

GENOTYPE SPECIFIC SOFT RED WINTER WHEAT MANAGEMENT (2012-2014)

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INTRODUCTION

The complex interaction of genotype x environment x management (GxExM) that defines crop yield is often explored with just one genotype or a select few genotypes. Improvements in crop management will require a broad understanding of genotype interactions with management systems across multiple environments. A multi-year soft red winter wheat study was initiated in the 2012-2013 growing season and continued through the 2013-2014 season.

METHODS

A randomized split plot design was replicated 3 times at the University of Kentucky Spindletop Research Farm in Lexington, KY in 2012-13 (1 location) and 2013-14 (2 locations) and in Princeton, KY at the University of Kentucky Research and Education Center in 2013-14. We evaluated 10 genotypes under 3 management systems (HIGH, MEDIUM and LOW) across 4 nitrogen rates (0 lb/A, 60 lb/A, 100 lb/A and 150 lb/A). (Tables 1) Field measurements included: kernel growth rate, soil nitrate analysis, vegetative tissue and grain nitrogen analysis, NDVI, SPAD, relative water content, henology, lodging and disease observations.

Table 1. Wheat Management Systems

	Management Level		
	HIGH	MEDIUM	LOW
Seeding Rate	45 seeds/ft ²	35 seeds/ft ²	35 seeds/ft ²
Seed Treatment	Cruiser	Cruiser	Cruiser
Fungicides	Headline @ Feekes 6.0 Prosaro @ Feekes 10.5	Prosaro @ Feekes 10.5	No
Growth Regulator	Palisade	No	No
Insecticide	Warrior	Warrior	Warrior
Nitrogen	0 lb/A	0 lb/A	0 lb/A
	60 lb/A	60 lb/A	60 lb/A
	100 lb/A	100 lb/A	100 lb/A
	150 lb/A	150 lb/A	150 lb/A

Preliminary Results:

By Genotype:

Table 2. Effect Of Management System And Grain Yield Over 2 Years And 4 Locations (2012-2014 Lexington, Princeton) As Indicated By P Values. P Values Less Than 0.05 Indicate Statistically Significant Differences Among Treatments.

Genotype	Truman	Pembroke 2008	Pembroke 2014	Shirley	1238-17-1	25R32	Dinah	SS8700	SSMPV57	Branson
Management	0.0411	0.0047	ns	<0.0001	<0.0001	0.0002	ns	<0.0001	<0.0001	<0.0001
N Rate	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

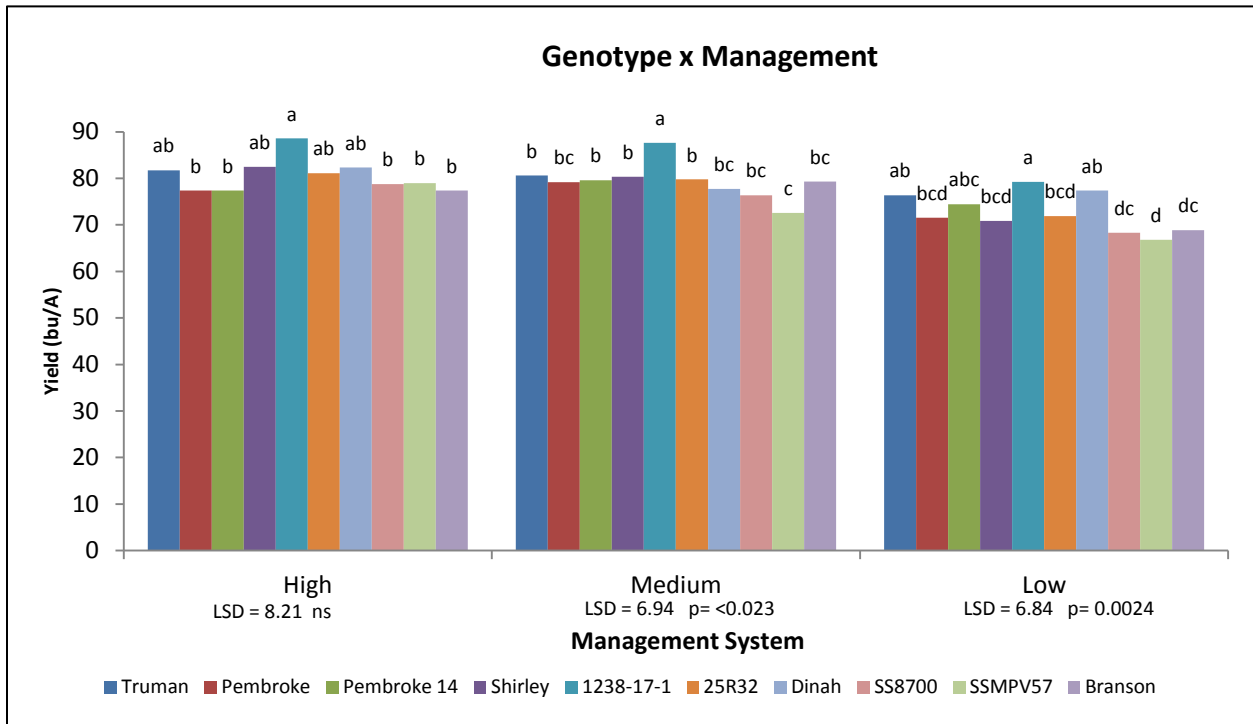
Nitrogen had a significant effect across all genotypes primarily due to the reduction in yields in the 0 lb/A rate (Table 2). Management level had a significant effect on all genotypes except Pembroke 14 and Dinah which did not display significant yield increases across management systems (Table 2). Yields of these two varieties under LOW management were similar to their yields under MEDIUM and HIGH managements, indicating good disease and lodging resistance without the need for additional control measures. Table 3 displays the yield results by individual genotypes and those treatments that differed significantly by genotype. For the remaining genotypes that differed significantly for management only SSMPV57 showed differences between the HIGH and MEDIUM managements; no other genotype yielded significantly higher in the HIGH management system compared to the MEDIUM management. Pembroke 14 did not yield significantly higher when N was increased from 60 to 100 lb/A, but there was a significant yield increase at the 150 lb/A rate. No other genotypes demonstrated a significant yield response N rates greater than 60 lb/A.

Table 3. Wheat Yield Results, 2 years, 4 locations (2012-2014 Lexington, Princeton)

Truman					25R32						
<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>		<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>	
High	81.71	a	0	63.71	b	High	81.13	a	0	60.61	b
Medium	80.63	a	60	83.53	a	Medium	79.76	a	60	80.36	a
Low	76.38	b	100	84.62	a	Low	71.85	b	100	84.61	a
			150	86.95	a				150	85.1	a
Pembroke					Dinah						
<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>		<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>	
High	77.36	a	0	57.87	b	High	82.35	ns	0	57.28	b
Medium	79.19	a	60	79.63	a	Medium	77.76	ns	60	84.99	a
Low	71.57	b	100	84.05	a	Low	77.39	ns	100	86.34	a
			150	82.09	a				150	88.03	a
Pembroke 14					SS8700						
<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>		<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>	
High	77.37	ns	0	57.55	c	High	78.76	a	0	60.88	b
Medium	79.59	ns	60	81.08	b	Medium	76.36	a	60	78.3	a
Low	74.43	ns	100	82.03	b	Low	68.33	b	100	77.61	a
			150	87.62	a				150	81.14	a
Shirley					SSMPV57						
<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>		<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>	
High	82.45	a	0	59.19	b	High	78.98	a	0	55.8	b
Medium	80.33	a	60	81.61	a	Medium	72.59	b	60	76.32	a
Low	70.85	b	100	84.06	a	Low	66.81	c	100	78.8	a
			150	86.63	a				150	80.24	a
1238-17-1					Branson						
<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>		<u>Management</u>	<u>Yield</u>		<u>N Rate (lb/A)</u>	<u>Yield</u>	
High	88.56	a	0	65.66	b	High	77.7	a	0	57.46	b
Medium	87.65	a	60	89.12	a	Medium	79.33	a	60	80.14	a
Low	79.22	b	100	92.98	a	Low	68.83	b	100	81.53	a
			150	92.35	a				150	82.13	a

Figure 1 displays the separations in yield among genotypes under each management system. KY1238-17-1 consistently yielded greater than other genotypes with little variability among the remaining genotypes for yields with years and locations combined.

Figure 1. Wheat yield by management level for 2 years and 4 locations (2012-2014 Lexington, Princeton)



Genotypes Combined:

As expected from the results of individual genotypes analyzed the combined analysis showed no significant yield increases from the 100 to 150 lb/A nitrogen rates across all management systems (Figure 2). Significant reductions occur at 0 lb/A nitrogen rates and slight but not significant reductions occur in the HIGH and LOW managements at 60 lb/A rates (Figure 2). There were no yield differences among HIGH and MEDIUM managements in 60 lb/A, 100 lb/A and 150 lb/A nitrogen rates when genotypes were combined, with a significant reduction in yield in low management systems (Figure 3).

Figure 2. Wheat Yield by Management Level and Nitrogen Rate, Genotypes combined, 2 years, 4 locations (2012-2014 Lexington, Princeton)

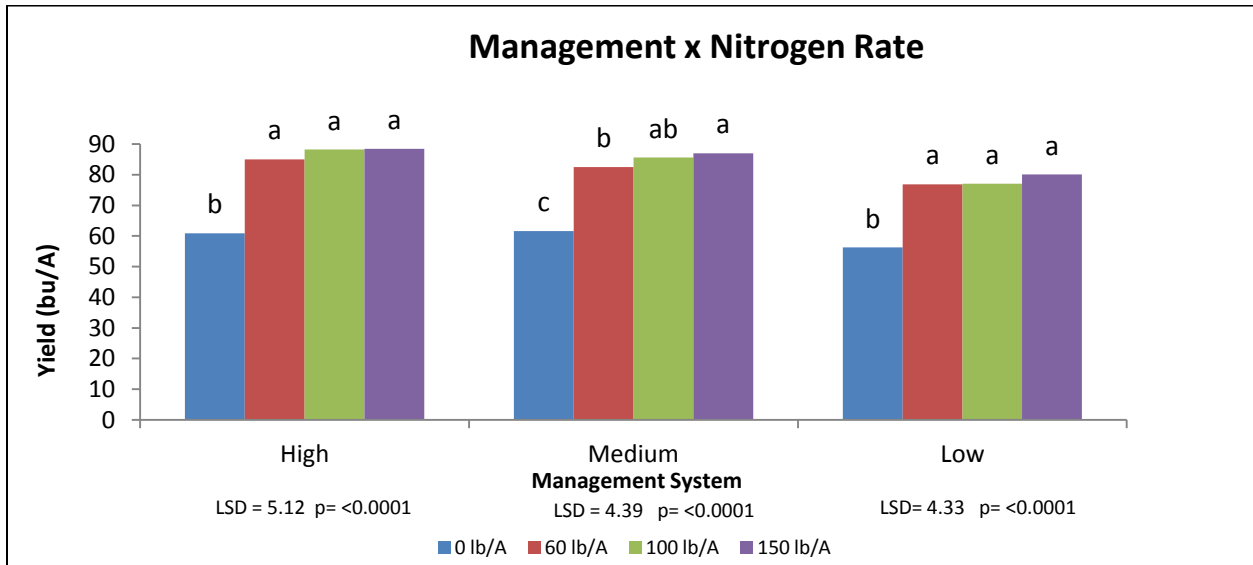
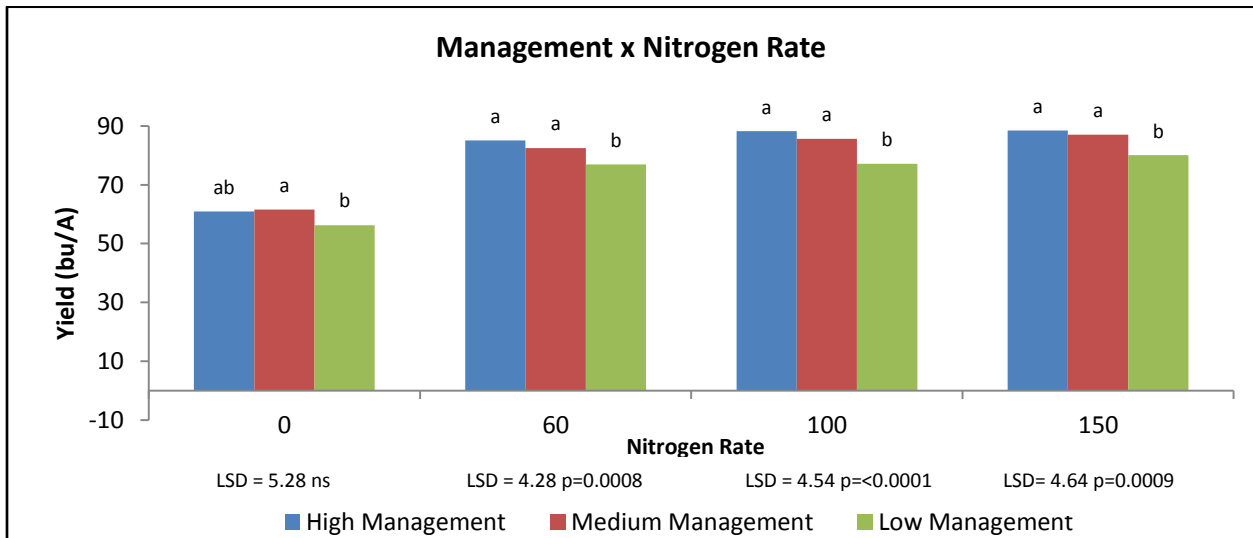


Figure 3. Wheat Yield by Management Level and Nitrogen Rate, Genotypes combined, 2 years, 4 locations (2012-2014 Lexington, Princeton)



Discussion:

For all three management levels, N rates of 100 and 150 lbs/acre resulted in similar yields. For the HIGH and MEDIUM management levels, yields were slightly lower for 60 lbs N/acre. Further analysis of vegetative tissue, grain and soil will be performed to determine the status of nitrogen movement among these treatments across each location.