Research Report 2013

Sequential fungicide program evaluation in Spring Wheat

NDSU | LANGDON RESEARCH EXTENSION CENTER

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Last updated on: Feb 2014

Highlights:

- Results are from only one location and year.
- Study was carried out with artificial inoculation and under supplemental overhead irrigation to promote disease.
- Though Prosaro applied at flowering resulted in significantly lower FHB disease and DON levels, it resulted in 3.8 bu/A numerically lower yield and test weight than untreated.
- In addition to the levels of FHB disease and DON being similar to Prosaro applied at flowering, application of Priaxor at herbicide timing, followed by Twinline at flag leaf and Caramba at flowering stage yielded numerically lower only by 0.22 bu/A compared to untreated.

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Objective

Objective of this study was to evaluate sequential fungicide program on controlling Fusarium head blight (FHB) and Deoxynivalenol (DON) contamination in hard red spring wheat (HRSW).

Methods

Location: NDSU Langdon Research Extension Center.

Experimental Design: Randomized complete block with six 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 15, 2013. A border plot was planted between treated plots to minimize interference from spray drift.

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

Inoculation: Plots were inoculated by spreading corn spawn inoculum at around boot stage (Feekes 9-10) at the rate of 286 g/plot.

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

TRT #	Treatments	Chemistry (FRAC group)	App. rate
1	Untreated		
2	Caramba (C)	Metconazole (3)	13.5 oz/A
3	Prosaro (C)	Prothiconazole (3) +Tebuconazole (3)	6.5 oz/A
4	Headline (A) Caramba (C)	Pyraclostrobin (11) Metconazole (3)	3 oz/A 13.5 oz/A
5	Priaxor (A) Caramba (C)	Pyraclostrobin (11) + Fluxapyroxad (7) Metconazole (3)	2 oz/A 13.5 oz/A
6	Tilt (A) Prosaro (C)	Propiconazole (3) Prothioconazole (3) + Tebuconazole (3)	2 oz/A 6.5 oz/A
7	Priaxor (A) Twinline (B) Caramba (C)	Pyraclostrobin (11) + Fluxapyroxad (7) Pyraclostrobin (11) + Metconazole (3) Metconazole (3)	2 oz/A 9 oz/A 13.5 oz/A

Notes: A = herbicide timing, B = flag leaf timing, C = flowering timing
All treatments were applied with NIS @ 0.125% v/v.

Disease development: Supplemental moisture was provided by running overhead irrigation from Feekes 10.5 to 11.25 at the rate of 1 hour per day to create conducive environment for FHB development.

Fungicide treatments: Fungicide treatments, their chemistry and application rates and time are listed in Table 1. Fungicides were applied, with CO_2-pressurized backpack sprayer with three nozzle boom (XR8001), at the water volume of 10 GPA. Herbicide timing fungicide applications (A) were made at Feekes' growth stage 5 on June 12 (wind westerly, speed two MPH, temperature 63° F at 08:30 AM). Flag leaf timing fungicide application (B) was made at Feekes 9 on July 02 (wind easterly, speed three MPH, 83° F at 2:30 PM). Flowering timing fungicide application (C) was made at Feekes 10.51 on July 11 (wind southerly, speed 10 MPH, 70° F at 8:30 AM).

Disease Assessment: Fusarium head blight (FHB) severity and crop response were rated 14 and 28 days after treatments (DAT) of flowering timing (C). 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, the following scale was used; 0 = less than untreated, 1 = untreated or similar to untreated, 2 = more than untreated. FHB head severity (SEV) was rated using 0-100% scale on arbitrary 25 heads, excluding two outer rows on 14, 21 and 28 DAT. FHB incidence (INC) was calculated by counting numbers of heads showing FHB symptoms out of 25 heads that were rated for severity. FHB index (FHBI) was calculated using formula FHBI = (SEV*INC)/100.

Harvest: Plots were harvested 04 September (112 days after planting) with a small plot combine and the yield and test weight determined. Deoxynivalenol (DON) was tested on 50 g sub-sample at Veterinary Diagnostic Laboratory, NDSU.

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

Trial plots at Langdon REC, Langdon, ND

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Results

Table 2. FHB incidence (%), severity (%) and index, crop response (disease and foliage density) rated on 14 and 28 days after treatment (DAT), yield (bu/A), test weight (lb/bu) and DON (ppm) in hard red spring wheat.

TRT#	Treatments[t]	14 DAT					28 DAT					Yield (bu/A)	Test Weight (lb/bu)	DON (ppm)
		FHB INC[v](%)	FHB SEV[w] (%)	FHB I[x]	Crop response		FHB INC[v] (%)	FHB SEV[w] (%)	FHB I[x]	Crop response				
					Disease	Foliage				Disease	Foliage			
1	Untreated	16.67 a[u]	1.35 ab[u]	0.29 ab[u]	1.00	1.00	76.67 a[u]	12.01 a[u]	9.65 a[u]	1.00	1.00	93.43 a[u]	60.98 a[u]	7.13 a[u]
2	Caramba (C)	10.00 ab	0.89 ab	0.11 abc	0.17	1.17	74.00 ab	9.39 abc	7.00 abc	0.67	1.17	94.10 a	61.12 a	4.77 b
3	Prosaro (C)	7.33 b	0.61 b	0.06 c	0.67	1.17	56.67 c	6.26 d	3.69 d	0.50	1.17	89.56 a	60.82 a	5.53 b
4	Headline (A) Caramba (C)	10.67 ab	0.79 ab	0.11 abc	0.33	1.17	72.00 ab	10.17 ab	7.31 abc	0.67	1.00	93.56 a	61.08 a	5.95 ab
5	Priaxor (A) Caramba (C)	12.67 ab	1.03 ab	0.16 abc	0.50	1.50	76.00 a	10.03 ab	7.90 ab	0.83	1.67	93.37 a	61.07 a	5.08 b
6	Tilt (A) Prosaro (C)	17.33 a	1.65 a	0.34 a	0.33	1.33	63.33 abc	8.25 bcd	5.44 bcd	0.67	1.33	86.99 a	61.21 a	5.85 ab
7	Priaxor (A) Twinline (B) Caramba (C)	10.00 ab	0.70 b	0.10 bc	0.17	1.17	60.00 bc	7.08 cd	4.57 cd	0.17	1.50	93.21 a	61.08 a	5.53 b
% CV		56.50	37.72	60.03			17.63	11.95	22.44			8.23	0.64	24.76
Mean		12.10	1.00	0.17			68.38	9.03	6.51			92.00	61.05	5.69
Max		17.33	1.65	0.34	1.00	1.50	56.67	12.01	9.65	1.00	1.67	94.10	61.21	7.13
Min		7.33	0.61	0.06	0.17	1.00	76.67	6.26	3.69	0.17	1.00	86.99	60.82	4.77

[t] A: Herbicide timing application, B:Flag leaf timing application; C: Flowering timing
[u] Means with same letter within individual variable (within column) are not statistically different at P<0.05
[v] FHB INC: Fusarium head blight Incidence
[w] FHB SEV: Fusarium head blight severity
[x] FHB I: Fusarium head blight Index

Results are shown in Table 2.

FHB Incidence: FHB incidence on 14 DAT was significantly lower only in Prosaro treated plots compared to untreated. On 28 DAT, Except for Prosaro and Tilt+Prosaro, other fungicide resulted in statistically similar level of FHB incidence.

FHB Severity: 14 DAT FHB severity was significantly lower in Prosaro and Priaxor+Twinline+Caramba treatments compared to that of untreated. On 28 DAT rating, in addition to Prosaro and Priaxor+Twinline+Caramba, Tilt+Prosaro also resulted in statistically lower FHB severity than untreated.

FHB Index: 14 DAT FHB Index was significantly lower than untreated only in Prosaro treatment. But in 28 DAT it was significantly lower in Prosaro, Tilt+Prosaro and Priaxor+Twinline+Caramba treatments than untreated.

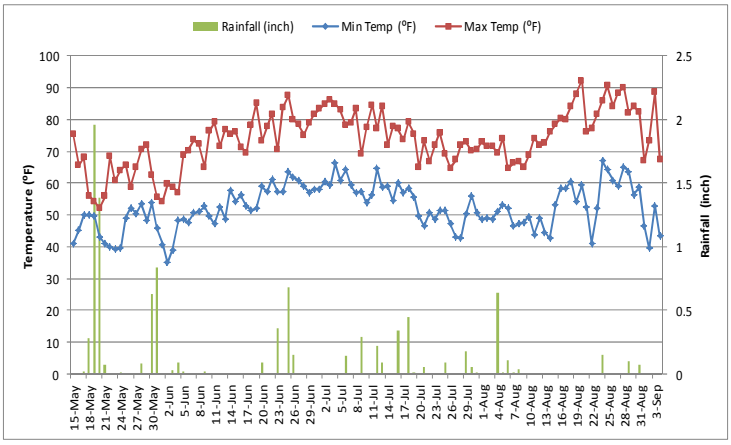
DON: Except for Headline+Caramba and Tilt+Prosaro treatment, all fungicide resulted in significantly lower DON compared to untreated. Numerically Caramba resulted in lowest DON levels.

Crop Response: Except for 28 DAT foliage density in Headline+Caramba treatment, all fungicide treated plots had lower foliage disease and higher foliage density on 14 and 28 DAT compared to untreated. On 28 DAT rating, foliage density of Headline+Caramba treatment was similar to that of untreated plot.

Yield: None of the fungicide treatments resulted in statistically higher or lower yield than untreated. Numerically, Prosaro and Tilt+Prosaro resulted in 3.8 bu/A and 6.44 bu/A lower yield, respectively, than untreated. Caramba and Headline+Caramba resulted in 0.67 bu/A and 0.13 bu/A more yield, respectively than untreated.

Test Weight: None of the fungicide resulted in significantly higher or lower test weight than untreated. Numerically, Tilt+Prosaro and Prosaro treatment resulted in the highest and the lowest test weight, respectively.

Typical symptoms of Fusarium head blight with discolored spikelets and pink colored sporodochia on infected spikelet



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

Acknowledgements

We would like to thank Bryan Hanson, NDSU-LREC for technical assistance, Kelly Benson, NDSU Veterinary Diagnostic Laboratory for DON analysis, and BASF Crop Protection for financial support of the study.