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

C. R. Da Silva, S. B. Brand, and D. E. P. Telenko.
Dept. Botany and Plant Pathology,
Purdue University, West Lafayette, IN 47907

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).

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

C. R. Da Silva, S. B. Brand, and D. E. P. Telenko
Dept. Botany and Plant Pathology, Purdue University
West Lafayette, IN 47907-2054

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-crimped 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 tillage 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).

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*

C. R. Da Silva, S. B. Brand, and D. E. P. Telenko
Dept. Botany and Plant Pathology
Purdue University, West Lafayette, IN 47907-2054

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).