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

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

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

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

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

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

[z] Fungicides were applied on 22 May at the Feekes growth stage 10.5.1. All plots were inoculated with a mixture of isolates of *Fusarium graminearum* endemic to Indiana on 24 May with a spore suspension (50,000 spores/ml) applied at 300 ml/plot with CO_2 handheld sprayer on 23 May.
[y] FHB incidence was measured as the number of infected heads out of 60 plants in each plot and calculated as a percentage on 10 Jun.
[x] FHB severity was rated by visually assessing the percentage of the infected head.
[w] FHB index was calculated as: (% FHB incidence multiplied by % FHB severity)/100 per plot. FHB = fusarium head blight.
[v] Analysis of the mycotoxin deoxynivalenol (DON) completed by the University of Minnesota DON Testing Lab on 17 Aug. nd = not detected, DON <0.05 ppm.
[u] FDK = percentage of Fusarium damaged kernels.
[t] Yields were adjusted to 13.5% moisture and harvested on 10 Jul.
[s] All data were analyzed in SAS 9.4 (SAS Institute, Cary, NC). A generalized linear mixed model analysis of variance was performed using PROC GLIMMIX. Values are least squares means and values with different letters are significantly different based on least significant difference (LSD, α= 0.05).

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

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

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

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

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

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

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

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

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

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

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

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

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

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