WHEAT VARIETY RESPONSE TO FUNGICIDE TREATMENT IN 2015

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This year a mild scab epidemic was seen in inoculated plots in Lexington (Table 1). In Princeton such low levels of scab traits were seen that while agronomic measurements were taken, disease traits were not. Overall at Lexington fungicide treatment resulted in significant ($P<0.05$) reductions in deoxynivalenol (DON) accumulation (71% reduction), *Fusarium*-damaged kernels (FDK) in grain (64% reduction), and for the measures of head symptoms, incidence (51% reduction), severity (20% reduction) and index (62% reduction)(Table 1). The levels of disease were low but the degrees of disease reductions by fungicide were similar to those seen in previous years with higher epidemic levels.

There were significant yield differences between fungicide treated and control (untreated) plots at both Lexington and Princeton (Table 2) but only at Lexington was this likely due to reduction in Fusarium head blight. At Lexington we observed a significant increase in test weight of fungicide treated wheat (Table 2). This was consistent with the reduction in *Fusarium*-damaged kernels (FDK) seen with fungicide treatment (Table 1). The higher levels of disease at Lexington resulted in yield and test weight improvements in fungicide-treated plots much greater than in Princeton. This location by treatment effect was highly significant ($P<0.01$ for yield and $P<0.0001$ for test weight).

The range of scab traits varied among the varieties and lines tested (Table 3). In the control treatment significant ($P<0.001$) differences were seen among lines and varieties. DON was as low as 0.4ppm for Truman, a late-heading variety well known for scab resistance and MBC13_110, a line developed at UK using marker-assisted backcrossing of quantitative trait loci for resistance. DON values as high as 6.7 and 5.2ppm for Syngenta SY483 and Pioneer26R10 respectively were seen (Table 3). There is a wide variation in genetic resistance to DON among varieties available to growers (Table 3). DON and FDK correlated well ($r=0.84$). FDK was as high as 7.2% and 6.7% for Pioneer 26R10 and Syngenta SY483 respectively and as low as 1.0 and 1.1 for MBC13_110 and Truman respectively. Head symptoms often correlate more loosely to DON than FDK and that was the case with severity and index showing a moderate correlation ($r=0.51$ and 0.45 respectively) and incidence showing a low correlation ($r=0.27$). The unusually high incidence seen for Truman might be partly a consequence of it being significantly ($P<0.05$) later than all other lines (Table 3) and that it was just beginning to senesce when symptoms were taken around 21 days after heading, perhaps inflating its score.

Fungicide application reduced DON, FDK, incidence, severity and index in all varieties and lines (Table 3) with one exception: severity of SS 8340, where the difference was minor and not significant ($P<0.05$). There were significant treatment by variety test effects for DON ($P<0.0001$), FDK ($P<0.0001$) and index ($P<0.05$) but not for incidence or severity. DON reduction with fungicide varied from 51.2% for KY06C-1003-139-16-5 to 87.7% for Dyna-Gro 9171. FDK reduction varied from 14.5% for Pembroke14 to 90.7% for USG3438. Control Pembroke14 already had a very low FDK of 1.2%, USG was higher at 6.0% so there was greater room for

improvement. However, among all varieties and lines there was no correlation between the level of DON in the control and the extent of the reduction in DON with fungicide (r=-0.0001) or the amount of FDK and its reduction with fungicide (r=0.0952).

The yield of varieties and lines in the control treatment at Lexington varied from 57.1bu/acre for Pioneer variety 26R53 to 87.8 bu/acre for KAS S1200 (Table 4). Yields for the fungicide treatment varied from 70.2bu/acre for Pembroke08 to 88.5 bu/acre for KAS S1200 (Table 4). There was a good correlation (-0.75) between control yield and improvement of yield with fungicide. In other words the varieties and lines that benefited most from fungicide application seemed to be the ones that had the lowest yield without it. There was a significant variety by treatment for test weight ($P<0.0001$) and a very good correlation (-0.94) between control test weight and improvement in test weight with fungicide. Similar to the situation with yield, the higher the test weight of the variety in the control treatment the less the benefit from the fungicide, in general. Test weights varied from 46.3lb/bu for Pioneer variety 26R10 to 56.8lb/bu for MBC13_110 in the control treatment and from 53.1 lb/bu for Syngenta SY483 to 57.8lb/bu for MBC13_110.

METHODS

In 2015, variety x fungicide trials were conducted in replicated plots at Lexington and Princeton, KY. Entries in the 2015 test were grown in 6-row 10 ft. plots, planted into corn residue which had been conventionally tilled. Princeton was planted Oct 24th 2014, Lexington Oct 26th 2014. 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 15th at Princeton and April 13th at Lexington. The inoculum had time to develop and emit spores during flowering and 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 expressed as a percentage. After harvest, yield, test weight, and *Fusarium* damaged kernels (FDK) were measured. FDK is the percentage of scabby seed or tombstones in a representative grain sample.

CONCLUSION

Varieties available to growers vary widely in their scab resistance. Fungicide application can be effective at reducing scab traits including DON. 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. By signing up for FHB alerts (http://scabusa.org/fhb_alert.php) growers can receive email or text message alerts to let them know when scab is likely to develop in their area.

TABLE 1. AVERAGE EFFECT OF FUNGICIDE APPLICATION ON FUSARIUM HEAD BLIGHT TRAITS OF 24 WHEAT VARIETIES AND LINES AT LEXINGTON IN 2015					
	DON	**FDK**	**INCIDENCE**	**SEVERITY**	**INDEX**
TREATMENT	**ppm**	**%**	**%**	**%**	**%**
Control	2.1a	3.3a	37a	20a	8a
Fungicide	0.6b	1.2b	18b	16b	3b

Means followed by different letters are significantly different from one another (P<0.05).

TABLE 2. AVERAGE EFFECT OF FUNGICIDE APPLICATION ON YIELD AND TEST WEIGHT OF 24 WHEAT VARIETIES AND LINES AT LEXINGTON AND PRINCETON IN 2015			
		YIELD	**TEST WEIGHT**
LOCATION	**TREATMENT**	**Bu/Ac**	**Lb/Bu**
Lexington	Control	70.4d	53.0c
	Fungicide	79.0c	55.7b
Princeton	Control	85.9b	55.9ab
	Fungicide	88.6a	56.1a

Means followed by different letters are significantly different from one another (P<0.05).

TABLE 3. THE EFFECT OF FUNGICIDE ON FUSARIUM HEAD BLIGHT TRAITS OF 24 WHEAT VARIETIES AND LINES AT LEXINGTON IN 2015												
	Control						Fungicide					
	DON	FDK	Incidence	Severity	Index	Heading	DON	FDK	Incidence	Severity	Index	Heading
Variety	ppm	%	%	%	%	Julian	ppm	%	%	%	%	Julian
AgriMAXX 413	1.7	4.2	50.0	22.6	12.4	131.7	0.2	1.6	15.0	13.5	2.1	130.7
ARMOR HAVOC	1.7	3.6	41.7	20.2	8.6	128.7	0.4	0.7	13.3	13.6	1.8	128.7
BECK 120	2.7	4.0	28.3	19.6	5.5	129.7	0.4	1.8	20.0	11.3	2.3	129.0
Dyna-Gro 9171	2.4	3.5	45.0	18.0	7.5	129.3	0.3	2.4	11.7	15.3	1.7	129.3
Dyna-Gro 9223	2.1	3.8	45.0	25.4	11.2	132.0	0.5	1.3	16.7	15.2	2.9	131.0
KAS S1200	1.4	3.4	33.3	14.3	4.7	129.0	0.2	1.2	15.0	9.1	1.3	129.0
KAS S2000	1.0	2.8	45.0	26.9	11.4	129.0	0.3	1.2	11.7	19.7	2.6	128.7
KY03C-1237-05	1.6	2.3	33.3	17.4	5.8	135.3	0.3	1.1	35.0	20.7	7.3	135.3
KY03C-1237-10	1.5	2.7	40.0	18.5	7.4	129.7	0.5	1.1	21.7	17.0	3.6	129.0
KY04C-2004-1-1-1	1.5	2.5	31.7	21.7	6.5	131.3	0.5	0.8	15.0	14.3	2.2	131.0
KY06C-1003-139-16-5	1.2	2.8	23.3	19.3	3.9	130.0	0.6	1.1	20.0	14.8	2.7	128.7
MBC13_110	0.4	1.0	25.0	16.3	3.9	130.7	0.2	0.2	11.7	8.9	1.1	131.0
PEMBROKE 2008	2.1	2.9	38.3	24.2	8.8	131.0	0.7	1.1	20.0	19.3	3.6	131.0
PEMBROKE 2014	1.1	1.2	30.0	19.5	5.9	129.0	0.3	1.0	26.7	13.8	3.5	128.3
PEMBROKE 2016	1.7	1.7	40.0	14.3	6.3	129.3	0.5	0.8	13.3	11.4	1.6	129.3
Pioneer variety 25R32	1.1	3.1	35.0	15.6	5.7	131.0	0.2	1.2	13.3	9.6	1.3	130.7
Pioneer variety 25R40	2.7	3.6	38.3	16.2	6.2	131.3	1.2	2.0	16.7	14.5	2.4	132.0
Pioneer variety 26R10	5.2	7.2	50.0	27.9	13.9	131.7	1.6	2.1	31.7	21.7	7.2	131.7
Pioneer variety 26R41	3.7	4.3	21.7	23.1	5.2	131.0	0.9	1.1	16.7	20.2	3.1	130.7
Pioneer variety 26R53	2.8	3.2	31.7	17.7	5.1	131.3	0.6	1.0	15.0	14.4	2.1	131.3
SS 8340	1.4	1.5	30.0	20.1	6.0	130.3	0.4	0.8	20.0	21.0	4.0	130.3
Syngenta SY483	6.7	6.7	53.3	32.2	17.3	132.0	2.4	2.6	25.0	22.8	5.5	132.0
Truman	0.4	1.1	53.3	25.8	13.9	137.7	0.1	0.5	30.0	21.6	6.6	137.3
USG 3438	2.5	6.0	21.7	14.6	3.2	130.0	0.4	0.6	6.7	9.4	0.6	130.0
Mean	**2.1**	**3.3**	**36.9**	**20.5**	**7.8**	**130.9**	**0.6**	**1.2**	**18.4**	**15.5**	**3.1**	**130.7**
LSD	**1.6**	**1.9**	**22.8**	**8.8**	**6.3**	**0.8**	**0.4**	**0.8**	**11.9**	**7.7**	**2.5**	**0.8**
CV	**44.9**	**34.4**	**37.7**	**26.1**	**49.1**	**0.4**	**48.1**	**42.1**	**39.3**	**30.1**	**49.5**	**0.4**

TABLE 4. 2015 YIELD AND TEST WEIGHT RESPONSES OF 24 WHEAT VARIETIES AND LINES TO FUNGICIDE TREATMENT AND LOCATION.								
	Lexington				Princeton			
	Control		Fungicide		Control		Fungicide	
	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight
Variety	**bu/acre**	**lb/bu**	**bu/acre**	**lb/bu**	**bu/acre**	**lb/bu**	**bu/acre**	**lb/bu**
AgriMAXX 413	81.9	52.3	83.3	55.5	90.3	54.3	90.4	54.7
ARMOR HAVOC	68.7	54.0	74.5	56.3	87.1	56.4	87.2	57.2
BECK 120	68.6	52.7	85.0	55.2	85.9	54.2	93.1	55.6
Dyna-Gro 9171	82.3	51.4	87.1	55.8	78.8	54.1	94.2	55.4
Dyna-Gro 9223	65.0	50.9	86.3	55.4	86.9	55.1	96.2	55.0
KAS S1200	87.8	51.8	88.5	54.9	91.8	54.7	90.2	53.6
KAS S2000	76.8	52.9	85.8	55.9	87.3	54.0	83.9	55.4
KY03C-1237-05	70.1	51.8	80.4	54.7	82.0	56.2	89.6	56.3
KY03C-1237-10	71.7	54.2	76.1	55.7	85.3	56.0	89.3	56.2
KY04C-2004-1-1-1	69.3	56.2	77.4	57.6	87.6	58.7	95.3	59.1
KY06C-1003-139-16-5	68.0	54.6	80.2	54.5	85.8	56.1	80.4	56.2
MBC13_110	73.5	56.8	72.9	57.8	76.7	59.2	81.4	58.9
PEMBROKE 2008	62.0	54.1	70.2	56.9	82.4	56.8	80.7	56.7
PEMBROKE 2014	63.0	55.9	78.3	55.6	81.6	56.9	82.9	56.6
PEMBROKE 2016	69.8	55.1	74.0	55.9	90.3	56.7	93.5	57.1
Pioneer variety 25R32	73.8	54.7	81.1	56.2	86.4	56.6	84.7	58.2
Pioneer variety 25R40	70.0	49.6	71.2	54.7	91.4	55.6	96.1	56.1
Pioneer variety 26R10	57.2	46.3	78.6	54.0	87.4	55.3	89.5	55.6
Pioneer variety 26R41	70.4	51.2	80.8	55.9	86.6	56.3	89.5	57.2
Pioneer variety 26R53	57.1	53.4	74.2	55.9	80.5	57.3	89.4	56.5
SS 8340	74.4	55.8	82.0	57.8	91.4	57.6	87.3	58.2
Syngenta SY483	64.6	48.2	83.1	53.1	98.5	54.3	96.0	53.4
Truman	73.0	56.0	71.8	55.6	74.1	53.6	78.8	52.1
USG 3438	72.2	51.9	73.6	55.7	85.2	54.7	87.3	55.5
Mean	**70.2**	**53.0**	**79.0**	**55.7**	**85.9**	**55.9**	**88.6**	**56.1**
LSD	**9.0**	**2.3**	**12.7**	**1.8**	**8.9**	**1.2**	**12.9**	**1.4**
CV	**7.8**	**2.7**	**9.8**	**2.0**	**6.3**	**1.3**	**8.9**	**1.5**