

Evaluation of foliar fungicide on several HRSW cultivars and two durum cultivars, Langdon 2010

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Materials and Methods

A field experiment was planted on 14 May at the North Dakota State University Langdon Research Extension Center located at Langdon in NE North Dakota. The trial was conducted using best management practices for hard red spring wheat including seeding date and rate, fertility, weed control and harvest management. The experiment was a randomized complete block design with a split plot arrangement with four replications. The previous crop was soybean. The soil type was Svea-Barnes loam. Whole plot factors were cultivars; all cultivars were seeded at a rate of 1.5 million pure live seeds /acre. Subplot factor were Prosaro fungicide or untreated. Plots seven rows wide by 21 ft. long, 6-in row spacing, were planted with an Almaco plot planter equipped with double disk openers and press wheels. Fusarium inoculums consisting of two isolates were hand-broadcast at a rate of 150 grams /plot two and three weeks prior to flowering to encourage development of Fusarium head blight disease (FHB). After herbicide application was completed, an overhead irrigation system was installed to provide supplemental water to wet the Fusarium inoculum and the grain heads to encourage the development of FHB. The Prosaro fungicide was tank mixed with Induce adjuvant at a rate of 6.5 fl. oz. /acre and 0.25% v/v, respectively and applied with a CO₂-pressurized backpack sprayer operated at 40 psi and delivering 18.4 GPA. The sprayer was equipped with a three-nozzle boom, nozzles spaced 20 inches on center. The foliar treatments were made using Spraying Systems XR8002 nozzles oriented vertically. The flowering treatments were made using Spraying Systems XR8001 nozzles mounted on a double swivel and oriented to spray forward and backward 30 degrees downward from horizontal. The fungicide applications were made at Feekes growth stage 10.51. Because of the different growth of the cultivars they reached growth stage Feekes 10.51 on three different dates. The fungicide applications were on 6 Jul (wind speed ten MPH, temperature 64° F at 8:15 a.m., cultivar Brick), 9 Jul (wind speed five MPH, temperature 66° F at 8:30 a.m., cultivars, Dapps, Briggs, Glenn, Steele-ND, Trooper, Howard, Barlow, Brennan and Traverse) and 12 Jul (no wind, temperature 50° F at 8:00 a.m., cultivars, Ada, Alsen, Faller, Sampson, Reeder, Sabin and Granger) by maturity. Fusarium head blight (FHB) incidence (I), head severity (HS) and index (FS) were determined from a twenty grain head sample collected at Feekes 11.2 growth stage. Leaf severity was determined from a sample of five leaves at the same growth stage. Plots were harvested 7 Sept with a small plot combine and the yield and test weight determined.

The fungicide treatment had a significant effect on all characters measured except heading date. Yield, test weight and DON averaged over cultivars was 7.6 bu/a higher, 1.1 lb/bu higher and 1.66 ppm lower, respectively, compared to the untreated treatment. The fungicide x cultivar interaction for yield was non-significant meaning all cultivars had similar yield responses to fungicide. There was significant fungicide x cultivar interactions for other characteristics which indicates the differences between the fungicide and untreated treatments varied among cultivars.

Table 1. Heading date, yield, test weight, Fusarium head blight incidence, index and head severity, deoxynivalenol and leaf necrosis by cultivar or fungicide, Langdon 2010.

Cultivar or Fungicide	Heading	Yield	Test Weight	Fusarium Head Blight			DON ²	Leaf Necrosis
	Date			Incidence	Head Severity	Ppm		
	DAP ¹	Bu./ acre	Lb./ bu.	%	Index	%	Ppm	%
Ada	52.9	61.9	59.3	96.9	28.3	29.4	1.56	63.7
Alsen	50.9	60.0	58.8	96.9	25.6	27.0	0.99	65.6
Barlow	49.9	64.5	59.4	71.9	8.7	13.9	1.53	32.4
Brennan	50.5	58.1	57.5	88.1	15.8	18.7	0.94	35.2
Brick	47.5	68.3	59.8	63.8	5.9	13.7	0.38	30.6
Briggs	49.0	70.3	58.5	75.0	10.2	16.0	0.93	31.7
Dapps	49.8	62.7	57.3	65.0	6.3	12.4	2.47	20.2
Divide ⁴	58.8	56.5	54.5	96.3	24.0	25.1	1.51	47.5
Faller	51.4	82.0	58.6	88.8	15.2	18.0	1.06	57.4
Glenn	48.8	66.7	61.0	66.9	7.7	12.7	0.96	38.1
Granger	50.0	62.9	57.5	87.1	34.5	39.1	1.31	57.6
Granite	54.6	59.9	61.0	88.8	19.4	21.2	1.27	56.9
Howard	50.4	66.4	59.0	85.6	13.5	17.7	1.57	44.5
Jenna	54.3	62.2	56.6	98.1	39.2	40.2	2.71	38.1
Reeder	52.3	60.9	57.8	94.4	23.0	24.6	2.99	65.6
Sabin	53.9	61.2	57.8	100.0	24.4	24.4	0.77	73.6
Samson	51.9	67.2	56.7	98.8	32.2	32.7	5.82	70.1
Steele-ND	50.3	64.7	58.8	73.8	9.4	13.8	1.93	41.2
Tioga ⁴	58.8	55.7	54.1	88.8	14.0	16.5	2.91	27.8
Traverse	48.8	70.1	54.9	68.1	6.4	12.8	0.83	49.3
Trooper	49.1	68.0	58.6	76.1	7.9	12.5	1.73	46.8
LSD _(0.05)	NA ³	4.6	0.6	12.7	6.3	5.8	1.8	11.4
Untreated	51.6	60.5	57.5	92.2	24.1	26.1	2.55	51.3
Fungicide	51.6	68.1	58.6	76.3	11.3	16.0	0.89	43.3
LSD _(0.05)	NA	1.3	0.1	3.8	2.2	2.0	0.33	3.8

¹DAP = days after planting. ²DON = deoxynivalenol. ³NA = not an applicable calculation. ⁴Durum cultivar.

Table 2. Heading date, yield, test weight, Fusarium head blight incidence, index and head severity, deoxynivalenol and leaf necrosis by cultivar and fungicide treatment and source of variation, Langdon 2010.

Cultivar and Treatment	Heading		Test	Fusarium Head Blight			DON ²	Leaf Necrosis
	Date	Yield	Weight	Incidence		Head Severity		
	DAP ¹	Bu./ acre	Lb./ bu.	%	Index	%	Ppm	%
Ada	52.8	58.9	58.9	100.0	39.8	39.8	2.42	64.5
Ada + F	53.0	65.0	59.6	93.8	16.8	19.0	0.70	62.8
Alsen	51.0	57.4	58.5	98.8	31.6	32.1	1.48	66.5
Alsen + F	50.8	62.7	59.1	95.0	19.7	21.9	0.51	64.8
Barlow	49.8	61.7	58.7	86.3	13.8	17.5	2.29	30.8
Barlow + F	50.0	67.2	60.0	57.5	3.5	10.3	0.77	34.0
Brennan	50.5	57.2	57.0	96.3	22.3	24.0	1.50	25.8
Brennan + F	50.5	59.0	57.9	80.0	9.3	13.5	0.38	44.7
Brick	47.8	63.0	59.1	78.8	8.8	14.0	0.58	37.8
Brick + F	47.3	73.6	60.5	48.8	3.0	13.3	0.18	23.5
Briggs	49.0	65.5	58.0	83.8	14.7	19.1	1.13	39.0
Briggs + F	49.0	75.1	59.0	66.3	5.8	12.9	0.74	23.9
Dapps	49.5	59.2	56.8	80.0	9.8	14.1	4.01	25.0
Dapps + F	50.0	66.1	57.8	50.0	2.8	10.6	0.94	15.3
Divide ⁴	58.8	53.4	53.7	100.0	29.4	29.4	2.10	44.8
Divide + F⁴	58.8	59.6	55.4	92.5	18.5	20.8	0.93	50.3
Faller	51.3	77.1	58.1	95.0	21.5	23.3	1.47	68.2
Faller + F	51.5	86.8	59.1	82.5	8.8	12.8	0.65	46.5
Glenn	48.8	61.6	60.7	81.3	12.2	15.3	1.37	36.0
Glenn + F	48.8	71.8	61.3	52.5	3.3	10.0	0.55	40.3
Granger	50.3	61.5	57.2	100.0	47.2	47.2	2.08	56.8
Granger + F	49.8	64.3	57.9	74.3	21.7	31.0	0.54	58.5
Granite	54.5	55.7	60.1	100.0	31.3	31.2	2.26	62.0
Granite + F	54.8	64.0	61.9	77.5	7.5	11.2	0.29	51.8
Howard	50.8	61.7	58.2	88.8	14.8	18.4	2.47	66.3
Howard + F	50.0	71.1	59.7	82.5	12.1	17.1	0.67	22.8
Jenna	54.3	57.4	55.9	100.0	52.4	52.4	4.45	38.3
Jenna + F	54.3	67.1	57.3	96.3	25.9	28.0	0.98	38.0

Table 2. Continued

Cultivar and Treatment	Heading	Yield Bu./ acre	Test	Fusarium Head Blight			DON ² Ppm	Leaf Necrosis %
	Date DAP ¹		Weight Lb./ bu.	Incidence %	Index	Head Severity %		
Reeder	52.3	57.5	57.3	100.0	33.1	33.1	4.50	73.8
Reeder + F	52.3	64.4	58.4	88.8	13.0	16.2	1.48	57.5
Sabin	53.8	59.4	57.5	100.0	27.4	27.4	1.07	80.3
Sabin + F	54.0	63.0	58.1	100.0	21.5	21.5	0.48	67.0
Samson	52.3	62.3	55.6	100.0	44.6	44.6	8.36	74.3
Samson + F	51.5	72.2	57.8	97.5	19.8	20.8	3.28	66.0
Steele-ND	50.3	60.0	58.1	92.5	14.5	16.8	2.27	51.3
Steele-ND + F	50.3	69.5	59.4	55.0	4.3	10.7	1.58	31.0
Tioga ⁴	58.8	51.7	53.8	96.3	18.3	19.7	4.00	27.8
Tioga + F⁴	58.8	59.6	54.4	81.3	9.6	13.2	1.83	27.8
Traverse	48.8	66.5	55.5	75.0	8.0	14.2	1.14	52.5
Traverse + F	48.8	73.7	56.4	61.3	4.8	11.4	0.52	46.0
Trooper	49.0	61.8	57.9	83.8	10.6	14.7	2.72	56.0
Trooper + F	49.3	74.2	59.2	68.8	5.3	10.3	0.73	37.5
LSD _(0.05) ³	NS	NS	0.7	NS	10.1	9.1	1.5	17.3
<u>Source of variation</u>								
Rep	<0.0001	0.0007	<0.0001	0.1881	0.0570	0.0175	0.0253	0.0461
Cultivar	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
Rep * Cultivar	0.1230	0.1841	0.0153	0.3743	0.8336	0.7885	<0.0001	0.7222
Fungicide Treatment	0.6104	<0.0001	<0.0001	<0.0001	<0.0001	<0.0003	<0.0001	<0.0001
Cultivar*Fungicide	0.3549	0.5947	0.0343	0.0863	0.0049	0.0021	0.0040	0.0075
% C.V.	1.0	6.4	0.8	14.5	40.5	30.6	62.5	25.9

¹DAP = days after planting. ²DON = deoxynivalenol. ³LSD = to compare fungicide treatment for each cultivar. ⁴Durum cultivar.