WHEAT VARIETY RESPONSE TO FUNGICIDE TREATMENT IN 2014

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INTRODUCTION

2014 saw reports of unexpectedly high levels of Deoxynivalenol (DON) in Kentucky wheat. Although the levels of DON seen in the Variety x Fungicide Trial were moderate, the levels of DON in Princeton were relatively high considering the very low levels of *Fusarium*-damaged kernels (FDK) or "tombstones" seen at that location. Despite the complexity of Fusarium head blight (FHB), this study confirms resistant varieties and timely fungicide applications remain two powerful management tools available to help KY wheat growers reduce damage from this disease. This year reminds us that, while advances have been made in understanding and managing FHB, much work remains.

RESULTS AND DISCUSSION

Following fungicide treatment DON and FDK were significantly ($P<0.0001$) reduced at both Princeton and Lexington (Table 1) by approximately 58% and 52% respectively. Although the overall level of DON was lower at Princeton than Lexington, the level of FDK was much lower at Princeton (Table 1). DON is usually linked to FDK so the level of DON at Princeton is especially interesting in a year where high DON surprised some Kentucky growers. After adjusting DON for FDK by covariate analysis it was significantly ($P<0.0001$) higher at Princeton than Lexington (Table 2). That could be due to relatively high levels of DON in *Fusarium*-damaged kernels at Princeton, relatively high levels of DON in healthy-looking grain at Princeton, or both. At Princeton two fungicide-treated lines with 0% FDK contained 0.6 and 1.7 ppm DON (Table 3) suggesting DON in healthy-looking grain was a factor in some cases.

Test weight was significantly ($P<0.001$) increased by fungicide treatment at both locations and yield significantly ($P<0.001$) increased at Lexington (Table 1). Fungicide application significantly ($P<0.001$) reduced FHB head symptoms, which were measured at Lexington (Table 4).

Varieties and lines varied somewhat in their individual DON, FDK, test weight, and yield responses to fungicide and these responses varied by location also (Table 3). At both Lexington and Princeton, however, in almost every case DON and FDK were reduced and test weight increased following fungicide treatment (Table 3). At Lexington the yield of all wheat varieties or lines increased following fungicide application (Table 3). The effects of fungicide treatment on FHB head symptoms also varied among varieties and lines although all scab symptoms were reduced in almost every variety or line (Table 5).

Heading dates, collected for all varieties and lines at Lexington, varied (Table 6); however there were no strong correlations (data not shown) between them and any FHB trait suggesting disease pressure was present throughout the infection window for all varieties and lines.

METHODS

In 2014, variety x fungicide trials were conducted in replicated plots at Lexington and Princeton, KY. Entries in the 2014 test were grown in 6-row 10 ft. plots, planted after corn, the residue of which had been conventionally tilled. At each location, entries were replicated three times and subjected to 2 treatments: fungicide-treated and control. Entries in the

test consisted of 24 varieties and breeding lines, all of which were also entered in the state wheat variety trial. The test was inoculated with scabby corn on April 24th at Princeton and April 30th at Lexington. The inoculum had time for fruiting bodies to emit spores during flowering; these were observed at Lexington prior to flowering. At Lexington, plots were also sprayed with a 50 000 spore/ml suspension during flowering. Fungicide-treated plots were sprayed at flowering with Prosaro (6.5 fl. oz./A) and Induce (0.125% w/v). At Lexington, 21 days after flowering, scab symptom incidence and severity were counted, index calculated and ratings taken. Scab incidence is the percentage of wheat heads having any scab symptoms; severity is the percentage coverage of the heads that have symptoms; index is a combination of incidence and severity and is also expressed as a percentage. Rating is similar to index but is taken by assessing the plot as a whole (rather than counting individual heads and spikelets) and is expressed on a 0-9 scale where 0 is no or almost no scab and 9 completely or almost completely diseased. After harvest, yield, test weight, and FDK, the percentage of scabby seed or tombstones in a representative grain sample, were measured.

CONCLUSION

To minimize the risks from scab use best management practices by planting scab resistant varieties and applying fungicides when weather favors disease development. The *Fusarium* head blight Prediction Center (http://www.wheatscab.psu.edu/riskTool.html) provides useful information when deciding whether to spray fungicide to control scab. Growers, agents, and consultants are encouraged to sign up for FHB alerts (http://scabusa.org/fhb_alerts) to receive emails or text messages when conditions favor scab development.

Table 1. Average Effect of Fungicide Application on 24 Wheat Varieties and Lines at Lexington and Princeton in 2014

Location	Treatment	DON ppm	FDK %	Test Weight lb/bu	Yield bu/acre
Lexington	Control	3.6a	4.4a	52.0d	65.4c
	Fungicide	1.5c	2.3b	54.8c	83.2a
Princeton	Control	2.5b	1.0c	55.3b	69.8b
	Fungicide	1.2d	0.4d	56.1a	70.4b

Means followed by different letters are significantly different from one another (P<0.001).

Table 2. Average Effect on DON adjusted for FDK of Fungicide Application at Lexington and Princeton in 2014

Location	Treatment	DON adjusted for FDK ppm
Lexington	Control	2.4b
	Fungicide	1.4c
Princeton	Control	3.0a
	Fungicide	2.1b

Means followed by different letters are significantly different from one another (P<0.001).

Table 3. 2014 DON, FDK, Test Weight and Yield Responses of 24 Wheat Varieties and Lines to Fungicide Treatment, Lexington and Princeton, KY.

	Lexington								Princeton							
	Control				Fungicide				Control				Fungicide			
Variety	DON ppm	FDK %	Test Weight lb/bu	Yield bu/acre	DON ppm	FDK %	Test Weight lb/bu	Yield bu/acre	DON ppm	FDK %	Test Weight lb/bu	Yield bu/acre	DON ppm	FDK %	Test Weight lb/bu	Yield bu/acre
ARMOR HAVOC	3.3	5.2	51.9	78.7	1.0	2.3	54.7	96.8	2.1	0.6	55.6	73.0	0.6	0.0	55.9	75.6
AgriMAXX 413	4.6	7.4	49.9	69.2	2.0	3.2	52.5	85.8	2.1	1.0	54.1	76.2	0.7	0.2	54.6	73.5
BECK 113	1.8	3.1	52.8	69.9	0.9	1.4	56.6	91.1	0.5	0.6	56.6	76.6	0.3	0.5	57.0	74.2
BECK 120	3.9	5.5	51.0	77.6	1.6	3.7	52.9	90.8	1.5	0.9	54.5	72.5	1.0	0.2	55.2	72.6
Dyna-Gro 9042	4.2	5.0	51.4	58.8	2.6	2.9	53.4	79.2	3.6	2.2	54.7	69.3	1.7	0.8	55.7	68.3
KY03C-1002-02	1.5	2.6	53.1	73.4	1.5	1.4	54.1	78.9	0.9	0.4	55.6	63.3	0.6	0.2	55.5	58.8
KY03C-1195-10-8-5	3.5	2.2	54.7	69.5	1.4	1.2	56.9	89.0	2.2	0.9	55.5	65.8	1.4	0.4	56.2	56.9
KY03C-1237-05	4.6	3.4	53.3	65.0	2.3	2.2	54.9	71.6	4.3	1.7	54.9	64.1	1.5	0.3	56.2	70.9
KY03C-1237-10	3.7	4.0	51.8	64.2	1.5	2.8	54.7	78.6	1.7	0.8	55.9	69.7	0.9	0.3	56.6	71.7
KY03C-1237-12	2.9	2.5	53.7	60.9	1.1	1.7	54.8	79.3	1.8	0.8	55.6	66.8	1.0	0.3	56.2	69.5
Pembroke 2014	1.4	1.5	55.1	74.5	0.8	1.0	56.6	89.7	1.0	0.7	56.3	62.5	0.3	0.3	56.7	67.0
KY03C-1237-39	3.7	4.6	52.1	58.6	1.7	2.2	55.3	78.0	2.6	0.6	55.9	68.3	0.7	0.1	56.8	66.4
KY04C-2004-1-1-1	4.3	4.5	52.7	65.6	1.8	1.8	56.7	88.3	2.8	0.6	57.7	65.9	2.7	0.7	58.1	64.0
KY05C-1600-92-9-5	3.5	4.2	52.7	62.3	1.3	1.2	55.5	84.6	3.1	1.0	55.4	62.5	1.2	0.3	55.9	69.8
KY06C-1003-139-16-5	2.4	3.9	52.8	58.7	0.7	2.3	55.2	70.7	1.1	0.4	55.6	69.9	0.8	0.4	56.2	75.8
Pembroke 2008	5.0	5.8	51.2	56.0	2.4	3.4	54.2	76.3	2.2	0.8	55.9	64.6	1.3	0.4	57.0	64.4
Pioneer variety 25R32	2.0	3.1	52.2	54.8	0.6	1.6	55.3	69.3	0.5	0.6	55.8	74.2	0.3	0.2	56.7	70.1
Pioneer variety 25R40	4.6	4.4	49.8	56.0	2.4	3.1	54.8	87.1	3.9	0.9	55.6	73.6	2.3	0.3	56.1	76.5
Pioneer variety 26R10	4.6	5.3	50.1	64.9	2.4	3.3	52.5	80.4	4.1	1.4	54.5	74.6	2.2	0.7	55.4	76.7
Pioneer variety 26R53	3.5	4.8	51.0	59.3	1.7	2.5	55.5	85.0	3.9	0.9	56.1	69.8	1.7	0.0	57.0	64.9
SC 1321	4.1	7.1	49.9	71.0	1.8	3.7	52.8	84.3	1.6	0.4	54.2	69.3	0.9	0.5	54.6	69.1
SS 8700	4.9	7.3	48.6	59.4	2.0	3.0	53.2	76.9	2.8	1.5	53.3	78.3	2.2	0.3	54.2	81.5
SYNGENTA SY 483	5.0	4.4	50.7	64.7	1.0	1.8	54.2	99.0	6.4	2.4	52.2	73.4	2.7	0.9	54.7	79.4
Truman	2.9	2.8	54.8	77.8	0.2	0.9	56.7	85.0	3.1	1.1	55.6	70.6	1.1	0.5	56.8	71.5
Mean	3.6	4.4	52.0	65.4	1.5	2.3	54.8	83.2	2.5	1.0	55.3	69.8	1.2	0.4	56.1	70.4
LSD (0.05)	1.8	2.2	1.7	9.7	1.0	0.9	1.5	11.8	1.1	0.9	0.7	8.2	0.7	0.4	0.9	13.9
CV (%)	30.7	30.1	2.0	9.0	38.0	25.1	1.7	8.6	26.4	59.4	0.8	7.1	35.5	72.4	1.0	12.0
R^2	0.63	0.69	0.81	0.72	0.67	0.79	0.78	0.66	0.87	0.58	0.91	0.58	0.82	0.54	0.82	0.45

Table 4. Average Effect of Fungicide Application on Scab Symptoms of 24 Wheat Varieties and Lines at Lexington in 2014

	Incidence	Severity	Index	Rating
Treatment	**%**	**%**	**%**	**0-9**
Control	56.0a	41.1a	23.1a	1.4a
Fungicide	39.7b	31.9b	13.4b	0.6b

Means followed by different letters are significantly different from one another (P<0.001).

Table 5. The Effect of Fungicide on Scab Symptoms of 24 Wheat Varieties and Lines at Lexington in 2014

	Control				Fungicide			
	Incidence	Severity	Index	Rating	Incidence	Severity	Index	Rating
Variety	**%**	**%**	**%**	**0-9**	**%**	**%**	**%**	**0-9**
ARMOR HAVOC	68.3	39.4	27.3	1.3	35.0	42.7	15.9	0.3
AgriMAXX 413	40.0	36.3	14.5	0.7	33.3	26.9	9.0	0.0
BECK 113	41.7	52.6	21.7	0.0	23.3	16.6	4.0	0.0
BECK 120	38.3	37.4	14.0	0.3	21.7	21.1	4.7	0.0
Dyna-Gro 9042	40.0	46.4	18.6	0.7	33.3	32.5	10.8	0.0
KY03C-1002-02	38.3	33.6	12.5	0.3	38.3	18.9	7.4	0.0
KY03C-1195-10-8-5	70.0	26.4	18.9	2.7	60.0	11.9	7.2	0.0
KY03C-1237-05	80.0	26.1	20.1	2.0	48.3	15.5	7.7	0.3
KY03C-1237-10	53.3	44.9	24.9	1.0	35.0	38.5	13.9	1.0
KY03C-1237-12	53.3	42.7	23.0	1.0	43.3	35.0	14.9	0.0
Pembroke 2014	36.7	28.4	10.5	0.0	30.0	20.9	6.4	0.0
KY03C-1237-39	76.7	37.1	28.2	3.0	61.7	39.8	24.6	0.7
KY04C-2004-1-1-1	56.7	40.8	22.8	1.7	35.0	41.2	14.3	0.3
KY05C-1600-92-9-5	70.0	37.0	25.0	2.3	40.0	30.2	12.4	0.0
KY06C-1003-139-16-5	41.7	43.8	18.2	0.3	21.7	26.3	7.0	0.0
Pembroke 2008	70.0	44.6	31.3	2.0	58.3	42.8	25.4	0.7
Pioneer variety 25R32	45.0	27.7	12.7	0.3	31.7	15.5	4.8	0.0
Pioneer variety 25R40	63.3	38.0	24.2	4.0	63.3	39.2	24.9	1.3
Pioneer variety 26R10	61.7	51.2	30.0	1.7	45.0	46.5	21.3	1.0
Pioneer variety 26R53	70.0	46.9	33.3	1.7	50.0	43.5	22.1	0.0
SC 1321	31.7	39.3	12.8	0.3	30.0	31.8	9.7	0.0
SS 8700	78.3	55.5	42.4	2.0	61.7	49.0	30.6	1.0
SYNGENTA SY 483	78.3	61.6	48.3	2.3	36.7	41.1	15.2	0.0
Truman	41.7	48.4	20.2	1.0	16.7	37.7	6.4	0.0
Mean	50.0	41.1	23.1	1.4	39.7	31.9	13.4	0.3
LSD	22.1	13.7	11.0	1.2	20.8	10.9	9.4	0.5
CV(%)	26.9	20.3	28.8	55.4	31.9	20.9	43	103.5
R^2	0.68	0.65	0.75	0.75	0.65	0.81	0.73	0.77

Table 6. 2014 Heading Date of 24 Wheat Varieties and Lines at Lexington

Variety	Heading Days (May 1=1)
ARMOR HAVOC	15.2
AgriMAXX 413	13.0
BECK 113	12.7
BECK 120	12.7
Dyna-Gro 9042	14.0
KY03C-1002-02	15.0
KY03C-1195-10-8-5	15.0
KY03C-1237-05	18.7
KY03C-1237-10	14.5
KY03C-1237-12	15.5
Pembroke 2014	13.2
KY03C-1237-39	15.5
KY04C-2004-1-1-1	15.2
KY05C-1600-92-9-5	16.0
KY06C-1003-139-16-5	14.7
Pembroke 2008	14.7
Pioneer variety 25R32	16.0
Pioneer variety 25R40	15.2
Pioneer variety 26R10	14.5
Pioneer variety 26R53	14.7
SC 1321	12.7
SS 8700	15.0
SYNGENTA SY 483	14.8
Truman	20.8
Mean	15.0
LSD	1.1
CV(%)	6.3
R^2	0.82