

2014 WHEAT VARIETY – FUSARIUM HEAD SCAB NURSERY RESULTS

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INTRODUCTION

Fusarium head blight (head scab) and the associated contamination of grain by the mycotoxin deoxynivalenol (DON) are major concerns for Kentucky wheat producers. Head scab reduces grain yield, test weight, and seed germination/vigor. Because of health concerns associated with human/animal consumption of the mycotoxin DON, excessive DON levels reduce marketability and end use of the harvested grain.

Variety selection is recognized as the most cost effective way for maximizing potential production profitability. Agronomic characteristics of varieties, such as grain yield and test weight are important, but secondary characteristics such as height, maturity and disease susceptibility are also important. There has been progress in recent years in developing varieties that resist head scab and DON accumulation. The University of Kentucky (UK) wheat variety testing program rates and reports annual visual disease ratings for head scab and any other disease that is prevalent in a given year or test environment. Because head scab is such a detrimental disease, the wheat varieties tested in the 2014 UK Variety Test were also evaluated in the 2014 UK Fusarium head scab nursery.

OBJECTIVE

The objective of this study was to evaluate the response of wheat varieties to a high/consistent level of head scab disease pressure.

METHODS

112 wheat varieties/lines were tested in the 2013-14 UK Wheat Variety Test. These wheat entries were also evaluated for susceptibility to

head scab infection and DON contamination in the UK scab nursery in Fayette Co., KY. The nursery was inoculated with the Fusarium head blight pathogen *Fusarium graminearum* Schwabe [teleomorph *Gibberella zeae* (Schwein.:Fr.) Petch], and mist irrigated to provide a high and relatively even level of exposure and infection across heading dates. There were two replicated plots per entry. The nursery was seeded 10/25/2013 and harvested 7/7/2014 – 7/9/2014.

In Table 1, the nursery infection rating scale ranges from 0-9. 0, for example represented 0-10% of spikelets in the row showing a bleached appearance; a 9 rating indicated 90-100%. These infection ratings were taken 24 days after heading for each variety, rather than all at once, to maintain a more uniform rating independent of differences in heading date among varieties. For comparison, field scab ratings are also presented from the 2014 UK wheat variety test in Logan Co. (Rating Scale: 1=resistant; 9=susceptible). Logan Co. field ratings were recorded on 5-29-14.

Seed from the nursery was hand harvested, threshed and cleaned using low air to retain the light weight tombstone grains. The % FDK is the percent of *Fusarium*-damaged kernels. DON concentration was reported in parts per million (ppm). The DON analysis was performed at the University of Minnesota, DON Testing Laboratory supervised by Yanhong Dong using gas chromatography with mass spectrometry.

RESULTS

Visual ratings taken 24 days after heading in the scab nursery ranged from 0.0 to 6.5 and averaged 2.0 indicating broad based genetic

differences in head scab infection among varieties (Table 1). The percentage of *Fusarium*-damaged kernels (FDK) ranged from 3.6 to 32.1 % and averaged 12.1 %. The DON concentrations ranged from 5.1 to 25.9 ppm and averaged 12.3 ppm.

As demonstrated in the 2014 UK Wheat Variety Test field ratings for head scab, the results from the UK scab nursery showed a broad range of differences in the level of susceptibility among varieties. In many cases it was evident that certain varieties showed a high or low level of susceptibility to head scab, with many lines falling in the intermediate level. Varieties such as L-Brand 343, SS 8415 and Terral TV8861 had a very high infection rating, %FDK and DON level. Varieties such as, KAS 5058, L-Brand 304 and L-Brand 334 showed good uniform resistance to head scab.

There are other examples of mixed results within a variety, such as USG 3438, which had a low infection rating of 1, an average DON level of 13.9 ppm and a very high %FDK of 24.7% or Pioneer variety XW12K which had the highest infection rating of 6.5 and one of the lowest DON levels at 6.5 ppm, or AgriMAXX EXP 1335 with a low rating of 1.5 and a high DON level of

22.5 ppm. We also saw examples like ARMOR ARX1325, which had low FDK, yet high DON, something experienced by KY growers in pockets of the state this year. In spite of this variability, there was a moderate correlation (Table 2) between the scab nursery ratings and DON levels and roughly the same correlation between scab ratings taken in the Logan County variety trial (Table 13 of the Wheat Variety Bulletin; <http://www.uky.edu/Ag/wheatvarietytest/2014/2014%20Results%20-%20Excel.htm>) and the DON levels from the scab nursery. Mixed results may be a result of limited sample size associated with testing two replications, but also may also be indicative of a varieties ability to sustain a high infection while and suppressing DON accumulation or vice versa.

These data indicate that there are genetic differences among varieties in the susceptibility or resistance to *Fusarium* head blight. Disease reaction is an important genetic characteristic and is important to consider when making variety selection decisions. With a very complex disease like scab, it pays the grower to access all of the available information to make an informed decision.

TABLE 1. 2014 Kentucky Wheat Variety - Fusarium Head Scab Nursery Results.

Name	Scab Nursery Rating	% FDK	DON (ppm)	Field Rating*
AgExp02444	0.5	14.7	6.9	3.5
AgExp0762	0.0	11.4	9.4	2.5
AgriMAXX 412	1.5	10.3	13.7	4.3
AgriMAXX 413	1.0	9.2	11.5	4.5
AgriMAXX 415	1.0	11.2	18.2	4.5
AgriMAXX 438	2.5	11.8	16.4	4.0
AgriMAXX 444	1.5	12.9	14.5	4.5
AgriMAXX 447	2.5	8.7	15.7	4.0
AgriMAXX EXP 1335	1.5	19.3	22.1	4.3
AgriMAXX EXP 1465	3.0	13.0	17.4	4.3
ARMOR ARX1313	1.5	12.4	15.1	5.5
ARMOR ARX1325	2.5	9.6	19.5	4.3
ARMOR ARX1327	0.5	11.0	10.3	4.0
ARMOR ARX1329	1.0	7.4	9.5	4.8
ARMOR ARX1332	2.0	14.2	9.8	5.5
ARMOR HAVOC	1.0	7.1	12.5	3.8
ARMOR OCTANE	2.0	10.4	12.4	4.0
ARMOR RAMPAGE	2.0	11.1	13.2	5.0
ARMOR VANDAL	4.5	14.0	19.2	6.8
BECK 113	2.0	8.6	5.4	3.3
BECK 120	0.5	16.8	9.1	4.3
BECK 125	1.5	9.0	10.1	4.3
BECK 129	4.0	19.1	9.1	4.0
Bess	0.5	7.0	11.2	3.8
Clark	2.0	7.7	7.4	4.0
Delta Grow 3200	2.5	25.8	13.3	5.3
Delta Grow 7100	3.0	9.8	11.5	2.5
Delta Grow 7200	3.0	8.7	12.0	3.8
Delta Grow 7500	1.5	19.7	20.0	4.5
Delta Grow 9700	1.5	8.4	11.5	4.5
Dixie DXEX 13-3	2.5	13.2	8.2	4.3
Dixie Extreme	2.5	10.0	12.2	4.3
Dixie Glory	5.5	18.3	18.4	3.8
Dixie McAlister	1.0	12.8	14.7	4.5
Dyna-Gro 9042	1.0	8.4	10.6	3.8
Dyna-Gro 9171	0.5	17.6	12.3	4.3
Dyna-Gro 9223	1.5	9.5	7.6	4.3
Dyna-Gro 9343	1.5	8.8	17.7	3.3
Dyna-Gro 9522	2.5	10.5	10.1	4.3
Dyna-Gro 9591	1.0	7.9	12.1	5.0
Equity Brand Butler	2.0	9.6	11.6	3.3
Equity Brand Guardian	0.0	6.9	11.6	2.8
Equity Brand Sienna	1.0	10.6	14.2	5.0

KAS 5058	0.0	7.6	6.3	4.3
KAS ELLERY	2.0	9.9	11.7	4.0
KAS S1200	1.5	11.5	10.3	5.0
KAS S2000	0.5	12.6	9.3	3.8
KY03C-1002-02	2.0	9.0	7.1	4.5
KY03C-1195-10-8-5	3.5	9.1	13.1	4.8
KY03C-1237-05	3.5	8.5	13.9	3.0
KY03C-1237-10	3.5	15.5	10.3	5.3
KY03C-1237-12	5.0	13.2	14.1	5.3
KY03C-1237-39	3.5	14.5	11.5	5.3
KY04C-2004-1-1-1	2.0	6.2	9.5	4.0
KY05C-1600-92-9-5	3.0	8.8	12.9	4.3
KY06C-1003-139-16-5	2.0	8.3	8.6	4.3
L-Brand 203	1.5	8.5	7.8	3.3
L-Brand 304	0.0	7.3	5.1	2.5
L-Brand 334	0.0	3.6	6.8	2.5
L-Brand 343	6.0	32.1	17.7	8.5
L-Brand 448	1.0	8.3	12.2	4.5
Pembroke 2008	2.0	18.5	12.6	6.3
Pembroke 2014	2.0	10.2	7.7	4.3
Pioneer variety 25R32	2.0	14.1	9.7	3.3
Pioneer variety 25R40	4.0	13.0	12.8	5.0
Pioneer variety 25R46	1.0	9.5	15.2	2.8
Pioneer variety 25R78	2.0	13.2	12.8	6.0
Pioneer variety 26R10	3.5	14.9	9.7	5.3
Pioneer variety 26R20	4.0	18.7	18.5	7.3
Pioneer variety 26R41	2.0	14.1	15.3	5.5
Pioneer variety 26R53	3.5	13.0	16.0	4.8
Pioneer variety XW12J	1.1	10.3	9.1	3.8
Pioneer variety XW12K	6.5	17.6	6.5	3.3
PROGENY P 117	0.0	8.1	8.0	4.3
PROGENY P 185	0.5	12.4	11.4	5.8
PROGENY P 357	4.5	14.0	12.4	5.8
PROGENY P 870	2.0	21.2	14.1	4.8
PROGENY PGX 13-1	3.0	8.8	12.9	3.5
PROGENY PGX 13-2	3.5	20.7	8.3	5.8
PROGENY PGX 13-4	3.0	9.4	18.3	2.5
PROGENY PGX 13-6	2.0	13.1	12.6	4.3
SC 1321TM	0.5	17.5	11.8	4.3
SC 1324TM	1.1	10.4	11.2	5.8
SC 1325-15TM	1.0	9.4	5.9	3.8
SC 1335-15TM	0.0	8.6	15.9	4.3
SC 1342TM	3.0	11.8	9.5	4.8
SS 8340	1.5	7.4	6.6	4.3
SS 8360	1.0	12.2	20.1	5.0
SS 8412	4.0	9.4	13.6	5.8
SS 8415	6.5	26.4	15.5	6.3

SS 8700	3.0	16.3	20.7		6.5
SS 8870	1.5	7.6	11.4		3.0
STEYER HUNKER	2.5	10.6	11.4		4.5
STEYER PIERSON	0.5	8.6	10.7		2.8
SYNGENTA SY 007	0.5	12.8	7.3		4.8
SYNGENTA SY 474	2.5	10.4	13.6		4.8
SYNGENTA SY 483	2.0	14.2	17.2		4.8
SYNGENTA SY 547	1.5	11.0	10.0		5.5
Terral TV8525	1.0	11.4	12.2		4.5
Terral TV8535	2.0	22.1	17.3		4.8
Terral TV8848	1.5	6.3	9.9		4.5
Terral TV8861	5.0	16.5	25.9		6.3
Truman	3.0	7.7	15.4		2.0
USG 3013	3.0	13.7	14.6		4.5
USG 3251	1.5	8.6	11.6		5.0
USG 3404	1.0	12.0	10.7		4.5
USG 3438	1.0	24.7	13.9		4.3
USG 3612	0.5	11.6	12.0		4.8
USG 3833	1.5	10.5	15.3		4.5
USG 3993	0.5	9.4	10.6		3.0
VA 10W-123	2.0	11.6	8.9		5.3
VA 10W-21	2.5	12.2	7.7		4.3
AVERAGE	2.0	12.1	12.3		4.5

Note: Shaded signifies lines that exemplify the phenomenon of low FDK masking high DON, an anomaly reported by growers in 2014.

* Field ratings taken at the 2014 UK Wheat Variety Test in Logan Co., KY on 5-29-14.

TABLE 2. 2014 Kentucky Fusarium Head Scab Nursery Correlations.

	Field Rating*	Nursery Rating	% FDK	DON (ppm)
Field Rating	1	0.397	0.5484	0.3183
Nursery rating	0.397	1	0.4554	0.3278
% FDK	0.5484	0.4554	1	0.3557
DON (ppm)	0.3183	0.3278	0.3557	1

* Field ratings taken at the 2014 UK Wheat Variety Test in Logan Co., KY on 5-29-14. Nursery rating, %FDK and DON data from 2014 UK Scab Nursery in Fayette Co., KY.