

Project Title: Nitrogen use response of irrigated spring wheat

Project Leader: Jessica Torrion (PI), Bob Stougaard (Co-PI)

Project Personnel: John Garner, Brooke Bohannon

Objective: To evaluate variety-specific nitrogen use response of irrigated spring wheat for agronomic performance.

Summary:

Eight spring wheat cultivars were grown under four different nitrogen levels as a split plot, randomized complete block design, with four replications, where nitrogen levels represent the whole plot factor and the spring wheat varieties were the sub plot factor. The four nitrogen treatments included no added fertilizer and 150, 300, and 450 pounds/A, respectively, based on soil test N levels plus supplemental N fertilization. Irrigation was applied when necessary to keep soil moisture from falling below 50% of the plant available water. Other agronomic management procedures are detailed in Table 1.

Significant interactions were observed between nitrogen and variety for protein, days to maturity, test weight and grain moisture. Nitrogen treatment had significant effect on yield and seed size (Table 2). Volt had the highest yield and Brennan and WB Rockland the least. The known inverse relationship between yield and protein is evident (Figure 1). Plant height and falling number were not influenced by the N treatment, but appeared to be strongly related to variety.

Figure 2 shows variety-specific nitrogen use efficiency (NUE) segregated into Partial Productivity (PPF) for the total N input (soil + fertilizer) vs. N from fertilizer input. As expected, NUE for all varieties decreased as 300 lbs N or greater was applied. Consistently, McNeal and Volt had superior NUE followed by Cabernet, Solano, Espresso, and Buck Pronto. WB Rockland and Brennan consistently had the lowest NUEs.

Table 1. Materials and methods.

Seeding Date:	4/23/14	Herbicide:	5/30/14
Julian Date:	113		Huskie 11 floz/ac, Axial XL 16.4 floz/ac
Seeding Rate:	20 plnts/sqft	Insecticide:	7/1/14
Previous Crop:	Canola		Warrior II 1.5 floz/ac
Tillage:	Conventional	Fungicide:	7/1/14
Irrigation:	Yes		Headline 7 floz/ac
Soil Type:	Fine sandy loam	Harvest Date:	8/26/14
Soil Test:	120-14-69	Julian Date:	238
Fertilizer:	___-10-100		

Table 2. Spring wheat nitrogen effects on agronomic performance — 2014

Variety	HT in	PM* days	SS seeds/lb	MC %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
<b>80 lbs N (no added fertilizer)</b>									
Brennan	29.6	85	11,337	13.5	96.4	15.3	60.2	40.0	280
Buck Pronto	29.6	91	9,191	14.1	117.7	13.9	60.5	49.4	376
Cabernet	25.6	93	10,886	13.3	118.6	13.0	59.7	41.7	350
Espresso	27.9	95	11,053	13.5	123.0	14.3	61.0	41.1	373
McNeal	33.2	93	10,013	14.1	129.0	13.4	61.3	45.4	444
Solano	27.1	93	10,600	13.4	119.5	14.2	60.5	42.8	373
Volt	29.6	93	12,077	13.9	130.6	12.7	62.6	37.6	390
WB Rockland	26.6	92	10,435	13.3	106.3	15.5	59.9	43.5	382
<b>150 lbs N (soil + fertilizer)</b>									
Brennan	28.4	88	11,521	13.4	111.3	15.2	60.8	39.4	283
Buck Pronto	33.3	95	9,251	14.1	126.0	14.8	60.4	49.1	369
Cabernet	26.8	93	11,091	13.0	131.3	13.4	59.6	40.9	333
Espresso	29.1	95	10,967	13.8	130.2	14.4	61.1	41.4	357
McNeal	36.0	94	10,206	14.2	146.5	14.2	61.5	44.5	410
Solano	27.5	94	10,540	13.6	132.1	14.3	60.8	43.1	362
Volt	32.6	95	12,184	14.4	144.6	13.1	62.6	37.3	372
WB Rockland	25.9	95	10,432	13.3	116.0	15.7	60.3	43.5	361
<b>300 lbs N (soil + fertilizer)</b>									
Brennan	29.3	94	11,623	13.2	105.7	15.5	60.6	39.0	278
Buck Pronto	29.9	94	9,351	14.3	123.0	14.8	59.9	48.6	374
Cabernet	24.9	94	11,189	13.4	126.3	13.4	59.7	40.6	339
Espresso	28.0	95	11,424	13.4	123.9	14.1	60.7	39.7	375
McNeal	32.2	94	10,666	14.2	130.1	14.2	61.1	42.6	410
Solano	26.6	95	10,792	13.5	123.9	14.3	60.7	42.1	366
Volt	29.7	96	12,340	14.1	141.6	13.1	62.4	36.8	386
WB Rockland	27.4	95	10,788	13.1	112.7	15.7	60.2	42.1	381
<b>450 lbs N (soil + fertilizer)</b>									
Brennan	27.6	93	11,547	13.2	101.5	15.7	60.7	39.3	297
Buck Pronto	28.8	95	9,338	14.3	115.3	15.1	60.0	48.6	360
Cabernet	27.0	93	11,270	13.0	115.0	13.9	59.6	40.3	333
Espresso	27.8	96	11,388	13.7	118.6	14.6	60.5	39.9	348
McNeal	32.8	96	10,635	14.1	130.8	14.6	60.8	42.7	423
Solano	25.7	94	11,016	13.5	113.5	14.4	60.2	41.2	346
Volt	30.4	94	12,542	14.4	135.5	13.0	61.9	36.2	383
WB Rockland	27.8	95	10,552	13.2	105.6	15.8	60.0	43.0	361
C.V	12.1	3.1	8.3	3.7	12.8	7.3	1.4	8.5	13.1
LSD	2.0	2.1	216.0	0.2	7.6	0.6	0.9	0.9	32.0
Pr>F <sub>(0.05) - N</sub>	0.152	0.007	0.002	0.419	0.002	0.090	0.007	0.002	0.435
Pr>F <sub>(0.05) - Var</sub>	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pr>F <sub>(0.05) - N x Var</sub>	0.824	<0.0001	0.881	0.041	0.484	0.010	0.019	0.831	0.899

HT: height, PM: physiological maturity \*(duration from emergence), SS: seed size, MC: moisture content, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number,

Figure 1. Varietal response on yield, protein, falling number, and seed size to N levels.

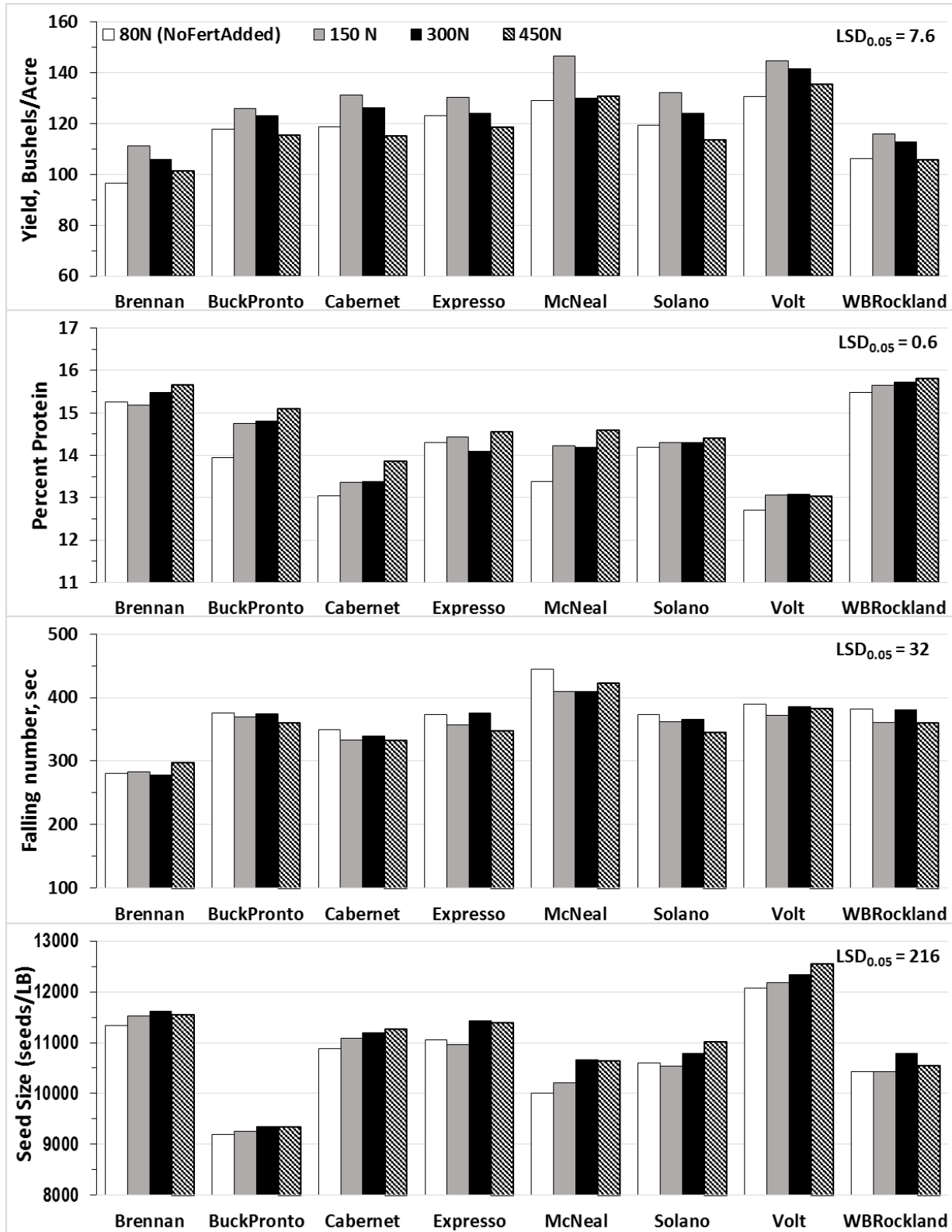


Figure 2. Nitrogen Partial Factor Productivity (PFP) of various spring wheat varieties

