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2020 Plant Disease Summaries for Small Grains

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2020 Plant Disease Summaries for Small Grains

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SUMMARY

A number of field trials were implemented in the 2020 growing season with the general objective of assessing various disease management practices suitable for South Dakota growers and the Great Plains. Specific objectives included testing different application rates, times, sequential applications of different product combinations of both experimental and commercial fungicides to manage foliar diseases and scab of wheat (Fusarium head blight or FHB). These studies were conducted at four locations within the state namely; Brookings (east of campus), North Brookings, Northeast research farm (NERF) near South Shore, and Volga research farm.

Most of the trials were planted in May with soil temperatures between 45 and 57°F. Ambient temperatures were around 54°F with near normal moisture average of 2.6 inches. Germination was slow due to the cooler conditions, especially at Volga, which had excess moisture owing to previous season's excess precipitation. Prevailing conditions were not conducive to the development of high intensities of fungal diseases except in artificially infected and irrigated/misted fields. Consequently, measured variables such as disease severity and yield in most of the experiments did not show statistically significant differences among treatments. However, visible differences may be of significance under the large field scale. Generally, where disease pressure was relatively high, fungicide application resulted in a substantial protection of quality and yield potential.

All fungicides and bactericides used in these studies were approved for use in SD at the time of application. Where advanced stage experimental products were used, strict guidelines were followed to ensure environmental safety, including native fauna and flora. Alternative application approaches that are not currently part of the product label such as crop, timing and/or rate were used for research purposes. Therefore, results from these research endeavors should not be considered recommendations until the research is finalized and official recommendations are communicated. Growers using any chemical products should always consult product labels regarding safe and appropriate chemical handling such as personal protection requirements, re-entry intervals, pre-harvest use, application rates and methods and any other important information.

ACKNOWLEDGEMENTS

Implementation of these field studies was possible with invaluable assistance provided by personnel from various programs in the department of Agronomy, Horticulture and Plant Science at SDSU. Some of the programs that rendered assistance include Winter Wheat Breeding, Spring Wheat Breeding, Crop Performance Testing, Entomology, Foundation Seed, Northeast, Southeast and Volga Research Farms.

1.0 Fusarium head blight (FHB) I

The efficacy of Miravis Ace for managing FHB was assessed comparative to the efficacies of other commercial fungicides at South Shore/Northeast research farm and Volga research farm. Miravis Ace was applied at various wheat growing stages.

Miravis Ace proved effective in reducing FHB index when applied at anthesis and heading at Northeast (Table 1.1)**.** Although Volga had lower FHB pressure than Northeast, the trend was similar (Table 1.2). However, FHB index scores observed for Miravis Ace were statistically not different from those observed in plots that were treated with Prosaro and Caramba at both locations.

2.0 Fusarium head blight (FHB) II

Several commercial and experimental fungicides for managing FHB were sprayed at heading, early flowering and full flowering stages to assess the efficacy of each product in managing the disease. All products and timings reduced FHB index compared to the untreated check at both locations (Tables 2.1 and 2.2).

3.0 Fusarium head blight (FHB) III

The efficacies of commercial and experimental fungicides for managing FHB and some foliar diseases in wheat were evaluated. The application scheme included single and sequential applications in various combinations at different wheat growth stages (Table 3.1 and 3.2).

The lowest FHB incidence, severity and index were observed when Miravis Ace was applied at anthesis at Northeast (Table 3.1). No significant differences were observed among products at Volga for FHB index (Table 3.2). Values were similar for other FHB metrics.

4.0 Fusarium head blight (FHB) IV

Commercial and experimental products were applied to wheat spikes at early flowering/anthesis to assess the efficacy of each product in managing FHB. Miravis Ace had the lowest FHB incidence, severity and index as well as Fusarium damaged kernels (FDK) at Northeast research farm (Table 4.1) while Prosaro 421 SC had the lowest FHB prevalence metrics at Volga (Table 4.2).

5.0 Fusarium head blight (FHB) V

This study was maintained at Volga research farm to evaluate the efficacies of several commercial and experimental FHB managing fungicides applied at flag leaf and early flowering. The higher rate of Prosaro had the highest efficacy at controlling FHB followed by an experimental product A (Table 5). Miravis Ace, when applied at at 13.7 fl oz/acre produced lower FHB index and Fusarium damaged kernels than at 11 fl oz/acre.

6.0 Uniform Fungicide Trial

The Uniform Fungicide Trial (UFT) assessed the efficacy of Miravis Ace in controlling FHB when applied at heading (Feekes 10.3), early flowering (Feekes 10.5.1) and 4 to 6 days after early flowering.

Statistically, the results from Brookings Pathology Farm did not demonstrate that the application of Miravis Ace followed by Caramba, Prosaro or Tebuconazole made a difference in reducing disease symptoms indicated by the FHB index and Fusarium damaged kernel (FDK) scores (Table 6.1). However, the lowest FHB index and Fusarium damaged kernel values at Northeast were observed when an application of Miravis Ace at early flowering was followed by an application of Prosaro, Caramba, or Tebuconazole 4 to 6 days later. Treated plots at Northeast research farm had lower values for FHB metrics compared to the untreated control (Table 6.2). The lowest FHB index and Fusarium damaged kernel values at Volga came from plots that were treated with Miravis Ace at early flowering followed by an application of Prosaro or Caramba 4 to 6 days later (Table 6.3).

7.0 Fusarium head blight (FHB) Integrated Management

Three cultivars namely, Boost (moderately resistant), Brick (moderately resistant) and Samson (susceptible) were used to evaluate the efficacy of various fungicides for FHB management. The importance of artificial inoculation in research trial was also explored. Some treatments included a sequential application of fungicide combinations. Applications were carried out at three wheat growth stages, Feekes 10.3 (half head visible), Feekes 10.5.1 (early flowering) and 4 to 6 days after Feekes 10.5.1. The Brookings and Volga locations were artificially inoculated and misted to create optimal conditions for disease development.

As expected, inherent cultivar reaction to colonization by the pathogen that causes FHB, *Fusarium spp*., was the primary determining factor for the level of severity for each cultivar. Generally, results supported artificial disease introduction as 'untreated, non-inoculated' plots experienced lower disease than 'untreated, inoculated' plots (Tables 7.1 & 7.3). Application of Miravis Ace at early flowering followed by an application of Tebuconazole 4 to 6 days later exhibited lower FHB index than the rest of the sprayed plots at Brookings and Volga where plots were artificially inoculated. This is particularly clear for Samson (Tables 7.1 & 7.3). FHB pressure was lowest at Northeast and no particular pattern was observed except for the susceptible Samson where untreated plots had significant FHB index (Table 7.2).

8.0 Bacterial leaf streak (BLS) Effect on Yield

The extent of BLS effect on yield was evaluated in eight spring wheat genotypes by inoculating some plots while leaving other plots non-inoculated in a split plot arrangement where cultivar was the main factor. Yield comparisons between inoculated and non-inoculated plots were conducted. Inoculations were carried out at Feekes 4. A blanket fungicide application was made to protect plots from fungal diseases and a bactericide was applied to the non-inoculated plots to prevent natural infection. However, the applied bactericide did not completely prevent natural BLS infestation in the non-inoculated plots.

Despite this challenge, yield differences were observed between inoculated and non-inoculated plots across all locations. However, North Brookings and Volga showed consistent yield loss and showed that inoculated plots had higher BLS intensity (Tables 8.1 & 8.3). Inconsistent yield loss observed at Northeast research farm may be attributable to low BLS incidence and severity or other unknown factors. (Table 8.2). The SDSU breeding line SD4011 had consistently low yield loss due to BLS.

Cultivar: RB07
Previous Crop: Corn
Planted: 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 1.1 Fusarium head blight (FHB) Study I: Evaluation of Miravis Ace applied at different spring wheat growth stages at Northeast research farm.

Treatment	Rate	Rate Unit	Timing†	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated check				54.8 *b*	61.9 *a*	33.4 *b*	51.0 *a*	22.5 *a*	11.2 *a*	3.5 *a*	2.45 *a*
Miravis Ace	13.7	fl oz/A	FK10.5	56.2 *ab*	62.0 *a*	34.7 *a*	31.5 *ab*	12.5 *a*	3.8 *b*	1.3 *b*	1.58 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	59.0 *a*	62.2 *a*	34.3 *ab*	20.5 *b*	13.0 *a*	2.7 *b*	0.5 *b*	1.25 *a*
Miravis Ace	13.7	fl oz/A	4DAA	59.2 *a*	62.6 *a*	34.2 *ab*	39.5 *ab*	13.8 *a*	5.1 *ab*	0.3 *b*	1.50 *a*
Prosaro	6.5	fl oz/A	FK10.5.1	58.1 *ab*	61.8 *a*	33.4 *ab*	30.5 *ab*	17.7 *a*	5.4 *ab*	1.0 *b*	0.88 *a*
Caramba	10	fl oz/A	FK10.5.1	60.7 *a*	62.2 *a*	34.2 *ab*	42.0 *ab*	18.3 *a*	7.4 *ab*	1.0 *b*	1.00 *a*

†FK = Feekes growth stage, 10.5 = heading, 10.5.1 = early flowering/anthesis, 4DAA = 4 days after anthesis.
‡Means followed by the same letter are not significantly different, p≤0.05

Table 1.2 Fusarium head blight (FHB) Study I: Evaluation of Miravis Ace applied at different spring wheat growth stages at Volga research farm in 2020.

Treatment	Rate	Rate Unit	Timing†	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Flag leaf disease (%)
UTC				52.9 *a*	59.2 *a*	32.9 *ab*	36.5 *a*	13.0 *a*	4.7 *a*	3.0 *a*	4.3 *a*
Miravis Ace	13.7	fl oz/A	FK10.5	51.0 *a*	60.3 *a*	33.0 *ab*	9.5 *b*	11.8 *a*	1.0 *b*	1.8 *b*	0.8 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	52.0 *a*	58.3 *a*	32.0 *b*	12.5 *b*	11.1 *a*	1.7 *b*	1.3 *b*	0.8 *a*
Miravis Ace	13.7	fl oz/A	4DAA	53.9 *a*	57.4 *a*	34.5 *a*	10.5 *b*	13.4 *a*	1.4 *b*	1.8 *b*	1.3 *a*
Prosaro	6.5	fl oz/A	FK10.5.1	50.8 *a*	58.4 *a*	32.4 *b*	7.5 *b*	8.4 *a*	1.0 *b*	1.8 *b*	0.8 *a*
Caramba	10	fl oz/A	FK10.5.1	55.5 *a*	59.8 *a*	33.3 *ab*	14.0 *b*	10.2 *a*	1.7 *b*	1.0 *b*	2.0 *a*

†FK = Feekes growth stage, 10.5 = heading, 10.5.1 = early flowering/anthesis, 4DAA = 4 days after anthesis.
‡Means followed by the same letter are not significantly different, p≤0.05

Cultivar: RB07
Previous Crop: Corn
Planted: 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 2.1. Fusarium head blight Study (FHB) II: Evaluation of new FHB fungicides in hard red spring wheat applied at different wheat growth stages at Northeast research farm.

Treatment[†]	Rate	Rate unit	Timing[‡]	Yield[§] (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severe (%)	FHB index (%)	Fusarium damaged kernel (%)	Leaf spot (%)
Untreated				60.2 *a*	59.1 *b*	35.3 *a*	48.0 *a*	24.9 *a*	11.9 *a*	1 *a*	2.4 *ab*
Product A	7.3	fl oz/A	FK10.5	62.3 *a*	60.6 *a*	36.5 *a*	40.5 *abc*	14.6 *b*	5.9 *b*	1 *a*	2.3 *ab*
Product A	7.3	fl oz/A	FK10.5.1	61.5 *a*	60.0 *ab*	36.1 *a*	37.0 *abc*	13.4 *b*	5.1 *b*	0 *a*	6.0 *a*
Product A	7.3	fl oz/A	FK10.5.3	62.2 *a*	59.8 *ab*	36.4 *a*	43.0 *ab*	16.8 *ab*	7.3 *ab*	1 *a*	2.7 *ab*
Miravis Ace	13.7	fl oz/A	FK10.5	63.8 *a*	59.7 *ab*	35.6 *a*	18.0 *c*	11.8 *b*	2.4 *b*	0 *a*	0.5 *b*
Miravis Ace	13.7	fl oz/A	FK10.5.1	63.9 *a*	59.9 *ab*	36.4 *a*	20.0 *bc*	11.6 *b*	2.4 *b*	1 *a*	1.2 *b*
Miravis Ace	13.7	fl oz/A	FK10.5.3	59.1 *a*	60.0 *ab*	36.0 *a*	30.5 *abc*	19.4 *ab*	6.1 *b*	0 *a*	0.7 *b*
Caramba	13.5	fl oz/A	FK10.5.1	61.5 *a*	59.5 *b*	35.4 *a*	33.0 *abc*	14.7 *b*	4.8 *b*	1 *a*	1.1 *b*
Product A	7.3	fl oz/A	FK10.5.1	61.8 *a*	59.6 *ab*	36.0 *a*	42.0 *ab*	13.4 *b*	5.8 *b*	1 *a*	1.9 *b*

[†]Product A = Experimental product A
[‡]FK = Feekes growth stage, 10.5 = complete heading, 10.5.1 = early flowering/anthesis, 10.5.3 = full anthesis
[§]Means followed by the same letter are not significantly different, p≤0.05

Table 2.2. Fusarium head blight Study (FHB) II: Evaluation of new FHB fungicides in hard red spring wheat applied at different wheat growth stages at Volga research farm.

Treatment[†]	Rate	Rate unit	Timing[‡]	Yield[§] (bu/A)	Test Weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severe (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated				60.8 *b*	55.7 a	32.7 *abc*	67.0 *a*	27.9 *a*	18.3 *a*	7.3 *a*	2.6 *a*
Product A	7.3	fl oz/A	FK10.5	67.6 *ab*	58.2 a	33.4 *ab*	36.0 *b*	15.5 *ab*	5.8 *b*	1.8 *ab*	0.3 *b*
Product A	7.3	fl oz/A	FK10.5.1	65.4 *ab*	57.4 a	33.3 *ab*	35.0 *b*	23.3 *ab*	7.7 *b*	2.3 *ab*	1.1 *ab*
Product A	7.3	fl oz/A	FK10.5.3	64.1 *ab*	57.1 a	31.9 *bc*	48.5 *ab*	12.8 *b*	6.2 *b*	2.3 *ab*	2.1 *ab*
Miravis Ace	13.7	fl oz/A	FK10.5	70.0 *ab*	58.0 a	33.5 *ab*	33.0 *b*	17.2 *ab*	6.1 *b*	2.5 *ab*	0.3 *b*
Miravis Ace	13.7	fl oz/A	FK10.5.1	69.4 *ab*	58.8 a	34.0 *a*	25.5 *b*	11.6 *b*	3.1 *b*	0.5 *b*	0.1 *b*
Miravis Ace	13.7	fl oz/A	FK10.5.3	72.2 *a*	57.8 a	33.2 *abc*	34.5 *b*	15.3 *ab*	5.4 *b*	1.5 *ab*	0.9 *ab*
Caramba	13.5	fl oz/A	FK10.5.1	73.4 *a*	55.8 a	31.3 *c*	34.0 *b*	16.7 *ab*	5.8 *b*	0.8 *b*	0.4 *ab*
Product A	7.3	fl oz/A	FK10.5.1	70.7 *a*	58.1 a	34.0 *a*	33.5 *b*	21.2 *ab*	7.4 *b*	4.0 *ab*	0.2 *b*

[†]Product A = Experimental product A
[‡]FK = Feekes growth stage, 10.5 = complete heading, 10.5.1 = early flowering/anthesis, 10.5.3 = full anthesis
[§]Means followed by the same letter are not significantly different, p≤0.05

Cultivar: RB07
Previous Crop: Corn
Planted: 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 3.1. Fusarium head blight (FHB) III: Evaluation of commercial fungicides and an experimental fungicide 'A' applied at early flowering to manage FHB at Northeast research farm in 2020.

Treatment[†]	Rate	Rate unit	Timing[‡]	Yield[§] (bu/A)	Test weight (lb/bu)	1000 Kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated check				58.3 *a*	59.6 *ab*	34.0 *a*	41.0 *a*	23.6 *a*	9.4 *a*	3.0 *a*	2.9 *a*
Product A	7.3	fl oz/A	FK 10.5.1	59.6 *a*	59.6 *ab*	34.1 *a*	34.5 *ab*	18.6 *abc*	6.7 *ab*	0.8 *b*	0.4 *b*
Nexicor	4.25	f oz/A	FK 4-6	61.0 *a*	59.5 *b*	34.6 *a*	34.5 *ab*	15.0 *abc*	5.7 *abc*	1.0 *b*	0.3 *b*
Product A	7.3	fl oz/A	FK 10.5.1								
Nexicor	8	fl oz/A	FK 8-9	63.8 *a*	59.8 *ab*	34.3 *a*	26.5 *abc*	15.4 *abc*	4.0 *bcd*	0.5 *b*	0.3 *b*
Product A	7.3	fl oz/A	FK 10.5.1								
Nexicor	4.25	fl oz/A	FK 4-6	62.0 *a*	59.6 *ab*	34.5 *a*	27.0 *abc*	19.5 *ab*	5.3 *abc*	0.5 *b*	0.7 *b*
Nexicor	8	fl oz/A	FK 8-9								
Product A	7.3	fl oz/A	FK 10.5.1								
Prosaro XTR	6.5	fl oz/A	FK 10.5.1	61.1 *a*	59.5 *b*	34.3 *a*	18.0 *bc*	15.1 *abc*	2.6 *cd*	0.8 *b*	0.6 *b*
Stratego YLD	4	fl oz/A	FK 4-6	61.6 *a*	59.5 *b*	34.7 *a*	18.0 *bc*	14.4 *abc*	2.6 *cd*	0.5 *b*	0.3 *b*
Prosaro 421 SC	6.5	fl oz/A	FK 10.5.1								
Miravis Ace	13.7	fl oz/A	FK 10.5.1	59.8 *a*	60.1 *a*	34.4 *a*	14.0 *c*	10.8 *c*	1.5 *d*	0.8 *b*	0.3 *b*
Trivapro	9.4	fl oz/A	FK 4-6	60.8 *a*	59.9 *ab*	34.8 *a*	20.0 *bc*	12.9 *bc*	2.4 *cd*	0.5 *b*	0.6 *b*
Miravis Ace	13.7	fl oz/A	FK 10.5.1								

[†]Product A = Experimental product A
[‡]FK = Feekes growth stage, 4 - 6 = stem elongation, 8 – 9 = flag leaf, 10.5.1 = early flowering/anthesis
[§]Means followed by the same letter are not significantly different, p≤0.05

Table 3.2. Fusarium head blight (FHB) III: Evaluation of commercial fungicides and an experimental fungicide 'A' applied at early flowering to manage FHB at Volga research farm in 2020.

Treatment†	Rate	Rate unit	Timing‡	Yield (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated check				57.7 *b*	58.8 *a*	31.5 *a*	73.5 *a*	22.6 *a*	15.4 *a*	10.0 *a*	4.1 *ab*
Product A	7.3	fl oz/A	FK 10.5.1	61.6 *ab*	58.9 *a*	31.4 *a*	67.5 *ab*	12.4 *b*	8.3 *b*	5.0 *b*	9.4 *a*
Nexicor	4.25	f oz/A	FK 4-6	62.9 *ab*	58.3 *a*	31.4 *a*	32.0 *c*	14.1 *ab*	4.3 *bc*	3.8 *b*	3.9 *ab*
Product A	7.3	fl oz/A	FK 10.5.1								
Nexicor	8	fl oz/A	FK 8-9	64.3 *a*	58.6 *a*	32.3 *a*	41.5 *bc*	10.4 *b*	4.7 *bc*	2.0 *b*	3.2 *ab*
Product A	7.3	fl oz/A	FK 10.5.1								
Nexicor	4.25	fl oz/A	FK 4-6	64.5 *a*	60.3 *a*	33.5 *a*	33.0 *c*	9.4 *b*	3.3 *bc*	1.8 *b*	3.0 *ab*
Nexicor	8	fl oz/A	FK 8-9								
Product A	7.3	fl oz/A	FK 10.5.1								
Prosaro XTR	6.5	fl oz/A	FK 10.5.1	65.1 *a*	59.1 *a*	33.2 *a*	27.0 *c*	9.1 *b*	2.6 *c*	1.8 *b*	1.8 *b*
Stratego YLD	4	fl oz/A	FK 4-6	63.5 *a*	59.0 *a*	31.7 *a*	26.0 *c*	9.8 *b*	2.6 *c*	2.0 *b*	3.0 *ab*
Prosaro 421 SC	6.5	fl oz/A	FK 10.5.1								
Miravis Ace	13.7	fl oz/A	FK 10.5.1	65.0 *a*	59.6 *a*	33.2 *a*	27.5 *c*	9.5 *b*	2.7 *c*	1.0 *b*	3.3 *ab*
Trivapro	9.4	fl oz/A	FK 4-6	64.5 *a*	61.2 *a*	33.0 *a*	28.5 *c*	9.5 b	2.9 *c*	1.0 *b*	2.4 *ab*
Miravis Ace	13.7	fl oz/A	FK 10.5.1								

†Product A = Experimental product A

‡FK = Feekes growth stage, 4 - 6 = stem elongation, 8 – 9 = flag leaf, 10.5.1 = early flowering/anthesis

§Means followed by the same letter are not significantly different, p≤0.05

Cultivar: RB07
Previous Crop: Corn
Planted: 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 4.1. Fusarium head blight (FHB) IV: Evaluation of commercial and experimental fungicides for FHB managent at Northeast research farm in 2020.

Treatment†	Rate	Rate Unit	Timing	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated check				59.1 *a*	63.1 *a*	34.7 *a*	24 *a*	20.7 *a*	4.9 *a*	2.8 *a*	1.1 *a*
Proline 480 SC	5.7	fl oz/A	Anthesis	61.6 *a*	63.5 *a*	35.2 *a*	13 *a*	23.4 *a*	2.6 *a*	0.8 *a*	1.1 *a*
Product A	10.9	fl oz/A	Anthesis	60.3 *a*	62.4 *a*	35.4 *a*	12 *a*	26.9 *a*	1.7 *a*	0.8 *a*	1.4 *a*
Caramba	17	fl oz/A	Anthesis	61.5 *a*	62.7 *a*	34.2 *a*	19 *a*	20.4 *a*	3.6 *a*	1.5 *a*	0.7 *a*
Miravis Ace	13.7	fl oz/A	Anthesis	58.9 *a*	62.7 *a*	35.8 *a*	8 *a*	2.1 *a*	0.7 *a*	0.3 *a*	1.2 *a*
Prosaro 421 SC	8.2	fl oz/A	Anthesis	59.6 *a*	62.3 *a*	35.4 *a*	11.5 *a*	12.4 *a*	1.8 *a*	0.5 *a*	1.7 *a*
Tilt	4	fl oz/A	Anthesis	61.8 *a*	62.9 *a*	35.3 *a*	10 *a*	10.3 *a*	2.1 *a*	0.5 *a*	1.2 *a*
Product B	10.9	fl oz/A	Anthesis	62.4 *a*	62.7 *a*	35.5 *a*	15 *a*	20.1 *a*	3.3 *a*	1.3 *a*	0.9 *a*

†Product A, Product B = Experimental products A and B
‡Means followed by the same letter are not significantly different, p≤0.05

Table 4.2. Fusarium head blight (FHB) IV: Evaluation of commercial and experimental fungicides for FHB managent at Volga research farm in 2020.

Treatment†	Rate	Rate Unit	Timing	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated check				51.5 *a*	56.7 *b*	30.8 *a*	32.5 *a*	23.1 *a*	7.6 *a*	5.5 *a*	0.9 *a*
Proline 480 SC	5.7	fl oz/A	Anthesis	57.8 *a*	56.8 *b*	31.7 *a*	12.5 *b*	11.8 *a*	1.5 *b*	1.8 *b*	0.4 *a*
Product A	10.9	fl oz/A	Anthesis	57.7 *a*	58.1 *ab*	32.1 *a*	14.5 *b*	13.3 *a*	2.0 *b*	1.0 *b*	0.2 *a*
Caramba	17	fl oz/A	Anthesis	57.1 *a*	58.1 *ab*	32.5 *a*	12.5 *b*	27.5 *a*	3.1 *b*	2.0 *b*	0.4 *a*
Miravis Ace	13.7	fl oz/A	Anthesis	57.8 *a*	60.5 *a*	33.0 *a*	11.0 *b*	12.6 *a*	1.5 *b*	1.3 *b*	1.0 *a*
Prosaro 421 SC	8.2	fl oz/A	Anthesis	57.6 *a*	59.6 *ab*	32.1 *a*	9.0 *b*	10.7 *a*	1.2 *b*	1.0 *b*	0.6 *a*
Tilt	4	fl oz/A	Anthesis	57.3 *a*	57.3 *ab*	31.7 *a*	14.0 *b*	15.1 *a*	2.0 *b*	1.3 *b*	0.8 *a*
Product B	10.9	fl oz/A	Anthesis	56.6 *a*	58.2 *ab*	32.4 *a*	13.5 *b*	14.6 *a*	2.1 *b*	1.8 *b*	1.2 *a*

†Product A, Product B = Experimental products A and B
‡Means followed by the same letter are not significantly different, p≤0.05

Cultivar: RB07
Previous Crop: Corn
Planted: 05/01/2020 (Volga)

Table 5. Fusarium head blight (FHB) V: Evaluation of commercial and experimental fungicides at flag leaf and early flowering for FHB managent at Volga research farm in 2020.

Treatment[†]	Rate	Rate unit	Timing	Yield[‡] (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated				59.4 *c*	51.4 *ab*	29.8 *b*	72.0 *a*	20.3 *a*	14.5 *a*	6.5 *a*	4.0 *a*
Caramba	13.5	fl oz/A	Anthesis	63.8 *abc*	59.3 *a*	33.4 *a*	34.0 *bc*	12.5 *bc*	4.4 *bc*	4.0 *ab*	2.2 *ab*
HM1939	2.5	pt/A	Flag leaf	64.3 *ab*	50.0 *b*	30.5 *ab*	55.5 *ab*	12.7 *bc*	7.0 *b*	3.5 *ab*	3.9 *a*
Miravis Ace	13.7	fl oz/A	Anthesis	63.3 *abc*	59.5 *a*	33.2 *a*	33.5 *bc*	11.8 *bc*	3.9 *bc*	1.8 *b*	2.0 *ab*
Miravis Ace	11.0	fl oz/A	Anthesis	63.6 *abc*	59.4 *a*	32.7 *ab*	49.0 *abc*	12.6 *bc*	6.2 *bc*	2.0 *b*	2.4 *ab*
Prosaro	6.5	fl oz/A	Anthesis	64.4 *ab*	59.2 *a*	32.7 *ab*	37.0 *bc*	11.4 *c*	4.2 *bc*	3.0 *ab*	2.1 *ab*
Prosaro	8.2	fl oz/A	Anthesis	65.8 *a*	53.3 *ab*	31.9 *b*	26.5 *c*	10.2 *c*	2.7 *c*	0.5 *b*	0.2 *b*
Product A	13.7	fl oz/A	Anthesis	63.3 *abc*	59.4 *a*	33.2 *a*	32.0 *bc*	10.8 *c*	3.5 *c*	3.0 *ab*	3.2 *ab*
Product A	10.4	fl oz/A	Anthesis	60.8 *bc*	58.8 *a*	33.4 *a*	43.0 *bc*	17.2 *ab*	7.3 *b*	2.3 *b*	1.9 *ab*
Viathon	1.0	qt/A	Anthesis	66.1 *a*	54.4 *ab*	32.0 *ab*	31.5 *bc*	9.3 *c*	3.0 *c*	0.8 *b*	1.3 *ab*

[†]Product A = Experimental products A
[‡]Means followed by the same letter are not significantly different, p≤0.05

Cultivar: Samson
Previous Crop: Soybean (Brookings), Corn (Northeast and Volga)
Planted: Brookings (05/29/2020), 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 6.1. Uniform Fungicide: Efficacy of Miravis Ace applied at early heading (Feekes 10.3), early flowering (Feekes 10.5.1) compared with Caramba and Prosaro applied at early flowering and in sequential combinations following Miravis Ace application to manage FHB at Brookings research farm in 2020.

Treatment	Rate	Rate Unit	Timing†	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated				46.1 *b*	51.9 *d*	33.9 *b*	60.7 *a*	31.4 *a*	17.1 *a*	21.5 *a*	6.1 *a*
Prosaro	6.5	fl oz/A	FK10.5.1	51.6 *ab*	52.9 *cd*	34.7 *ab*	27.7 *b*	13.2 *b*	3.9 *b*	4.7 *b*	5.1 *a*
Caramba	13.5	fl oz/A	FK10.5.1	56.9 *a*	53.5 *bcd*	34.8 *ab*	28.2 *b*	11.2 *b*	3.4 *b*	9.1 *b*	4.5 *a*
Miravis Ace	13.7	fl oz/A	FK10.3	54.4 *ab*	55.7 *abc*	35.7 *ab*	14.5 *b*	10.4 *b*	1.5 *b*	2.6 *b*	3.6 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	58.0 *a*	55.9 *abc*	35.8 *ab*	12.0 *b*	11.0 *b*	1.5 *b*	7.9 *b*	4.9 *a*
Miravis Ace	13.7	fl oz/A	D4-6:FK10.51	54.3 *ab*	54.4 *abcd*	35.8 *ab*	22.7 *b*	10.1 *b*	2.3 *b*	3.2 *b*	8.1 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	58.2 *a*	56.9 *a*	36.2 *a*	9.2 *b*	8.7 *b*	0.8 *b*	1.2 *b*	4.3 *a*
Caramba	13.5	fl oz/A	D4-6:FK10.51								
Miravis Ace	13.7	fl oz/A	FK10.5.1	55.6 *a*	56.6 *ab*	35.8 *ab*	14.5 *b*	10.5 *b*	1.6 *b*	0.9 *b*	3.8 *a*
Prosaro	6.5	fl oz/A	D4-6:FK10.51								
Miravis Ace	13.7	fl oz/A	FK10.5.1	56.8 *a*	56.3 *ab*	35.4 *ab*	14.8 *b*	10.1 *b*	1.6 *b*	2.7 *b*	4.2 *a*
Tebuconazole	4.0	fl oz/A	D4-6:FK10.51								

†FK = Feekes growth stage, 4 - 6 = stem elongation, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis
‡Means followed by the same letter are not significantly different, p≤0.05

Table 6.2. Uniform Fungicide: Efficacy of Miravis Ace applied at early heading (Feekes 10.3), early flowering (Feekes 10.5.1) compared with Caramba and Prosaro applied at early flowering and in sequential combinations following Miravis Ace application to manage FHB at Northeast research farm in 2020.

Treatment	Rate	Rate Unit	Timing†	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated				55.4 *a*	59.6 *a*	36.3 *a*	23 *a*	23.4 a	5.9 *a*	1.3 *a*	3.7 *a*
Prosaro	6.5	fl oz/A	FK10.5.1	60.0 *a*	60.7 *a*	35.9 *a*	13 *ab*	18.3 a	2.7 *ab*	0.8 *ab*	2.0 *a*
Caramba	13.5	fl oz/A	FK10.5.1	55.4 *a*	60.5 *a*	36.7 *a*	15 *ab*	12.9 a	2.0 *ab*	1.0 *ab*	3.0 *a*
Miravis Ace	13.7	fl oz/A	FK10.3	62.2 *a*	60.1 *a*	36.6 *a*	7 *b*	11.3 a	1.1 *b*	0.0 *b*	2.5 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	60.6 *a*	60.6 *a*	35.8 *A*	4 *b*	25.4 a	1.1 *b*	0.5 *ab*	3.2 *a*
Miravis Ace	13.7	fl oz/A	D4-6:FK10.5.1	60.2 *a*	60.5 *a*	36.2 *a*	15 *ab*	21.9 a	2.9 *ab*	0.0 *b*	1.5 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	58.6 *a*	61.1 *a*	36.3 *a*	5 *b*	21.8 a	1.0 *b*	0.3 *ab*	1.3 *a*
Caramba	13.5	fl oz/A	D4-6:FK10.5.1								
Miravis Ace	13.7	fl oz/A	FK10.5.1	58.6 *a*	61.0 *a*	35.9 *a*	10 *ab*	16.2 a	2.2 *ab*	0.3 *ab*	1.2 *a*
Prosaro	6.5	fl oz/A	D4-6:FK10.5.1								
Miravis Ace	13.7	fl oz/A	FK10.5.1	61.2 *a*	61.0 *a*	36.3 *a*	9 *ab*	13.5 a	1.3 *b*	0.3 *ab*	1.7 *a*
Tebuconazole	4	fl oz/A	D4-6:FK10.5.1								

†FK = Feekes growth stage, 4 - 6 = stem elongation, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis

‡Means followed by the same letter are not significantly different, p≤0.05

Table 6.3. Uniform Fungicide: Efficacy of Miravis Ace applied at early heading (Feekes 10.3), early flowering (Feekes 10.5.1) compared with Caramba and Prosaro applied at early flowering and in sequential combinations following Miravis Ace application to manage FHB at Volga research farm in 2020.

Treatment	Rate	Rate Unit	Timing†	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated				28.2 *a*	53.0 *b*	30.9 *a*	54.7 *a*	32.1 *a*	17.8 *a*	13.6 *a*	5.0 *a*
Prosaro	6.5	fl oz/A	FK10.5.1	30.6 *a*	55.1 *ab*	31.5 *a*	20.2 *c*	11.9 *b*	2.3 *b*	4.1 *b*	3.2 *a*
Caramba	13.5	fl oz/A	FK10.5.1	36.4 *a*	55.6 *ab*	31.8 *a*	30.7 *bc*	24.5 *ab*	7.8 *b*	7.6 *ab*	3.7 *a*
Miravis Ace	13.7	fl oz/A	FK10.3	38.9 *a*	58.2 *a*	33.3 *a*	18.0 *c*	13.8 *b*	2.5 *b*	5.4 *b*	3.5 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	34.7 *a*	57.9 *ab*	32.2 *a*	15.0 *c*	13.0 *b*	2.2 *b*	4.2 *b*	1.0 *a*
Miravis Ace	13.7	fl oz/A	D4-6:FK10.51	31.6 *a*	53.5 *ab*	30.9 *a*	43.7 *ab*	21.8 *ab*	9.7 *ab*	6.6 *ab*	3.0 *a*
Miravis Ace	13.7	fl oz/A	FK10.5.1	36.4 *a*	56.2 *ab*	32.3 *a*	14.2 *c*	10.7 *b*	1.3 *b*	4.1 *b*	3.2 *a*
Caramba	13.5	fl oz/A	D4-6:FK10.51								
Miravis Ace	13.7	fl oz/A	FK10.5.1	38.3 *a*	58.0 *ab*	33.2 *a*	15.0 *c*	10.0 *b*	1.5 *b*	3.4 *b*	4.5 *a*
Prosaro	6.5	fl oz/A	D4-6:FK10.51								
Miravis Ace	13.7	fl oz/A	FK10.5.1	33.2 *a*	57.0 *ab*	32.3 *a*	25.5 *bc*	15.9 *b*	5.7 *b*	3.2 *b*	3.7 *a*
Tebuconazole	4.0	fl oz/A	D4-6:FK10.51								

†FK = Feekes growth stage, 4 - 6 = stem elongation, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis

‡Means followed by the same letter are not significantly different, p≤0.05

Previous Crop: Soybean (Brookings), Corn (Northeast and Volga)
Planted: 05/29/2020 (Brookings), 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 7.1. Integrated Fusarium head blight (FHB) Management: Efficacy of Miravis at early heading (Feekes 10.3) and early flowering (Feekes 10.5.1) in comparison to Prosaro at early flowering for FHB management at Brookings research farm.

Treatment	Rate	Rate Unit	Timing†	Cultivar	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated, inoculated				Boost	50.0 *g*	52.1 *gh*	32.6 *d*	47.0 *ab*	14.5 *cd*	6.7 *bc*	7.0 *abc*	4.5 *defg*
Prosaro	6.50	fl oz/A	FK 10.5.1	Boost	60.9 *abc*	56.0 *abcde*	35.3 *ab*	18.0 *def*	9.6 *d*	1.7 *defg*	0.8 *de*	3.6 *efg*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Boost	59.9 *abcd*	57.6 *ab*	35.6 *a*	14.5 *defg*	8.7 *d*	1.3 *fg*	0.8 *de*	2.8 *fg*
Miravis Ace	13.70	fl oz/A	FK 10.3	Boost	62.2 *abc*	57.9 *a*	36.0 *a*	8.0 *efg*	5.7 *d*	0.6 *fg*	0.5 *de*	1.2 *g*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Boost								
Tebuconazole	4.00	fl oz/A	D4-6:FK10.5.1	Boost	60.5 *abc*	57.8 *a*	35.9 *a*	13.5 *defg*	7.6 *d*	1.1 *fg*	0.0 *e*	2.5 *fg*
Untreated, non-inoculated				Boost	53.1 *efg*	52.9 *efgh*	33.6 *bcd*	41.0 *bc*	13.5 *cd*	5.7 *bcd*	7.5 *ab*	4.3 *efg*
Untreated, inoculated				Brick	51.3 *g*	54.1 *cdefg*	34.9 *abca*	28.0 *cd*	46.6 *a*	12.8 *a*	6.8 *abc*	17.3 *a*
Prosaro	6.50	fl oz/A	FK 10.5.1	Brick	53.9 *efg*	53.4 *defgh*	34.6 *abc*	16.0 *defg*	23.8 *bc*	3.8 *cdefg*	4.5 *abcbde*	11.8 *b*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Brick	57.1 *cdef*	55.3 *abcdef*	35.6 *a*	6.0 *fg*	11.1 *d*	0.6 *fg*	2.0 *bcde*	7.1 *bcdef*
Miravis Ace	13.70	fl oz/A	FK 10.3	Brick	60.6 *abc*	54.3 *bcdefg*	35.5 *a*	7.5 *efg*	10.6 *d*	1.0 *fg*	1.5 *cde*	9.3 *bcd*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Brick								
Tebuconazole	4.00	fl oz/A	D4-6:FK10.5.1	Brick	58.3 *bcde*	57.4 *abc*	36.3 *a*	2.5 *g*	8.8 *d*	0.2 *g*	1.0 *de*	8.3 *bcde*
Untreated, non-inoculated				Brick	51.8 *fg*	56.5 *abcd*	35.2 *abc*	19.5 *def*	23.3 *bc*	5.2 *bcde*	3.0 *bcde*	11.4 *b*
Untreated, inoculated				Samson	54.2 *efg*	50.3 *h*	32.3 *d*	60.5 *a*	27.0 *b*	16.0 *a*	8.8 *a*	10.9 *b*
Prosaro	6.50	fl oz/A	FK 10.5.1	Samson	63.1 *ab*	52.2 *fgh*	33.6 *bcd*	26.5 *cd*	13.9 *cd*	4.3 *bcde*	2.0 *bcde*	10.4 *bc*
Miravis Ace	13.70	fl oz/A	FK 10.3	Samson	64.9 *a*	56.1 *abcde*	34.9 *abc*	15.5 *defg*	13.7 *cd*	2.8 *cdefg*	4.0 *abcde*	5.6 *cdefg*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Samson	59.9 *abcd*	55.6 *abcdef*	35.0 *abac*	22.5 *de*	8.4 *d*	2.0 *defg*	6.0 *abcd*	4.9 *defg*
Miravis Ace	13.70	fl oz/A	FK 10.5.1	Samson								
Tebuconazole	4.00	fl oz/A	D4-6:FK10.5.1	Samson	64.5 *a*	55.9 *abcde*	34.7 *abc*	9.5 *efg*	11.1 *d*	1.4 *efg*	2.3 *bcde*	6.9 *bcdef*
Untreated, non-inoculated				Samson	54.9 *defg*	51.9 *gh*	33.3 *cd*	51.0 *ab*	15.4 *cd*	7.7 *b*	6.0 *abcd*	10.6 *b*

†FK = Feekes growth stage, 10.3 = early heading, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis
‡Means followed by the same letter are not significantly different, p≤0.05

Table 7.2. Integrated Fusarium head blight (FHB) Management: Efficacy of Miravis at early heading (Feekes 10.3) and early flowering (Feekes 10.5.1) in comparison to Prosaro at early flowering for FHB management at Northeast research farm.

Treatment	Rate	Rate Unit	Timing[†]	Cultivar	Yield[‡] (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated, non-inoculated				Boost	56.3 *efgh*	59.0 *a*	36.3 *cd*	2.5 *d*	18.75 *bcd*	0.56 d	0.25 *b*	0.85 *abc*
Prosaro	6.5	fl oz/A	FK 10.5.1	Boost	58.4 *cdef*	52.0 *b*	36.6 *bcd*	3.5 *d*	9.69 *cd*	0.53 d	0.25 *b*	0.18 *bc*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Boost	57.2 *defg*	59.2 *a*	37.1 *abcd*	0.5 *d*	1.75 *d*	0.04 d	0.00 *b*	0.00 *c*
Miravis Ace	13.7	fl oz/A	FK 10.3	Boost	59.8 *cde*	59.2 *a*	37.4 *abc*	0.0 *d*	0.00 *d*	0.00 d	0.00 *b*	0.00 *c*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Boost								
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1	Boost	56.9 *defg*	59.0 *a*	36.9 *bcd*	0.5 *d*	1.75 *d*	0.04 d	0.00 *b*	0.00 *c*
Untreated, non-inoculated				Boost	56.6 *efg*	59.1 *a*	36.1 *d*	2.5 *d*	6.71 *d*	0.35 d	0.25 *b*	0.00 *c*
Untreated, non-inoculated				Brick	53.4 *gh*	60.3 *a*	37.3 *abc*	2.5 *d*	49.08 *ab*	1.15 cd	0.75 *ab*	2.88 *a*
Prosaro	6.5	fl oz/A	FK 10.5.1	Brick	56.0 *efgh*	59.9 *a*	37.1 *abcd*	2.5 *d*	20.58 *bcd*	0.82 d	0.25 *b*	2.45 *a*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Brick	55.2 *fgh*	60.6 *a*	38.2 *a*	0.5 *d*	1.75 *d*	0.04 d	0.50 *b*	2.45 *a*
Miravis Ace	13.7	fl oz/A	FK 10.3	Brick	54.8 *fgh*	60.0 *a*	37.3 *abc*	1.5 *d*	30.25 *abcd*	0.61 d	0.50 *b*	1.35 *abc*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Brick								
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1	Brick	56.1 *efgh*	59.5 *a*	37.6 *ab*	0.5 *d*	5.25 *d*	0.11 d	0.25 *b*	1.83 *abc*
Untreated, non-inoculated				Brick	52.6 *h*	60.0 *a*	36.2 *cd*	2.5 *d*	28.13 *abcd*	1.06 d	0.75 *ab*	2.33 *ab*
Untreated, non-inoculated				Samson	59.5 *cde*	59.0 *a*	36.3 *cd*	16.0 *a*	55.90 *a*	8.91 a	0.75 *ab*	1.75 *abc*
Prosaro	6.5	fl oz/A	FK 10.5.1	Samson	62.1 *abc*	59.1 *a*	36.5 *bcd*	9.5 *c*	52.97 *a*	5.21 b	0.00 *b*	2.08 *abc*
Miravis Ace	13.7	fl oz/A	FK 10.3	Samson	64.1 *ab*	59.3 *a*	37.3 *abcd*	8.5 *c*	42.03 *ab*	3.59 bc	0.25 *b*	0.75 *abc*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Samson	65.2 *a*	59.3 *a*	36.9 *bcd*	11.0 *bc*	40.22 *abc*	3.99 b	0.25 *b*	2.38 *ab*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Samson								
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1	Samson	60.8 *bcd*	59.2 *a*	36.1 *d*	9.0 *c*	41.18 *ab*	4.01 b	0.50 *b*	1.50 *abc*
Untreated, non-inoculated				Samson	59.1 *cde*	59.2 *a*	36.6 *bcd*	15.0 *ab*	56.07 *a*	9.03 a	1.50 *a*	2.58 *a*

[†]FK = Feekes growth stage, 10.3 = early heading, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis

[‡]Means followed by the same letter are not significantly different, p≤0.05

Table 7.3. Integrated Fusarium head blight (FHB) Management: Efficacy of Miravis at early heading (Feekes 10.3) and early flowering (Feekes 10.5.1) in comparison to Prosaro at early flowering for FHB management at Volga research farm.

Treatment	Rate	Rate Unit	Timing†	Cultivar	Yield‡ (bu/A)	Test weight (lb/bu)	1000 kernel weight (g)	FHB incidence (%)	FHB severity (%)	FHB index (%)	Fusarium damaged kernels (%)	Leaf spot (%)
Untreated, inoculated				Boost	39.5 *def*	56.7 *abc*	34.3 *abc*	37.0 *ab*	17.3 *bc*	6.5 *b*	3.0 *bc*	13.7 *bcd*
Prosaro	6.5	fl oz/A	FK 10.5.1	Boost	42.2 *bcde*	57.9 *a*	33.8 *bc*	23.0 *cd*	10.2 *ef*	2.4 *cde*	4.5 *bc*	5.0 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Boost	43.6 *abcd*	57.2 *ab*	34.5 *ab*	21.5 *cd*	10.2 *ef*	2.2 *de*	2.0 *bc*	4.4 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.3	Boost	40.0 *cdef*	57.5 *a*	33.1 *bc*	18.0 *def*	10.5 *def*	2.0 *de*	2.0 *bc*	0.1 *d*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Boost	40.0 *cdef*	57.3 *ab*	33.4 *bc*	18.5 *de*	10.9 *def*	2.0 *de*	0.3 *c*	10.1 *bcd*
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1									
Untreated, non-inoculated				Boost	39.6 *def*	56.8 *abc*	33.0 *bc*	34.5 *abc*	14.1 *cdef*	5.1 *bc*	7.5 *bc*	11.1 *bcd*
Untreated, inoculated				Brick	36.8 *f*	55.3 *bcd*	33.9 *bc*	25.5 *bcd*	16.2 *bcd*	4.3 *bcd*	8.8 *b*	46.8 *a*
Prosaro	6.5	fl oz/A	FK 10.5.1	Brick	40.5 *cdef*	57.2 *ab*	34.6 *ab*	10.0 *ef*	13.3 *cdef*	1.2 *e*	4.5 *bc*	12.7 *bcd*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Brick	39.5 *def*	56.9 *abc*	35.7 *a*	10.0 *ef*	9.8 *ef*	1.0 *e*	0.8 *c*	4.2 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.3	Brick	40.4 *cdef*	57.6 *a*	33.8 *bc*	10.5 *ef*	8.2 *f*	0.9 *e*	4.8 *bc*	5.5 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Brick	41.4 *bcdef*	57.1 *ab*	34.8 *ab*	9.0 *f*	8.6 *f*	0.9 *e*	1.5 *bc*	10.6 *bcd*
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1									
Untreated, inoculated				Brick	37.7 *ef*	55.0 *cd*	34.8 *ab*	26.0 *bcd*	13.6 *cdef*	3.5 *cde*	4.0 *bc*	44.6 *a*
Untreated, inoculated				Samson	41.0 *bcdef*	54.4 *d*	33.0 *bc*	46.0 *a*	25.8 *a*	11.2 *a*	23.8 *a*	16.2 *bc*
Prosaro	6.5	fl oz/A	FK 10.5.1	Samson	43.8 *abcd*	58.1 *a*	34.1 *abc*	15.5 *def*	14.1 *cdef*	2.1 *de*	2.3 *bc*	0.6 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.3	Samson	45.7 *ab*	57.6 *a*	34.2 *abc*	14.5 *def*	14.6 *cde*	2.1 *de*	6.3 *bc*	0.6 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Samson	44.6 *abc*	56.8 *abc*	33.8 *bc*	16.5 *def*	12.9 *cdef*	2.0 *de*	2.0 *bc*	0.7 *cd*
Miravis Ace	13.7	fl oz/A	FK 10.5.1	Samson	48.3 *a*	58.2 *a*	33.5 *bc*	14.5 *def*	10.5 *def*	1.5 *e*	5.0 *bc*	1.2 *cd*
Tebuconazole	4.0	fl oz/A	D4-6:FK10.5.1									
Untreated, non-inoculated				Samson	41.4 *bcdef*	56.3 *abcd*	32.5 *c*	44.0 *a*	21.9 *ab*	9.9 *a*	5.0 *bc*	24.5 *b*

†FK = Feekes growth stage, 10.3 = early heading, 10.5.1 = early flowering/anthesis, D4-6:FK10.51 = 4 to 6 days after anthesis
‡Means followed by the same letter are not significantly different, p≤0.05

Previous Crop: Corn
Planted: 04/29/2020 (North Brookings), 05/21/2020 (Northeast), 05/01/2020 (Volga)

Table 8.1. Differences in yield, disease on sampled plants per plot and whole plots disease assessments between Bacterial leaf streak (BLS) inoculated and non-inoculated plots at North Brookings for year 2020.

Cultivar	Yield loss (bu/A)	*P-value*	Sampled plants BLS severity difference (1 – 9)	*P-value*	Lower Odds Ratio	Upper Odds Ratio	Whole plot BLS severity difference (%)	*P-value*	Lower Odds Ratio	Upper Odds Ratio
Brick	-1.73	0.4779	0	0.9699	0.08	11.46	2	0.0964	0.686	98.189
Faller	-2.59	0.2899	1	0.5352	0.18	27.09	1	0.2904	0.324	43.174
Forefront	-1.32	0.5864	3	0.0542	0.95	351.00	2	0.0533	0.966	143.465
Prevail	-1.48	0.5442	3	0.0235	1.52	315.23	1	0.2567	0.355	48.481
SD4011	-3.74	0.1288	3	0.0438	1.08	181.98	2	0.1065	0.646	92.005
SD4741	-1.32	0.5886	3	0.0216	1.63	484.61	1	0.3664	0.268	35.477
Samson	-2.57	0.2922	1	0.2784	0.33	46.59	1	0.3779	0.256	36.457
Select	-4.75	0.0554	1	0.5561	0.17	27.93	2	0.1021	0.663	94.413

Table 8.2. Differences in yield, disease on sampled plants per plot and whole plot disease assessments between Bacterial leaf streak (BLS) inoculated and non-inoculated plots at Northeast research farm (South Shore) in 2020.

Cultivar	Yield Loss (bu/A)	*P-value*	Sampled plants BLS severity difference (1 – 9)	*P-value*	Lower Odds Ratio	Upper Odds Ratio	Whole Plot BLS Severity Difference (%)	*P-value*	Lower Odds Ratio	Upper Odds Ratio
Brick	2.79	0.3117	-0.4	0.7271	0.054	7.65	0.7	0.5820	0.17	22.43
Faller	-4.46	0.1091	0.3	0.8258	0.094	19.28	0.2	0.8891	0.10	13.96
Forefront	-1.44	0.5994	0.6	0.9675	<0.001	>999.99	0.8	0.9649	<0.00	>999.99
Prevail	3.36	0.2246	-0.7	0.9657	<0.001	>999.99	0.1	0.7476	0.13	17.91
SD4011	-0.33	0.9049	0.4	0.7744	0.126	16.155	-0.1	0.9602	0.08	10.66
SD4741	-2.65	0.3363	-1.4	0.3010	0.019	3.43	0.1	0.9241	0.10	13.44
Samson	0.06	0.9825	-2.5	0.0551	0.006	1.056	-0.3	0.7823	0.06	7.97
Select	2.59	0.3482	-1.9	0.1278	0.012	1.75	-1.6	0.2099	0.02	2.42

Table 8.3. Differences in yield, disease on sampled plants per plot and whole plot BLS assessments between Bacterial leaf streak (BLS) inoculated and non-inoculated plots at Volga in 2020.

Cultivar	Yield Loss (bu/A)	*P-value*	Sampled plants BLS Severity difference (1 – 9)	*P-value*	Lower Odds Ratio	Upper Odds Ratio	Whole plot BLS severity difference (%)	*P-value*	Lower Odds Ratio	Upper Odds Ratio
Brick	-4.63	0.1714	2	0.1609	0.49	72.83	1.3	0.2884	0.32	45.74
Faller	-4.31	0.2018	1	0.3701	0.27	34.47	3.2	0.0179	1.72	316.61
Forefront	-3.30	0.3270	4	0.0027	4.26	992.26	2.8	0.0373	1.18	230.92
Prevail	-1.16	0.7284	2	0.0735	0.81	119.97	3.1	0.0202	1.61	287.33
SD4011	-0.29	0.9321	1	0.6396	0.05	6.48	1.2	0.3680	0.25	42.58
SD4741	-4.89	0.1490	3	0.0493	1.01	154.12	3.5	0.0096	2.34	461.60
Samson	-3.31	0.3248	2	0.1733	0.47	64.29	1.4	0.2584	0.35	51.31
Select	-2.68	0.4244	3	0.0224	1.52	239.67	0.8	0.5420	0.18	25.57