

Last updated on: Feb 2014

Highlights:

- Results are from only one location and year.
- Study was carried out on natural inoculation and no supplemental water provided.
- Generally all fungicide lowered disease levels compared to untreated. Only Tilt, Approach, and Evito were significant on 42 DAT rating.
- All fungicide except Approach resulted in higher foliage density than untreated.
- No statistical difference was observed between untreated and fungicide treatments for root length.
- Although yield increase of 0.14 - 3.55 bu/A was observed in fungicide treated plots than untreated, none of them were significant.
- None of the fungicide treatment resulted in significant increase in test weight.

For further information:

Pravin Gautam, PhD
Plant Pathologist
North Dakota State University
Langdon Research Extension Center
9280 107th Ave NE
Langdon, ND 58249
Ph: 701-256-2582
Email: pravin.gautam@ndsu.edu

OBJECTIVES

Objectives of this study were to evaluate i) efficacy of foliar fungicides to control leaf diseases at early timing, and ii) impact on plant health and yield.

METHODS

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with four replications.

Previous crop: Hard red spring wheat.

Cultivars: FHB susceptible cultivar 'Samson' was used.

Planting: 1.2 million pure live seed/A was planted on May 24, 2013. A border plot was planted between treated plots to minimize interference from spray drift.

Plot size: Seven rows at six inch spacing. Individual plot was 5 x 20 sq. ft., mowed back to 5 x15 sq. ft.

Inoculation: Plots were naturally infected without artificial inoculation.

Fungicide treatments: Fungicide treatments, their chemistry and application rates and time are listed in Table 1. Fungicides were applied, with CO₂-pressurized backpack sprayer with three nozzle boom (XR8001), at the water volume of 10 GPA. Fungicides were applied at Feekes' growth stage 3.3 on June 18 (wind westerly, speed five MPH, temperature 69 °F at 10:00 AM).

Plant Health Assessment: Roots of six random plants excluding border rows were dug on 10 days after treatment (DAT), rinsed in water and pictures taken along with ruler. Root length was measured from picture later on. Crop response was rated at plot level as either more or less foliar disease and foliage density compared to that of control. For simplicity in data visualization, following scale was used; 0 = less than untreated, 1 = untreated or similar to untreated, 2 = more than untreated.

Disease Assessment: Leaf disease severity was rated on the day of treatment application (June 18) and subsequently on 14 (July 02), 28 (July 16) and 42 (July 30) DAT. Leaf disease severity was rated as percent leaf area showing disease symptoms. Disease ratings were carried out on samples of 10 top three leaves (three of each flag and flag-1 leaves, and four flag-2 leaves) excluding outer rows. Disease incidence was calculated by counting numbers of symptomatic leaves out of 10 leaves that were rated for severity.

Harvest: Plots were harvested 04 September (103 days after planting) with a small plot combine and the yield and test weight determined.

Data Analysis: Data on 0, 14, 28 and 42 DAT severity were log transformed to achieve homoscedasticity. 28 and 42 DAT incidence were squared root transformed. Other variables were analyzed untransformed. Data were analyzed using the general linear model (GLM) in SAS. Fisher's least significant difference (LSD) were used to compare means at P≤0.05. Actual means are presented in table for simplicity of understanding.



Root length observed in one replication of control plot.



Trial plots at Langdon, ND

Table 1. Fungicide treatments, their chemistry and FRAC group, and rate of application.

TRT #	Treatments	Chemistry (FRAC group)	App. rate
1	Untreated		
2	Headline	Pyraclostrobin (11)	3 oz/A
3	Priaxor	Pyraclostrobin (11) + Fluxapyroxad (7)	2 oz/A
4	Tilt	Propiconazole (3)	2 oz/A
5	Quilt Xcel	Azoxystrobin (11) + Propiconazole (3)	5 oz/A
6	Approach	Picoxystrobin (11)	3 oz/A
7	Evito	Fluoxastrobin (11)	1 oz/A
8	Stratego YLD	Prothioconazole (3)	2 oz/A
9	Priaxor	Pyraclostrobin (11) + Fluxapyroxad (7)	3 oz/A
10	Twinline	Pyraclostrobin (11) + Metconazole (3)	3.5 oz/A
11	Caramba	Metconazole (3)	2 oz/A

Notes: Fungicides were applied at Feekes growth stage 3.3. All treatments were applied with NIS @ 0.125% v/v.

Research Report **2013** Evaluation of foliar fungicides for disease control and plant health in Spring Wheat

RESULTS

Table 1. Mean comparison of treatments for Leaf disease incidence (%) and severity (%) rated 0, 14, 28 and 42 days after treatment (DAT), 42 DAT crop response, root length taken on 10 DAT, yield (bu/A), and test weight (lb/bu).

Treatments	0 DAT		14 DAT		28 DAT		42 DAT		Crop response (Disease)	Crop response (foliage)	Root length (cm)	Yield (bu/A)	Test weight (lb/bu)
	INC ^w (%)	SEV ^x (%)	INC ^w (%)	SEV ^x (%)	INC ^w (%)	SEV ^x (%)	INC ^w (%)	SEV ^x (%)					
Untreated	9.09 a ^v	0.12 a ^v	15.91 ab ^v	1.35 a ^v	79.55 a ^v	9.63 a ^v	86.36 ab ^v	13.88 a ^v	1.00	1.00	7.43 ab	76.16 a ^v	61.30 ab ^v
Headline	6.82 a	0.13 a	29.55 ab	0.43 a	56.82 bc	4.33 cd	81.82 ab	8.43 abc	0.50	1.75	7.89 a	76.88 a	61.04 b
Priaxor (2oz/A)	9.09 a	0.15 a	25.00 ab	0.33 a	38.64 c	1.65 d	72.73 ab	6.20 bc	0.50	1.50	6.01 b	79.02 a	61.19 ab
Tilt	9.09 a	0.15 a	29.55 ab	0.43 a	65.91 ab	3.98 bcd	75.00 ab	5.53 c	0.75	1.25	6.92 ab	78.66 a	61.11 b
Quilt Xcel	6.82 a	0.21 a	11.36 b	0.13 a	59.09 ab	5.83 abc	81.82 ab	10.40 abc	1.00	1.75	6.28 ab	75.47 a	61.18 ab
Approach	9.09 a	0.13 a	15.91 ab	0.98 a	56.82 b	5.10 abc	79.55 ab	6.38 bc	1.25	1.00	6.84 ab	79.71 a	61.26 ab
Evito	6.82 a	0.50 a	20.45 ab	0.20 a	52.27 bc	5.15 abc	79.55 ab	6.45 bc	1.00	2.00	6.80 ab	77.01 a	61.40 ab
Stratego YLD	11.36 a	0.25 a	36.36 a	0.45 a	61.36 ab	9.23 ab	86.36 ab	11.90 ab	0.75	1.75	6.31 ab	76.30 a	61.25 ab
Priaxor (3oz/A)	6.82 a	0.17 a	15.91 ab	0.10 a	63.64 ab	2.60 cd	72.73 ab	11.90 abc	0.75	1.25	6.25 ab	75.45 a	61.69 a
Twinline	11.36 a	0.35 a	22.73 ab	0.20 a	54.55 bc	3.73 cd	70.45 b	8.93 abc	1.00	1.75	6.83 ab	77.04 a	61.14 ab
Caramba	9.09 a	0.10 a	31.82 ab	0.40 a	59.09 ab	4.73 abc	90.91 a	10.23 abc	0.75	1.75	6.68 ab	76.49 a	61.34 ab
%CV	63.72	100.81	65.60	122.94	12.18	29.60	8.46	18.76			17.78	5.85	0.65
Mean	8.68	0.21	23.14	0.45	58.88	5.08	79.75	9.11	0.84	1.52	6.75	77.11	61.26
Max	11.36	0.50	36.36	1.35	79.55	9.63	90.91	13.88	1.25	2.00	7.89	79.71	61.69
Min	6.82	0.10	11.36	0.10	38.64	1.65	70.45	5.53	0.50	1.00	6.01	75.45	61.04

^v Means with same letter within individual variable (within column) are not significantly different at P≤0.05

^w INC: Leaf disease incidence

^x SEV: Leaf disease severity

Results are shown in Table 2.

Leaf Disease Incidence: Leaf disease incidence was not statistically different on the day of treatment application (0 DAT). Two weeks after treatment application, Incidence was significantly lower in Quilt Xcel than untreated. On 28 DAT, disease incidence was significantly lower in Headline, Approach, Evito, Twinline, and Priaxor (2 oz/A) compared to the untreated. None of the treatment significantly lowered disease incidence in 42 DAT.

Leaf Disease Severity: Leaf disease severity was statistically similar in all plots on the day of treatment application. None of the treatment significantly resulted in lower 14 DAT severity than untreated. On 28 DAT rating Headline, Priaxor (2 oz/A), Tilt, Priaxor (3 oz/A) and Twinline resulted in statistically lower disease severity compared to untreated. Priaxor (2 oz/A), Tilt, Approach and Evito were the only treatments with statistically lower disease severity than untreated.

Crop Response: All fungicide treated plots had higher foliage density on 42 DAT compared to untreated. Overall disease level at plot basis was lower in Headline, Priaxor (2 oz/A), Tilt, Stratego YLD, Priaxor (3 oz/A), and Caramba compared to untreated. However, disease levels at plot basis rating was higher than untreated in Approach treated plots. Disease was similar in Quilt Xcel, Evito and Twinline treated plots to untreated.

Root Length: None of the fungicide treatment resulted in statistically higher or lower root length than untreated. However, root length in Priaxor (2 oz/A) treatment was significantly lower than in Headline treatment.

Yield: None of the fungicide treatments resulted in statistically higher or lower yield than untreated. Numerically, Quilt Xcel and Priaxor (3 oz/A) resulted in 0.69 bu/A and 0.71 bu/A lower yield, respectively, than untreated. All other treatments resulted in numerically higher yield by 0.14 - 3.55 bu/A than untreated.

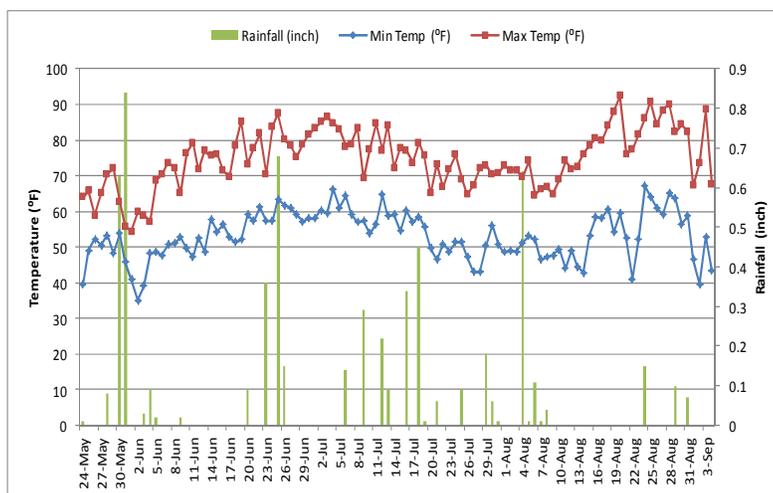
Test Weight: None of the fungicide resulted in significantly higher or lower test weight than untreated. However, test weight in Headline and Tilt treatment was significantly lower than Priaxor (3 oz/A). Numerically, Priaxor (3 oz/A) and Headline treatment resulted in the highest and the lowest test weight, respectively.



Root length observed in one replication of Headline treated plot (left) and Priaxor (3 oz/A) treated plot (right)

ACKNOWLEDGEMENTS

We would like to thank Bryan Hanson, NDSU-LREC for technical assistance and BASF Crop Protection for financial support of the study.



Daily minimum and maximum temperature, and rainfall recorded in Langdon, ND during planting to harvest of hard red spring wheat in this study.