 19 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 19 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 square means test (α=0.05).

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

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Evaluation of in-furrow and foliar fungicides in corn in central Indiana, 2022 (COR22-15.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 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 'P0574AM' was planted in 30-inch row spacing at a rate of 2 seeds/ft on 13 May. In-furrow applications were applied at planting at 10 gal/A or 2x0 application applied by CO_2 backpack sprayer at 10/gal A. Foliar applications were made at VT/R1 (tassel/silk) on 22 Jul. 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 8 Sep at R5 (dent) 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 and five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 15 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 square means test (α =0.05).

In 2022, very little disease developed in plots. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) were present in the trial, but only remained at low levels. All treatments significantly reduced GLS over the nontreated control on 8 Sep, except Xyway 2x0 (Table 2). There was no significant effect of treatment on NCLB, harvest moisture, test weight, and yield of corn.

Table 2. Effect of treatment on foliar disease severity and corn yield.

Treatment, rate/A, and timing[z]	**GLS severity**[y] **%**	**NCLB severity**[y] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[x] **bu/A**
Nontreated control	1.2 a	4.3	18.2	55.3	226.2
Xyway LFR 15.2 fl oz in-furrow	0.4 b	0.7	18.9	55.7	237.2
Xyway LFR 15.2 fl oz 2x0 application	0.9 a	2.0	18.2	55.6	213.8
Xyway LFR 10.5 fl oz in-furrow fb Topguard EQ 5 fl oz at VT/R1	0.2 b	1.0	19.0	55.5	232.2
Topguard EQ 5.0 fl oz at VT/R1	0.1 b	0.0	18.8	55.3	276.2
Veltyma 3.34 S 7.0 fl oz at VT/R1	0.2 b	0.4	18.0	55.8	234.0
P-value[w]	*0.0001*	*0.0844*	*0.2492*	*0.7369*	*0.7269*

[z] In-furrow applications were applied at planting at 10 gal/A or 2x0 application applied by CO_2 backpack sprayer at 10/gal A. Foliar fungicide applications were made at VT/R1 (tassel/silk) on 22 Jul.
[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 8 Sep. GLS = gray leaf spot; NCLB=northern corn leaf blight.
[x] Yields were adjusted to 15.5% moisture and harvested on 15 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 square means test (α =0.05).

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

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Evaluation of Double Nickel in corn in central Indiana, 2022 (COR22-31.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 non-irrigated grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 34,000 seeds/ft on 13 May. In-furrow applications were applied at planting at 10 gal/A. 2x0 applications were applied by CO_2 backpack sprayer on 14 May. Stand counts were taken at V4 growth stage on 24 Jun. Disease ratings were assessed on 8 Sep at R5 (dent) growth stage. Northern corn leaf blight (NCLB) and gray leaf spot (GLS) visually assessed as a percentage (0-100%) of symptomatic leaf area on ear leaf, five plants were assessed per plot and averaged before analysis. The two center rows of each plot were harvested on 15 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 square means test (α=0.05).

In 2022, low levels of disease developed in plots. Northern corn leaf blight (NCLB) and gray leaf spot (GLS) were present in the trial, but only reached low levels. There was no significant effect of treatment on stand count compared to the nontreated control on 24 Jun (Table 3). There was no significant effect of treatment on GLS, NCLB, harvest moisture, test weight and yield of corn (Table 3).

Table 3. Effect of treatment on stand count, foliar disease severity and corn yield.

Treatment, rate/A, and application[z]	Stand count #/A[y]	GLS severity[x] %	NCLB severity[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	36,881	1.1	8.0	17.9	56.0	195.5
Xyway LFR 10.5 fl oz at plant 2x0	35,678	0.4	4.4	17.8	56.4	191.9
Double Nickel LC 8.0 oz applied in-furrow	35,429	0.6	5.8	17.0	56.2	189.0
Double Nickel LC 8.0 oz applied 2x0	31,508	0.8	3.7	18.4	56.3	195.1
Double Nickel LC 16.0 oz applied in-furrow	35,429	0.4	8.0	17.5	67.7	192.6
Double Nickel LC 16.0 oz applied 2x0	35,356	0.6	6.4	17.5	56.5	194.0
P-value[v]	*0.5439*	*0.0945*	*0.6338*	*0.7333*	*0.5860*	*0.8673*

[z] In-furrow applications were applied at planting on 13 May. 2x0 applications applied on 14 May by backpack sprayer.
[y] Stand counts were taken at V4 growth stage on 24 Jun.
[x] 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 8 Sep. NCLB= northern corn leaf blight; GLS = gray leaf spot.
[w] Yields were adjusted to 15.5% moisture and harvested on 15 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 square means test (α=0.05).

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

C. R. Da Silva, S. B. Brand, and D. E. P. Telenko
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Evaluation of fungicides for foliar diseases in corn in central Indiana, 2022 (COR22-34.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 grain corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 13 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 at 3.6 mph. Fungicides were applied on 5 Aug at R1 (silk) growth stage. Disease ratings were assessed on 15 Sep at R5 (dent) growth stage. Gray leaf spot (GLS), northern corn leaf blight (NCLB), and tar spot were rated by visually assessing the percent severity on ear leaf on five plants in each plot. Values for the five leaves were averaged before analysis. The two center rows of each plot were harvested on 19 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 square means test (α=0.05).

In 2022, low disease developed in plots. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) were the primary diseases, and tar spot was also present in the trial. There was no significant effect of treatment on tar spot over nontreated controls (Table 4). All treatments reduced GLS and NCLB over nontreated control. No significant difference between treatments for harvest moisture, test weight, and yield of corn.

Table 4. Effect of fungicide on foliar diseases severity and corn yield.

Treatment and rate/A[z]	**Tar spot stomata**[y] **%**	**GLS Severity**[y] **%**	**NCLB Severity**[y] **%**	**Harvest moisture** %	**Test weight lb/bu**	**Yield**[x] **bu/A**
Nontreated control	0.00	0.7 a	2.7 a	23.7	52.5	197.9
ADM.03509.F.3.D 8.0 fl oz	0.00	0.1 b	1.0 b	23.6	52.3	206.8
ADM.03509.F.3.D 12.0 fl oz	0.00	0.1 b	0.7 b	23.3	52.7	214.0
ADM.03509.F.3.D 16.0 fl oz	0.03	0.1 b	1.0 b	23.8	52.3	204.4
ADM.03509.F.3.B 16.0 fl oz	0.03	0.1 b	1.0 b	23.5	52.6	206.6
Stratego YLD 4.65 fl oz	0.00	0.2 b	1.0 b	23.1	53.3	203.5
Headline AMP 1.68 SC 14.4 fl oz	0.00	0.2 b	0.5 b	23.1	52.3	202.8
Quilt Xcel 2.2 SE 14.0 fl oz	0.00	0.1 b	0.7 b	23.6	52.7	207.1
P-value[w]	*0.5828*	*0.0001*	*0.0308*	*0.9646*	*0.6095*	*0.2875*

[z] Fungicide treatments were applied on 5 Aug at R1 (silk) 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 15 Sep. GLS = gray leaf spot, NCLB = northern corn leaf blight.
[x] Yields were adjusted to 15.5% moisture and harvested on 19 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 square means test (α=0.05).

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

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Comparison of fungicide efficacy of in-furrow and 2x0 for corn diseases in central Indiana, 2022 (COR22-37.ACRE).

A trial was established at the 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 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 13 May with plot planter. In-furrow applications were applied at plating at 10 gal/A. 2x0 applications were applied by CO_2 backpack sprayer on 14 May at 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 22 Jul at VT/R1 (tassel/silk) growth stage. Disease ratings were assessed on 8 Sep at R5 (dent) growth stage. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) was rated by visually assessing the percentage of disease per leaf on five plants in each plot at the ear leaf (EL). Values for the five leaves were averaged before analysis. The two center rows of each plot were harvested on 15 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Gray leaf spot (GLS) and northern corn leaf blight (NCLB) were present in the trial, but only remained at low levels. There was no significant effect on treatments on GLS and NCLB compared to Veltyma on 8 Sep (Table 5). There was no significant effect of treatment on harvest moisture, test weight, and yield of corn.

Table 5. Effect of treatment on foliar disease severity and corn yield.

Treatment, rate/A, and timing[z]	GLS Severity[y] %	NCLB Severity[y] %	Harvest moisture %	Test weight lb/bu	Yield[x] bu/A
Standard Veltyma 3.34 S 7.0 fl oz at VT/R1	0.1	0.05	19.6	55.2	211.8
Proline 480 SC 4.0 fl oz in-furrow fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.1	0.05	18.3	56.0	217.0
Xyway LFR 15.2 fl oz 2x0 fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.1	0.00	19.2	55.4	223.1
Azteroid FC 3.3 4.2 fl oz in-furrow fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.1	0.10	18.9	55.4	206.4
Azteroid FC 3.3 8.4 fl oz in 2x0 fb Veltyma3.34 S 7.0 fl oz at VT/R1	0.1	0.03	19.2	54.6	210.5
P-value[w]	*0.8293*	*0.7088*	*0.5680*	*0.5061*	*0.1441*

[z] In-furrow applications were applied at plating on 13 May at 10 gal/A. 2x0 applications were applied by CO_2 backpack sprayer on 14 May. Foliar fungicide treatments were applied on 22 Jul at VT/R1 (tassel/silk) 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 8 Sep. GLS = gray leaf spot, NCLB = northern corn leaf blight.
[x] Yields were adjusted to 15.5% moisture and harvested on 15 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Septoria brown spot; *Septoria glycines*

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Comparison of fungicide efficacy for foliar disease of soybeans in central Indiana, 2022 (SOY22-01.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 31 May. Fungicide applications were applied on 5 Aug at R3/R4 (beginning pod/full pod) and were applied at 15 gal/A at 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. Disease ratings were assessed on 14 Sep at R6 (full seed) growth stage. Septoria brown spot (SBS) was rated for disease severity by visually assessing the percentage of symptomatic leaf area in the lower canopy. Green stem was visually rated on a scale of 0-100% on 4 Oct. The two center rows of each plot were harvested on 7 Oct and yields were adjusted to 13% moisture. All data were analyzed using a mixed model analysis of variance (SAS 9.4) and values are least squares means and values with the same letter are not significantly different based on a least square means test (α=0.05).

In 2022, very little disease developed in plots. Septoria brown spot (SBS) was the most prominent disease in the trial and reached low severity. Only Miravis Neo reduced SBS over the nontreated control, but it was not significantly different from the other fungicides, except Quadris (Table 6). Applications of Delaro Complete and Revytek resulted in increased green stem at harvest when compared to the nontreated control and other treatements. There were no differences between treatments for harvest moisture, test weight, and yield of soybean.

Table 6. Effect of treatment on foliar disease severity, % green stem, and soybean yield.

Treatment and rate/A[z]	SBS severity[x] %	Green stem[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	6.8 b	0.0 b	11.3	55.8	59.6
Topguard EQ 5.0 fl oz	4.0 bc	0.0 b	11.1	57.1	56.6
Lucento 4.17 SC 5.0 fl oz	4.5 bc	0.0 b	11.5	56.8	59.2
Trivapro 2.21 SE 13.7 fl oz	5.3 bc	0.3 b	12.0	56.7	52.0
Quadris 2.1 F 6.0 fl oz	13.5 a	0.0 b	11.4	56.8	55.8
Veltyma 3.34 S 7.0 fl oz	3.5 bc	0.0 b	11.9	56.8	51.8
Revytek 3.33 LC 8.0 fl oz	2.5 bc	1.3 a	12.3	56.6	55.7
Echo 36.0 fl oz + Folicur 3.6 F 4.0 fl oz +Topsin 20.0 fl oz	4.8 bc	0.0 b	12.3	56.6	55.4
Delaro Complete 3.83 SC 8.0 fl oz	3.5 bc	1.0 a	12.4	55.9	53.4
Miravis Neo 2.5 SE 13.7 fl oz	1.8 c	0.0 b	12.2	56.6	56.1
P-value[v]	*0.0010*	*0.0044*	*0.4267*	*0.5767*	*0.5695*

[z] Fungicide applications were made on 5 Aug at R3/R4 (beginning pod/full pod) 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. SBS = Septoria brown spot.
[x] Green stem was visually rated on a scale of 0-100% on 4 Oct.
[w] Yields were adjusted to 13% moisture and harvested on 7 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 the same letter are not significantly different based on a least square means test (α=0.05).

SOYBEAN (*Glycine max* ‘P33A53X‘)
Sudden death syndrome; *Fusarium virguliforme*

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Evaluation of seed treatment for management of SDS on soybean in central Indiana, 2022 (SOY22-03.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 ‘P33A53X‘ was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 24 May. *Fusarium virguliforme* inoculum was applied at planting at 1.25 g/ft within the seedbed. Seed treatments were applied on seeds before planting. All treatments contained a base treatment except nontreated control. Ten roots per plot were sampled from border rows at the R4 (full pod) growth stage on 12 Aug, gently washed, and rated for root rot severity on a scale of 0-100%. The two center rows of each plot were harvested on 10 Oct and yields were adjusted to 13% moisture. All data were analyzed using a mixed model analysis of variance, and values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, sudden death syndrome (SDS) root rot symptoms were evident, but weather conditions were not favorable for the development of SDS foliar symptoms (Table 7). There were no significant differences between nontreated control, base and other seed treatments for root rot severity, green stem, and yield of soybean.

Table 7. Effect of seed treatment on sudden death syndrome (SDS) root rot severity, green stem, and soybean yield.

Treatment[z]	**Root rot**[y] **%**	**Green stem**[x] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	37.9	0.3	11.0	57.6	56.5
BASF Base	40.0	0.3	11.9	57.0	64.0
BASF Base + ILeVO (0.15 mg ai/seed)	38.9	0.5	11.6	57.0	63.2
BASF Base + Saltro (0.075 mg ai/seed)	40.1	0.8	11.3	57.2	59.4
BASF Base + Thiabendazole (0.64 fl oz/cwt) + Heads Up (0.16 fl oz/cwt) + BIO_{ST} (0.16 fl oz/cwt) + Ascribe SAR (0.5 fl oz/cwt)	37.2	0.3	11.2	57.4	60.3
BASF Base + Saltro (0.075 mg ai/seed) + Ataplan (0.068 mg ai/seed)	40.1	0.3	11.2	57.3	62.9
BASF Base + CeraMax (2.46 fl oz/100 lbs)	35.0	0.5	11.4	57.3	55.8
BASF Base + ILeVO (0.15 mg ai/seed) + CeraMax (2.46 fl oz/100 lbs)	36.7	0.3	12.0	57.2	61.2
P-value[v]	*0.7586*	*0.7709*	*0.4378*	*0.6554*	*0.4573*

[z] Seed treatments were applied on seeds before planting. BASF base contained Allegiance Fl at 4.0 g ai/100 kg, Stamina at 7.5 g ai/100 kg, Systiva XS Xemium Brand at 5.0 g ai/100 kg, and Poncho 600 at 0.11 mg ai/seed.
[y] Ten roots per plot were sampled from border rows at R4, gently washed and rated for root rot severity on scale of 0-100% on 12 Aug.
[x] Green stem rated on scale of 0-100% of stems remaining green within a plot on 10 Oct.
[w] Yields were adjusted to 13% and harvested on 10 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 square means test (α =0.05).

SOYBEAN (*Glycine max* ‘AG33XF2’)
Rhizoctonia seedling blight; *Rhizoctonia solani*

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Evaluation of seed treatment for Rhizoctonia in soybean in central Indiana, 2022 (SOY22-14.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 ‘AG33XF2’ was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 24 May. Seed treatments were applied by cooperator. *Rhizocotonia solani* was inoculated in-furrow at planting at 1.25 g/ft. Stand counts were assessed on 6 Jun and 13 Jun at 14 DAP and V1 growth stage, respectively. Percent canopy green was visually assessed percentage (0-100%) of canopy green on 30 Sep. The two center rows of each plot were harvested on 7 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 square means test (α=0.05).

In 2022, very little disease developed in plots. There was no significant effect of treatment on stand count, canopy greenness, harvest moisture, test weight, and yield of soybean.

Table 8. Effect of treatment on stand counts, canopy greenness, and soybean yield.

Treatment and rate/A[z]	Stand count #/A[y] 6 Jun	Stand count #/A[y] 13 Jun	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Non-inoculated, Zeltera Suite	97,357	94,307	12.5	11.7	56.2	63.4
Inoculated, Zeltera Suite System	91,912	91,258	12.5	11.6	56.3	62.5
Inoculated, Cruiser MAXX Vibrance	96,485	102,802	12.5	11.5	56.6	64.4
Inoculated, Acceleron System	100,624	102,148	11.3	11.5	56.2	67.2
Inoculated, Zeltera Suite System + Aveo	97,139	98,010	13.8	11.7	56.3	61.9
P-value[v]	*0.1756*	*0.0766*	*0.9440*	*0.8793*	*0.8095*	*0.1705*

[z] Seed treatments applied by cooperator. Plots were inoculated with *R. solani* in-furrow at planting at 1.25 g/ft.
[y] Stand counts were assessed on 6 Jun and 13 Jun at 14 DAP and V1 growth stage, respectively.
[x] Canopy green was visually assessed percentage (0-100%) of canopy green on 30 Sep.
[w] Yields were adjusted to 13% moisture and harvest on 7 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'AG31XF2')

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Uniform oomycete seed treatment trial in soybean in central Indiana, 2022 (SOY22-15.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 'AG31XF2' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 24 May. Seed treatments were applied by cooperator. Stand counts were assessed 6 Jul and 22 Jul at V3 and R3 growth stages, respectively. Green stem was visually rated on scale of 0-100% of stems remaining green within a plot 4 Oct. The two center rows of each plot were harvested on 5 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 square means test (α=0.05).

In 2022, very little disease developed in plots. There was no significant effect of treatment on stand count, green stem, harvest moisture, test weight, and yield of soybean (Table 9).

Table 9. Effect of treatment on stand counts, green stem, and soybean yield.

Treatment[z]	Stand count #/A[y] 6 Jul	Stand count #/A[y] 22 Jul	Green stem[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Base	88,645	109,553	1.3	9.8	56.7	54.6
Intego + Zeltera + Precinct	87,338	102,584	1.0	9.8	56.8	53.4
CruiserMaxx Vibrance	88,645	113,474	1.0	9.7	56.7	56.3
CruiserMaxx Vibrance +Vayantis	83,767	99,693	1.3	9.7	56.6	56.5
Obvius Plus + Poncho 600	88,209	108,247	1.3	9.8	56.7	55.6
Acceleron	83,635	110,642	1.0	9.9	56.4	49.9
P-value[v]	*0.7231*	*0.2769*	*0.6398*	*0.9374*	*0.9698*	*0.2621*

[z] Seed treatments were applied by cooperator.
[y] Stand counts were assessed 6 Jul and 22 Jul at V3 and R3 growth stages, respectively.
[x] Green stem was visually rated on scale of 0-100% of stems remaining green within a plot 4 Oct.
[w] Yields were adjusted to 13% moisture and harvest on 5 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 square means test (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, 2022 (SOY22-16.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 31 May. Fungicide applications were applied on 5 Aug at R3/R4 (beginning pod/full pod) and were applied at 15 gal/A at 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. Disease ratings were assessed on 14 Sep at R6 (full seed) growth stage. Frogeye leaf spot (FLS), Cercospora leaf blight (CLB), and Septoria brown spot (SBS) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies. 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, very little disease developed in plots. Frogeye leaf spot (FLS), Cercospora leaf blight (CLB), and Septoria brown spot (SBS) were present in the trial, but only reached low levels. All fungicides reduced SBS over the nontreated control on 14 Sep (Table 10). There was no significant effect of treatment on FLS, CLB severity, harvest moisture, test weight, and yield of soybean.

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

Treatment and rate/A[z]	FLS severity[y] %	CLB severity[y] %	SBS severity[y] %	Harvest moisture %	Test weight lb/bu	Yield[x] bu/A
Nontreated control	0.3	4.8	3.3 a	12.1	55.6	55.4
Miravis Neo 2.4 SE 13.7 fl oz	0.0	4.8	1.8 b	13.9	54.5	54.8
Miravis Top 1.67 SC 13.7 fl oz	0.0	2.3	1.5 b	14.5	54.8	57.2
Miravis Neo 2.4 SE 13.7 fl oz + Endigo ZCX 4.0 fl oz	0.0	3.0	1.8 b	14.5	54.6	54.7
Miravis Top 1.67 SC 13.7 fl oz + Endigo ZCX 4.0 fl oz	0.0	4.8	1.0 b	13.8	54.7	57.0
P-value[w]	*0.0519*	0.7657	*0.0010*	*0.1650*	*0.1826*	*0.9341*

[z] Fungicide applications were made on 5 Aug at R3/R4 growth stage.
[y] Foliar disease incidence rated on scale of 0-100% of plants within a plot with disease symptoms on 14 Sep. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB= Cercospora leaf blight.
[x] Yields were adjusted to 13% moisture and harvest 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

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

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Evaluation of foliar fungicides in soybean in central Indiana, 2022 (SOY22-19.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 8 seeds/ft on 24 May. Xyway 2x0 application were applied with CO_2 backpack sprayer at 10 gal/A at planting. Fungicide applications were applied at V5/R1 on 11 Jul using a Lee self-propelled sprayer and R3/R4 (beginning pod/full pod) on 5 Aug using a CO_2 backpack sprayer. All fungicides were applied at 15 gal/A at 40 psi using a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 14 Sep at R6 (full seed) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf bight (CLB) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies. 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, very little disease developed in plots. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf bight (CLB) were present in the trial, but only reached low levels. Delaro Complete and the program of Topguard applied at V5 followed by Lucento at R3 resulting in the lowest severity of SBS as compared to the nontreated control, but they were not significantly different from Miravis Top at 13.7 fl oz, Adastrio at 7.0 fl oz, or Topguard at 5.0 fl oz. There was no significant effect of treatment on FLS and CLB severity (Table 11). There was no significant effect of treatment on test weight (Table 11). Delaro complete increased yield over the nontreated control, but was not significantly different from Miravis Top or Lucento.

Table 11. Effect of treatment on foliar disease severity and soybean yield.

Treatment, rate/A, and timing[z]	**FLS severity**[y] **%**	**SBS severity**[y] **%**	**CLB severity**[y] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[x] **bu/A**
Nontreated control	1.2	4.0 a	6.3	11.2 d	57.9	55.5 bc
Topguard 4.29 EQ 5.0 fl oz at R3/R4	0.0	2.3 bc	5.8	12.4 a	57.3	55.8 bc
Lucento 4.17 SC 5.0 fl oz at R3/R4	0.0	3.3 ab	8.5	11.2 d	57.5	59.4 ab
Adastrio 4.0 SC 7.0 fl oz at R3/R4	0.0	2.3 bc	4.5	12.0 abc	57.3	55.5 bc
Adastrio 4.0 SC 8.0 fl oz at R3/R4	0.0	3.8 a	4.5	12.3 ab	57.1	52.1 c
Xyway 15.20 fl oz at plant 2x0	0.0	3.8 a	5.3	11.9 abc	59.6	53.7 c
Topguard 5.0 fl oz at V5 fb Lucento 4.17 SC 5.0 fl oz at R3/R4	0.0	3.8 c	4.3	11.5 cd	57.4	56.0 bc
Miravis Top 1.67 SC 13.7 fl oz at R3/R4	1.0	2.0 bc	6.3	11.6 bcd	57.1	58.6 ab
Delaro Complete 458 SC 8.0 fl oz at R3/R4	0.0	1.5 c	5.5	11.7 bcd	56.8	61.3 a
P-value[w]	*0.2008*	*0.0022*	*0.0674*	*0.0057*	*0.4743*	*0.0102*

[z] Xyway applied 2x0 at plant on 24 May. Foliar fungicides were applied on 11 Jul at V5 and 5 Aug at R3-R4 (beginning to full pod) growth stages 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 14 Sep. FLS = frogeye leaf spot; SBS = Septoria brown spot; CLB= Cercospora leaf blight
[x] Yields were adjusted to 13% moisture and harvest 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 squares means and values with different letters are significantly different based on least square means test (α =0.05).

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

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Evaluation of foliar fungicide timing in soybean in central Indiana, 2022 (SOY22-22.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 seed/A on 31 May. Foliar fungicide applications were applied on 5 Aug and 18 Aug at R3/R4 (beginning pod/full pod) and R5 (beginning seed) growth stages, respectively. Applications were made using a CO_2 backpack sprayer at 15 gal/A at 40 psi using a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. Disease ratings were assessed on 14 Sep at R6 (full seed) growth stage. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf bight (CLB) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies. The two center rows of each plot were harvested on 7 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Frogeye leaf spot (FLS), Septoria brown spot (SBS), and Cercospora leaf bight (CLB) were present in the trial, but only reached low levels. There was no significant difference between treatments and nontreated controls for FLS and CLB on 14 Sep (Table 12). All fungicide treatments significantly reduced SBS severity over the nontreated control 1, but not nontreated control 2. All treatments reduced defoliation over the nontreated control 1, except Lucento at R5 (Table 12). There was no significant effect of treatment on harvest moisture, test weight, and yield of soybean.

Table 12. Effect of treatment on foliar disease severity, defoliation, and soybean yield.

Treatment, rate/A, and timing[z]	FLS severity[y] %	SBS severity[y] %	CLB severity[y] %	Defoliation[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control 1	0.0	13.0 a	8.3	15.0 a	11.3	56.9	50.8
Delaro Complete 458 SC 8.0 fl oz at R3/R4	0.0	2.8 b	6.3	6.5 c	11.7	57.0	55.5
Lucento 4.17 SC 5.0 fl oz at R3/R4	0.0	2.8 b	8.5	8.5 bc	11.1	56.9	55.3
Trivapro 2.21 SE 13.7 fl oz at R3/R4	0.0	4.5 b	1.8	3.3 c	11.7	56.6	59.7
Miravis Neo 2.5 SE 13.7 fl oz at R3/R4	0.0	2.3 b	4.5	6.3 c	11.7	56.7	59.9
Revytek 3.33 LC 8.0 fl oz at R3/R4	0.0	2.5 b	5.0	6.3 c	12.3	56.3	56.6
Delaro Complete 458 SC 8.0 fl oz at R5	0.0	3.5 b	4.0	6.5 c	11.5	57.1	59.9
Lucento 4.17 SC 5.0 fl oz at R5	0.0	4.3 b	8.5	12.5 ab	11.1	57.2	53.7
Trivapro 2.21 SE 13.7 fl oz at R5	0.0	6.0 b	6.8	7.5 bc	11.5	57.1	53.1
Miravis Neo 2.5 SE 13.7 fl oz at R5	0.0	2.5 b	5.0	7.3 bc	11.5	56.8	55.9
Revytek 3.33 LC 8.0 fl oz at R5	0.1	4.3 b	7.5	8.8 bc	11.7	56.8	55.1
Nontreated control 2	0.0	5.5 b	3.8	6.5 c	11.0	57.2	63.2
P-value[v]	*0.4710*	*0.0002*	*0.1444*	*0.0260*	*0.1496*	*0.2122*	*0.2569*

[z] Foliar fungicide applications were applied on 5 Aug and 18 Aug at R3/R4 (beginning pod/full pod) and R5 (beginning seed) growth stages, respectively. All treatments contain NIS 0.25% v/v

[y] Foliar disease incidence rated on scale of 0-100% of plants within a plot with disease symptoms on 14 Sep. FLS = frogeye leaf spot; SBS = Septoria brown spot.; CLB= Cercospora leaf blight.

[x] Defoliation rated on scale of 0-100% within in a plot 14 Sep.

[w] Yields were adjusted to 13% moisture and harvest on 7 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')

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Compare the efficacy of in-furrow fungicide for seedling disease soybean, 2022 (SOY22-24.ACRE).

A trial was established at the 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 24 May. Ethos and Double Nickel applications were applied in-furrow at 10 gal/A at planting on 24 May. Stand counts were assessed on 9 Jun and 13 Jun at 10 days after emergence (DAE) and 14 DAE. Percent green stem was visually rated on a scale of 0-100% on 4 Oct. The center rows of each plot were harvested on 5 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 square means test (α=0.05).

In 2022, very little disease developed in the trial. No significant differences between treatments and nontreated control were detected for stand counts, green stem, harvest moisture, test weight, and yield of soybean (Table 13).

Table 13. Effect of treatment on stand counts, green stem, and soybean yield.

Treatment and rate/A[z]	**Stand count #A[y] 9 Jun**	**Stand count #A[y] 13 Jun**	**Green stem[x] %**	**Harvest moisture %**	**Test weight lb/bu**	**Yield[w] bu/A**
Nontreated control	77,537	79,933	1.3	10.5	56.3	40.4
Ethos XB 4.0 fl oz in-furrow	77,755	81,022	1.0	9.9	56.6	41.9
Double Nickel LC 8.0 oz in-furrow	71,656	77,319	1.0	10.3	57.2	43.0
Double Nickel LC 16.0 oz in-furrow	77,755	85,378	1.0	10.2	57.0	42.4
P-value[v]	*0.2924*	*0.4466*	*0.4363*	*0.3129*	*0.4939*	*0.9723*

[z] Ethos and Double Nickel applications were applied in-furrow at 10 gal/A at planting on 24 May.
[y] Stand counts were assessed on 9 Jun and 13 Jun at 10 DAE and 14 DAE.
[x] Green stem visually rated on a scale of 0-100% on 4 Oct.
[w] Yields were adjusted to 13% moisture and harvest on 5 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 square means test (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 foliar diseases in soybean in central Indiana, 2022 (SOY22-30.ACRE).

A trial was established at the 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 31 May. 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 Aug at R4 (full pod) growth stage. Disease ratings were assessed on 14 Sep at R6 (full seed) growth stage. Frogeye leaf spot (FLS), Cercospora leaf blight (CLB) and Septoria brown (SBS) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies. Percent canopy green was visually assessed percentage (0-100%) of crop canopy green on 14 Sep. The center rows of each plot were harvested on 5 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Frogeye leaf spot (FLS), Cercospora leaf blight (CLB) and Septoria brown spot (SBS) were present in the trial, but only remained at low levels. There was no significant effect of treatments on FLS, CLB severity.However, all treatments reduced SBS over the nontreated control on 14 Sep (Table 14). Fungicides ADM.03509.F.3.B at 12.0 fl oz and 16.0 fl oz significantly increased canopy greenness over nontreated control (Table 14). All treatments showed higher harvest moisture compared to nontreated control. There was no significant effect of treatment on test weight and yield of soybean.

Table 14. Effect of treatment on foliar disease severity, canopy greenness, and soybean yield.

Treatment and rate/A[z]	FLS severity[y] %	CLB severity[y] %	SBS severity[y] %	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.3	6.5	7.0 a	76.3 b	10.6 c	56.2	52.0
ADM.03509.F.3.B 8.0 fl oz	0.0	6.5	3.3 b	76.3 b	11.9 ab	55.6	50.5
ADM.03509.F.3.B 12.0 fl oz	0.0	3.8	2.5 bc	85.0 a	11.6 abc	56.0	59.1
ADM.03509.F.3.B 16.0 fl oz	0.0	6.5	2.3 bc	80.0 a	12.4 a	55.5	50.9
ADM.03509.F.3.D 16.0 fl oz	0.0	6.8	2.3 bc	78.8 b	12.2 ab	56.0	53.4
Stratego YLD 4.65 fl oz	0.0	7.0	3.5 b	76.3 b	11.3 abc	56.4	56.7
Miravis Neo 2.5 SE 13.7 fl oz	0.3	3.8	1.3 c	80.0 ab	12.3 ab	54.8	53.4
Quadris Top 1.67 SC 14.0 fl oz	0.8	4.8	4.0 b	80.0 ab	11.2 bc	55.9	53.0
P-value[v]	*0.5227*	*0.4102*	*0.0001*	*0.0294*	*0.0378*	*0.2233*	*0.1449*

[z] Fungicides were applied 5 Aug at R4 (full pod) growth stage.
[y] Foliar disease severity were rated by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies on 14 Sep. FLS = frogeye leaf spot; CLB = Cercospora leaf blight; SBS = Septoria brown spot.
[x] Canopy greenness was visually assessed percentage (0-100%) of crop canopy green on 14 Sep.
[w] Yields were adjusted to 13% moisture and harvested on 5 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'AG23XF2')
Sudden death syndrome; *Fusarium virguliforme*

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Evaluation of fertilizers in combination with seed treatments and Nano products in soybean in Indiana, 2022 (SOY22-31.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 'AG23XF2' was planted in 30-inch row spacing at a rate of 140,000 seeds/A on 24 May. *Fusarium virguliforme* inoculum was applied at planting at 1.25 g/ft within the seedbed. An application of 28% N at 51 gal (150 lbs N) was made prior to planting soybean. Seed treatments were applied on seeds before planting and contained base seed treatment. Foliar applications were applied a R1 (beginning bloom) growth stage on 12 Jul. 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. Stand counts were assess at V3 on 20 Jun. Phytoxicity was visually rated on a scale of 0-100%. Ten roots per plot were sampled from border rows at R4 on 11 Aug, gently washed and rated for root rot severity on scale of 0-100%. The two center rows of each plot were harvested on 4 Oct and yields were adjusted to 13% moisture. All data were analyzed using a mixed model analysis of variance, and values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, very little disease developed in plots. There was no significant effect of treatment on stand count, phytoxicity, root rot, and yield of soybean (Tables 15).

Table 15. Effect of treatment on stand count, phytoxicity, root rot, and soybean yield.

Treatment, rate/A, and timing[z]	Stand count #/A	Phyto[y] %	Root rot[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Base	102,148	6.3	12.4	10.1	56.6	56.8
Base fb NanoStress 4.0 fl oz + NanoN 4.0 fl oz at R1	104,980	6.3	11.5	10.1	56.5	58.5
Base + 150 lbs N prior to planting	100,188	5.0	10.7	10.1	56.4	62.1
Base + Ilevo	108,464	6.3	13.3	10.0	56.6	59.0
Base + Ilevo fb NanoStress 4.0 fl oz + NanoN 4.0 fl oz at R1	101,930	5.0	15.2	10.0	56.2	59.0
Base + Ilevo + 150 lbs N prior to planting	107,593	7.5	14.1	10.0	56.4	62.4
P-value[v]	*0.7275*	*0.5915*	0.5425	*0.8492*	*0.6761*	*0.4035*

[z] Seed treatments were pre-applied to the seed of cultivar. *Fusarium virguliforme* inoculum was applied at planting at 1.25 g/ft within the seedbed. Seed treatments were applied on seeds before planting. Foliar applications were was applied a R1 (beginning bloom) growth stage on 12 Jul. All treatments contained a base treatment.
[y] Phytoxicity (phyto) visually rated on a scale of 0-100% across plot on 20 Jun.
[x] Ten roots per plot were sampled from border rows at R4 on 11 Aug and rated for root rot severity on scale of 0-100%.
[w] Yields were adjusted to 13% moisture and harvest 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

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

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Evaluation of products and cultivars for Fusarium head blight (FHB) in organic wheat in Indiana, 2022 (WHT22-01.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 'Kaskaskia' and 'Harpoon' were planted in 7.5-inch row spacing using a drill on 8 Nov, 2021. 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 24 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 25 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot. Disease ratings were assessed on 13 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, 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 7 Jul and yields were adjusted to 13.5% moisture. A subsample of grain was taken from each plot and partitioned for deoxynivalenol (DON) 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. Data were subjected to mixed model analysis of variance (SAS 9.4, 2019) and means were compared based on least square means test (α=0.05).

In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB). Fusarium head blight (FHB) was the most prominent disease. There were no significant interactions between cultivar and fungicide treatments; therefore, main effects of each are presented (Table 16). No differences were detected for FHB incidence and index in both cultivars Harpoon and Kaskaskia. In the cultivar Harpoon, FHB severity was reduced when compared to Kaskaskia. There were no differences in foliar treatments from nontreated control for FHB incidence, severity, and index. The concentration of deoxynivalenol (DON) was significantly lower in the cultivar Harpoon as compared to Kaskaskia, and when treated with Prosaro. There was no significant difference between treatments and cultivars for Fusarium damaged kernels (FDK). The cultivar Harpoon had a highest percent of wheat yield when compared to Kaskaskia.

Table 16. Effect of cultivar and fungicide on Fusarium head blight (FHB), DON, FDK, and wheat yield.

Treatment[z]	FHB incidence[y] %	FHB severity[x] %	FHB Index[w]	DON ppm[v]	FDK[u] %	Yield[t] bu/A
Cultivar						
Kaskaskia	13.0	7.9 a	0.8	0.377 a	10.1	44.4 b
Harpoon	17.9	4.1 b	0.7	0.215 b	9.2	51.6 a
Fungicide rate/A						
Nontreated control	13.8	9.4	1.2	0.296 a	10.0	47.9
Prosaro 421 SC 8.2 fl oz	13.3	3.6	0.4	0.110 b	9.5	49.1
ChampION 50 WP 1.5 lb	21.7	3.7	0.7	0.351 a	8.2	48.8
Pacesetter WS 13.0 fl oz	17.1	5.2	0.7	0.301 a	10.1	46.3
Sonata 1.0 qt	10.8	7.9	0.6	0.396 a	9.9	46.4
Actinovate AG 12.0 fl oz	16.0	6.3	0.7	0.308 a	10.3	49.5
P-value *cultivar*[s]	*0.0816*	*0.0150*	*0.5295*	*0.0007*	*0.1238*	*0.0001*
P-value *fungicide*	*0.3105*	*0.1587*	*0.3415*	*0.0285*	*0.3291*	*0.7328*
P-value *cultivar*fungicide*	*0.3438*	*0.2749*	*0.3321*	*0.2773*	*0.3879*	*0.0157*

[z] Fungicides were applied on 24 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 25 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot. [y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage on 13 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 average 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.[u] FDK = percentage of Fusarium damaged kernels.[t] Yields were adjusted to 13.5% moisture and harvested on 7 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 square means test (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, 2022 (WHT22-02.ACRE).

Plots were 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. On 8 Nov 2021 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 24 May and 30 May at the Feekes growth stage 10.5.1 and 10.5.1 + 6 days after 10.5.1, respectively. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 25 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 13 June. 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 average FHB severity)/100 per plot. Values for each plot were averaged before analysis. The eight center rows of each plot were harvested with a Kincaid plot combine on 7 Jul and yields were adjusted to 13.5% moisture. Data were subjected to mixed model analysis of variance (SAS 9.4, 2019) and means were compared using least square means test (α=0.05).

In 2022, weather conditions were moderatly favorable for Fusarium head blight (FHB). FHB was the most prominent disease. No differences were detected for FHB incidence and severity as compared to the nontreated control (Table 17). FHB index a was reduced by Miravis Ace applied at 10.5.1 and Miravis Ave at 10.5.1 fb Sphaerex at 6 DAT over the nontreated control. The concentration of deoxynivalenol (DON) was reduced over the nontreated control by all treatments, except Prosaro applied at 10.5.1 (Table 17). Harvest moisture was higher in all of the fungicide treated plots, except for Prosaro Pro at 10.5.1, as compared to the nontreated control. There was no significant difference in yield of wheat.

Table 17. Effect of fungicide on Fusarium head blight (FHB), DON, FDK, and wheat yield.

Treatment, rate/A, and timing[z]	FHB incidence[y] %	FHB severity[x] %	FHB Index[w]	DON[v] ppm	FDK[u] %	Harvest moisture %	Yield[t] bu/A
Nontreated control	20.4	4.7	0.9 ab	0.853 a	9.5	18.3 cd	57.3
Prosaro 421 SC 6.5 fl oz at 10.5.1	20.0	3.1	0.6 abc	0.585 ab	9.5	18.8 bcd	58.9
Caramba 90 EC 13.5 fl oz at 10.5.1	21.7	2.7	0.6 abc	0.525 b	9.5	19.2 ab	59.0
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1	10.4	2.6	0.3 c	0.280 bc	8.0	19.0 ab	57.8
Prosaro Pro 400 SC 10.3 fl oz at 10.5.1	25.0	3.8	1.0 a	0.513 b	7.8	18.3 d	55.6
Sphaerex 7.3 fl oz at 10.5.1	16.3	2.0	0.5 bc	0.340 bc	8.8	18.9 abc	56.6
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Prosaro Pro 400 SC 10.3 fl oz at 6 DAT	19.2	2.7	0.5 bc	0.345 bc	7.8	19.5 a	63.6
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Sphaerex 7.3 fl oz at 6 DAT	8.3	3.5	0.3 c	0.188 c	7.5	19.3 ab	54.5
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Tebuconazole 3.6 F 4.0 fl oz at 6 DAT	14.6	3.2	0.5 bc	0.355 bc	8.8	19.0 ab	56.3
P-value[s]	*0.0964*	*0.4660*	*0.0445*	*0.0081*	*0.1394*	*0.0060*	*0.0542*

[z] Fungicides treatments applied on 24 May and 30 May at the Feekes growth stage 10.5.1 and 10.5.1 + 6 days after treatment (DAT), respectively. All treatments contained a non-ionic surfactant (Preference) at a rate of 0.25% 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 25 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 13 Jun.
[x] FHB severity was rated by visually assessing the percentage of the infected head. FHB = Fusarium head blight on 13 Jun.
[w] FHB index was calculated as: (total FHB incidence multiplied by average FHB severity)/100 per plot on 13 Jun.
[v] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab.
[u] FDK = percentage of Fusarium damaged kernels.
[t] Yields were adjusted to 13.5% moisture and harvested on 7 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 square means test (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, 2022 (WHT22-03.ACRE).

Plots were 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. On 8 Nov 2021 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 24 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 25 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 13 June 2022. 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 average FHB severity)/100 per plot. Values for each plot were averaged before analysis. The eight center rows of each plot were harvested with a Kincaid plot combine on 7 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, weather conditions were moderatly favorable for Fusarium head blight (FHB). FHB was the most prominent disease. P25R61 had reduced FHB incidence, FHB severity, DON, percentage of FDK, and yield as compared to P25R40. FHB incidence and Index was reduced by all fungicides over the nontreated, inoculated control on 13 Jun (Table 18). The concentration of deoxynivalenol (DON) was reduced by all fungicides applied at 10.5.1 over nontreated controls. There was no difference in treatment for FHB severity, percentage of fusarium damaged kernels (FDK), and yield over nontreated control.

Table 18. Effect of cultivar and fungicide on Fusarium head blight (FHB), DON, FDK, and wheat yield.

Cultivar or treatment and rate/A[z]	FHB incidence[y] %	FHB severity[x] %	FHB Index[w]	FDK[v] %	DON[u] ppm	Yield[t] bu/A
P25R40 (scab susceptible)	13.5 a[s]	12.8 a	1.6 a	9.6 a	0.783 a[s]	64.0 a
P25R61 (scab resistant)	4.0 b	5.3 b	0.3 b	8.9 b	0.229 b	59.0 b
Nontreated control, inoculated	15.0 a	11.8	2.0 a	9.5	0.770 a	59.4
Prosaro 421 SC 6.5 fl oz at 10.5.1	8.8 b	6.5	0.9 b	8.9	0.398 b	60.3
Miravis Ace 275 SC 13.7 fl oz at 10.5.1	5.8 b	12.8	0.5 b	9.5	0.350 b	65.6
Prosaro Pro 400 SC 10.3 fl oz at 10.5.1	6.0 b	7.6	0.5 b	9.3	0.409 b	64.1
Sphaerex 7.3 fl oz at 10.5.1	9.0 b	5.5	0.7 b	8.6	0.311 b	59.6
Nontreated control, non-inoculated	7.7 b	10.3	0.9 b	9.8	0.796 a	60.1
P-value *cultivar*[s]	*0.0001*	*0.0074*	*0.0001*	*0.0360*	*0.0001*	*0.0256*
P-value *fungicide*	*0.0019*	*0.5127*	*0.0040*	*0.2881*	*0.0001*	*0.4030*
P-value *cultivar*fungicide*	*0.0009*	*0.9962*	*0.0053*	*0.1449*	*0.0352*	*0.3051*

[z] Fungicides treatments applied on 24 May at the 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, except nontreated, non-inoculated plots. Spore suspension applied at 300 ml/plot with handheld sprayer on 25 May.
[y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage.
[x] FHB severity was rated by visually assessing the percentage of the infected head. FHB = Fusarium head blight.
[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.
[t] Yields were adjusted to 13.5% moisture and harvested on 7 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 square means test (α=0.05).

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

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Evaluation of foliar fungicides for wheat disease management in central Indiana, 2022 (WHT22-06.ACRE).

Plots were 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. On 8 Nov 2021 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 24 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 25 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 13 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 average FHB severity)/100 per plot. Values for each plot were averaged before analysis. The eight center rows of each plot were harvested with a Kincaid plot combine on 7 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB). FHB was the most prominent disease. FHB incidence and Index were not significantly reduced by all fungicide treatments over the nontreated control (Table 19). No differences in FHB severity was detected compared to nontreated control, but Prosaro at 8.2 fl oz had significantly higher severity as compared to all other fungicide treatments. The concentration of deoxynivalenol (DON) was significanly reduced in all treatments over the nontreated control, except Prosaro at 6.5 fl oz/A. There were no significant differences in percentage of fusarium kernels damage (FDK) and yield of wheat.

Table 19. Effect of cultivar and fungicide on Fusarium head blight (FHB), DON, FDK, and wheat yield.

Treatment and rate/A[z]	FHB incidence[y] %	FHB severity[x] %	FHB Index[w]	DON[v] ppm	FDK[u] %	Yield[t] bu/A
Nontreated control	30.8	2.9 ab	0.9	1.310 a	7.5	65.6
Prosaro 421 SC 8.2 fl oz	20.4	4.0 a	0.8	0.698 bc	7.5	70.6
Prosaro Pro 400 SC 10.3 fl oz	27.1	1.9 b	0.5	0.455 c	8.5	65.9
Miravis Ace 5.2 SC 13.7 fl oz	20.9	2.1 b	0.5	0.678 bc	9.0	68.8
Sphaerex 7.3 fl oz	17.1	2.3 b	0.4	0.603 bc	9.5	70.5
Prosaro 421 SC 6.5 fl oz	27.5	2.3 b	0.7	0.978 ab	9.5	67.1
P-value[s]	*0.2175*	*0.0296*	*0.0875*	*0.0071*	*0.6385*	*0.0976*

[z] Fungicides were applied on 24 May at the Feekes growth stage 10.5.1 and contained a non-ionic surfactant at a rate of 0.125% v/v. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 25 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot.
[y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage on 13 Jul.
[x] FHB severity was rated by visually assessing the percentage of the infected head on 13 Jul.
[w] FHB index was calculated as: (% FHB incidence multiplied by average 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.
[u] FDK = percentage of Fusarium damaged kernels.
[t] Yields were adjusted to 13.5% moisture and harvested on 7 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 square means test (α=0.05).

WHEAT (*Triticum aestivum* 'P25R40')
Leaf Blotch; *Septoria tritici*
Stagonospora nodorum

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Evaluation of foliar fungicides for wheat in central Indiana, 2021 (WHT22-08.ACRE).

Plots were 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. On 13 Nov 2021 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. Foliar fungicides were applied on 12 May at Feekes 8 and 24 May at the Feekes 10.5.1. Leaf blotch severity was assessed on 13 Jun and was rated by visually assessing the percentage of symptomatic leaf tissue on the flag leaf on five plants per plot and then averaged. The eight center rows of each plot were harvested with a Kincaid plot combine on 7 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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB), very little leaf blotch developed. No differences were detected for FHB incidence, severity, and index as compared to the nontreated control (data not presented). No differences were detected for leaf spot severity or wheat yield.

Table 20. Effect of cultivar and fungicide on leaf blotch severity and wheat yield.

Treatment and rate/A[z]	**Leaf blotch severity[y] %**	**Yield[x] bu/A**
Nontreated control	0.6	54.7
Nexicor EC 7.0 fl oz at Feekes 8	1.0	57.3
Topguard EQ 10.0 fl oz at Feekes 8	0.0	52.5
Priaxor 4.0 fl oz at Feekes 8	0.4	60.1
Trivapro SE 9.4 fl oz at Feekes 8	0.1	55.0
Delaro 325SC 8.0 fl oz at Feekes 8	0.0	58.0
Quilt Xcel 2.2 SE 10.5 fl oz at Feekes 8	0.3	53.9
Tilt 3.6 EG 4.0 fl oz at Feekes 8	0.0	52.1
Headline SC 6.0 fl oz at Feekes 8	0.0	57.1
Prosaro 421 SC 6.5 fl oz at Feekes 10.5.1	0.3	57.6
P-value[s]	0.4598	*0.5547*

[z] Fungicides were applied on 24 May at the Feekes growth stage 8 and 10.5.1 and contained a non-ionic surfactant at a rate of 0.125% v/v.
[y] Leaf blotch severity was visually assessed as percentage of symptomatic leaf tissue on flag leaf on 13 Jun. Five plants per plot were assessed and data averaged.
[x] Yields were adjusted to 13.5% moisture and harvested on 7 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Uniform fungicide comparison for tar spot in corn in northwestern Indiana, 2022 (COR22-02_UFTTAR.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 May. The field was overhead irrigated at 1 in. once a week unless weekly rainfall was 1 in. or more 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 2 Aug at R1 (silk) and on 23 Aug at R4 (dough) growth stages, and three weeks after treatments (WAT). Disease ratings were assessed on 20 Sep and 5 Oct at R5 (dent) and R6 (maturity) 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 R6 (maturity) growth stage. The two center rows of each plot were harvested on 4 Nov and yields were adjusted to 15.5% moisture All disease and yield data were analyzed using a mixed model analysis of variance, and values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, very little disease developed in plots. All treatments reduced tar spot stromata severity over the nontreated control, except for Miravis Neo on 20 Sep at R5. Tar spot stromata severity was significantly reduced over the nontreated control by all fungicide treatments, except Aproach Prima, Miravis Neo, and Delaro Complete on 5 Oct at R6. Headline Amp fb Velytma, Aproach Prima fb Headline AMP, Miravis Neo fb Headline AMP, Headline AMP fb Delaro Complete at 3 WAT, and single application of Aproach Prima significantly increased the percentage of canopy green over the nontreated control on 5 Oct at R6 (Table 21). There was no significant effect of treatment on yield of corn.

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

Treatment, rate/A and timing[z]	Tar spot % stromata[y] 20 Sep	Tar spot % stromata[y] 5 Oct	Canopy[x] green %	Yield[w] bu/A
Nontreated control	0.07 b	0.45 a	13.8 e	200.5
Veltyma 3.34 S 7.0 fl oz at R1	0.00 c	0.11 c	32.5 a-e	205.5
Aproach Prima 2.34 SC 6.8 fl oz at R1	0.03 c	0.39 a	42.5 ab	220.1
Miravis Neo 2.5 SE 13.7 fl oz at R1	0.12 a	0.39 a	25.0 b-e	216.0
Delaro Complete 458 SC 8.0 fl oz at R1	0.02 c	0.31 ab	37.5 a-e	216.0
Headline AMP 1.68 SC 10.0 fl oz at R1	0.01 c	0.12 bc	22.5 cde	207.7
Veltyma 3.34 S 7.0 fl oz at R1 fb Headline AMP 1.68 SC 10.0 fl oz at 3 WAT	0.00 c	0.01c	30.0 a-e	206.2
Aproach Prima 2.34 SC 6.8 fl oz at R1 fb Headline AMP 1.68 SC 10.0 fl oz at 3 WAT	0.01 c	0.06 c	42.5 ab	213.5
Miravis Neo 2.5 SE 13.7 fl oz at R1 fb Headline AMP 1.68 SC 10.0 fl oz at 3 WAT	0.01 c	0.06 c	40.0 abc	211.7
Delaro Complete 458 SC 8 fl oz at R1 fb Headline AMP 1.68 SC 10.0 fl oz at 3 WAT	0.00 c	0.04 c	30.0 a-e	209.8
Headline AMP 1.68 SC 10.0 fl oz at R1 fb Veltyma 3.34 S 7.0 fl oz at 3 WAT	0.00 c	0.02 c	47.5 a	216.5
Headline AMP 1.68 SC 10.0 fl oz at R1 fb Aproach Prima 2.34 SC 6.8 fl oz at 3WAT	0.00 c	0.09 c	20.0 de	210.5
Headline AMP 1.68 SC 10.0 fl oz at R1 fb Miravis Neo 2.5 SE 13.7 fl oz at 3 WAT	0.00 c	0.05 c	17.5 e	204.6
Headline AMP 1.68 SC 10.0 fl oz at R1 fb Delaro Complete 458 SC 8.0 fl oz at 3 WAT	0.00 c	0.04 c	42.5 ab	222.3
Headline AMP 1.68 SC 10.0 fl oz at R1 fb Headline AMP 1.68 SC 10.0 fl oz at 3 WAT	0.00 c	0.10 c	32.5 a-e	189.7
P-value[v]	*0.0001*	*0.0001*	*0.0143*	*0.5419*

[z] Fungicides were applied on 2 Aug at R1 (silk) corn growth stage and on 23 Aug, 3 weeks after treatment (WAT), at R4 (dough). All treatments applied contained a non-ionic surfactant (Preference) at a rate of 0.25% v/v. Fb= followed by. [y] Tar spot stromata severity visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 20 Sep at R5 and 5 Oct at R6. [x] % Canopy greenness visually assessed percentage (0-100%) on 5 Oct at R6. [w] Yields were adjusted to 15.5% moisture and harvested on 4 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 square means test (α=0.05).

CORN (*Zea mays* ‘ W2585VT2P and P0589AMXT’)
Tar spot; *Phyllachora maydis*

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Evaluation of hybrids and fungicide timing for tar spot in corn in northwestern Indiana, 2022 (COR22-03.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 used for evaluation. The previous crop was corn. Standard practices for grain corn production in Indiana were followed. Corn hybrids ‘W2585VT2P’ and ‘P0589AMXT’ were planted in 30-inch row spacing at a rate of 34,000 seeds/A on 20 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 fungicide was applied on 14 Jul, 21 Jul, 2 Aug, 12 Aug, and 23 Aug at the V8 (eight-leaf), V10 (10-leaf), VT/R1 (tassel/silk), R2 (blister), and R4 (dough) growth stages, respectively. A weather-based prediction model, Tarspotter (https://ipcm.wisc.edu/apps/tarspotter/) was used and applications were made at the V8 and VT/R1 growth stages. Disease ratings were assessed on 21 Sep, and 5 Oct at the R5 (dent) and R6 (maturity) 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 each plot were averaged before analysis. Percentage canopy green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at the R5 (dent) and R6 (maturity) growth stages. The two center rows of each plot were harvested on 20 Oct and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed using a mixed model analysis of variance (SAS 9.4, 2019) and values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent disease in the trial and reached low severity. There was no significant interaction between hybrid and fungicide for disease and yield, therefore main effects are presented. No differences between cultivars were observed on 21 Sep. Tar spot stromata severity was significantly reduced with the tar spot tolerant cultivar compared to the tar spot susceptible on 5 Oct (Table 22). No differences between fungicide treatments and nontreated control were observed for tar spot on 21 Sep. On 5 Oct, Delaro Complete applied at R2 significantly reduced the severity of tar spot over nontreated, but was not significantly different from application at R4 or when applied using the Tarspotter app (V8 followed by VT/R1). Percent canopy green significantly increased for the susceptible cultivar compared to the tolerant cultivar on 5 Oct, but no significant differences between cultivars for canopy greenness were observed on 21 Sep. The susceptible cultivar had significantly higher moisture than the tolerant cultivar. Delaro Complete applied at VT/R1 significantly increased Canopy greenness compared to nontreated control on Sep 21. No differences between treatments for canopy greennes on 5 Oct were observed. There was no significant difference between hybrids and fungicide applications and nontreated for grain moisture and yield.

Table 22. Effect of fungicide on tar spot stromata severity, canopy greenness and corn yield.

Treatment, rate/A, and timing[z]	Tar spot % stromata[y] 21 Sep	Tar spot % stromata[y] 5 Oct	Canopy % green[x] 21 Sep	Canopy % green[x] 5 Oct	Moisture %	Test weight lb/bu	Yield[w] bu/A
Hybrids							
Susceptible (W2583VT2P)	0.03	0.15 a	52.9	20.0 a	22.7 a	54.1	212.4
Tolerant (P0589AMXT)	0.01	0.03 b	53.5	8.0 b	20.5 b	55.0	206.1
Fungicide Programs							
Nontreated control	0.02	0.11 ab	48.8 bc	10.9	21.2	54.1	202.8
Delaro Complete 458 SC 8.0 fl oz/A at V10	0.07	0.17 a	44.4 c	10.8	21.1	54.4	212.9
Delaro Complete 458 SC 8.0 fl oz/A at VT/R1	0.02	0.14 a	61.9 a	15.6	21.8	54.0	202.9
Delaro Complete 458 SC 8.0 fl oz/A at R2	0.00	0.02 c	55.6 ab	16.3	21.6	56.5	212.5
Delaro Complete 458 SC 8.0 fl oz/A at R4	0.01	0.02 bc	49.4 bc	12.0	21.6	54.2	216.2
Delaro Complete 458 SC 8.0 fl oz/A at Tarspotter	0.01	0.10 abc	59.4 ab	18.3	22.6	54.2	208.1
P-value *hybrid*[v]	*0.1337*	*0.0001*	*0.8448*	*0.0006*	*0.0001*	*0.0311*	*0.1051*
P-value *fungicide*	*0.2530*	*0.0049*	*0.0218*	*0.6465*	*0.0733*	*0.0088*	*0.2351*
P-value *hybrid*fungicide*	*0.3248*	*0.0621*	*0.6855*	*0.7098*	*0.5455*	*0.0144*	*0.2030*

[z]Fungicide treatments applied on 14 Jul, 21 Jul, 2 Aug, 12 Aug, and 23 Aug at the V8 (eight-leaf), V10 (10-leaf), VT/R1 (silk), R2 (blister), and R4 (dough) growth stages, respectively. Tarspotter applications on 14 Jul and 2 Aug. fb = followed by. [y]Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 21 Sep and on 5 Oct. [x] Canopy greenness visually assessed percentage (0-100%) on 21 Sep and 5 Oct. [w]Yields were adjusted to 15.5% moisture and harvest on 20 Oct. [v]All data were analyzed in SAS 9.4. A 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 square means test (α=0.05).

CORN (*Zea mays* 'ALSEED O.84-95UP and 0.52-96')
Tar spot; *Phyllachora maydis*
Gray leaf spot; *Cercospora zeae-maydis*
Northern corn leaf blight; *Exserohilum turcicum*

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Evaluation of products and hybrids for tar spot in organic corn in northwestern Indiana, 2022 (COR22-04.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 organic grain corn production in Indiana were followed. Organic hybrids 'ALSEED O.84-95UP' and '0.52-96' were planted in 30-inch row spacing at a rate of 34,000 seeds/A on 20 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. Fungicide treatments were applied on 26 Jul at R1 (silk) growth stage. Disease ratings were assessed on 29 Aug at R5 (dent) growth stage. Tar spot, gray leaf spot (GLS), and northern corn leaf blight (NCLB) were rated by visually assessing the percentage (0-100%) per leaf area 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 R5 (dent) growth stage. The two center rows of each plot were harvested on 21 Oct and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed using a mixed model analysis of variance, and means were separated using least square means test (α=0.05).

In 2022, very little disease developed in plots. Tar spot, gray leaf spot (GLS) and northern corn leaf blight (NCLB) were present in the trial, but only remained at low levels. There was not significant interaction between hybrid and fungicide, therefore main effects of hybrid and fungicide were evaluated (Table 23). No differences between hybrids for tar spot, GLS and NCLB were detected. ALSEED 0.84-95UP had significantly greener canopy and higher yield than 0.52-96 hybrid. No differences between treatments and nontreated control for tar spot, GLS, NCLB, canopy greenness, and yield of corn.

Table 23. Effect of fungicide on foliar disease severity, canopy greenness, and corn yield.

Treatment and rate/A[z]	**Tar spot stromata**[y] **%**	**GLS severity**[y] **%**	**NCLB severity**[y] **%**	**Canopy**[x] **green %**	**Yield**[w] **bu/A**
Hybrids					
ALSEED O.84-95UP	0.001	0.03	0.0	86.4 a	201.0 a
0.52-96	0.004	0.04	0.1	66.7 b	186.5 b
Fungicide programs					
Nontreated control	0.013	0.02	0.0	73.8	200.1
Headline AMP 1.68 SE 10 fl oz	0.000	0.05	0.0	78.8	206.6
Serifel WP 16 fl oz	0.003	0.06	0.0	76.6	202.0
Actinovate AG 12 ox	0.000	0.04	0.0	73.8	183.1
Badge X2 SC 1.8 lb	0.000	0.03	0.3	75.6	176.5
OxiDate 5.0 128 fl oz	0.000	0.03	0.0	80.6	194.1
P-value *hybrid*[v]	*0.4303*	*0.8665*	*0.3246*	*0.0001*	*0.0395*
P-value *fungicide*	*0.4583*	*0.9611*	*0.4331*	*0.7011*	*0.1048*
P-value *hybrid*fungicide*	*0.3710*	*0.2080*	*0.4331*	*0.5945*	*0.0234*

[z] Fungicide treatments were applied at on 26 Jul at R1 (silk) growth stage.
[y] Tar spot stromata, GLS, and NCLB visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 29 Sep. GLS = gray leaf spot. NCLB = northern corn leaf blight.
[x] Canopy greeness visually assessed percentage (0-100%) green on 29 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 21 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Fungicide efficacy and timing for tar spot in corn in northwestern Indiana, 2022 (COR22-05.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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. Fungicides were applied at first detection of tar spot (9 Sep), V8 growth stage (14 July), VT (tassel) grow stage (2 Aug), R3 (milk) growth stage (19 Aug), first detection of tar spot fb 3 weeks after treatment (WAT) (this timing not receive application due to PHI of fungicide), V8 fb 3 WAT (2 Aug), VT fb 3 WAT (23 Aug), and R3 fb 3 WAT (9 Sep). Disease ratings were assessed on 20 Sep at the R5 (dent) and 5 Oct at the R6 (maturity) growth stages. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for the five leaves were averaged before analysis. Percent stay green was rated by visually assessing the percentage (0-100%) of whole plot for crop canopy that remained green at the R5 (dent) and R6 (maturity) growth stages. The two center rows of each plot were harvested on 4 Nov and yields were adjusted to 15.5% moisture. All data were analyzed in SAS 9.4. 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Tar spot was present in the trial, but remained at low levels. All fungicide programs significantly reduced the percentage of stromata of tar spot over the nontreated control 1 at the R5(dent) growth stage (Table 24). There were no significant differences between treatments for canopy greennes on 20 Sep. All application timings of Veltyma significantly reduced the severity of stromata of tar spot over nontreated controls on 5 Oct at the R6, except the applications at V8 and at first detection fb 3 WAT. At first detection application was the only timing of Lucento that reduced tar spot over nontreated controls on 5 Oct at R6. All fungicide treatments significantly increased the percent of canopy greeness over the nontreated control 1 at R6, except Veltyma at R3, V8 fb 3 WAT and Lucento at first detection of tar spot, R3, first detection fb 3 WAT, V8 fb 3 WAT, VT fb 3 WAT and R3 fb 3 WAT. No significant differences in yield were detected.

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

Treatment, rate/A and timing[z]	Tar spot % stromata[y] 20 Sep	Canopy % green[x] 20 Sep	Tar spot % stromata[y] 5 Oct	Canopy[x] % green 5 Oct	Yield[w] bu/A
Nontreated control 1	0.8 a	72.5	1.9 a	41.3 fg	223.6
Veltyma 3.34 S 7.0 fl oz at first detection	0.0 b	87.5	0.1 d	63.8 abc	229.2
Veltyma 3.34 S 7.0 fl oz at V8	0.0 b	86.3	0.5 cd	62.5 abc	231.7
Veltyma 3.34 S 7.0 fl oz at VT	0.0 b	85.0	0.2 d	70.0 a	236.5
Veltyma 3.34 S 7.0 fl oz at R3	0.0 b	76.0	0.1 d	53.0 b-f	248.1
Veltyma 3.34 S 7.0 fl oz at first detection fb 3 WAT	0.2 b	80.0	1.9 a	58.8 a-d	247.6
Veltyma 3.34 S 7.0 fl oz at V8 fb 3 WAT	0.0 b	81.7	0.0 d	50.0 c-g	259.2
Veltyma 3.34 S 7.0 fl oz at VT fb 3 WAT	0.1 b	85.0	0.0 d	65.0 ab	254.3
Veltyma 3.34 S 7.0 fl oz at R3 fb 3 WAT	0.0 b	88.8	0.0 d	57.5 a-e	234.3
Nontreated control 2	0.2 b	76.3	0.9 bc	57.5 a-e	235.9
Lucento 7.17 SC 5.0 fl oz at first detection	0.0 b	87.5	0.1 d	52.5 b-f	225.1
Lucento 7.17 SC 5.0 fl oz at V8	0.0 b	82.0	1.3 ab	57.5 a-d	247.4
Lucento 7.17 SC 5.0 fl oz at VT	0.1 b	80.0	0.6 cd	61.3 abc	252.0
Lucento 7.17 SC 5.0 fl oz at R3	0.0 b	77.5	0.5 cd	43.8 efg	227.5
Lucento 7.17 SC 5.0 fl oz at first detection fb 3 WAT	0.0 b	73.8	0.4 cd	36.3 g	243.7
Lucento 7.17 SC 5.0 fl oz at V8 fb 3 WAT	0.2 b	73.8	0.6 bcd	42.5 fg	226.0
Lucento 7.17 SC 5.0 fl oz at VT fb 3 WAT	0.1 b	76.3	0.6 bcd	45.0 d-g	235.9
Lucento 7.17 SC 5.0 fl oz at R3 fb 3 WAT	0.1 b	83.8	0.2 d	52.5 b-f	256.6
P-value[v]	*0.0347*	*0.0617*	*0.0001*	*0.0005*	*0.0921*

[z] Fungicide treatments were at first detection of tar spot on 9 Sep, V8 on 14 July, VT (tassel/silk) on 2 Aug, R3 (milk) on 19 Aug, first detection of tar spot fb 3 weeks after treatment (WAT) (this timing not receive application due to PHI of fungicide), V8 fb 3 WAT on 2 Aug, VT fb 3 WAT on 23 Aug, and R3 fb 3 WAT on 9 Sep. All treatments at VT or later contained a non-ionic surfactant at a rate of 0.25% v/v. Fb = followed by. [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 5 Oct. [x] Canopy greenness visually assessed percentage (0-100%) green on 5 Oct. Yields were adjusted to 15.5% moisture and harvested on 4 Nov. [v] All data were analyzed in SAS 9.4. A mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and different letters indicate significant difference based on least square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of Xyway programs for tar spot control in northwestern Indiana, 2022 (COR22-14.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 hybrid 'W2585VT2P' was planted in 30-in. row spacing at a rate of 2 seeds/ft on 20 May. Standard practices for non-irrigated grain corn production in Indiana were followed. Xyway was applied in-furrow and 2x0 at planting at 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 and were applied on 2 Aug at the VT/R1 (tassel/silk) growth stage. Disease ratings were assessed on 21 Sep at the R5 (dent) and 3 Oct at the R6 (maturity) growth stages. Tar spot severity was rated by visually assessing the percentage (0-100%) of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. The two center rows of each plot were harvested on 20 Oct and yields were adjusted to 15.5% moisture. All data were analyzed using a mixed model analysis of variance (SAS 9.4) and values are least squares means and values with the same letter are not significantly different based on a least square means test (α=0.05).

In 2022, very little disease developed in plots. Tar spot was present in the trial, but only remained at low levels. There were no significant differences between treatments and the nontreated control for severity of tar spot stromata (Table 25). There were no significant differences between treatments and nontreated plots for canopy greenness, harvest moisture, test weight, and yield of corn.

Table 25. Effect of fungicide on tar spot stromata severity, canopy greenness, and corn yield.

Treatment, rate/A and application[z]	**Tar spot % stromata**[y] **21 Sep**	**Tar spot % stromata**[y] **3 Oct**	**Canopy green**[x] **%**	**Harvest moisture %**	**Test Weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	0.02	0.11	10.0	21.1	55.4	197.3
Xyway LFR 15.2 fl oz in-furrow	0.02	0.22	7.5	20.3	55.6	194.8
Xyway LFR 15.2 fl oz 2x0 application	0.02	0.29	8.8	20.9	55.3	195.4
Xyway LFR 8.35 fl oz in-furrow fb Topguard EQ, 5.0 fl oz at VT/R1	0.02	0.20	6.3	20.2	56.0	196.4
Topguard EQ, 5.0 fl oz at VT/R1	0.01	0.15	10.0	20.6	56.4	197.4
Veltyma 7.0 fl oz at VT/R1	0.01	0.24	8.8	19.1	56.6	208.9
P-value[v]	*0.5522*	*0.1013*	*0.7279*	*0.5781*	*0.6473*	*0.6418*

[z] Xyway was applied in-furrow and 2x0 at planting at 10 gal/A on 20 May. Foliar fungicides were applied on 2 Aug at the VT/R1 (tassel/silk) growth stages. fb= followed by.

[y] Tar spot stromata severity was visually assessed as the percentage (0-100%) of leaf area covered by stromata on five plants in each plot at the ear leaf at R5 (dent) on 21 Sep and R6 (maturity) growth stage on 3 Oct.

[x] Canopy greenness visually assessed as percentage (0-100%) at R6 on 3 Oct.

[w] Yields were adjusted to 15.5% moisture and harvested on 20 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Fungicide comparison for tar spot in corn in northwestern Indiana, 2022 (COR22-16.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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. Fungicides were applied on 2 Aug at VT/R1 (tassel/silk) growth stage. Disease ratings were assessed on 19 Sep and 5 Oct. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants Tar spot stromata visually assessed percentage (0-100%) of leaf area 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 R5 (dent) and R6 (maturity) growth stages. The two center rows of each plot were harvested on 4 Nov and yields were adjusted to 15.5% 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 2022, very little disease developed in plots. Tar spot was present in the trial, but only remained at low levels. There was no significant effect of treatment on tar spot stromata over the nontreated controls on 19 Sep and 5 Oct (Table 26). There was no significant effect of treatment on canopy greenness, harvest moisture, test weight, and yield or corn.

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

Treatment and rate/A[z]	Tar spot stromata[y] % 19 Sep	Tar spot stromata[y] % 5 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.1	0.9	53.8	19.1	55.7	218.4
Miravis Neo 2.5 SE 13.7 fl oz	0.2	1.1	57.5	20.0	55.4	217.5
Delaro Complete 458 SC 8.0 fl oz	0.0	0.8	61.3	20.4	54.5	215.1
Veltyma 3.24 S 7.0 fl oz	0.1	0.7	56.3	20.8	54.8	215.0
BioMineral Exp A 7.6 fl oz	0.2	1.6	52.5	19.7	54.5	218.7
BioMineral Exp B 56.3 fl oz	0.3	1.4	43.8	19.5	55.1	217.2
Brixen 10.0 fl oz	0.2	1.2	56.3	20.0	56.3	204.8
Brixen 10.0 fl oz + Stilo PSR 5.0 fl oz	0.1	1.5	51.3	19.7	55.1	214.6
Brixen at 13.0 fl oz	0.2	1.0	61.3	20.3	57.5	216.6
Brixen 13.0 fl oz + Stilo PSR 5.0 fl oz	0.2	1.1	56.3	19.8	55.7	214.3
Quilt Xcel 2.2 SE 10.5 fl oz	0.2	1.6	61.3	20.4	55.2	207.5
Quilt Xcel 2.2 SE 10.5 fl oz + Stilo PSR 5.0 fl oz	0.2	1.0	56.3	19.7	55.2	215.3
Headline Amp 1.68 SC 10.0 fl oz	0.0	0.3	55.0	19.2	55.5	219.0
P-value[v]	*0.7474*	*0.6699*	*0.5121*	*0.7253*	*0.8623*	*0.6582*

[z] Fungicide treatments were applied at VT/R1 (tassel/silk) grow stage on 2 Aug. All treatments contained a non-ionic surfactant (at a rate of 0.25% v/v, except Biomineral Exp A and B.

[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 19 Sep.

[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy on 20 Sep and 5 Oct.

[w] Yields were adjusted to 15.5% moisture and harvested on 4 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicide programs for tar spot in corn in northwestern Indiana, 2022 (COR22-18.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 2 seed/ft on 20 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 14 Jul, 2 Aug, 12 Aug, 19 Aug and 23 Aug at V8 (8-leaf), VT/R1 (tassel/silk), R2 (blister), R3 (milk), R4 (dough) growth stages, respectively. Tarspotter application made on 14 Jul and 2 Aug. Disease ratings were assessed on 21 Sep and 5 Oct at R5 (dent) and R6 (maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. No significant differences between treatments and nontreated control were detected for tar spot stromata severity on 21 Sep and 5 Oct (Table 27). Aproach Prima applied at R2 and R4 increased canopy greenness over the nontreated control on 5 Oct. There were no significant differences for harvest moisture, test weight, and yield of corn.

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

Treatment, rate/A, and timing[z]	**Tar spot % stromata**[y] **21 Sep**	**Tar spot % stromata**[y] **5 Oct**	**Canopy green**[x] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[w] **bu/A**
Nontreated control	0.04	0.9	17.5 b	20.3	53.8	205.0
Aproach Prima 2.34 SC 6.8 fl oz at VT/R1	0.00	0.4	21.3 b	20.7	53.7	216.0
Aproach Prima 2.34 SC 6.8 fl oz at R2	0.00	0.3	43.8 a	18.5	54.2	210.4
Aproach Prima 2.34 SC 6.8 fl oz at R3	0.00	0.4	12.5 b	20.5	53.6	198.6
Aproach Prima 2.34 SC 6.8 fl oz at R4	0.03	0.6	43.8 a	20.4	54.0	202.0
Aproach Prima 2.34 SC 6.8 fl oz at VT/R1 fb Trivapro 2.21 SE 13.7 fl oz at R3/R4	0.00	0.2	12.5 b	21.0	52.9	205.4
Aproach Prima 2.34 SC 6.8 fl oz at VT/R1 fb Delaro Complete 485 SC 9.0 fl oz at R3/R4	0.00	0.1	13.8 b	19.6	54.4	210.2
Aproach Prima 2.34 SC 6.8 fl oz at VT/R1 fb Headline AMP 1.68 SC 10.0 fl oz at R3/R4	0.00	0.1	26.3 ab	20.1	54.5	207.7
Aproach Prima 2.34 SC 6.8 fl oz at Tarspotter	0.00	0.2	25.0 b	19.5	55.2	211.5
P-value[v]	*0.2628*	*0.3460*	*0.0050*	*0.5233*	*0.3880*	*0.5431*

[z] Fungicides were applied on 14 Jul, 2 Aug, 12 Aug, 19 Aug and 23 Aug at V8 (8-leaf), VT/R1 (tassel/silk), R2 (blister), R3 (milk), R4 (dough) growth stages, respectively. Tarspotter application made on 14 Jul and 2 Aug. fb=followed by.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 21 Sep and 5 Oct.
[x] Canopy greenness visually assessed percentage (0-100%) on 5 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Fungicide comparison for foliar diseases in corn in northwestern Indiana, 2022 (COR22-24.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 corn. Standard practices for grain corn production in Indiana were followed. Corn hybrid 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 14 Jul, 26 Jul, 2 Aug, 12 Aug, and 19 Aug at V8, V12-V14, R1 (silk), R2 (blister), and R3 (milk) growth stages. Tarspotter applications were made on 14 Jul (V8) and 2 Aug (R1). Disease ratings were assessed on 21 Sep and 3 Oct at R5 (dent) and R6 (maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot. Tar spot was the most prominent diseases in the trial, but only reached low severity. There was no significant effect of fungicide treatment on tar spot on 21 Sep (Table 28). On 3 Oct, Veltyma at R1, Delaro Complete at R2, Miravis Neo applied at R2 and R3 and the programs with multiple applications significantly reduced tar spot over nontreated. There were no significant differences between treatments and the nontreated control for canopy greenness, harvest moisture, test weight, and yield of corn.

Table 28. Effect of fungicide treatment on tar spot stromata severity, canopy greennes, and corn yield.

Treatment, rate/A, and timing[z]	Tar spot % stromata[y] 21 Sep	Tar spot % stromata[y] 3 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.11	0.39 ab	25.0	18.4	55.1	201.6
Miravis Neo 2.5 SE 13.7 fl oz at V12	0.08	0.30 abc	30.0	19.3	54.5	205.1
Trivapro 2.21 SE 13.7 fl oz at V12	0.05	0.22 bcd	32.5	19.0	55.2	203.6
Miravis Neo 2.5 SE 13.7 fl oz at R1	0.05	0.41 a	22.5	18.9	54.5	206.1
Trivapro 2.21 SE 13.7 fl oz at R1	0.05	0.25 a-d	32.5	19.9	54.2	208.9
Veltyma 3.34 S 7.0 fl oz at R1	0.02	0.11 de	32.5	20.6	53.7	200.0
Delaro Complete 458 SC 8.0 fl oz at R1	0.02	0.09 de	30.0	18.3	55.9	199.9
Miravis Neo 2.5 SE 13.7 fl oz at R2	0.01	0.10 de	27.5	18.4	55.4	201.8
Miravis Neo 2.5 SE 13.7 fl oz at R3	0.02	0.14 cde	32.5	19.7	60.0	206.4
Miravis Neo 2.5 SE 13.7 fl oz at V12 fb Miravis Neo 2.5 SE 13.7 fl oz at R2	0.03	0.14 cde	32.5	20.3	53.8	205.1
Veltyma 3.34 S 7.0 fl oz at R1 fb Veltyma 3.34 S 7.0 fl oz at R3	0.00	0.03 e	35.0	19.5	54.7	210.0
Miravis Neo 2.5 SE 13.7 fl oz at R1 fb Miravis Neo 2.5 SE 13.7 fl oz at R3	0.03	0.14 cde	27.5	19.6	54.4	208.1
Miravis Neo 2.5 SE 13.7 fl oz at Tarspotter (V8 and R1)	0.04	0.22 bcd	21.3	19.5	54.7	204.7
P-value[v]	*0.0574*	*0.0016*	*0.7648*	*0.3369*	*0.4255*	*0.4817*

[z] Foliar Fungicides were applied on 14 Jul, 26 Jul, 2 Aug, 12 Aug, and 19 Aug at V8, V12-V14, R1 (silk), R2 (blister), and R3 (milk) growth stages. Tarspotter applications were made on 14 Jul (V8) and 2 Aug (R1). Fungicide treatments contained a non-ionic surfactant at a rate of 0.25% v/v, except V8 and V12 applications.

[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 21 Sep and 3 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 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 square means test (α=0.05).

CORN (*Zea mays* ‘W2585VT2P’)
Tar spot; *Phyllachora maydis*

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Evaluation of Xyway programs in corn for tar spot in northwestern Indiana, 2022 (COR22-27.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 ‘W2585VT20’ was planted in 30-inch row spacing at a rate of 34,000/A on 20 May. Xyway applications were applied 2x0 at 10 gal/A on 23 May by CO_2 backpack sprayer. 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 21 July, 2 Aug and 12 Aug at V10, R1 (silk), and R2 (blister) growth stages, respectively. Disease ratings were assessed on 21 Sep and 3 Oct at R5 (dent) and R6 (maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. Percent canopy green was visually assessed percentage (0-100%) of crop canopy green on 3 Oct. The two center rows of each plot were harvested on 20 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. All treatments reduced tar spot over the nontreated control on 20 Sep (Table 29). On 3 Oct, no treatments were significantly different from nontreated control. Xyway LFR 9.5 fl oz applied 2x0 followed by Adastrio 7.0 fl oz at R2, Xyway LFR at 15.2 fl oz applied 2x0 fb Veltyma 7.0 fl oz at R2, and Delaro 5.0 at V10 followed by Delaro Complete at R2 had a significantly greener canopy on 20 Oct as compared to nontreated control. There was no significant effect of treatments on harvest moisture, test weight, and yield of corn.

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

Treatment, rate/A and timing[z]	Tar spot % stromata[y] 20 Sep	Tar spot % stromata[y] 3 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.12 a	0.11 a-d	1.5 d	21.4	54.3	188.6
Xyway LFR 9.5 fl oz at plant 2x0	0.03 bc	0.15 ab	1.5 d	21.8	54.0	192.5
Xyway LFR 15.2 fl oz at plant 2x0	0.05 bc	0.16 a	2.8 bcd	20.1	55.0	201.8
Xyway LFR 9.5 fl oz at plant 2x0 fb Adastrio 4.0 SC 7.0 fl oz at R1	0.06 b	0.13 abc	0.7 d	21.2	54.3	195.2
Xyway LFR 9.5 fl oz at plant 2x0 fb Adastrio 4.0 SC 7.0 fl ox at R2	0.01 c	0.05 cd	7.8 a	18.8	55.2	207.3
Xyway LFR 15.2 fl oz at plant 2x0 fb Veltyma 3.34 S 7.0 fl oz R2	0.00 c	0.03 d	7.3 ab	20.9	54.5	198.5
Topguard EQ 4.29 10 fl oz at V10 fb Adastrio 4.0 SC 7.0 fl oz at R2	0.01 bc	0.06 cd	3.0 bcd	20.3	55.8	200.0
Adastrio 4.0 SC 7.0 fl oz at R1	0.05 bc	0.16 a	2.5 cd	21.0	54.3	197.6
Delaro 325 SC 5.0 fl oz at V10 fb Delaro Complete 458 SC 8.0 fl oz at R2	0.00 c	0.04 cd	7.0 abc	19.0	53.6	209.1
Veltyma 3.34 S 7.0 fl oz at R1	0.01 c	0.07 bcd	2.5 cd	20.7	54.9	199.6
P-value[v]	*0.0007*	*0.0150*	*0.0307*	*0.1616*	*0.6507*	*0.3633*

[z] Xyway applications were applied 2x0 at 10 gal/A on 23 May. Foliar fungicides were applied on 21 July, 2 Aug and 12 Aug at V10, R1 (silk), and R2 (blister) 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 20 Sep and 3 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 harvest on 20 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of fungicide timing and application for tar spot in corn in northwestern Indiana, 2022 (COR22-29.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 14 Jul, 21 Jul, 2 Aug and 19 Aug at V8, V10, VT/R1 (tassel/silk) and R3 growth stage, respectively. Tarspotter applications were made at V8 and VT/R1. Disease ratings were assessed on 19 Sep and 5 Oct at R5 (dent) and R5/R6 (dent/maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf (EL). Values for each plot were averaged before analysis. 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 using a mixed model analysis of variance, and means were separated using Fisher's least significant difference (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. All fungicide treatments reduced tar spot stromata severity except Delaro Complete applied at V10 on 3 Oct (Table 30). No significant differences were detected for canopy greenness, harvest moisture, and test weight. No treatments significantly increased yield over the nontreated control.

Table 30. Effect of fungicide on tar spot stromata severity, canopy greennes, and corn yield.

Treatment, rate/A and timing[z]	Tar spot stromata[y] %	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.12 bc	6.8	18.5	54.8	202.5 abc
Delaro Complete 458 SC 8.0 fl oz at V10	0.35 a	7.5	18.8	54.2	208.4 a
Delaro Complete 458 SC 8.0 fl oz at V10 fb Delaro Complete 458 SC 8.0 fl oz at VT/R1	0.04 bc	7.5	18.3	55.2	194.2 cd
Delaro Complete 458 SC 8.0 fl oz at V10 fb Delaro Complete 458 SC 8.0 fl oz at R3	0.01 c	8.8	18.4	54.9	204.3 ab
Veltyma 3.34 S 7.0 fl oz at V10	0.16 b	12.5	18.2	55.8	202.9 abc
Veltyma 3.34 S 7.0 fl oz at V10 fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.03 c	11.3	19.6	55.7	203.1 abc
Delaro Complete 458 SC 8.0 fl oz at VT/R1	0.07 bc	7.5	18.8	54.8	201.1 abc
Delaro Complete 458 SC 10.0 fl oz at VT/R1	0.04 bc	5.8	19.4	54.7	196.0 bcd
Delaro Complete 458 SC 8.0 fl oz at VT/R1 fb Delaro Complete 458 SC 8.0 fl oz at R3	0.01 c	8.8	18.6	55.2	203.5 abc
Veltyma 3.34 S 7.0 fl oz at VT/R1 fb Veltyma 3.34 S 7.0 fl oz at R3	0.01 c	11.3	18.6	54.7	208.5 a
Miravis Neo 2.5 SE 13.7 fl oz at VT/R1 fb Miravis Neo 2.5 SE 13.7 fl oz at R3	0.10 bc	10.0	19.3	55.3	205.5 a
Delaro 325 SC 4.0 fl oz at V8 fb Delaro 325 SC 8.0 fl oz at VT/R1	0.04 bc	8.8	19.8	54.3	191.6 d
Delaro 325 SC 10.0 fl oz at VT/R1	0.08 bc	9.5	18.9	54.7	202.7 abc
Delaro Complete 458 SC 10.0 fl oz at VT/R1	0.04 bc	7.5	18.2	55.4	202.1 abc
Delaro Complete 458 SC 8.0 fl oz at Tarspotter App	0.06 bc	8.3	19.0	54.9	205.7 a
P-value[v]	*0.0005*	*0.5327*	*0.4253*	*0.3974*	*0.0265*

[z] Fungicides were applied on 2 Aug and 19 Aug at VT/R1 (tassel/silk) and R3 growth stage, respectively. Tarspotter applications were made at V8 and VT/R1. All treatments applied at VT/R1 or R3 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 3 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 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of efficacy of CX-9032 and CX-10250 for tar spot in corn in northwestern Indiana, 2022 (COR22-30.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 2 Aug and 19 Aug at VT/R1 (tassel/silk) and R3 (milk) growth stages, respectively. Disease ratings were assessed on 19 Sep and 5 Oct at R5 (dent) and R5/R6 (dent/maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. The two center rows of each plot were harvested on 4 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. No differences between fungicide treatments and the nontreated control for tar spot stromata severity on 19 Sep and 3 Oct (Table 31). No differences between treatments and the nontreated control were detected for canopy greenness, harvest moisture, test weight, and yield of corn.

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

Treatment, rate/A and timing[z]	Tar spot % stromata[y] 19 Sep	Tar spot % stromata[y] 3 Oct	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.4	2.2	23.8	19.2	69.9	200.8
CX-9032 1.0 qt at V10 fb CX-9032 1.0 qt at VT/R1	0.3	0.4	33.8	20.1	56.9	209.8
CX-9032 1.0 qt at VT/R1	0.1	0.5	36.3	19.6	56.4	201.9
CX-10250 1.0 fl oz at V10 fb CX-10250 1.0 fl oz at VT/R1	0.2	0.2	30.0	19.7	57.0	204.6
Veltyma 3.34 S 7.0 fl oz at VT/R1	0.0	0.0	42.5	19.8	56.7	203.6
P-value[v]	*0.1012*	*0.3485*	*0.3723*	*0.9438*	*0.5049*	*0.5576*

[z] Fungicides were applied on 2 Aug and 19 Aug at VT/R1 (tassel/silk) and R3 (milk) growth stages, respectively. All treatments applied at VT 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 19 Sep and 3 Oct.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green 5 Oct.
[w] Yields were adjusted to 15.5% moisture and harvest on 4 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Fungicide timing and application for tar spot in corn in northwestern Indiana, 2022 (COR22-32.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 14 July and 2 Aug at V8 and VT/R1 (tassel/silk) growth stage, respectively. Disease ratings were assessed on 19 Sep and 5 Oct at R5 (dent) and R5/R6 (dent/maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. The two center rows of each plot were harvested on 4 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. All fungicide significantly reduced the severity of tar spot stromata compared to the nontreated control on 19 Sep, except OR-009E at V8 fb OR-009E at VT/R1 (Table 32). All fungicide significantly reduced the severity of tar spot stromata compared to the nontreated control on 5 Oct, except OR-009E fb OR-009E, Veltyma at V8. No differences between treatments and the nontreated control were detected for canopy greenness, harvest moisture and test weight. Delaro Complete + OR-009E 0.4 % v/v applied at VT/R1 significantly increased yield over the nontreated control, but was not significantly difference from Veltyma +OR-009E at V8, Veltyma at VT/R1, Veltyma + OR-009E at VT/R1 or Veltyma +OR-009E at V8 followed by Veltyma +OR-009E at VT/R1.

Table 32. Effect of fungicide on tar spot stromata severity, canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	Tar spot % stromata[y] 19 Sep	Tar spot % stromata[y] 5 Oct	Canopy Green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.14 a	3.2 a	20.0	20.0	54.4	214.1 bc
OR-009E 0.4 % v/v at V8 fb OR-009E 0.4 % v/v at VT/R1	0.10 ab	2.1 abc	33.8	21.0	54.2	209.9 c
Veltyma 3.34 S 7.0 fl oz at V8	0.08 bc	2.6 ab	33.8	21.3	53.4	208.6 c
Veltyma 3.34 S 7.0 fl oz + OR-009E 0.4 % v/v at V8	0.09 bc	1.4 bcd	36.3	19.3	54.9	218.7 abc
Veltyma 3.34 S 7.0 fl oz at VT/R1	0.02 d	0.3 d	41.3	20.5	53.6	217.3 abc
Veltyma 3.34 S 7.0 fl oz + OR-009E 0.4 % v/v at VT/R1	0.02 d	0.6 cd	48.8	20.3	53.5	213.0 bc
Veltyma 3.34 S 7.0 fl oz + OR-009E 0.4 % v/v at V8 fb Veltyma3.34 S 7.0 fl oz + OR-009E 0.4 % v/v VT/R1	0.01 d	0.2 d	47.5	20.0	53.5	221.1 ab
Delaro Complete 458 SC 8.0 fl oz at VT/R1	0.05 cd	0.6 cd	43.8	20.5	54.2	214.7 bc
Delaro Complete 458 SC 8.0 fl oz + OR-009E 0.4 % v/v at VT/R1	0.04 d	0.6 cd	37.5	20.6	53.9	226.7 a
P-value[v]	*0.0001*	*0.0030*	*0.3059*	*0.7382*	*0.5935*	*0.0499*

[z] Fungicides were applied on 14 July and 2 Aug at V8 and VT/R1 (tassel/silk) growth stage, respectively.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 19 Sep and 5 Oct.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 5 Oct.
[w] Yields were adjusted to 15.5% moisture and harvest on 4 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of foliar fungicides in corn in northwestern Indiana, 2022 (COR22-33.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 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 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 1 July and 2 Aug at V6 and VT/R1 (tassel/silk) growth stage, respectively. Disease ratings were assessed on 21 Sep and 3 Oct at R5 (dent) and R6 (maturity) growth stages, respectively. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. The two center rows of each plot were harvested on 2 Nov and yields were adjusted to 15.5% moisture. All disease and yield data were analyzed using a mixed model analysis of variance, and means were separated using least square means test (α=0.05).

In 2022, weather conditions were not favorable for tar spot disease. Tar spot was the most prominent diseases in the trial and reached low severity. There was no significant difference of tar spot severity over the nontreated control on 21 Sep (Table 33). Domark at V6 followed by Veltyma at VT/R1 and Affiance at VT/R1 significantly reduced tar spot stroma over nontreatd control on 3 Oct. There was no significant effect of treatment on canopy greenness, harvest moisture, test weight, and yield of corn.

Table 33. Effect of fungicide on tar spot stromata severity, canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	Tar spot stromata[y] % (21 Sep)	Tar spot stromata[y] % (3 Oct)	Canopy green[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.01	0.46 a	20.0	18.8	56.4	190.6
Affiance 1.5 SC 10.0 fl oz + Domark 230 ME 6.0 fl oz at V6	0.01	0.32 ab	22.5	19.5	56.1	195.9
Affiance 1.5 SC 10.0 fl oz at VT/R1	0.01	0.21 bc	20.0	19.3	55.3	199.8
Domark 230 ME 6.0 fl oz at VT/R1	0.25	0.31 ab	22.5	19.5	56.3	203.8
Affiance 1.5 SC 10.0 fl oz at V6 fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.01	0.25 abc	22.5	19.7	55.7	204.6
Domark 230 ME 6.0 fl oz at V6 fb Veltyma 3.34 S 7.0 fl oz at VT/R1	0.01	0.08 c	21.3	19.4	55.6	192.1
P-value[v]	*0.4642*	*0.0398*	*0.9990*	*0.9174*	*0.8595*	*0.4524*

[z] Fungicides were applied on 1 July and 2 Aug at V6 and VT/R1 (tassel/silk) growth stage, respectively. fb=followed by.
[y] Tar spot stromata visually assessed percentage (0-100%) of leaf area on five plants in each plot at the ear leaf on 21 Sep and 3 Oct.
[x] Canopy greenness visually assessed percentage (0-100%) on 3 Oct.
[w] Yields were adjusted to 15.5% moisture and harvest 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 square means test (α=0.05).

CORN (*Zea mays* 'W2585VT2P')
Tar spot; *Phyllachora maydis*

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Evaluation of drone applications for tar spot in corn in northwestern Indiana, 2022 (COR22-35.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 hybrid 'W2585VT2P' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 31 May. Veltyma 7.0 fl oz/A was applied at the R1 (silk) corn growth stage on 21 Aug 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 five-ft boom, fitted with four TJ-VS 8002 nozzles spaced 20-in. apart at 3.1 mph applied 15 gal/A at 40 PSI; and a DJI Agras T10 drone equipped 2.1-gal spray tank with a 16.4 with spray pattern using four TJ-VS 8002 nozzles spaced apart at 3.1 mph and an application rate of 1.65 gal/A at 40 PSI. Disease ratings were assessed on 20 Sep at the R5 (dent) growth stage. Tar spot was rated by visually assessing the percentage of stromata per leaf on five plants in each plot at the ear leaf. Values for each plot were averaged before analysis. 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 using a mixed model analysis of variance, and values are least squares means and values with different letters are significantly different based on least square means test (α=0.05).

In 2022, very little disease developed in plots. Tar spot was the most prominent disease in the trial. Veltyma sprayed with the ground rig, backpack, and drone significantly reduced tar spot stromata severity over the nontreated control on 20 Sep (Table 34). There was no significant difference between treatments for canopy greenness, lodging, and yield of corn.

Table 34. Fungicide application effect on tar spot stromata severity, canopy greenness, lodging, and corn yield.

Application equipment and rate/A[z]	**Tar spot stromata**[y] **%**	**Canopy green**[x] **%**	**Lodging**[w] **%**	**Harvest moisture %**	**Test weight lb/bu**	**Yield**[v] **bu/A**
Nontreated control	0.04 a	38.8	1.5	19.5	55.1	211.0
Ground Rig with Veltyma 7.0 fl oz	0.01 b	42.5	0.5	19.4	55.4	221.5
Backpack with Veltyma 7.0 fl oz	0.00 b	35.0	0.2	19.8	53.4	220.4
Drone with Veltyma 7.0 fl oz	0.00 b	45.0	1.0	19.0	54.7	221.7
P-value[u]	*0.0121*	*0.7250*	*0.6139*	*0.5801*	*0.1102*	*0.3742*

[z] Fungicide treatment applied on 21 Aug at VT/R1 (tassel/silk) growth stage using ground rig, CO_2 backpack, and drone. All foliar treatments contained a non-ionic surfactant at a rate of 0.25% v/v.
[y] Tar spot stromata severity visually assessed percentage (0-100%) of leaf area on five plants in each plot on 20 Sep.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 5 Oct.
[w] Lodging = percentage of lodged stalks when pushed from shoulder height to 45° from vertical on 5 Oct.
[v] Yield were adjusted to 15.5% moisture and harvested on 3 Nov.
[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 square means test (α=0.05).

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

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Fungicide evaluation for white mold in soybean in northwestern Indiana, 2022 (SOY22-04.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 soybean. 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 17 May. Inoculum of *S. 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 CO_2 backpack sprayer equipped with a 10-ft boom, fitted with six TJ-VS 8002 nozzles spaced 20-in. apart. A spray boom with four, 360-drop nozzles was used for the 360 undercover treatment. Fungicides were applied on 23 Jun, 14 Jul, 16 Jul, 29 Jul, and 2 Aug at V4, R1 (beginning bloom), R2 (full bloom), R3 (beginning pod) growth stages, respectively. Sporecaster applications was made on 2 Aug at R3. Disease ratings were assessed on 15 Sep at R7/R8 (maturity) growth stage. White mold disease assessed by counting the number of plants in each plot with symptoms. Phytoxicity was visually rated on a scale of 0-100% on 29 Sep. The two center rows of each plot were harvested on 29 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 square means test (α=0.05).

In 2022, very little disease developed in plots. White mold was present in the trial but only reached low levels. There were no significant differences between fungicide treatments and the nontreated control for white mold rating on 15 Sep (Table 35). Cobra at V4, Cobra at V4 fb Domark at R3, and Cobra at V4 fb Topsin at R3 significantly increased phytoxicity on 29 Sep. There was no significant effect of treatment on harvest moisture, test weight, and yield of soybean.

Table 35. Effect of fungicide on white mold incidence, phytoxicity, and soybean yield.

Treatment, rate/A, and timing[z]	White mold #/plot[y]	Phyto[x] %	Harvest moisture %	Test weight lb/bu	Yield[w] bu/A
Nontreated control	0.0	0.0 c	14.1	57.0	52.6
Endura 70 WDG 8.0 oz at R1 fb Endura 70 WDG 8.0 oz at R3	0.0	1.3 c	13.7	56.7	52.6
Endura 70 WDG 8.0 oz at R3	0.0	1.3 c	13.9	57.3	52.1
Omega 16.0 fl oz at R3 by 360 under cover	0.2	0.0 c	13.9	57.3	56.2
Omega 16.0 fl oz at R3	0.0	1.3 c	13.8	57.0	53.7
Cobra 8.0 fl oz at V4	0.0	15.0 b	13.4	56.9	54.8
Cobra 8.0 fl oz at V4 fb Domark 5.0 fl oz at R3	0.0	31.3 a	13.6	56.9	51.0
Omega 12.0 fl oz at R1 fb Miravis Neo 2.5 SE 13.7 fl oz at R3	0.0	1.3 c	13.7	56.9	52.1
Delaro Complete 458 SC 8.0 fl oz at R3	0.0	0.0 c	13.9	57.0	54.7
Delaro Complete 458 SC 8.0 fl oz at R3 by 360 under cover	0.0	1.3 c	13.6	57.0	53.0
Headsup Seed Treatment	0.0	0.0 c	13.4	56.7	53.4
Headsup Seed Treatment fb Domark 5.0 fl oz at R3	0.0	0.0 c	13.6	57.3	52.7
Miravis Neo 2.5 SE 16.0 fl oz at R3	0.0	0.0 c	13.6	56.9	53.3
Cobra 8.0 fl oz at V4 fb Topsin 4.5 fl oz at R3	0.0	27.5 a	14.5	57.5	49.5
Omega 16.0 fl oz at Sporecaster 360 under cover at R3	0.0	0.0 c	13.6	56.9	53.1
Endura 70 WDG 8.0 oz/A at Sporecaster at R3	0.0	0.0 c	13.8	56.9	51.3
P-value[v]	*0.4718*	*0.0001*	*0.1210*	*0.8407*	*0.5188*

[z] Fungicides were applied on 23 Jun, 14 Jul, 16 Jul, 29 Jul, and 2 Aug at V4, R1 (beginning bloom), R2 (full bloom), and R3 (beginning pod) growth stages, respectively. On 2 Aug at R3, fungicide was applied by 360 under cover as indicated and sporecaster application was made on 2 Aug at R3. All fungicide treatments contained a non-ionic surfactant at a rate of 0.25% v/v, except Cobra. All plots were inoculated with *S. sclerotiorum*.
[y] White mold disease assessed by counting the number of plants/plots with symptoms on 15 Sep.
[x] Phytoxicity (Phyto) was visually rated on a scale of 0-100% on 29 Sep.
[w] Yields were adjusted to 13% moisture and harvest on 1 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 square means test (α=0.05).

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

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Evaluation of disease management options for white mold in organic soybean in northwestern Indiana, 2022 (SOY22-06.PPAC).

A trial was established at the Pinney Purdue Agricultural Center (PPAC) in Porter County, IN. The experiment was a split-plot four replications. Plots 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 16 Sep 2021 at a rate of 150 lbs/A and was terminated using either tillage or roller-crimping on 17 May. 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 17 May. Inoculum of *S. 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 fungicides applications were applied at 15 gal/A and 40 psi using a CO_2 backpack sprayer equipped with a 10-ft boom, fitted with four or six TJ-VS 8002 nozzles spaced 20 or 30-in. apart. Fungicides were applied on 16 Jul at R2 (full bloom) growth stage. Disease ratings were assessed on 1 Sep at R6 (full seed) growth stage. White mold disease incidence was assessed by counting the number of plants in each plot with symptoms. For severity plants were 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: DIX = [sum (disease severity score X number of plants)]/[(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 3 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 square means test (α=0.05).

In 2022, very little disease developed in the plots. White mold was the most prominent disease and reached low severity. There were no significant interactions between cover crop termination, cultivar, and fungicide, but there was a significant interaction between tillage treatment and cultivar (Table 36). White mold incidence and disease severity index (DIX) were greatest in the susceptible cultivar, Dwight under full-tillage, while the moderately resistant cultivar MN1410 has significantly less disease when planted in either full-tillage or roller-cripmed rye. In addition, planting Dwight in the roller-crimped rye also significantly reduced disease when compared to the full-tillage system. Canopy greenness was highest and defoliation lowest for in the Dwight cultivar verses the MN14. No significant differences were found between tillaged and cultivars in yield of soybean. There were no significant differences between the fungicide treatments and nontreated control for white mold, canopy greenness, defoliation and yield.

Table 36. Effect of fungicide on white mold, canopy greenness, defoliation, and soybean yield.

Treatment[z]	White mold % incidence[y]	White mold % DIX[x]	Canopy % green[w]	Defoliation[v] %	Yield[u] bu/A
Cover crop termination and cultivar					
Full tillage, Dwight	0.5 a	1.4 a	7.3 b	87.9 b	48.4
Full tillage, MN1410	0.0 b	0.0 b	0.0 c	100.0 a	44.2
Roller-crimped rye, Dwight	0.1 b	0.1 b	34.2 a	49.0 c	49.8
Roller-crimped rye, MN1410	0.0 b	0.0 b	0.0 c	96.3 a	45.3
Fungicide and rate/A					
Nontreated control	0.2	0.2	12.8	83.4	45.9
Endura 70 WDG 8.0 fl oz	0.2	0.5	10.0	83.8	46.8
Double Nickel 55 DWG 2.0 qt	0.3	0.7	7.8	86.3	48.1
Serifel WP 16.0 oz	0.1	0.1	10.3	84.4	47.6
Actinovate AG 12.0 oz	0.2	0.4	10.0	82.5	46.7
BotryStop 2.0 lb	0.2	0.5	11.3	79.4	46.3
P-value *till*[t]	*0.0398*	*0.0564*	*0.0060*	*0.0012*	*0.2143*
P-value *cultivar*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*
P-value *fungicide*	*0.2346*	*0.4245*	*0.8131*	*0.8950*	*0.5177*
P-value *till*cultivar*	*0.0001*	*0.0003*	*0.0001*	*0.0001*	*0.8550*
P-value *till*fungicide*	*0.6609*	*0.6535*	*0.7301*	*0.4674*	*0.5392*
P-value *cultivar*fungicide*	*0.2346*	*0.4245*	*0.8131*	*0.7400*	*0.5264*
P-value *till*cultivar*fungicide*	*0.6609*	*0.6535*	*0.7301*	*0.1835*	*0.1194*

[z] Fungicide applications were made on 16 Jul at R2 (full bloom) 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) was caculated: DIX = [sum (disease severity score X number of plants)]/[(maximum disease score) X (disease incidence)] × 100. [w] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 13 Sep. [v] Defoliation was percentage of leaf loss in plot. [u] Yields were adjusted to 13% moisture and harvest on 3 Oct. [t] All data were analyzed in SAS 9.4. 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'XO3131E')
Sudden death syndrome; *Fusarium virguliforme*

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Evaluation the efficacy of seed treatments in soybean in northwestern Indiana, 2022 (SOY22-12.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 'XO3131E' was planted in 30-inch row spacing at a rate of 8 seeds/ft on 17 May. Inoculum of *F. virguliforme* 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. Seed treatments were applied by cooperator. Disease ratings were assessed on 13 Sep at R6 (full seed) growth stage. SDS in each plot was rated for disease incidence (DI) and disease severity (DS). Disease incidence was percentage of plants with disease symptoms, and disease severity (DS) was rated using a 1-9 scale where 1 refers to low disease pressure and 9 refers to premature death of the plant. SDS Index was then calculated using the equation: DX= (DI x DS)/9. Root rot rating was assessed on 16 Aug at the R4/R5 (full pod to beginning seed) growth stage by visually assessing dark discoloration on roots. The 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 square means test (α=0.05).

Very little disease developed in plots. Sudden death (SDS) syndrome was present in the trial but only reached low levels. ILevo Votivo significantly reduced root rot over base treatment, but was not significantly different from ILevo 720, ILevo 720 + Relenva, ILevo 720 + Relenva+ Experimental, or Saltro (Table 37). There were no significant differences between seed treatments for SDS DI, SDS DS, SDS Index, harvest moisture, test weight, and yield of soybean.

Table 37. Effect of seed treatment on root rot, SDS, and soybean yield.

Cultivar and treatment[z]	Root rot[y] %	SDS DI[x]	SDS DS[w]	SDS Index[v]	Harvest moisture %	Test weight lb/bu	Yield[u] bu/A
Base	4.7 ab	26.3	3.8	10.8	13.6	56.2	56.7
ILEVO 720	2.3 bc	21.3	3.0	7.1	14.4	56.1	59.0
ILEVO 720 + Relenya	2.1 bc	22.5	2.8	7.1	13.7	56.1	58.7
ILEVO 720 + Relenya + Experimental	4.2 abc	27.5	3.3	10.4	13.3	56.2	58.9
ILEVO Votivo	1.9 c	27.5	3.8	11.8	13.3	56.7	56.7
Saltro	2.7 bc	22.5	2.8	7.1	13.9	56.0	59.3
CeraMax	6.1 a	28.8	4.0	12.4	13.4	56.3	56.3
P-value[t]	*0.0385*	*0.5684*	*0.0947*	*0.2348*	*0.4357*	*0.5458*	*0.6501*

[z] Seed treatment of Base = metalaxyl (8 g AI/100 kg seed) + oxathiapiprolin (7.4 g AI/100 kg seed) + prothioconazole (10 g AI/100 kg seed) + penflufen (5 g AI/100 kg seed) + imidacloprid (0.12 mg AI/seed); Illevo 0.15 m ai/seed; Relenya 10 g AI/seed; Experimental 104 ml/100 kg seed; Illevo Votivo 0.21 mg AI/seed; Saltro 0.075 mg AI/seed; CeraMax 80 ml/100 kg seed. All plots inoculated with *F. virguliforme*.
[y] Root rot visually assessed percentage (0-100%) of dark discoloration on roots on 16 Aug.
[x] Disease incidence (DI) visually assessed percentage (0-100%) of plants with disease symptoms on 13 Sep.
[w] SDS disease severity (DS) visually assessed (1-9 scale), where 1 = low disease pressure and 9 = premature death of the plant on 13 Sep.
[v] Disease Index calculated (DI*DS/9).
[u] Yields were adjusted to 13% moisture and harvest on 3 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 square means test (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, 2022 (SOY22-21.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 soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000/A on 17 May. Inoculum of *S. 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 at 3.6 mph. Fungicides were applied on 14 Jul, 16 Jul, and 29 Jul at the R1 (beginning bloom), R2 (full bloom), and R3 (beginning pod) growth stages, respectively. Disease ratings were assessed on 15 Sep at R7 (beginning maturity) growth stage. White mold disease incidence assessed by counting the number of plants in each plot with symptoms. For disease severity, each plant 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: DIX = [sum (disease severity score × number of plants)]/ [(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 29 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 square means test (α=0.05).

In 2022, very little disease developed in plots. White mold was present in the trial but only reached low levels. There were no significant differences between fungicide treatments and the nontreated control for white mold severity on 15 Sep. (Table 38). The fungicide treatment Delaro Complete at R1 fb Delaro Complete at R3 decreased defoliation over the nontreated control. There was no significant effect of treatment on green stem, harvest moisture, test weight, and yield of soybean.

Table 38. Effect of fungicide on white mold, defoliation, % green stem, and soybean yield.

Treatment, rate/A, and timing[z]	White mold DIX[y]	Defoliation[x] %	Green stem[w] %	Harvest moisture %	Test weight lb/bu	Yield[v] bu/A
Nontreated control/inoculated	0.3	64.3 ab	0.3	14.0	56.5	46.2
Delaro Complete 458 SC 8.0 fl oz at R1	0.0	72.5 a	0.0	13.8	56.6	49.6
Delaro Complete 458 SC 8.0 fl oz at R1 fb Delaro Complete 458 SC 8.0 fl oz at R3	0.0	30.0 c	0.5	14.3	56.0	51.1
Miravis Neo 2.5 SE 13.7 fl oz at R1	0.2	62.5 ab	0.0	14.2	55.2	48.0
Endura 70 WDG 6.0 fl oz at R1	0.0	77.5 a	0.3	13.4	56.6	50.7
Revytek 3.33 LC 8.0 fl oz at R1	0.2	52.5 b	0.8	14.2	55.4	51.4
Omega 12.0 fl oz at R1	0.0	73.8 a	0.5	13.6	56.9	48.9
P-value[u]	*0.6078*	*0.0017*	*0.5225*	*0.2630*	*0.3392*	*0.2508*

[z] Fungicides were applied on 29 Jul at the R3 (beginning pod) growth stage and 12 Aug at the R5 (beginning seed) growth stage. All fungicide treatments contained a non-ionic surfactant at a rate of 0.24% v/v. All plots inoculated with *S. sclerotiorum*.
[y] The disease severity index (DIX) was calculated by: DIX = [sum (disease severity score × number of plants)]/[(maximum disease score) × (disease incidence)] × 100 and rated on 15 Sep.
[x] Defoliation was percentage (0-100%) of leaf loss in plot and rated on 15 Sep.
[w] Green stem was percentage (0-100%) of stems remaining green in plot on 29 Sep.
[v] Yields were adjusted to 13% moisture and harvested on 29 Sep.
[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 square means test (α=0.05).

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

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Evaluation of fungicide programs for white mold in soybean in northwestern Indiana, 2022 (SOY22-23.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 soybean production in Indiana were followed. Soybean cultivar ‘P29A19E’ was planted in 30-inch row spacing at a rate of 140,000/A on 17 May. Inoculum of *S. 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 29 Jul at the R3 (beginning pod) growth stage and 12 Aug at the R5 (beginning seed) growth stage. Disease ratings were assessed on 15 Sep at R7 (beginning maturity) growth stage. White mold disease incidence assessed by counting the number of plants in each plot with symptoms. For disease severity, each plant that is observed should be 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: DIX = [sum (disease severity score × number of plants)]/[(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 29 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 square means test (α=0.05).

In 2022, very little disease developed in plots. White mold was present in the trial but only reached low levels. There were no significant differences between fungicide treatments and nontreated control for white mold DIX and defoliation on 15 Sep (Table 39). There was no significant effect of treatment on green stem, harvest moisture, test weight, and yield of soybean.

Table 39. Effect of fungicide on white mold, defoliation, % green stem, and soybean yield.

Treatment, rate/A, and timing[z]	White mold DIX[y]	Defoliation[x] %	Green stem[w] %	Harvest moisture %	Test weight lb/bu	Yield[v] bu/A
Nontreated control	3.3	47.5	0.6	14.3	56.0	51.9
CX-9032 1.0 qt at R3 fb CX-9032 1.0 qt at R5	0.5	27.5	0.8	14.0	55.9	50.2
Serenade ASO 1.5 qt at R3 fb Serenade ASO 1.5 qt at R5	1.1	42.5	1.7	14.5	56.1	49.4
CX-10250 1.0 fl oz at R3 fb CX-10250 1.0 fl oz at R5	15.4	16.3	0.7	14.3	55.5	49.7
Endura 70 WDG 8.0 fl oz at R3 fb Endura 70 WDG 8.0 fl oz at R5	0.0	27.5	0.5	14.6	55.9	49.8
P-value[u]	*0.4844*	*0.2297*	*0.5257*	*0.9122*	*0.8247*	*0.4333*

[z] Fungicides were applied on 29 Jul at the R3 (beginning pod) growth stage and 12 Aug at the R5 (beginning seed) growth stage. All fungicide treatments contained a non-ionic surfactant (Preference) at a rate of 0.24% v/v. All plots inoculated with *S. sclerotiorum*.
[y] 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 on 15 Sep.
[x] Defoliation was percentage (0-100%) of leaf loss in plot on 15 Sep.
[w] Green stem was percentage (0-100%) of stem green in plot on 29 Sep.
[v] Yields were adjusted to 13% moisture and harvest on 29 Sep.
[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 square means test (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, 2022 (SOY22-26.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 soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 30-inch row spacing at a rate of 140,000/A on 17 May. Inoculum of *S. 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. Pre-Emergence (PRE-E) applications made with CO_2 backpack sprayer on 23 May. All foliar 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. Treatments were applied on 23 Jun, 14 Jul, 29 Jul and 23 Aug at the V4, R1 (beginning bloom), R3 (beginning pod) and R5 (beginning seed) growth stages, respectively. Disease ratings were assessed on 15 Sep at R7 (beginning maturity) 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) was calculated: DIX = [sum (disease severity score X number of plants)]/[(maximum disease score) × (disease incidence)] × 100. The center rows of each plot were harvested on 29 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 square means test (α=0.05).

In 2022, very little disease developed in plots. White mold was present in the trial but only reached low levels. There were no significant differences between fungicide treatments and nontreated control for white mold incidence or DIX on 15 Sep (Table 40). The treatment ORO-079B 2.0 pt PRE-E increased harvest moisture over the nontreated control. There was no significant effect of treatment on test weight and yield of soybean.

Table 40. Effect of fungicide on white mold incidence and soybean yield.

Treatment, rate/A, and timing[z]	White mold incidence[y] %	White mold DIX[y]	Harvest moisture %	Test weight lb/bu	Yield[x] bu/A
Nontreated control	4.6	111.7	13.6 c	58.2	47.6
ORO-070B 2.0 pt at PRE-E fb ORO-009E 0.4 % v/v at R1	5.6	63.4	13.7 c	58.5	47.2
ORO-079B 2.0 pt at PRE-E fb ORO-009E 0.4 % v/v at V4 fb ORO-009E 0.4 % v/v at R1	9.3	285.0	13.5 c	58.4	46.5
ORO-079B 2.0 pt at PRE-E fb Endura 70 WDG 8.0 fl oz at R1	3.7	43.4	13.9 bc	58.3	52.0
ORO-009E 0.4 % v/v at V4 fb ORO-009E 0.4 % v/v at R1	7.2	199.1	13.6 c	58.5	45.8
ORO-079B 2.0 pt PRE-E	7.9	229.0	14.7 a	58.6	49.8
Endura 70 WDG 8.0 fl oz at R1	4.8	87.0	13.7 c	58.8	48.1
Endura 70 WDG 8.0 fl oz at R1 + ORO-009E 0.4 % v/v at R1	2.5	33.0	13.8 c	58.4	47.4
Endura 70 WDG 8.0 fl oz at R3 + 0RO-009E 0.4 % v/v at R3	2.9	53.6	13.8 c	58.8	50.7
ORO-369-A 2.0 pt PRE-E fb ORO-009E 0.4 % v/v at R1	5.6	209.5	13.6 c	58.5	46.2
ORO-009E 0.4 % v/v at R5	7.1	173.3	14.6 ab	58.7	50.2
P-value[w]	*0.2446*	*0.3915*	*0.0176*	*0.8577*	*0.5931*

[z] Preemergence (PRE-E) application were applied on 23 May and foliar applications were applied on 23 Jun, 14 Jul, 29 Jul and 23 Aug at the V4, R1 (beginning bloom), R3 (beginning pod) and R5 (beginning seed) growth stages, respectively. All plots inoculated with *S. sclerotiorum.*
[y] White mold disease severity index (DIX) was calculated by the formula: DIX = [sum (disease severity score X number of plants)]/ [(maximum disease score) X (disease incidence)] × 100 on 15 Sep.
[x] Yields were adjusted to 13% moisture and harvest on 29 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 square means test (α=0.05).

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

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Evaluation of fungicides for foliar diseases on soybean in southwestern Indiana, 2022 (SOY22-02.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 150,000 seed/A on 18 May. All fungicide 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 16 Aug at the R5 (beginning seed) growth stage. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies, respectively on 12 Sep. Percent canopy green was visually assessed percentage (0-100%) of canopy green on 12 Sep. The two center rows of each plot were harvested on 11 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 least square means test (α=0.05).

In 2022, very little disease developed in plots. 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 in the upper canopy (Table 41). All fungicides reduced SBS severity over the nontreated control both in the upper and lower canopy on 12 Sep, except Quadris.There was no significant effect of treatment on canopy greenness, harvest moisture, test weight, and yield of soybean.

Table 41. Effect of treatment on foliar diseases, canopy greenness, and soybean yield.

Treatment, rate/A, and timing [z]	FLS severity[y] %	SBS upper canopy[y] %	SBS lower canopy[y] %	Canopy green[x] %	Harvest moisture %	Test Weight lb/bu	Yield [w] bu/A
Nontreated control	1.8	10.0 a	13.8 a	75.0	8.7	56.2	62.3
Topguard EQ 4.29 5.0 fl oz at R5	1.0	4.5 b	7.0 bc	73.8	8.6	56.1	62.3
Lucento 4.17 SC 5.0 fl oz at R5	0.8	1.3 b	4.3 c	86.3	8.5	55.9	63.0
Trivapro 2.21 SE 13.7 fl oz at R5	1.4	4.0 b	5.5 bc	78.8	8.6	56.1	66.6
Quadris 6.0 fl oz at R5	2.3	7.5 a	12.5 ab	75.0	8.6	56.0	63.0
Veltyma 3.34 S 7.0 fl oz at R5	2.1	2.5 b	5.5 c	81.3	8.6	56.0	67.0
Revytek 3.33 LC 8.0 fl oz at R5	1.8	3.3 b	5.5 c	80.0	9.1	55.7	67.1
Echo 720 36.0 fl oz + Folicur 3.6 F 4.0 fl oz + Topsin 4.5 FL 20.0 fl oz at R5	1.0	2.8 b	6.3 c	75.0	8.6	56.1	62.5
Delaro Complete 458 SC 8.0 fl oz at R5	2.3	2.0 b	5.0 c	77.5	8.6	56.4	63.3
Miravis Neo 2.4 SE 13.7 fl oz at R5	1.5	3.5 b	6.3 c	72.5	8.6	55.7	64.7
Topsin 4.5 FL 20.0 fl oz at R5	1.8	3.5 b	6.3 c	76.3	8.7	55.8	60.6
P-value[v]	*0.4557*	*0.0010*	*0.0001*	*0.2688*	*0.3783*	*0.9842*	*0.7552*

[z] Fungicides were applied on 16 Aug at the R5 (beginning seed) growth stage. All treatments contained a non-ionic surfactant 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 and rated on 12 Sep. FLS = frogeye leaf spot. SBS = Septoria brown spot.
[x] Canopy greenness was visually assessed percentage (0-100%) of canopy green on 12 Sep.
[w] Yields were adjusted to 13% moisture and harvest on 11 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 square means test (α=0.05).

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

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Evaluation of fungicides for foliar diseases on soybean in southwestern Indiana, 2022 (SOY22-29.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 140,000 seed/A on 18 May. All fungicide 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 16 Aug at the R5 (beginning seed) growth stage. Foliar disease incidence was rated on scale of 0-100% of plants within a plot with disease symptoms on 12 Sep. Percent canopy green was visually assessed percentage (0-100%) of crop canopy on 12 Sep. The two center rows of each plot were harvested on 11 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Frogeye leaf spot (FLS) and Septoria brown spot (SBS) were present in the trial, but only reached low levels. All fungicides significantly reduced SBS severity in lower canpy compared to the nontreated control on 12 Sep (Table 42). There was no significant difference between treatments and FLS severity and SBS in upper canpy on 12 Sep. All fungicides significantly increased canopy greenness compared to the nontreated control. There was no significant effect of treatment on harvest moisture, test weight, and yield of soybean.

Table 42. Effect of fungicide on foliar disease, canopy greenness, and soybean yield.

Treatment and rate/A[z]	**FLS severity**[y] **%**	**SBS upper canopy**[y] **%**	**SBS lower canopy**[y] **%**	**Canopy green**[x] **%**	**Harvest moisture %**	**Test Weight lb/bu**	**Yield** [w] **bu/A**
Nontreated control	0.7	2.4	10.4 a	67.5 c	8.8	57.6	62.2
Delaro Complete 458 SC 8.0 fl oz	0.3	1.0	3.3 b	85.0 a	8.8	56.8	57.1
Lucento 4.17 SC 5.0 fl oz	0.2	0.9	4.5 b	72.5 bc	8.7	56.2	58.7
Trivapro 2.21 SE 13.7 fl oz	0.3	1.3	4.5 b	73.8 bc	8.8	56.3	55.0
Miravis Neo 2.5 SE 13.7 fl oz	0.7	0.9	3.3 b	78.8 ab	8.9	55.8	56.2
Revytek 3.33 LC 8.0 fl oz	0.8	1.0	3.0 b	75.0 bc	9.1	55.3	60.7
P-value[v]	*0.0718*	*0.0596*	*0.0004*	*0.0075*	*0.6780*	*0.3678*	*0.2437*

[z] Fungicides were applied on 16 Aug at the R5 (beginning seed) growth stage, and all treatments contained a non-ionic surfactant (Preference) at a rate of 0.25%.
[y] Foliar disease incidence rated on scale of 0-100% of plants within a plot with disease symptoms on 12 Sep. FLS=frogeye leaf spot. SBS = Septoria brown spot.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 12 Sep.
[w] Yields were adjusted to 13% moisture and harvest on 11 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 square means test (α=0.05).

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

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Evaluation of foliar fungicides for scab management in southern Indiana, 2022 (WHT22-04.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 soybean. On 4 Nov 2021 wheat cultivar 'P25R40' was drilled at 7.5 in. spacing. Harmony Extra at 0.8 oz/A plus AMS at 2 lb/A plus NIS at 0.25% v/v was applied on 29 Mar 2022 for weed management. 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, at 3.0 mph. Fungicides were applied on 11 May and 17 May at the Feekes growth stage 10.5.1 and 10.5.1 + 5 days after 10.5.1, respectively. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 11 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 31 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 of the infected head, FHB index was calculated as: (% FHB incidence multiplied by average FHB severity)/100 per plot. The eight center rows of each plot were harvested on 21 Jun and yields were adjusted to 13.5% moisture. Data were subjected to mixed model analysis of variance (SAS 9.4, 2019) and means were compared using least square means test (α=0.05).

In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB). FHB severity and FHB Index was reduced by all fungicides. The concentration of deoxynivalenol (DON) was reduced over the nontreated control for all treatments (43). There was no difference in FHB incidence, percentage of fusarium damaged kernels (FDK), and yield of wheat.

Table 43. Effect of fungicide on Fusarium head blight, DON, Fusarium damaged kernels (FDK), and yield in 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	85.0	3.1 a	2.6 a	7.0	0.8 a	109.1
Prosaro 421 SC 6.5 fl oz at 10.5.1	53.8	2.0 bcd	1.1 bc	7.0	0.4 b	122.3
Caramba 90 EC 13.5 fl oz at 10.5.1	60.0	2.2 bc	1.3 b	5.0	0.3 bc	110.0
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1	35.4	2.0 bcd	0.8 cd	5.5	0.3 bcd	116.1
Prosaro Pro 10.3 fl oz at 10.5.1	52.9	2.3 b	1.2 bc	6.0	0.3 bc	114.3
Sphaerex (BAS 84000F) 7.3 fl oz at 10.5.1	52.9	2.0 bcd	1.1 bc	5.8	0.3 bcd	111.6
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Prosaro 421 SC 6.5 fl oz at 10.5.1 + 5 days	24.2	1.4 d	0.4 d	4.3	0.2 cd	109.1
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Sphaerex 7.3 fl oz 10.5.1 + 5 days	23.8	1.6 cd	0.4 d	3.5	0.1 d	119.1
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1 fb Tebuconazole 4.0 fl oz at 10.51 + 5 days	21.7	1.7 bcd	0.4 d	5.3	0.2 cd	118.1
P-value[s]	*21.68*	*0.0043*	*0.0001*	*0.0515*	*0.0001*	*0.2957*

[z] Fungicides treatments applied on 11 May and 17 May at the Feekes growth stage 10.5.1 and 10.5.1 + 5 d, 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 31 May.
[x] FHB severity was rated by visually assessing the percentage of the infected head. FHB = Fusarium head blight on 31 May.
[w] FHB index was calculated as: (FHB incidence multiplied by average FHB severity)/100 per plot on 31 May.
[v] FDK is percentage of Fusarium damaged kernels.
[u] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab.
[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 squares means and values with different letters are significantly different based on least square means test (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, 2022 (WHT22-05.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. Wheat cultivars 'P25R40' and 'P25R61' were planted in 7.5 in. spacing using a drill on 4 Nov, 2021. Harmony Extra at 0.8 oz/A plus AMS at 2 lb/A plus NIS at 0.25% v/v was applied on 29 Mar 2020 for weed management. 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, at 4.0 mph. Fungicides were applied on 11 May at the Feekes growth stage 10.5.1. A mixture of isolates of *Fusarium graminearum* endemic to Indiana were used to inoculate plots on 11 May. The spore suspension (50,000 spores/ml) was applied at 300 ml/plot with the CO_2 handheld sprayer. Disease ratings were assessed on 31 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 of the infected head, FHB index was calculated as: (% FHB incidence multiplied by average FHB severity)/100 per plot. Disease severity on leaves were 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 8XP combine on 21 Jun and yields were adjusted to 13.5% moisture. Data were subjected to mixed model analysis of variance (SAS 9.4, 2019) and means were compared using least square means test (α=0.05).

In 2022, weather conditions were moderately favorable for Fusarium head blight (FHB). Fusarium head blight was the most prominent disease and there was little to no leaf blotch detected. The scab resistant cultivar, P25R61, had significantly less FHB, DON, test weight, harvest moisture and yield as compared to the susceptible P25R40 cultivar (Table 44). FHB incidence, severity, and Index were reduced by Miravis Ace at 10.5.1 and Prosaro Pro at 10.5.1 as compared to the nontreated, inoculated control. No significant differences were detected between treatments and nontreated controls for DON, FDK and wheat yield.

Table 44. Effect of cultivar and fungicide on Fusarium head blight (FHB), DON, FDK and wheat yield.

Cultivar or treatment and rate/A[z]	FHB incidence[y] %	FHB severity[x] %	FHB Index[w]	DON[v] ppm	FDK[u] %	Yield[t] bu/A
P25R40 (scab susceptible)	62.9 a[s]	2.6 a	1.7 a	0.541 a	8.0	95.0 a
P25R61 (scab resistant)	31.5 b	1.7 b	0.6 b	0.070 b	7.8	86.7 b
Nontreated control, inoculated control	58.1 a	2.6 a	1.6 a	0.363	8.0	91.1
Nontreated, non-inoculated control	55.6 ab	2.4 ab	1.4 ab	0.339	8.4	92.1
Prosaro 421 SC 6.5 fl oz at 10.5.1	43.1 bc	2.3 ab	1.1 bcd	0.324	7.3	93.0
Miravis Ace 5.2 SC 13.7 fl oz at 10.5.1	30.8 c	1.7 c	0.6 d	0.223	7.3	88.5
Prosaro Pro 10.3 fl oz at 10.5.1	41.3 c	1.9 bc	0.8 d	0.249	8.0	87.7
Sphaerex 7.3 fl oz at 10.5.1	54.2 ab	2.2 abc	1.3 abc	0.338	8.8	93.0
P-value *cultivar*[s]	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.5872*	*0.0033*
P-value *fungicide*	*0.0005*	*0.0484*	*0.0023*	*0.4740*	*0.1703*	*0.7612*
P-value *cultivar*fungicide*	*0.9163*	*0.9968*	*0.6664*	*0.3674*	*0.7931*	*0.0240*

[z] Fungicide treatments applied on 11 May at the Feekes growth stage 10.5.1. All treatments contained a non-ionic surfactant 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 11 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 31 May.
[x] FHB severity was rated by visually assessing the percentage of the infected head on 31 May. FHB = Fusarium head blight.
[w] FHB index was calculated as: (FHB incidence multiplied by average FHB severity)/100 per plot on 31 May.
[v] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab.
[u] FDK = percentage of Fusarium damaged kernels.
[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 squares means and values with different letters are significantly different based on least square means test (α=0.05).

CORN (Zea mays 'PO574AMXT')
Gray leaf spot; *Cercospora zeae-maydis*

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Field-scale evaluation of fungicides for foliar disease in corn in central Indiana, 2022 (COR22-08.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 four replications. Plots were 30-ft wide and 500-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated corn production in Indiana were followed. Corn hybrid 'P0574AMXT' was planted in 30-inch row spacing at a rate of 31,000 seeds/A on 13 May. All fungicide applications were applied at 20 gal/A and 50 psi using either a Raven plot sprayer or a Case IH Patriot sprayer. Fungicides were applied on 16 Jun, 22 Jun, and 1 Aug, and at the V8, V10, and at R2 (blister) growth stages, respectively. Gray leaf spot (GLS) was assessed on 12 Aug at R3 (milk) growth stage and on 22 Aug at R5 (dent) growth stage. Disease severity was rated by visually assessing the percentage of symptomatic leaf area at the ear leaf. Ten plants in three locations were assessed in each plot and averaged before analysis. Percent canopy green was visually assessed percentage (0-100%) of crop canopy green on 7 Sep. The twelve rows of each plot were harvest on 19 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for disease. Gray leaf spot (GLS) was the most prominent disease in the trial and reached low severity. All treatments reduced GLS severity over the nontreated control on 12 Aug (Table 45). On 22 Aug, GLS severity was significantly lower in plots treated with Delaro at the V8 and V10 growth stages. The V8 application had significantly lower GLS severity than all other treatments on 12 Aug and 22 Aug. Canopy greenness was significantly higher in the V8 and nontreated plots over the treatments at V10 and R2. There was no significant difference between treatments for harvest moisture and yield of corn.

Table 45. Effect of fungicide on gray leaf spot (GLS), canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	GLS % severity[y] 12 Aug	GLS % severity[y] 22 Aug	Canopy green[x] %	Harvest moisture %	Yield[w] bu/A
Nontreated control	0.4 a	1.0 a	76.0 a	16.3	192.6
Delaro 325 SC 8.0 fl oz at V8	0.0 c	0.2 c	77.0 a	16.2	195.2
Delaro 325 SC 8.0 fl oz at V10	0.2 b	0.7 b	74.2 b	16.2	191.2
Delaro 325 SC 8.0 fl oz at R2	0.2 b	1.0 a	72.5 b	16.2	196.0
P-value[v]	*0.0001*	*0.0002*	*0.0451*	*0.5990*	*0.5158*

[z] Fungicides were applied on 16 Jun, 22 Jun, and 1 Aug, and at the V8, V10, and R2 (blister) growth stages, respectively.
[y] Disease severity visually assessed percentage (0-100%) of symptomatic leaf area on ear leaf. Ten leaves were assessed in three locations per plot and averaged before analysis. GLS = gray leaf spot.
[x] Canopy greenness visually assessed percentage (0-100%) of crop canopy green on 7 Sep.
[w] Yields were adjusted to 15.5% moisture and harvested on 19 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 square means test (α=0.05).

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

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Field-scale fungicide timing comparison for foliar diseases on soybean in central Indiana, 2022 (SOY22-07.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 four replications. Plots were 30-ft wide and 485-ft long, consisted of twenty-four rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was planted in 15 inches row spacing at a rate of 150,000 seeds/A on 23 May. All fungicide applications were applied at 20 gal/A and 50 psi using a Raven plot sprayer or Case IH 2240 sprayer. Fungicides were applied on 30 Jun, 25 Jul, and 1 Aug at V4, at R3 (beginning pod), and at R5 (beginning seed) growth stages, respectively. Disease ratings were assessed on 22 Aug at late R5 (beginning seed)/early R6 (full seed) growth stages. Septoria brown spot (SBS), frogeye leaf spot (FLS), and downy mildew (DM) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies. The soybeans were harvested on 6 Oct and yields were adjusted to 13% moisture. All data were averaged before analysis in SAS 9.4 (SAS Institute, Cary, NC). All disease and yield data were analyzed using a mixed model analysis of variance, and means were separated using least square means test (α=0.05).

In 2022, very little disease developed in plots. Downy mildew (DM) was the most prominent diseases and reached low severity. There was no significant difference between treatments and nontreated controls for frog leaf spot (FLS), downy mildew (DM), Septoria brown spot (SBS), harvest moisture, and yield of soybean (Table 46).

Table 46. Effect of fungicide timing on foliar disease severity and soybean yield

Treatment, rate/A, and timing[z]	FLS[y] Upper canopy %	FLS[y] Lower canopy %	DM[y] Upper canopy %	SBS[y] Lower canopy %	Harvest moisture %	Yield[x] bu/A
Nontreated control	0.4	0.3	6.8	2.8	9.5	62.2
Delaro 325 SC 12 fl oz at V4	0.0	0.1	4.9	2.8	9.5	60.3
Delaro 325 SC 12 fl oz at R3	0.6	0.5	5.8	3.4	9.5	59.3
Delaro 325 SC 12 fl oz at R5	0.1	0.1	5.6	2.7	9.5	61.3
P-value[w]	*0.2443*	*0.5799*	*0.0833*	*0.3811*	*0.9467*	*0.3118*

[z] Fungicides were applied on 30 Jun, 25 Jul, and 1 Aug at V4, R3 (beginning pod), and R5 (beginning seed) growth stages, respectively.
[y] Foliar disease severity visually rated on scale of 0-100% of upper and lower canopy with disease symptoms on 22 Aug. FLS = frogeye leaf spot; DM = downy mildew; SBS = Septoria brown spot.
[x] Yields were adjusted to 13% moisture and harvested on 6 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 square means test (α=0.05).

CORN (*Zea mays* 'PO574AM')
Gray leaf spot; *Cercospora zeae-maydis*

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Field-scale fungicide timing comparison for foliar diseases in corn in northeastern Indiana, 2022 (COR22-09.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 four replications. Plots were 30-ft wide and 360-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated corn production in Indiana were followed. Corn hybrid 'P0574AM' was planted in 30-inch row spacing at a rate of 34,000 seeds/A on 20 May. Fungicide treatments applied on 23 Jun, 14 Jul, 29 Jul, 12 Aug, and 18 Aug at the V6, V10, VT/R1 (tassel/silk), R2 (blister), and R3 (milk) growth stages, respectively. Disease ratings were assessed on 24 Aug at the R5 (dent) growth stage. Gray leaf spot (GLS) was rated for disease severity by visually assessing the percentage (0-100%) of symptomatic leaf area on the ear leaf on ten plants at three locations in each plot. Lodging was assessed by pushing ten plants from shoulder height at a 45-degree angle at three locations in each plot and recording the number with snapped or bent stalks. Plants lodged from severe wind were totaled out of ten in each location and added to the lodging total. Canopy greenness was visually assessed percentage (0-100%) of canopy green on 7 Sep. The trial was harvested on 10 Oct and yields were adjusted to 15.5% moisture. Data were averaged before analysis and subjected to mixed model analysis of variance (SAS 9.4, 2019). 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 square means test (α=0.05).

In 2022, weather conditions were not favorable for disease. Gray leaf spot (GLS) reached low severity. Headline Amp applied at V6, VT/R1, and R3 significantly reduced GLS severity over the nontreated control on 24 Aug (Table 47). No treatment was significantly different from nontreated control for lodging, but the Headline AMP application at V10 had significantly reduced lodging over applications made at V6 and VT/R1. There was no significant effect of fungicide timing on canopy greenness, harvest moisture, and yield of corn.

Table 47. Effect of fungicide timing on foliar diseases severity, lodging, canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	GLS severity[y] %	Canopy green[x] %	Lodging [w] %	Harvest moisture %	Yield[v] bu/A
Nontreated control	0.08 a	79.6	9.8 abc	19.9	242.4
Headline AMP 1.68 SC 10.0 fl oz at V6	0.04 bc	82.9	10.4 ab	19.7	234.7
Headline AMP 1.68 SC 10.0 fl oz at V10	0.08 ab	80.8	4.2 c	19.8	235.6
Headline AMP 1.68 SC 10.0 fl oz at VT/R1	0.00 c	77.1	15.4 a	20.3	240.6
Headline AMP 1.68 SC 10.0 fl oz at R2	0.09 a	80.8	6.7 bc	19.9	242.4
Headline AMP 1.68 SC 10.0 fl oz at R3	0.01 b	82.9	6.5 bc	20.3	243.6
P-value[u]	*0.0006*	*0.1365*	*0.0135*	*0.7679*	*0.4237*

[z] Fungicide treatments applied on 23 Jun, 14 Jul, 29 Jul, 12 Aug, and 18 Aug at the V6, V10, VT/R1 (tassel/silk), R2 (blister), and R3 (milk) growth stages, respectively.
[y] Disease severity visually assessed percentage (0-100%) of symptomatic leaf area on the ear leaf. Ten leaves were assessed per plot and averaged on 24 Aug.
[x] Canopy greenness visually assessed percentage (0-100%) on 7 Sep.
[w] Lodging = percentage of lodged stalks present in the plot and lodged stalks when pushed from shoulder height to the 45° from vertical on 7 Sep.
[v] Yields were adjusted to 15.5% moisture and harvested on 11 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 square means test (α=0.05).

CORN (*Zea mays* '5794V2P')
Gray leaf spot; *Cercospora zeae-maydis*

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Evaluation of Xyway 2x2 application for foliar diseases in corn in northeastern Indiana, 2022 (COR22-13.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 eight replications. Plots were 30-ft wide and 360-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated corn production in Indiana were followed. Corn hybrid '5794V2P' was planted in 30-in. row spacing at a rate of 34,000 seeds/A on 20 May. Xyway 15.2 fl oz/A was applied with the starter fertilizer in a 2x2 configuration (two inches below and two inches to the side of the seed furrow) with 28% N and ammonium thiosulfate at 13.4 gal/A at planting. Disease ratings were assessed on 24 Aug at the R5 (dent) growth stage. Gray leaf spot (GLS) was rated by visually assessing the percentage (0-100%) of symptomatic leaf area on the ear leaf on ten plants at three locations in each plot. Percent canopy green was visually assessed percentage (0-100%) of canopy green on 7 Sep. Lodging was assessed by pushing ten plants from shoulder height at a 45-degree angle at three locations in each plot and recording the number with snapped or bent stalks. Plants lodged from severe wind were totaled out of ten in each location and added to the lodging percentage. The trial was harvested on 11 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 square means test (α=0.05)

In 2022, very little disease developed in plots. Gray leaf spot (GLS) was the most prominent disease and reached low severity. The 2x2 application of Xyway at planting had significantly lower GLS compared to the nontreated control. (Table 48). There were no significant differences between treatments for canopy greennes and lodging on 7 Sep. Yield was significantly higher in the Xyway treated plots as compared to nontreated control.

Table 48. Effect of fungicide on foliar diseases severity, canopy greenness, lodging, and corn yield.

Treatment and rate/A[z]	GLS severity[y] %	Canopy green[x] %	Lodging[w] %	Harvest moisture %	Yield[v] bu/A
Nontreated control	0.009 a	74.6	18.3	20.9	254.9 b
Xyway LFR 15.2 fl oz applied 2x2	0.001 b	76.0	17.6	20.6	266.5 a
P-value[u]	*0.0442*	*0.3042*	*0.8054*	*0.1318*	*0.0135*

[z] Xyway 15.2 fl oz applied in starter fertilizer in 2x2 with 28% N and ammonium thiosulfate at 13.4 gal/A at planting on 20 May.
[y] Disease severity visually assessed percentage (0-100%) of symptomatic leaf area on ear leaf on 24 Aug. GLS=gray leaf spot.
[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 7 Sep.
[w] Lodging was assessed by pushing ten plants from shoulder height at a 45° angle at three locations in each plot and recording the number with snapped or bent stalks on 7 Sep. Plants lodged from severe wind were totaled out of ten in each location and added to the lodging percentage.
[v] Yields were adjusted to 15.5 % moisture and harvested on 11 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'P29A19E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Downy mildew; *Peronospora manshurica*
White Mold; *Sclerotinia sclerotiorum*

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Field-scale fungicide timing for foliar diseases on soybean in northeastern Indiana, 2022 (SOY22-09.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 four replications. Plots were 30-ft wide and 390-ft long. The previous crop was corn. Standard practices for non-irrigated soybean production in Indiana were followed. Soybean cultivar 'P29A19E' was drilled in 7.5-inch row spacing at a rate of 175,000 seeds/A on 12 May. Fungicide treatments were applied on 22 Jun, 10 Jul, 29 Jul, and 12 Aug at the V4, R1 (beginning bloom), R3 (beginning pod), and R5 (beginning pod) growth stages, respectively. Disease ratings were assessed on 24 Aug at the early R6 (full seed) growth stage. Septoria brown spot (SBS), frogeye leaf spot (FLS), and downy mildew (DM) were rated for disease severity by visually assessing the percentage of symptomatic leaf area in the upper and lower canopies in three locations in each plot. White mold was rated by visually assessing the number of infected plants within a 38-ft diameter radius at three locations in each plot. The soybeans were harvested on 1 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 square means test (α=0.05).

In 2022, very little disease developed in plots. All timings of Miravis Top significantly reduced frogeye leaf spot (FLS) severity in the upper and lower canopy over the nontreated control (Table 49). All treatments significantly reduced Septoria brown spot (SBS) severity compared to the nontreated control. Miravis Top at V4 resulted in significantly lower SBS severity than application at R1 and R3, but the V4 treatment was not significantly different from the R5 application. No differences were detected between treatments for downy mildew (DM). There was no significant difference between treatments for white mold. Miravis Top applied at R3 significantly increased yield over the nontreated control and other fungicide application timings.

Table 49. Effect of fungicide timing on foliar disease severity and soybean yield.

Treatment, rate/A, and timing[z]	**FLS[y] Upper canopy %**	**FLS[y] Lower canopy %**	**SBS severity[y] %**	**DM severity[y] %**	**White mold[x] # of plants**	**Yield[w] bu/A**
Nontreated control	1.5 a	0.9 a	2.3 a	1.7	0.6	61.0 b
Miravis Top 1.67 SC 13.7 oz at V4	0.6 b	0.1 b	0.2 c	1.7	1.6	58.6 b
Miravis Top 1.67 SC 13.7 oz at R1	0.1 b	0.1 b	1.3 b	0.7	0.2	61.1 b
Miravis Top 1.67 SC 13.7 oz at R3	0.6 b	0.2 b	1.4 b	1.3	0.6	64.9 a
Miravis Top 1.67 SC 13.7 oz at R5	1.7 b	0.2 b	0.8 bc	1.9	2.3	61.2 b
P-value[v]	*0.0074*	*0.0039*	*0.0013*	*0.1790*	*0.2134*	*0.0253*

[z] Fungicide treatments were applied on 22 Jun, 10 Jul, 29 Jul, and 12 Aug at the V4, R1 (beginning bloom), R3 (beginning pod), and R5 (beginning pod) growth stages, respectively.
[y] Foliar disease severity was visually rated on scale of 0-100% of the upper and lower canopy with disease symptoms on 24 Aug. FLS = frogeye leaf spot; SBS = Septoria brown spot in lower canopy; DM = downy mildew upper canopy.
[x] White mold was rated by visually assessing the number of infected plants at three locations in each plot and then averaged on 24 Aug.
[w] Yields were adjusted to 13% moisture and harvested on 1 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 square means test (α=0.05).

CORN (*Zea mays* ‘P1077’)
Gray leaf spot; *Cercospora zeae-maydis*

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Field-scale evaluation of fungicide timing for foliar disease in corn in southeastern Indiana, 2022 (COR22-10.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 600-ft long, consisted of twelve rows, and the two center rows used for evaluation. The previous crop was soybean. Standard practices for non-irrigated corn production in Indiana were followed. Corn hybrid ‘P1077’ was planted in 30-in. row spacing at a rate of 33,000 seeds/A on 12 May. All fungicide applications were applied at 20 gal/A and 35 psi using Apache 720 sprayer. Fungicides were applied on 15 Jun, 19 Jul, and 4 Aug at the V6, VT (tassel), and R3 (milk) growth stages, respectively. Disease ratings were assessed on 2 Aug at R3 (milk) and on 16 Aug at R5 (dent) growth stages. Gray leaf spot (GLS) was rated for disease severity by visually assessing the percentage (0-100%) of symptomatic leaf area on the ear leaf. Ten plants in three locations were assessed in each plot and averaged before analysis. Percent canopy green was visually assessed percentage (0-100%) of canopy green on 2 Sep. The twelve rows of each plot were harvest on 5 Oct and yields were adjusted to 15.5% moisture. Data were subjected to mixed model analysis of variance (SAS 9.4, 2019). 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 square means test (α=0.05).

In 2022, very little disease developed in plots. Gray leaf spot (GLS) was the most prominent disease and reached low severity. On both rating dates all Lucento treatment timings reduced GLS severity over the nontreated control with the VT application having significantly less GLS compared to the R3 application on 16 Aug (Table 50). Harvest moisture was significantly lower in the nontreated control and V6 applications when compared to VT and R3 applications. No significant differences were detected between treatments for canopy greennes and yield of corn.

Table 50. Effect of fungicide timing on foliar diseases severity, canopy greenness, and corn yield.

Treatment, rate/A, and timing[z]	**GLS % severity[y] 2 Aug**	**GLS % severity[y] 16 Aug**	**Canopy green[x] %**	**Harvest moisture %**	**Yield[w] bu/A**
Nontreated control	0.67 a	1.4 a	70.0	20.6 b	244.4
Lucento 4.17 SC 5.0 fl oz at V6	0.12 b	0.3 bc	71.3	20.5 b	248.9
Lucento 4.17 SC 5.0 fl oz at VT	0.01 b	0.1 c	74.2	21.5 a	257.1
Lucento 4.17 SC 5.0 fl oz at R3	0.22 b	0.7 b	72.1	21.4 a	257.7
P-value[v]	*0.0029*	*0.0004*	*0.4606*	*0.0081*	*0.3450*

[z] Fungicides were applied on 15 Jun, 19 Jul, and 4 Aug at the V6, VT (tassel), and R3 (Milk) growth stages, respectively. Treatments applied at R3 contained a non-ionic surfactant (Haf-Pynt) at a rate of 1.6 oz/Acre

[y] Disease ratings were assessed on 2 Aug at the R3 (Milk) growth stage and on 16 Aug at the R5 (Dent) growth stage. GLS= gray leaf spot

[x] Canopy greenness visually assessed percentage (0-100%) of canopy green on 2 Sep.

[w] Yields were adjusted to 15.5 % moisture and harvested on 5 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 square means test (α=0.05).

SOYBEAN (*Glycine max* 'P38T05E')
Frogeye leaf spot; *Cercospora sojina*
Septoria brown spot; *Septoria glycines*
Downy mildew; *Peronospora manshurica*
Sudden death syndrome*; Fusarium virguliforme*

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Field-scale fungicide timing comparison for foliar diseases on soybean in southeastern Indiana, 2022 (SOY22-08.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 four replications. Plots were 30-ft wide and 700-ft long, consisted of 24 rows, and the two center rows used for evaluation. The previous crop was corn. Standard practices for non-irrigated soybean production in Indiana were followed. Soybean cultivar 'P38T05E' was planted in 15-in. row spacing at a rate of 130,000 seeds/A on 2 May. All fungicide applications were applied at 20 gal/A and 35 psi. Fungicides were applied on 15 Jun, 19 Jul, and 12 Aug at the V4, R3 (beginning pod), and R5 (beginning seed) growth stages, respectively. Disease ratings were assessed on 16 Aug at R6 growth stage. Frogeye leaf spot (FLS) was rated in upper and lower canopies, downy mildew (DM) was rated in the upper canopy, and Septoria brown spot (SBS) rated in the lower canopy. Sudden death syndrome (SDS) was rated by visually assessing the percentage of symptomatic canopy area at three locations in each plot. Disease severity of each disease was visually assessing the percentage (0-100%) of symptomatic leaf area in the canopy in three locations in each plot on 16 Aug. All ratings were averaged in each plot before analysis. Soybean plots were harvested on 19 Oct and yields were adjusted to 13% moisture. Data were subjected to 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 square means test (α=0.05).

In 2022, very little foliar disease developed in plots. Sudden death syndrome (SDS) was the most prominant soybean disease in the plots. Frogeye leaf spot (FLS), downy mildew (DM), and Septoria brown spot (SBS) reached low severity. There were no significant differences between treatments for FLS in upper canopy and SBS (Table 51). All treatments significantly reduced FLS severity in lower canopy and DM severity compared to the nontreated control. No significant differences were observed for SDS and yield of soybean.

Table 51. Effect of fungicide timing on foliar disease severity and soybean yield.

Treatment, rate/A, and timing[z]	FLS[y] Upper canopy %	FLS[y] Lower canopy %	SBS severity[y] %	DM severity[y] %	SDS Incidence[x] %	Yield[w] bu/A
Nontreated control	0.5	0.4 a	0.6	0.2 a	10.5	68.1
Lucento 4.17 SC 5.0 fl oz at V4	0.1	0.1 b	0.3	0.4 b	10.1	68.4
Lucento 4.17 SC 5.0 fl oz at R3	0.0	0.0 b	0.6	0.7 b	10.5	71.9
Lucento 4.17 SC 5.0 fl oz at R5	0.0	0.0 b	0.7	0.3 b	8.8	72.7
P-value[v]	*0.0508*	*0.0448*	*0.2880*	*0.0093*	*0.9697*	*0.1405*

[z] Fungicides were applied on 15 Jun, 19 Jul, and 12 Aug at the V4, R3 (beginning pod), and R5 (beginning seed) growth stages, respectively and contained a non-ionic surfactant (Haf-Pynt) at a rate of 1.6 oz/acre.
[y] Foliar disease severity visually rated on scale of 0-100% of the upper and lower canopy with disease symptoms 16 Aug.FLS = frogeye leaf spot; SBS = Septoria brown spot; DM = downy mildew.
[x] Sudden death syndrome (SDS) was rated by visually assessing the percentage incidence in canopy area at three locations in each plot on 16 Aug.
[w] Yields were adjusted to 13% moisture and harvested on 19 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 square means test (α=0.05).

APPENDIX –WEATHER DATA

Table 52. 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, 2022[z].

	ACRE			PPAC			SWPAC		
Months	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)
January	12.5	32.4	0.47	9.8	27.5	0.25	19.3	37.3	2.30
February	18.3	37.5	2.28	16.9	33.8	1.72	24.1	44.3	4.30
March	32.8	52.8	3.40	29.2	48.3	2.86	38.2	58.4	4.36
April	39.6	59.8	2.74	35.1	54.6	3.09	44.8	64.3	4.98
May	55.5	75.8	5.77	51.5	71.9	2.72	58.7	78.5	4.87
June	60.0	84.4	1.20	57.2	80.9	2.11	64.9	87.7	1.39
July	64.0	84.5	1.74	61.2	81.4	3.58	69.7	87.6	13.18
August	61.0	83.3	4.47	58.7	80.4	3.55	66.2	86.3	2.39
September	53.1	77.5	1.80	51.3	74.2	1.34	58.6	81.3	1.16
October	40.4	65.7	2.73	38.2	62.7	4.09	44.6	69.4	1.29
November	33.4	52.8	1.97	30.8	49.7	1.18	36.8	56.5	1.45
December	24.5	38.4	1.25	20.9	34.2	1.06	27.6	42.6	3.02
Annual	41.4	62.2	29.82	38.5	58.4	27.55	46.3	66.3	44.69

	DPAC			NEPAC			SEPAC		
Months	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)	Temp. min.[y] °F	Temp. max.[y] °F	Total precipit.[x] (in)
January	12.0	32.1	1.66	11.5	29.8	0.51	18.2	37.1	2.61
February	19.6	38.6	3.13	17.9	35.2	2.61	23.8	44.8	6.43
March	31.8	53.2	4.05	31.7	51.6	3.93	35.2	58.2	3.60
April	38.4	58.2	2.81	37.8	56.2	3.49	42.0	62.9	3.57
May	53.8	74.8	3.63	53.6	73.2	4.4	55.5	77.6	5.04
June	58.8	84.7	1.33	59.9	83.1	1.65	60.4	85.9	3.60
July	64.4	84.4	5.61	63.6	82.8	8.06	67.1	86.6	7.04
August	60.1	82.7	2.89	60.9	82.0	2.31	62.9	85.1	4.38
September	52.8	76.4	1.85	53.7	75.5	1.39	56.5	80.4	3.54
October	39.2	65.7	0.87	40.1	64.3	2.86	40.7	68.4	1.50
November	31.7	53.9	0.86	32.8	51.6	2.3	35.0	57.9	1.16
December	22.9	38.5	1.82	23.5	35.7	2.04	26.7	43.3	2.65
Annual	40.6	62.0	30.51	40.8	60.2	35.55	43.8	65.8	45.12

[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.

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