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2018 Field Plot Summaries for Wheat Disease Management Trials

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SUMMARY

The wheat disease management field experiments conducted in the 2018 growing season evaluated several experimental and commercially available fungicides for managing foliar, head or root diseases of spring wheat. Foliar and spike/head diseases incidence and severity were assessed. The field experiments were implemented at Volga Research Farm and Northeast Research Farm (NERF) near South Shore, SD. Results of the same experiment may vary between Volga and Northeast due to environmental differences between the two locations.

Generally, the 2018 wheat season was not conducive to foliar fungal disease development because of low moisture before wheat headed out. However, the prediction model for *Fusarium* head blight (FHB) or scab forecasted higher disease severity than the previous two seasons. Overall, the Volga location had more disease severity compared with the NERF location. Bacterial leaf streak incidence was sporadic with low severity early in the season until about flag leaf when severity increased such that plots that were not artificially inoculated got infected regardless. Generally, inoculated plots still had a higher severity rating than the naturally infested plots.

Low disease incidence and severity owing to unfavorable disease conditions resulted in lack of statistically significant differences among fungicide treatments. However, the observed quantitative differences that followed expected patterns may have practical consequences in large scale production. Thus, a grower would almost always choose an extra bushel unless that choice significantly compromises quality particularly if the loss of quality has a substantial negative market value. Overall, where disease pressure was relatively high, fungicide application prevented yield loss.

All fungicides and bactericides used in these studies were approved for use in SD at the time of application. However, some experimental products were also used. Alternative application approaches that are not currently part of the product label such as crop, timing and/or rate were employed for research purposes. Therefore, results from such experimental or research uses should not be considered recommendations until the research is finalized and official recommendations are made. Growers using any chemical products should always consult product labels regarding appropriate use, method of application and rate, handling, safety tips, pre-harvest and re-entry intervals, and any other important information.

ACKNOWLEDGEMENTS

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Hard Red Spring Wheat

FOLIAR DISEASES: Bacterial

1.0 The Effect of Bacterial leaf streak (BLS) on Yield — Aurora, NERF & Volga

The purpose of plant disease management is to protect yield potential. The importance of any disease is determined by its economic impact. The effect of BLS on yield in spring wheat has not been fully investigated. This study was designed to assess the importance of BLS on yield of eight spring wheat cultivars. Two plots of each cultivar were planted side by side where one plot was artificially inoculated with BLS while the other plot was not artificially inoculated. Each pair of such plots was replicated four times at each one of the three locations.

Unfortunately, non-inoculated plots got infected by natural BLS inocula although the level of infection was not the same as in artificially inoculated plots. Since there are no effective bactericides against BLS, this posed a challenge to our experimental design and data analyses. Consequently, there were no statistically significant differences in yield between inoculated and non-inoculated plots across all cultivars at all three locations (Table 1). A Spearman correlation coefficient analysis revealed a negative association between yield and BLS severity at Volga, r = -0.36, p=0.003. A greenhouse run is being conducted where inoculations are better managed.

1.0 The Effect of Bacterial leaf streak (BLS) on Yield — Aurora, NERF & Volga

Cultivars: Several spring wheat cultivars

Previous Crop: Corn

Planted: 05/05/2018 (Aurora) 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 1. Bacterial leaf streak (BLS) Effect on Yield: Evaluation of the effect of BLS on yield in spring wheat at Aurora, Volga and Northeast research farms in SD.

				Aurora		Volga		NERF	
Cultivar	**Compared treatments**			**Yield difference (bu/ac)**	**p-value**	**Yield difference (bu/ac)**	**p-value**	**Yield difference (bu/ac)**	**p-value**
Brick	Inoculated	vs.	Noninoculated	-3.32	0.1860	2.45	0.5032	2.55	0.2953
Faller	Inoculated	vs.	Noninoculated	0.27	0.9072	-0.57	0.8762	-3.08	0.2142
Forefront	Inoculated	vs.	Noninoculated	-2.19	0.3622	2.58	0.4809	-4.58	0.0816
Prevail	Inoculated	vs.	Noninoculated	-0.35	0.8798	-0.82	0.8225	1.98	0.4106
SD 4011	Inoculated	vs.	Noninoculated	-2.41	0.3198	-0.71	0.8450	-1.44	0.5443
SD 4741	Inoculated	vs.	Noninoculated	-0.08	0.9736	0.19	0.9595	-0.77	0.7441
Samson	Inoculated	vs.	Noninoculated	0.30	0.8985	-1.61	0.6589	1.13	0.6322
Select	Inoculated	vs.	Noninoculated	-2.18	0.3658	-3.93	0.2838	-1.44	0.5443

Means followed by the same letter are not significantly different, $p \leq 0.05$

FOLIAR DISEASES: Fungal

2.0 Foliar Fungicide Study I NERF & Volga

The efficacy of integrated disease management approaches to manage spring wheat diseases at NERF and Volga using cultivars, Brick and Samson. The 'treatment applied only if expected disease severity can cause economic loss' is an integrated disease management (IDM) approach. The trial was laid out as a randomized complete block design (RCBD) with a split-plot arrangement where cultivars were main plots and treatments were considered sub-plots.

Different application rates and application times were employed in this study: FK2 (tillering), FK8-9 (flag leaf) and FK10.5.1 (flowering). No significant differences in yield were observed at NERF (Table 2.1), although the observed numerical differences between the untreated and treated plots could have economic impact considering a large-scale production. Within cultivar differences were observed at Volga in the scab susceptible cultivar, Samson, due to a relatively significant scab prevalence at this location. Treated plots produced higher yields than untreated plots and FHB index was lowest in plots that were sprayed with a fungicide at early flowering (Table 2.2).

2.0 Foliar Fungicide Study I NERF & Volga

Cultivars: Brick and Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 2.1. Foliar Fungicide Study I: Evaluation of different foliar fungicides and rates applied to two hard red spring wheat cultivars at various growth stages at NERF near South Shore, SD.

Cultivar	Fungicide/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	Thousand kernel weight (g)	Leaf spot (%)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Brick	Headline 6fl oz/A @FK8-9#	60.16 a	61.87 a	39.00 a	0.45 b	7.00 bcde	15.03 ab	0.96 abc	3.50 cd
Brick	Headline 3fl oz/A @FK2	59.86 a	61.78 a	38.35 a	0.65 ab	4.00 cde	8.31 b	0.39 c	3.59 cd
Brick	Headline 3fl oz/A @FK2; Prosaro 6.5fl oz/A @FK10.5.1	60.63 a	60.91 a	38.62 a	0.48 b	1.50 e	3.50 b	0.11 c	2.50 cd
Brick	Prosaro 6.5fl oz/A @FK10.5.1	59.87 a	61.89 a	38.51 a	0.50 b	3.00 de	21.50 ab	0.86 abc	3.00 cd
Brick	Prosaro 6.5fl oz/A @FK10.5.1#	62.50 a	62.12 a	38.61 a	0.50 b	2.00 e	17.42 ab	0.91 abc	2.00 d
Brick	Untreated	58.50 a	61.80 a	38.26 a	1.88 ab	6.00 bcde	27.27 a	1.73 ab	2.50 cd
Samson	Headline 6fl oz/A @FK8-9#	58.11 a	60.61 a	37.69 a	1.75 ab	9.50 abc	10.86 ab	1.04 abc	5.00 bc
Samson	Headline 3fl oz/A @FK2	57.44 a	59.80 a	37.26 a	0.25 b	14.50 a	13.76 ab	2.04 a	5.00 bc
Samson	Headline 3fl oz/A @FK2; Prosaro 6.5fl oz/A @FK10.5.1	57.38 a	60.80 b	36.29 ab	3.43 a	9.33 abc	10.43 ab	1.31 abc	4.00 bcd

Cultivar	Fungicide/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	Thousand kernel weight (g)	Leaf spot (%)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Samson	Prosaro 6.5fl oz/A @FK10.5.1	53.37 a	59.32 a	37.34 a	0.38 b	8.00 bcd	9.65 ab	0.80 bc	5.00 bc
Samson	Prosaro 6.5fl oz/A @FK10.5.1#	59.56 a	59.40 a	37.01 a	0.63 ab	7.00 bcde	9.53 ab	0.90 abc	6.50 ab
Samson	Untreated	53.55 a	58.59 ab	28.31 b	1.07 ab	11.99 ab	19.96 ab	1.93 ab	7.97 a

#Treatment applied only if expected disease severity can cause economic loss
Means followed by the same letter are not significantly different, p≤0.05
†Fusarium head light (scab)

Table 2.2. Foliar Fungicide Study I: Evaluation of different foliar fungicides and rates applied to two hard red spring wheat cultivars at various growth stages at Volga, SD.

Cultivar	Fungicide/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu	Thousand kernel weight (g)	Leaf spot (%)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Brick	Headline 6fl oz/A @FK8-9#	47.52 abcd	58.34 ab	30.73 a	4.2 bc	21.50 cd	14.96 de	3.24 d	12.00 bc
Brick	Headline 3fl oz/A @FK2	46.43 bcd	57.89 b	29.50 a	4.3 c	20.50 cd	11.65 e	2.48 d	13.75 bc
Brick	Headline 3fl oz/A @FK2; Prosaro 6.5fl oz/A @FK10.5.1	48.80 abc	58.74 ab	29.51 a	9.2 abc	14.50 cd	11.66 e	1.69 d	14.50 bc
Brick	Prosaro 6.5fl oz/A @FK10.5.1	48.69 abcd	59.32 a	29.07 a	7.2 abc	9.50 d	25.20 ab	2.28 d	15.00 bc
Brick	Prosaro 6.5fl oz/A @FK10.5.1#	51.32 ab	58.80 ab	29.22 a	5.1 c	15.50 cd	21.77 abcd	3.44 cd	7.25 c
Brick	Untreated	44.13 bcde	58.35 ab	29.98 a	3.2 c	22.50 bcd	16.32 bcde	3.62 cd	12.50 bc
Samson	Headline 6fl oz/A @FK8-9#	41.46 de	52.02 d	26.75 b	16.2 ab	37.50 a	17.34 bcde	6.72 bc	35.00 a
Samson	Headline 3fl oz/A @FK2	40.49 cde	52.60 d	27.04 a	13.6 abc	35.50 ab	24.48 abc	8.66 ab	32.50 a
Samson	Headline 3fl oz/A @FK2; Prosaro 6.5fl oz/A @FK10.5.1	49.64 abc	55.24 c	28.13 a	20.1 a	17.50 cd	18.54 bcde	3.36 cd	18.75 b
Samson	Prosaro 6.5fl oz/A @FK10.5.1	49.42 abc	55.44 c	26.59 b	9.3 abc	23.00 bc	15.85 cde	3.91 cd	21.25 b
Samson	Prosaro 6.5fl oz/A @FK10.5.1#	50.70 a	55.93 c	21.44 b	10.4 abc	27.50 abc	12.49 e	3.60 cd	15.00 bc
Samson	Untreated	38.46 e	52.35 d	26.06 b	21.3 a	40.00 a	30.01 a	11.99 a	31.25 a

#Treatment applied only if expected disease severity can cause economic loss
Means followed by the same letter are not significantly different, p≤0.05
†Fusarium head light (scab)

The cultivar Select was used in Foliar Fungicide Study II to assess the efficacy of old and new fungicides applied at different growth stages, using different rates and in different sequential combinations (Table 2.1). Plots were laid out as RCBD with four blocks per location.

A number of fungicides applied at different growth stages and in different combinations were tested for managing various fungal diseases in spring wheat. Results revealed that plots treated with a fungicide at both green-up/tillering (Feekes 4-6) and at early flowering (Feekes 10.5.1) stages produced higher yield than plots that received a fungicide once although the differences were not statistically different at NERF (Table 3.1). A significant negative association between yield and *Fusarium* damaged kernels (FDK), r = -0.36, p=0.044 was observed.

There was a higher scab prevalence at Volga which resulted in a higher association between yield and FHB index, r = -0.63, p=0.0001 and r = -0.34, p=0.035 between yield and FDK. Similarly, to NERF, sequential fungicide application at tillering and early flowering resulted in better yield protection at Volga (Table 3.2).

3.0 Foliar Fungicide Study II NERF & Volga

Cultivars: Focus

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 3.1. Foliar Fungicide Study II: Evaluation various fungicides for managing foliar fungal diseases and scab of wheat applied at various growth stages at NERF near South Shore, SD.

Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	Leaf spot (%)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	57.38 ab	59.83 a	30.99 a	8.45 a	8.75 a	21.71 a	2.42 a	5.50 a
Caramba, 13.5fl oz/ac @FK10.5.1	63.13 ab	60.02 a	31.09 a	9.05 a	4.75 ab	11.05 a	0.62 a	2.75 ab
Nexicor, 3.5fl oz/ac @FK4-6	61.61 ab	59.42 a	30.27 a	7.85 a	7.00 ab	20.41 a	1.64 a	3.00 ab
Tilt, 4fl oz/ac @FK4-6	54.76 b	59.22 a	30.91 a	11.35 a	6.75 ab	26.71 a	2.11 a	5.50 a
Prosaro XTR, 6.5fl oz/ac @FK10.5.1	57.10 ab	59.84 a	31.40 a	7.30 a	3.00 ab	11.23 a	0.37 a	1.25 b
Stratego YLD, 4fl oz/ac @FK4-6; Prosaro XTR, 6.5fl oz/ac @FK10.5.1	61.03 ab	60.29 a	31.99 a	9.88 a	3.00 ab	20.06 a	0.50 a	1.00 b
Prosaro 421 SC, 6.5fl oz/ac @FK10.5.1	58.63 ab	60.35 a	31.82 a	8.28 a	1.50 b	8.75 a	0.16 a	3.25 ab
Trivapro, 9.4fl oz/ac @FK4-6; Prosaro 421 SC, 6.5fl oz/ac @FK10.5.1	64.40 a	59.88 a	31.77 a	9.10 a	2.25 ab	11.25 a	0.29 a	2.00 ab

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

†Fusarium head light (scab)

Table 3.2. Foliar Fungicide Study II: Evaluation various fungicides for managing foliar fungal diseases and scab of wheat applied at various growth stages at Volga, SD.

Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	Leaf spot (%)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	35.46 b	55.46 bc	34.67 c	9.85 a	32.75 a	28.02 a	9.17 a	12.50 a
Caramba, 13.5fl oz/ac @FK10.5.1	49.56 a	57.16 ab	35.80 abc	9.05 a	21.75 ab	22.28 a	5.05 ab	9.75 a
Nexicor, 3.5fl oz/ac @FK4-6	39.00 b	55.79 abc	35.44 abc	7.85 a	27.00 ab	22.94 a	6.24 ab	7.50 a
Tilt, 4fl oz/ac @FK4-6	38.82 b	54.92 c	35.02 bc	10.15 a	24.50 ab	24.06 a	5.90 ab	15.00 a
Prosaro XTR, 6.5fl oz/ac @FK10.5.1	50.97 a	57.47 a	36.50 ab	8.90 a	20.00 ab	20.00 a	4.05 b	7.00 a
Stratego YLD, 4fl oz/ac @FK4-6; Prosaro XTR, 6.5fl oz/ac @FK10.5.1	50.85 a	57.29 ab	36.66 a	9.88 a	17.00 b	18.53 a	3.31 b	7.50 a
Prosaro 421 SC, 6.5fl oz/ac @FK10.5.1	51.18 a	57.70 a	35.59 abc	8.28 a	20.75 ab	18.12 a	3.83 b	8.50 a
Trivapro, 9.4fl oz/ac @FK4-6; Prosaro 421 SC, 6.5fl oz/ac @FK10.5.1	51.83 a	57.22 ab	36.04 abc	9.15 a	22.25 ab	22.19 a	5.12 ab	12.75 a

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

This study evaluated the efficacy of triazole and strobilurin fungicides applied at green-up stage (Feekes 2-4) for managing foliar fungal diseases in spring wheat at Northeast and Volga research farms. As the season was characterized low foliar disease pressure at both locations, no significant differences ($p \leq 0.05$) were observed at either location (Table 4.1).

4.0 Foliar Fungicide Study III NERF & Volga

Cultivars: Boost

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 4.1. Foliar Fungicide Study III: Evaluation various known fungicides for managing foliar fungal diseases of wheat applied at tillering (Feekes 2-4) at Northeast (NERF) and Volga research farms, SD.

	NERF			Volga		
Treatment/Rate/Timing	**Yield (bu/ac)**	**Test weight (lb/bu)**	**Leaf spot (%)**	**Yield (bu/ac)**	**Test weight (lb/bu)**	**Leaf spot (%)**
Untreated Check	59.37 a	60.86 a	2.20 a	49.63 a	57.90 a	7.45 a
Quilt Xcel, 7fl oz/ac @FK2-4	58.99 a	60.54 a	2.70 a	54.99 a	57.84 a	4.90 a
Trivapro, 9fl oz/ac @FK2-4	57.86 a	60.25 a	2.40 a	52.69 a	57.89 a	5.05 a
Alto, 4fl oz/ac @FK2-4	58.50 a	60.49 a	2.08 a	53.63 a	57.76 a	4.50 a
Priaxor, 4fl oz/ac @FK2-4	61.08 a	60.70 a	2.08 a	54.55 a	57.55 a	4.23 a

Means followed by the same letter are not significantly different, $p \leq 0.05$

The efficacy of various commercially available and experimental fungicides was evaluated for FHB management. The products were applied at boot stage (Feekes 10.3), heading stage (Feekes 10.5), early flowering (Feekes 10.5.1) and five days after early flowering (5DA Feekes 10.5.1).

As a result of low disease pressure, no significant differences were observed at NERF (Table 5.1). However, some significant differences were observed for all traits at Volga except for TKW at Volga (Table 5.2). In general, fungicide applications done five days after flowering (5DA) and earlier than Feekes 10.5.1 had lower yield quantity and higher FHB index compared with applications carried out at early flowering.

5.0 Fusarium Head Blight (FHB) I NERF & Volga

Cultivars: Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 5.1. Fusarium head blight (FHB) I: Evaluation of commercial and experimental fungicides at varying growth stages for managing FHB at Northeast research farm, SD.

Treatment/Rate/Timing	Yield (bu/ac)		Test weight (lb/bu)		1000 Kernel Weight (g)		FHB† Incidence (%)		FHB Severity (%)		FHB Index		Fusarium damaged kernels (%)	
Untreated Check	51.34	a	58.02	a	36.56	a	11.50	a	11.30	a	1.39	a	5.61	a
Prosaro, 8.2fl oz/ac @FK10.3	52.91	a	58.18	a	36.74	a	9.62	ab	9.94	a	0.97	ab	6.05	a
A1, A2 @FK10.3	52.16	a	58.98	a	36.88	a	2.62	c	3.50	a	0.17	b	4.93	a
Prosaro, 8.2fl oz/ac @FK10.5.1	49.69	a	58.37	a	37.20	a	3.62	bc	6.13	a	0.27	ab	5.93	a
A1, A2 @FK10.5.1	53.43	a	57.91	a	36.57	a	0.32	c	3.50	a	0.04	b	5.88	a
Prosaro, 8.2fl oz/ac @5DA FK10.5.1	51.70	a	58.72	a	36.73	a	4.00	bc	7.88	a	0.32	ab	5.00	a
A1, A2, @5DA FK10.5.1	53.89	a	57.99	a	37.20	a	3.50	bc	30.38	a	0.77	ab	4.50	a
Prosaro, 8.2fl oz/ac @FK10.5.1	56.24	a	58.63	a	36.73	a	2.62	c	9.63	a	0.27	ab	4.93	a
Prosaro 421 SC, 6.5fl oz/ac @FK10.5	50.49	a	58.93	a	37.33	a	2.93	bc	6.13	a	0.24	ab	5.42	a
Miravis ACE, 13.7fl oz/ac @FK10.5	48.92	a	56.84	a	36.28	a	11.00	a	8.81	a	1.02	ab	6.50	a
Folicur, 4fl oz/ac @FK10.5	52.84	a	58.28	a	37.59	a	5.62	abc	27.75	a	0.79	ab	5.05	a

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

Table 5.2. Fusarium head blight (FHB) I: Evaluation of commercial and experimental fungicides at varying growth stages for managing FHB at Volga research farm, SD.

Treatment/Rate/Timing	Yield (bu/ac)		Test weight (lb/bu)		1000 Kernel Weight (g)		FHB† Incidence (%)		FHB Severity (%)		FHB Index		Fusarium damaged kernels (%)	
Untreated Check	43.48	c	51.20	ab	27.21	a	83.00	ab	25.14	a	20.75	a	26.25	a
Prosaro, 8.2fl oz/ac @FK10.3	55.18	ab	52.45	ab	28.57	a	49.50	bcd	21.73	ab	10.81	bc	16.25	ab
A1, A2 @FK10.3	57.52	a	53.27	ab	28.06	a	57.00	abc	13.66	b	7.81	cd	9.25	b
Prosaro, 8.2fl oz/ac @FK10.5.1	51.09	abc	53.88	ab	29.00	a	24.50	de	12.38	b	3.11	d	9.75	b
A1, A2 @FK10.5.1	57.90	a	54.57	ab	28.65	a	38.00	cde	16.17	ab	6.27	cd	8.75	b
Prosaro, 8.2fl oz/ac @5DA FK10.5.1	48.13	abc	53.05	ab	28.86	a	56.50	abc	15.96	ab	9.14	bcd	10.00	b
A1, A2, @5DA FK10.5.1	54.54	abc	53.67	ab	27.24	a	63.50	abc	17.58	ab	11.25	bc	11.50	b
Prosaro, 8.2fl oz/ac @FK10.5.1	57.51	a	55.04	a	27.37	a	20.50	e	12.45	b	2.56	d	8.50	b
Prosaro 421 SC, 6.5fl oz/ac @FK10.5	49.03	abc	52.73	ab	27.07	a	45.00	cde	13.85	b	6.56	cd	7.75	b
Miravis ACE, 13.7fl oz/ac @FK10.5	44.81	bc	50.56	b	26.18	a	73.50	ab	21.49	ab	15.37	abc	20.00	ab
Folicur, 4fl oz/ac @FK10.5	48.09	abc	52.25	ab	28.27	a	47.00	bcde	16.58	ab	8.19	bcd	15.00	ab

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

This study investigated the efficacy of experimental and commercially available fungicides applied at early flowering (Feekes 10.5.1) to manage FHB.

Some significant differences were observed at NERF among treatments for yield and FHB severity and index (Table 6.1). A similar trend was observed at Volga (Table 6.2) where a negative correction between yield and FHB index was observed r = -0.47, p=0.001 As well as between yield and FDK (r = -0.32, p=0.043).

6.0 Fusarium Head Blight (FHB) II NERF & Volga

Cultivars: Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 6.1. Fusarium head blight (FHB) II: Evaluation of commercial and experimental fungicides applied at early flowering (Feekes 10.5.1) for managing FHB at NERF, SD.

Treatment/Rate	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	58.09 b	58.46 a	36.45 b	36.50 a	45.34 a	16.24 a	6.00 a
Prosaro, 6.5fl oz/ac	59.38 b	59.36 a	36.90 ab	20.50 a	32.92 ab	6.02 b	5.50 a
Prosaro, 6.5fl oz/ac; A	64.28 ab	59.69 a	37.23 ab	23.00 a	25.05 ab	6.05 b	4.00 a
Prosaro, 6.5fl oz/ac; A1	63.58 ab	60.03 a	37.86 a	18.00 a	20.32 b	5.87 b	6.00 a
Prosaro, 6.5fl oz/ac; A1	64.68 ab	59.74 a	37.63 ab	19.00 a	39.69 ab	6.73 ab	5.50 a
Prosaro, 6.5fl oz/ac; A1	62.71 ab	59.75 a	36.88 ab	15.50 a	29.12 ab	4.46 b	6.00 a
Caramba 90, 13.5fl oz/ac	63.84 ab	59.51 a	36.64 ab	25.00 a	29.06 ab	7.52 ab	5.00 a
A2; A3	68.80 a	59.59 a	37.07 ab	23.00 a	35.06 ab	8.22 ab	5.00 a
Prosaro, 8.2fl oz/ac	64.99 ab	58.95 a	36.95 ab	21.00 a	35.88 ab	7.33 ab	4.50 a
Prosaro, 4.86fl oz/ac; A1; Proline 480SC, 2.14fl oz/ac	63.26 ab	60.05 a	36.90 ab	19.00 a	31.93 ab	6.54 b	6.00 a

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

†Fusarium head light (scab)

‡Experimental products A1, A2, A3

Table 6.2. Fusarium head blight (FHB) II: Evaluation of commercial and experimental fungicides applied at early flowering (Feekes 10.5.1) for managing FHB at Volga, SD.

Treatment/Rate	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	43.60 a	54.04 a	33.31 ab	69.50 a	27.07 a	18.70 a	20.00 a
Prosaro, 6.5fl oz/ac	47.76 a	55.56 a	31.88 b	63.50 a	16.39 b	10.02 bc	4.50 b
Prosaro, 6.5fl oz/ac; A	52.46 a	56.34 a	33.83 ab	44.00 a	16.70 b	7.34 c	5.50 b
Prosaro, 6.5fl oz/ac; A1	51.57 a	53.74 a	33.24 ab	54.00 a	19.11 ab	10.11 bc	5.50 b
Prosaro, 6.5fl oz/ac; A1	43.27 a	54.93 a	34.67 a	46.50 a	26.06 ab	11.94 bc	5.50 b
Prosaro, 6.5fl oz/ac; A1	48.49 a	56.37 a	32.56 ab	46.50 a	18.79 ab	8.81 bc	4.50 b
Caramba 90, 13.5fl oz/ac	49.14 a	55.51 a	33.61 ab	57.50 a	25.97 ab	14.93 ab	4.00 b
A2; A3	53.16 a	56.87 a	33.87 ab	46.00 a	20.55 ab	9.09 bc	6.00 b
Prosaro, 8.2fl oz/ac	49.76 a	55.55 a	32.79 ab	52.50 a	17.46 ab	9.18 bc	6.50 b
Prosaro, 4.86fl oz/ac; A1; Proline 480SC, 2.14fl oz/ac	47.03 a	56.38 a	34.00 ab	49.50 a	16.88 b	8.62 c	6.50 b

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

†Fusarium head light (scab)

‡Experimental products A1, A2, A3

This trial was conducted to assess the efficacy of variable combinations of both experimental and commercially available triazole fungicides (tebuconazoles and prothiaconazole) applied at early flowering (Feekes 10.5.1) for managing FHB.

Some statistically significant differences at NERF in FHB index and FDK were observed but were not large enough to influence any significant differences in yield among treatments (Table 7.1). Although not statistically significant, the differences in yield among treatments may result in substantial economic impact on a large scale. At Volga, there were some statistically significant differences among treatments for yield and FHB index (Table 7.2).

7.0 Fusarium head blight (FHB) III NERF & Volga

Cultivars: Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 7.1. Fusarium head blight (FHB) III: Evaluation of commercial, experimental and combination of fungicides applied at early flowering (Feekes 10.5.1) for FHB management at NERF, SD.

Treatment/Rate	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	67.34 a	55.94 b	34.14 a	33.56 a	30.50 a	10.22 a	7.70 a
Prosaro, 6.5fl oz/ac	69.11 a	58.17 ab	33.58 a	20.81 bc	22.48 a	4.77 bc	2.91 ab
Prosaro, 8.2fl oz/ac	71.09 a	58.12 ab	33.19 a	16.55 bc	17.18 a	3.01 bc	2.57 b
Prosaro, 6.5fl oz/ac; Proline 480SC, 1.43fl oz/ac	71.14 a	58.79 a	34.07 a	10.05 c	19.09 a	2.08 c	3.07 ab
Prosaro, 4.87fl oz/ac; Proline 480SC, 2.85fl oz/ac	68.96 a	58.66 a	32.80 a	21.26 abc	25.39 a	5.67 abc	1.34 b
Prosaro, 6.5fl oz/ac; A1	68.70 a	58.98 a	34.59 a	21.26 abc	19.74 a	4.69 bc	2.84 ab
Prosaro, 8.2fl oz/ac; A1	72.98 a	59.68 a	33.94 a	16.05 bc	21.38 a	3.45 bc	3.07 ab
Prosaro, 6.5fl oz/ac; Proline 480SC, 1.43fl oz/ac; A1	69.24 a	59.18 a	32.32 a	11.05 c	26.59 a	2.49 bc	4.07 ab
Prosaro, 4.87fl oz/ac; Proline 480SC, 2.14fl oz/ac; A1	72.79 a	59.35 a	32.32 a	15.87 bc	18.18 a	3.06 bc	3.36 ab
A2; A3	68.70 a	58.14 ab	33.21 a	26.50 ab	26.81 a	7.11 ab	3.75 ab

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

‡Experimental products A1, A2, A3

Table 7.2. Fusarium head blight (FHB) III: Evaluation of commercial, experimental and combination of fungicides applied at early flowering (Feekes 10.5.1) for FHB management at Volga, SD.

Treatment/Rate‡	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Untreated Check	40.79 b	52.54 b	29.20 b	68.50 a	29.83 a	21.38 a	21.25 a
Prosaro, 6.5fl oz/ac	46.12 ab	55.68 a	30.60 ab	42.50 b	21.01 ab	8.41 b	8.00 b
Prosaro, 8.2fl oz/ac	50.29 a	56.43 a	31.58 a	41.00 b	20.46 ab	8.13 b	6.00 b
Prosaro, 6.5fl oz/ac; Proline 480SC, 1.43fl oz/ac	46.02 ab	56.86 a	31.13 ab	40.50 b	19.36 ab	7.53 b	4.50 b
Prosaro, 4.87fl oz/ac; Proline 480SC, 2.85fl oz/ac	52.48 a	55.91 a	30.22 ab	42.00 b	19.73 ab	8.64 b	8.00 b
Prosaro, 6.5fl oz/ac; A1	47.31 ab	55.34 a	30.71 ab	43.00 b	14.79 b	6.26 b	8.00 b
Prosaro, 8.2fl oz/ac; A1	47.01 ab	55.26 ab	29.79 ab	42.50 b	18.23 ab	7.76 b	6.50 b
Prosaro, 6.5fl oz/ac; Proline 480SC, 1.43fl oz/ac; A1	49.50 a	55.30 ab	30.42 ab	47.00 ab	16.23 ab	7.68 b	7.50 b
Prosaro, 4.87fl oz/ac; Proline 480SC, 2.14fl oz/ac; A1	48.58 ab	55.91 a	31.04 ab	42.00 b	19.39 ab	8.73 b	8.50 b
A2; A3	51.17 a	57.09 a	29.97 ab	41.50 b	19.70 ab	8.21 b	6.50 b

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

†Fusarium head light (scab)

‡Experimental products A1, A2, A3

Three cultivars, Brick (FHB-resistant), prevail (FHB-moderately resistant) and Samson (FHB-susceptible) were used to determine the efficacy of fungicides containing propiconazole+adepidyn compared with tebuconazole+prothiaconazole applied at heading (Feekes 10.5) and at early flowering (Feekes 10.5.1) in FHB management.

There were some statistically significant differences in yield and FDK at NERF (Table 8.1). A Pearson correlation analysis between yield and FHB index and between yield and FDK revealed significant negative associations, r = -0.28, p=0.018 and r = -0.26, p=0.026, respectively.

At Volga, the Pearson product-moment correlation coefficients between yield and FHB index, FDK and 1000 kernel weight (TKW) demonstrated significant relationships, r = -0.43, p=0.0002 and r = -0.42, p=0.0002, respectively. However, some of the statistically significant differences observed in yield observed at Volga may be attributable to other micro-environmental factors other than treatment effect alone (Table 8.2).

Cultivars: Brick, Prevail, Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 8.1. Integrated Fusarium head blight (FHB) Management: Efficacy of Miravis and Prosaro at heading (Feekes 10.5) and early flowering (Feekes 10.5.1) for FHB management at NERF near South shore, SD.

Cultivar	Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Brick	UNTREATED, INOCULATED	64.74 fghji	57.24 abc	36.85 abc	18.50 bcde	27.29 defgh	4.80 bc	6.50 abc
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	68.33 bcdefgh	57.19 abc	37.62 ab	4.00 f	10.50 h	0.65 c	5.00 bcd
Brick	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	64.64 ghij	57.52 ab	37.01 abc	16.50 bcdef	27.68 cdefgh	4.83 bc	5.50 abcd
Brick	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	63.77 hij	56.77 abc	36.95 abc	24.00 bcd	23.82 efgh	5.48 bc	7.00 ab
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	71.29 abc	57.11 abc	35.96 c	7.00 ef	11.08 gh	1.05 c	6.50 abc
Brick	UNTREATED, NON-INOCULATED	64.96 efghij	57.86 a	37.78 a	11.50 def	15.56 fgh	2.13 bc	5.50 abcd
Prevail	UNTREATED, INOCULATED	68.33 bcdefgh	56.76 abc	37.15 abc	15.50 bcdef	41.91 abcd	6.35 bc	4.50 cde
Prevail	Prosaro, 6.5fl oz/ac @FK10.5.1	70.53 abcd	57.16 abc	37.56 ab	12.00 cdef	35.87 abcde	5.08 bc	2.50 e
Prevail	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	69.54 abcdefg	57.23 abc	37.46 ab	14.50 bcdef	29.02 bcdefgh	4.73 bc	4.00 de
Prevail	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	68.90 bcdefgh	56.93 abc	35.93 c	19.00 bcde	47.22 abc	8.65 b	4.50 cde
Prevail	Prosaro, 6.5fl oz/ac @FK10.5.1	74.14 a	57.84 a	37.05 abc	8.00 ef	29.19 bcdefgh	3.10 bc	4.50 cde
Prevail	UNTREATED, NON-INOCULATED	69.88 abcdef	57.43 ab	36.81 abc	23.50 bcd	31.96 abcdef	8.10 b	5.00 bcd
Samson	UNTREATED, INOCULATED	65.84 defghij	52.22 d	36.54 abc	50.00 a	51.05 a	26.08 a	6.50 abc

Cultivar	Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	70.07 abcd	54.67 cd	36.39 bc	26.00 b	30.47 bcefg	8.80 b	7.00 ab
Samson	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	61.97 ij	55.96 abc	36.51 abc	52.00 a	48.09 ab	25.00 a	7.00 ab
Samson	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	61.45 j	55.21 abc	35.93 c	52.00 a	40.97 abcde	21.35 a	7.00 ab
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	73.23 ab	56.47 abc	36.60 abc	25.50 bc	26.62 defgh	7.10 bc	5.50 abcd
Samson	UNTREATED, NON-INOCULATED	66.80 cdefghi	54.96 bcd	36.54 abc	51.50 a	44.80 abcd	23.46 a	7.50 a

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

†Fusarium head light (scab)

Table 8.2. Integrated Fusarium head blight (FHB) Management: Efficacy of Miravis and Prosaro at heading (Feekes 10.5) and early flowering (Feekes 10.5.1) for FHB management at Volga, SD.

Cultivar	Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Brick	UNTREATED, INOCULATED	49.08 cd	56.02 abcde	35.97 abc	20.50 gh	19.62 cdef	3.73 ef	9.00 b
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	53.19 bc	57.89 a	36.42 a	25.00 fgh	12.72 ef	3.80 ef	6.50 b
Brick	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	51.63 bc	57.04 ab	35.84 abc	19.50 h	12.99 ef	2.75 f	7.00 b
Brick	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	52.61 bc	56.99 ab	36.43 a	37.00 cdefg	20.43 cdef	7.68 cdef	8.50 b
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	54.40 abc	56.99 ab	35.63 abc	25.50 efgh	10.66 f	3.15 ef	8.75 b
Brick	UNTREATED, NON-INOCULATED	52.76 bc	57.03 ab	35.80 abc	19.00 h	21.45 cdef	3.70 ef	6.00 b
Prevail	UNTREATED, INOCULATED	52.08 bc	55.93 abcde	35.30 abc	50.00 bc	28.18 cd	14.80 c	8.75 b
Prevail	Prosaro, 6.5fl oz/ac @FK10.5.1	59.92 a	56.75 abc	36.09 ab	26.50 defgh	16.66 def	4.60 def	5.50 b
Prevail	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	53.38 bc	54.02 efg	35.37 abc	50.50 bc	25.20 cd	14.13 cd	6.75 b
Prevail	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	51.96 bc	55.11 bcdef	35.54 abc	51.00 bc	24.51 cde	12.58 cde	5.00 b
Prevail	Prosaro, 6.5fl oz/ac @FK10.5.1	59.67 a	56.23 abcd	35.06 abcd	43.50 bcd	19.93 cdef	8.90 cdef	6.25 b
Prevail	UNTREATED, NON-INOCULATED	54.20 abc	55.63 bcde	34.72 abcd	34.50 cdefgh	23.57 cde	8.18 cdef	9.75 b
Samson	UNTREATED, INOCULATED	40.28 e	50.26 h	34.33 bcd	74.00 a	49.66 a	37.73 a	21.00 a
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	53.96 abc	53.93 efg	34.51 abcd	42.50 bcde	19.28 cdef	8.08 cdef	6.00 b
Samson	MIRAVIS ACE, 11.5fl oz/ac @FK10.5.1	49.38 cd	52.92 g	33.95 cd	42.50 bcde	21.45 cdef	8.80 cdef	12.00 ab
Samson	MIRAVIS ACE, 11.5fl oz/ac @FK10.5	44.16 de	53.02 fg	33.05 d	59.00 ab	41.12 ab	24.55 b	13.75 ab
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	56.43 ab	54.29 defg	34.76 abcd	32.50 defgh	21.64 cdef	7.23 cdef	8.50 b
Samson	UNTREATED, NON-INOCULATED	50.98 bc	54.82 cdefg	34.68 abcd	39.00 cdef	29.54 bc	12.45 cde	6.00 b

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

Products containing meticonazole, propiconazole+adepidyn and tebuconazole+prothiaconazole fungicidal formulations were evaluated in FHB management using two spring wheat cultivars, Brick (FHB-resistant) and Samson (FHB-susceptible).

Although statistically significant differences were observed for FHB index at NERF, the within cultivar differences were not significant due to low disease pressure (Table 9.1). At Volga, treatment differences were also observed (Table 9.2), however, Miravis was applied closer to flowering due to prevailing unfavorable conditions.

9.0 Uniform Fungicide Study NERF & Volga

Cultivars: Brick and Samson

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 9.1. Uniform Fungicide: Efficacy of Caramba, Miravis and Prosaro at early heading (Feekes 10.3) and early flowering (Feekes 10.5.1) for FHB management at Northeast, SD.

Cultivar	Treatment/Rate/Timing	Yield (bu/ac)		Test weight (lb/bu)		1000 Kernel Weight (g)		FHB† Incidence (%)		FHB Severity (%)		FHB Index		Fusarium damaged kernels (%)	
Brick	UNTREATED, INOCULATED	65.44	abc	59.35	a	35.86	ab	4.00	e	11.91	ab	0.84	bc	6.76	abc
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	61.56	c	58.93	ab	35.72	ab	5.55	de	16.23	ab	0.73	bc	5.45	abcd
Brick	Caramba, 13.5fl oz/ac @FK10.5.1	62.96	bc	58.89	ab	35.46	abc	7.58	bcde	19.97	a	1.52	ab	5.56	abcd
Brick	Miravis ACE, 11.5fl oz/ac @FK10.3	66.29	ab	59.20	a	36.63	a	4.08	e	8.57	b	0.42	c	5.31	bcd
Brick	Miravis ACE, 11.5fl oz/ac @FK10.5.1	63.10	bc	58.79	ab	34.75	bc	4.05	e	12.64	ab	0.65	bc	6.95	ab
Brick	Miravis ACE, 13.7fl oz/ac @FK10.3	62.60	bc	58.90	ab	35.30	abc	7.55	bcde	14.62	ab	1.14	bc	4.45	d
Brick	Miravis ACE, 13.7fl oz/ac @FK10.5.1	65.34	abc	59.10	a	37.01	a	6.55	cde	17.54	ab	1.04	bc	4.95	bcd
Samson	UNTREATED, INOCULATED	60.99	c	57.24	bc	34.34	bc	14.00	a	15.63	ab	2.24	a	4.75	cd
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	67.99	a	57.35	bc	34.79	bc	12.00	abc	13.82	ab	1.59	ab	7.00	ab
Samson	Caramba, 13.5fl oz/ac @FK10.5.1	64.79	abc	57.29	bc	34.36	bc	14.00	a	9.91	ab	1.52	ab	7.00	ab
Samson	Miravis ACE, 11.5fl oz/ac @FK10.3	65.16	abc	57.25	bc	35.25	abc	11.50	abc	13.45	ab	1.53	ab	5.50	abcd
Samson	Miravis ACE, 11.5fl oz/ac @FK10.5.1	65.03	abc	56.70	c	34.62	bc	10.00	abcd	10.36	ab	1.09	bc	6.50	abcd
Samson	Miravis ACE, 13.7fl oz/ac @FK10.3	65.43	abc	56.87	c	33.88	c	12.50	ab	9.37	ab	1.18	abc	7.50	a
Samson	Miravis ACE, 13.7fl oz/ac @FK10.5.1	63.53	abc	56.74	c	34.65	bc	11.50	abc	8.86	ab	1.09	bc	6.00	abcd

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

Table 9.2. Uniform Fungicide: Efficacy of Caramba, Miravis and Prosaro at early heading (Feekes 10.3) and early flowering (Feekes 10.5.1) for FHB management at Volga, SD.

Cultivar	Treatment/Rate/Timing	Yield (bu/ac)	Test weight (lb/bu)	1000 Kernel Weight (g)	FHB† Incidence (%)	FHB Severity (%)	FHB Index	Fusarium damaged kernels (%)
Brick	UNTREATED, INOCULATED	50.94 cde	57.97 a	36.70 a	39.50 bcdef	20.53 abc	9.95 abc	10.25 cd
Brick	Prosaro, 6.5fl oz/ac @FK10.5.1	59.88 ab	57.94 a	36.37 ab	27.50 def	11.70 d	3.82 c	7.50 d
Brick	Caramba, 13.5fl oz/ac @FK10.5.1	56.73 bc	57.88 a	36.28 ab	26.50 ef	11.91 d	3.44 c	8.75 d
Brick	Miravis ACE, 11.5fl oz/ac @FK10.3	55.05 bcd	56.48 ab	35.92 abc	31.50 cdef	14.58 cd	4.83 c	8.50 d
Brick	Miravis ACE, 11.5fl oz/ac @FK10.5.1	51.68 cde	55.15 bcd	34.94 cd	25.50 ef	11.33 d	3.00 c	8.00 d
Brick	Miravis ACE, 13.7fl oz/ac @FK10.3	50.09 cde	57.00 ab	35.86 abc	23.00 f	16.62 bcd	3.60 c	7.50 d
Brick	Miravis ACE, 13.7fl oz/ac @FK10.5.1	47.25 e	55.40 abcd	35.38 abc	27.50 def	14.08 cd	4.28 c	8.50 d
Samson	UNTREATED, INOCULATED	56.10 bc	54.77 bcd	33.17 e	64.50 a	24.82 a	17.00 a	22.50 a
Samson	Prosaro, 6.5fl oz/ac @FK10.5.1	64.60 a	56.76 ab	35.17 bcd	46.50 abcde	16.24 bcd	7.59 bc	8.00 d
Samson	Caramba, 13.5fl oz/ac @FK10.5.1	64.17 a	55.94 abc	34.65 cd	54.50 ab	17.59 abcd	9.79 abc	8.50 d
Samson	Miravis ACE, 11.5fl oz/ac @FK10.3	54.14 bcde	53.20 d	32.70 e	65.50 a	22.70 ab	15.19 a	16.25 abc
Samson	Miravis ACE, 11.5fl oz/ac @FK10.5.1	48.43 de	53.68 cd	34.03 de	49.50 abc	19.83 abc	9.71 abc	13.25 bcd
Samson	Miravis ACE, 13.7fl oz/ac @FK10.3	48.40 de	52.76 d	33.14 e	54.50 ab	25.01 a	15.41 a	15.25 bc
Samson	Miravis ACE, 13.7fl oz/ac @FK10.5.1	48.59 de	52.93 d	32.75 e	49.00 abcd	24.63 a	12.89 ab	17.00 ab

Means followed by the same letter are not significantly different, $p \leq 0.05$

†Fusarium head light (scab)

SEED TREATMENTS

10.0 Seed Treatment I — Volga

This study evaluated several seed treatment products at Volga and NERF. Second plant stand was significantly lower at NERF. This may indicate seed treatments prevented root rot development at this location. Lack of significance at the Volga location may be attributed to non-conducive environment for root rot pathogens to cause disease. No statistically significant differences were observed at NERF nor Volga for yield (Tables 10.1, 10.2). The numerical yield differences may be due to other confounding influences such as microenvironment elements.

10.0 Seed Treatment — NERF & Volga

Cultivars: Focus

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 10.1. Seed Treatment I: Efficacy of various seed treatment fungicides for *Fusarium spp*. management at NERF, SD.

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
UNTREATED NON-INOCULATED			63.51 a	60.23 a	762573 a	709500 b	4.00 a	0.75 a
GAUCHO 600 FS	30	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						
UNTREATED INOCULATED			59.23 a	60.47 a	741310 a	812167 ab	3.00 b	1.00 a
GAUCHO 600 FS	30	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						
EVERGOL ENERGY	11.51	g AI/100 kg	56.61 a	60.30 a	870672 a	737000 ab	3.00 b	1.25 a
GAUCHO 600 FS	30	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						
RAXIL PRO MD	325	mL/100 kg	59.93 a	60.69 a	862255 a	759000 ab	3.00 b	1.00 a
GAUCHO 600 FS	30	g AI/100 kg						
RAXIL PRO MD	8	g AI/100 kg	61.48 a	59.64 a	828893 a	781000 ab	3.00 b	1.00 a
EVERGOL PRIME	2.5	g AI/100 kg						
GAUCHO 600 FS	30	g AI/100 kg						
RAXIL PRO MD	8	g AI/100 kg	60.47 a	60.39 a	837826 a	821334 a	3.00 b	1.00 a
EVERGOL PRIME	5	g AI/100 kg						
GAUCHO 600 FS	30	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
DIVIDEND EXTREME	22.5	g AI/100 kg	59.19 a	61.49 a	836336 a	839667 a	2.75 b	1.00 a
VIBRANCE 500FS	2.608	g AI/100 kg						
CRUISER 5FS	25.82	g AI/100 kg						
RANCONA	1.5	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						
CRUISER MAXX V CEREALS	85.1	g AI/L	60.17 a	60.75 a	895748 a	786808 ab	3.00 b	1.04 a
VIBRANCE 500FS	500	g AI/L						
CRUISER 600FS	600	g AI/L						
RANCONA PINNACLE	325	mL/100 kg	60.06 a	60.53 a	924000 a	815833 ab	2.75 b	1.00 a
GAUCHO 600 FS	30	g AI/100 kg						
PRO-IZED RED COLORANT	32.6	mL/100 kg						

Means followed by the same letter are not significantly different, $p \leq 0.05$

Table 10.2. Seed Treatment I: Efficacy of various seed treatment fungicides for *Fusarium spp.* management at Volga, SD.

Treatment	Rate	Unit	Yield (bu/ac)		Test weight (lb/bu)		First stand count (plants/ac)		Second stand count (plants/ac)		Vigor (1-9)		Whole plot leaf spot Severity (%)	
UNTREATED NON-INOCULATED			47.51	a	59.42	abc	780907	a	835182	ab	2.75	a	6.25	a
GAUCHO 600 FS	30	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												
UNTREATED INOCULATED			48.02	a	59.51	abc	741310	a	795911	b	2.50	a	10.00	a
GAUCHO 600 FS	30	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												
EVERGOL ENERGY	11.51	g AI/100 kg	45.70	a	61.20	a	870672	a	889139	ab	2.25	a	10.75	a
GAUCHO 600 FS	30	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												
RAXIL PRO MD	325	mL/100 kg	48.14	a	58.98	bc	843922	a	890186	ab	1.50	a	6.25	a
GAUCHO 600 FS	30	g AI/100 kg												
RAXIL PRO MD	8	g AI/100 kg	47.96	a	59.52	abc	828893	a	861768	ab	2.25	a	6.00	a
EVERGOL PRIME	2.5	g AI/100 kg												
GAUCHO 600 FS	30	g AI/100 kg												
RAXIL PRO MD	8	g AI/100 kg	45.71	a	61.15	ab	873211	a	878053	ab	1.75	a	11.50	a
EVERGOL PRIME	5	g AI/100 kg												
GAUCHO 600 FS	30	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												
DIVIDEND EXTREME	22.5	g AI/100 kg	45.18	a	59.40	abc	827169	a	847724	ab	3.00	a	8.75	a
VIBRANCE 500FS	2.608	g AI/100 kg												
CRUISER 5FS	25.82	g AI/100 kg												
RANCONA	1.5	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												
CRUISER MAXX V CEREALS	85.1	g AI/L	48.25	a	59.72	abc	862503	a	875976	ab	2.00	a	5.00	a
VIBRANCE 500FS	500	g AI/L												
CRUISER 600FS	600	g AI/L												
RANCONA PINNACLE	325	mL/100 kg	45.24	a	58.96	c	924000	a	958998	a	2.25	a	12.00	a
GAUCHO 600 FS	30	g AI/100 kg												
PRO-IZED RED COLORANT	32.6	mL/100 kg												

Means followed by the same letter are not significantly different, $p \leq 0.05$

Seed treatment II investigated the efficacy of a different set of seed treatment products for soil borne seedling diseases caused by fungal pathogens. There were no significant yield differences among treatments at NERF (Table 11.1). A significant association between vigor and yield was detected (r = -0.41, p=0.008) where the lower the vigor value the better the crop looked at tillering stage. Similarly, there were no statistically significant differences for yield at Volga (Table 11.2). No significant association between yield and other traits were detected apart from leaf disease (leaf spot) severity, r = -0.46, p=0.0030.

11.0 Seed Treatment Study II NERF & Volga

Cultivars: Focus

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 11.1. Seed Treatment II: Efficacy of various seed treatment fungicides for soil borne seedling disease management at NERF, SD.

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
UNTREATED - INOCULATED			54.30 a	60.92 a	676500 ab	644454 b	4.00 a	1.30 a
UNTREATED NON-INOCULATED			59.98 a	60.58 a	894667 a	900203 a	2.00 b	1.38 a
RAXIL PRO SHIELD	5	OZ/Cwt	59.24 a	61.26 a	801167 ab	813633 ab	2.75 b	1.00 a
SNOW LEOPARD #3	1	OZ/Cwt						
RAXIL PRO MD	5	OZ/Cwt	60.25 a	61.08 a	738834 ab	780542 ab	2.25 b	1.65 a
GAUCHO 600 FS	0.767	OZ/Cwt						
RAXIL PRO SHIELD	5	OZ/Cwt	61.11 a	61.03 a	638000 b	679049 b	2.00 b	1.58 a
DIVIDEND EXTREME	2	OZ/Cwt	59.99 a	60.55 a	729667 ab	745983 ab	2.25 b	1.25 a
CRUISER 5FS	0.1892	OZ/Cwt						
PRO-IZED RED COLORANT								
CHARTER	3.098	OZ/Cwt	59.82 a	61.33 a	777333 ab	798783 ab	2.00 b	0.88 a
APRON XL	0.03988	OZ/Cwt						
STAMINA	0.4003	OZ/Cwt						
GAUCHO 600 FS	0.767	OZ/Cwt						
PRO-IZED RED COLORANT								
RANCONA PINNACLE	5	OZ/Cwt	59.37 a	61.09 a	599500 b	681560 b	2.00 b	1.00 a

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
NIPSIT INSIDE PRO-IZED RED COLORANT	0.3	OZ/Cwt						
DIVIDEND EXTREME	3	OZ/Cwt	60.88 a	60.90 a	735166 ab	746167 ab	2.00 b	1.00 a
VIBRANCE 500FS	0.08	OZ/Cwt						
CRUISER 5FS	0.6646	OZ/Cwt						
RANCONA	0.05045	OZ/Cwt						
CRUISER MAXX V CEREALS	5	OZ/Cwt	58.85 a	61.11 a	733334 ab	758817 ab	2.00 b	1.13 a

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

Table 11.2. Seed Treatment II: Efficacy of various seed treatment fungicides for soil borne seedling disease management at Volga, SD.

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
UNTREATED - INOCULATED			39.80 a	57.47 a	755334 a	714853 b	4.00 a	8.00 a
UNTREATED NON-INOCULATED			43.21 a	57.21 a	852500 a	862107 ab	2.00 b	6.50 a
RAXIL PRO SHIELD	5	OZ/Cwt	44.20 a	57.08 a	891000 a	899947 a	1.25 b	8.75 a
SNOW LEOPARD #3	1	OZ/Cwt						
RAXIL PRO MD	5	OZ/Cwt	44.57 a	57.51 a	911167 a	904805 a	1.25 b	6.00 a
GAUCHO 600 FS	0.767	OZ/Cwt						
RAXIL PRO SHIELD	5	OZ/Cwt	42.67 a	57.18 a	810333 a	814807 ab	2.00 b	4.75 a
DIVIDEND EXTREME	2	OZ/Cwt	46.75 a	57.29 a	856167 a	861722 ab	1.50 b	8.00 a
CRUISER 5FS	0.1892	OZ/Cwt						
PRO-IZED RED COLORANT								
CHARTER	3.098	OZ/Cwt	45.47 a	57.60 a	898333 a	899928 a	2.00 b	6.00 a
APRON XL	0.03988	OZ/Cwt						
STAMINA	0.4003	OZ/Cwt						
GAUCHO 600 FS	0.767	OZ/Cwt						
PRO-IZED RED COLORANT								
RANCONA PINNACLE	5	OZ/Cwt	45.03 a	57.09 a	887333 a	890175 ab	2.00 b	4.75 a
NIPSIT INSIDE	0.3	OZ/Cwt						
PRO-IZED RED COLORANT								
DIVIDEND EXTREME	3	OZ/Cwt	44.60 a	57.05 a	903833 a	904103 a	1.50 b	6.75 a
VIBRANCE 500FS	0.08	OZ/Cwt						
CRUISER 5FS	0.6646	OZ/Cwt						
RANCONA	0.05045	OZ/Cwt						
CRUISER MAXX V CEREALS	5	OZ/Cwt	44.27 a	57.23 a	843334 a	852848 ab	2.00 b	6.00 a

Means followed by the same letter are not significantly different, $p \leq 0.05$

Some commercially available and experimental seed treatment products were used in different combinations to assess their efficacy for controlling soil borne disease. No significant differences were observed at NERF among treatments for all assesses agronomic traits (Table 12.1). Yield and leaf spot disease association was significant, r = -0.37, p=0.025. At Volga, the non-seed treated plots had a significantly low yield and numerically lower plant stand. This indicates that seed treatmetns at this location prevented yield loss as a result of reduced plant stand (Table 12.2). A significant relationship between yield and vigor was detected (r = -0.50, p=0.002) at this location as well.

12.0 Seed Treatment Study III NERF & Volga

Cultivars: Select

Previous Crop: Corn

Planted: 05/22/2018 (NERF) and 05/17/2018 (Volga)

Table 12.1. Seed Treatment III: Efficacy of various combinations of commercially available and experimental seed treatment products for soil borne diseases management at NERF, SD.

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
CHECK - WATER			56.74 a	58.99 a	742500 a	703730 a	4.25 a	8.75 a
BAS 77200F	4.6	FL OZ/Cwt	59.24 a	58.86 a	696667 a	732648 a	3.00 b	6.00 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
VIBRANCE EXTREME	5	FL OZ/Cwt	58.10 a	59.39 a	682000 a	746900 a	3.00 b	7.75 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
EVERGOL ENERGY	1	FL OZ/Cwt	58.42 a	59.90 a	867167 a	832535 a	3.00 b	6.25 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	59.67 a	59.57 a	760834 a	830722 a	3.00 b	10.00 a
BAS 100ABU								
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
BAS 77200F	4.6	FL OZ/Cwt	58.39 a	59.13 a	661834 a	742733 a	3.00 b	6.75 a
BAS 75007F	0.382	FL OZ/Cwt						
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	58.50 a	58.66 a	669167 a	704299 a	3.25 b	7.25 a
BAS 45001I	0.256	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	58.32 a	59.00 a	759000 a	779822 a	3.00 b	5.00 a
BAS 79800F	0.307	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
Nexicor	7	FL OZ/A	58.41 a	59.84 a	647167 a	666468 a	3.00 b	5.75 a

Means followed by the same letter are not significantly different, $p \leq 0.05$

Table 12.2. Seed Treatment III: Efficacy of various combinations of commercially available and experimental seed treatment products for soil borne diseases management at Volga, SD

Treatment	Rate	Unit	Yield (bu/ac)	Test weight (lb/bu)	First stand count (plants/ac)	Second stand count (plants/ac)	Vigor (1-9)	Whole plot leaf spot Severity (%)
CHECK - WATER			39.95 b	54.71 a	732233 a	709359 a	4.00 a	12.75 a
BAS 77200F	4.6	FL OZ/Cwt	43.24 ab	54.20 a	800984 a	840596 a	2.00 b	15.00 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
VIBRANCE EXTREME	5	FL OZ/Cwt	48.07 a	54.39 a	830500 a	838529 a	1.75 b	11.25 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
EVERGOL ENERGY	1	FL OZ/Cwt	48.62 a	54.39 a	787967 a	788414 a	1.50 b	14.00 a
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	49.67 a	53.93 a	818217 a	822853 a	2.00 b	15.75 a
BAS 100ABU								
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	44.84 ab	54.29 a	859833 a	852487 a	1.75 b	15.50 a
BAS 75007F	0.382	FL OZ/Cwt						
CRUISER 5FS	1.33	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	45.46 ab	54.26 a	850667 a	848238 a	1.75 b	13.25 a
BAS 45001I	0.256	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
BAS 77200F	4.6	FL OZ/Cwt	45.55 ab	54.65 a	803000 a	810519 a	2.00 b	13.25 a
BAS 79800F	0.307	FL OZ/Cwt						
FLO RITE 1197	2	FL OZ/Cwt						
COLOR COAT RED	0.399	FL OZ/Cwt						
Nexicor	7	FL OZ/A	43.39 ab	54.97 a	792183 a	806824 a	1.75 b	12.50 a

Means followed by the same letter are not significantly different, $p \leq 0.05$