

Project Title: Evaluation of Yield and Protein in Irrigated Soft White and Hard Red Spring Wheat - 2016

Objective: To evaluate nitrogen use response of spring wheat varieties on yield and quality

Personnel: J.A. Torrion, R.N. Stougaard, L. Talbert, J. Garner, B. Bicego-Almeida

Methods:

Eight spring wheat cultivars, including four soft white and four hard red, were grown under five nitrogen (N) levels as a split plot, randomized complete block design with four replications. The N levels represent the whole plot factor and the eight spring wheat varieties were the sub plot factor. The five N treatments included an unfertilized check, 40, 80, 120, and 160 lbs/A added N. The check had an initial 98 lbs/A soil N. The resulting total N of the five treatments were 98 (check), 138, 178, 218, and 258 total lbs N per acre. Supplemental irrigation was applied to keep soil moisture from falling below 50% of the plant available water. Total irrigation applied was 5.7".

Summary:

N treatment was significant for protein and recorded a maximum protein response at 138 total N/A (Figure 1). Protein ranged from 10.45 percent for UI-Stone to 16.30 percent for Egan (Figure2, Table 2). All other agronomic traits showed no significant difference for N treatment (Table 2). Note that the check (no added N) had high initial N content. Yield and other traits were significant for the variety main effect. On average, yield of soft whites were higher than hard reds (Figure 3). Within hard red market class, Egan yield was significantly depressed from McNeal, but equivalent with Solano and Vida. Egan consistently had high protein. Refer to Table 3 for yield response - bushels produced per lb of N.

T able 1: Material and Methods

Seeding Date:	4/21/16	Herbicide:	5/17/16
Julian Date:	112		Huskie 11 fl oz/A + Axial 16.4 fl oz/A
Seeding Rate:	25 plnts/sqft	Fungicide:	6/23/16
Previous Crop:	Alfalfa		8.2 fl oz/A Prosaro
Tillage:	Conventional	Insecticide:	6/27/16
Irrigation:	Yes		1.92 fl oz/A Warrior II
Soil Type:	Fine sandy loam	Harvest Date:	8/25/16
Soil Test:	57-10-95	Julian Date:	238
Fertilizer:	()-63-148		

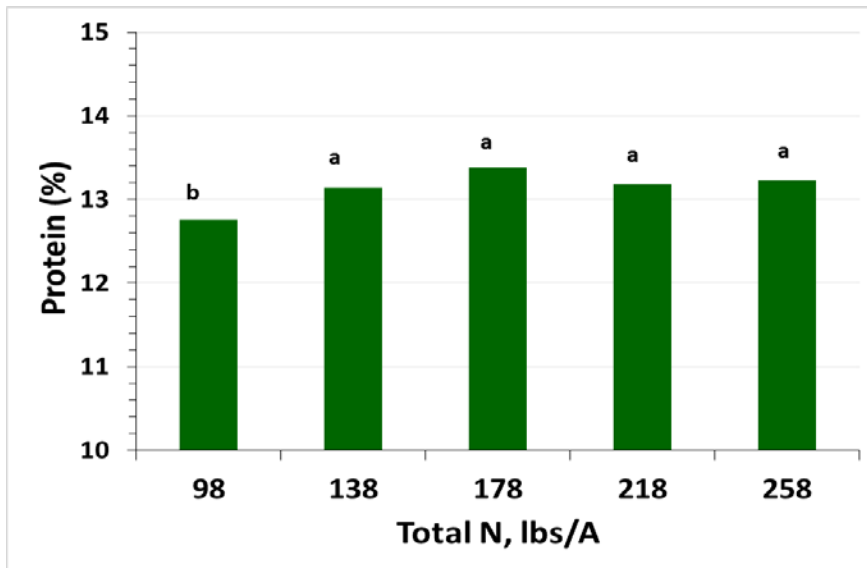


Figure 1. Mean protein response of irrigated wheat with total nitrogen (N) on an irrigated fine sandy loam soil. Same letter assignment denotes nonsignificance at $\alpha = 0.05$.

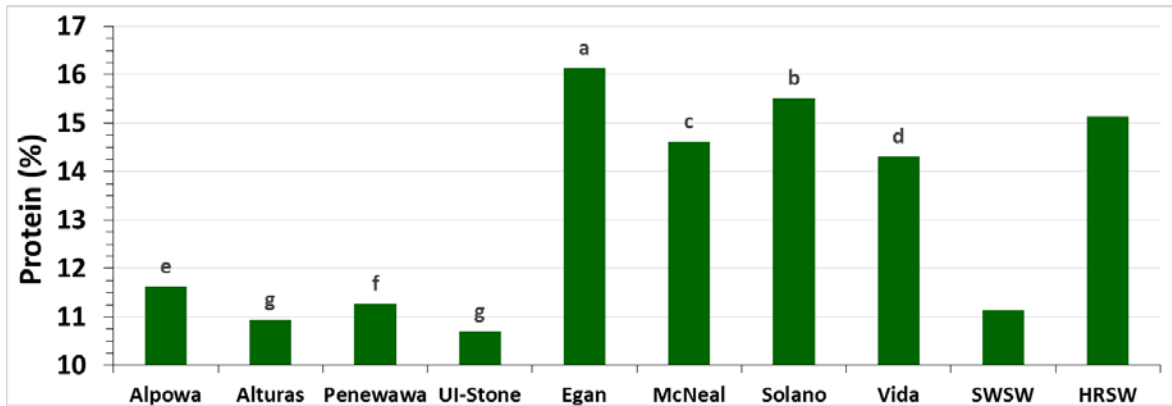


Figure 2. Mean variety protein response of soft white spring wheat (SWSW) and hard red spring wheat (HRSW). Same letter assignment denotes nonsignificance at $\alpha = 0.05$.

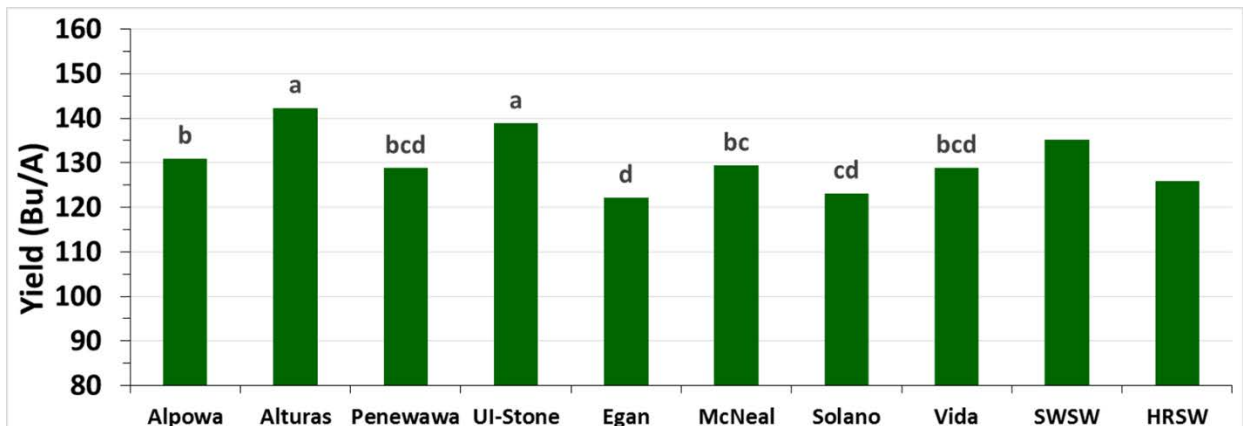


Figure 3. Mean yield response of soft white spring wheat (SWSW) and hard red spring wheat (HRSW). Same letter assignment denotes nonsignificance at $\alpha = 0.05$.

Table 2. Nitrogen effects on irrigated spring wheat agronomic performance

Cultivar	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec	PM days	MC %
98 lbs/A Nitrogen (no added fertilizer)									
Alpowa	35.0	7.5	137.9	11.15	64.3	43.5	377	100	10.9
Alturas	36.8	5.0	155.8	10.75	63.4	42.7	295	103	10.9
Penewawa	35.5	2.5	133.1	10.95	63.6	42.1	331	99	10.8
UI-Stone	34.5	0.0	143.8	10.45	63.2	42.3	308	100	11.0
Egan	37.8	0.0	125.2	15.38	62.5	43.0	489	99	10.5
McNeal	37.3	0.0	121.8	14.08	63.3	45.7	487	102	10.7
Solano	28.3	0.0	127.6	15.15	63.8	39.3	398	102	10.9
Vida	34.0	1.3	131.1	14.13	63.1	42.2	355	103	11.1
138 lbs/A Nitrogen									
Alpowa	35.0	25.0	128.1	11.55	64.0	43.3	341	102	11.2
Alturas	38.0	0.0	139.4	10.98	63.1	41.5	289	103	11.0
Penewawa	35.0	7.5	128.6	11.30	63.2	41.2	329	100	10.9
UI-Stone	34.0	20.0	141.8	10.85	62.8	41.9	255	102	11.1
Egan	35.8	10.0	121.9	16.30	62.2	42.1	478	101	10.7
McNeal	39.0	12.5	131.6	14.48	63.4	45.7	464	102	10.9
Solano	30.0	0.0	127.9	15.35	63.6	44.9	407	103	11.4
Vida	36.0	7.5	123.8	14.33	62.8	42.3	347	104	11.9
178 lbs/A Nitrogen									
Alpowa	35.8	2.5	131.8	11.90	64.2	43.8	357	101	11.0
Alturas	37.3	5.0	139.3	11.00	63.3	41.8	277	103	11.1
Penewawa	35.0	10.0	130.8	11.40	63.5	41.5	307	102	10.9
UI-Stone	33.5	25.0	146.9	10.85	63.0	41.0	291	101	11.4
Egan	36.8	0.0	109.5	16.40	62.4	42.0	491	101	10.7
McNeal	37.0	1.3	130.1	14.83	63.3	45.0	492	102	10.8
Solano	28.5	0.0	113.7	15.85	63.6	46.0	400	103	10.9
Vida	34.5	1.3	127.0	14.83	62.9	42.3	346	102	11.5
218 lbs/A Nitrogen									
Alpowa	34.5	17.5	133.6	11.68	64.2	44.1	360	100	10.9
Alturas	37.0	12.5	140.0	10.85	63.2	42.0	282	102	11.1
Penewawa	33.5	5.0	118.0	11.20	63.2	42.7	328	101	10.8
UI-Stone	34.5	1.3	141.7	10.65	62.9	42.0	301	99	10.8
Egan	38.8	0.0	127.0	16.28	62.4	42.0	477	100	10.6
McNeal	39.3	0.0	128.1	14.73	63.3	46.1	440	102	10.9
Solano	29.3	0.0	127.0	15.50	63.6	45.5	396	102	11.4
Vida	35.0	0.0	138.3	14.53	62.8	41.6	344	104	11.9
258 lbs/A Nitrogen									
Alpowa	35.5	5.0	123.5	11.83	64.1	45.2	346	102	11.2
Alturas	37.5	10.0	137.2	11.10	63.3	42.6	274	103	11.1
Penewawa	34.5	27.5	133.5	11.50	63.0	42.8	299	101	11.0
UI-Stone	34.3	17.5	120.2	10.70	62.9	39.6	291	101	11.1
Egan	37.0	2.5	127.5	16.28	62.4	40.0	461	101	10.7
McNeal	37.8	2.5	135.5	14.95	63.3	46.4	473	103	11.2
Solano	29.8	0.0	119.7	15.73	63.3	44.7	383	105	11.6
Vida	34.3	25.0	124.5	13.70	62.4	41.5	348	105	11.9
LSD	ns	ns	ns	0.5	ns	ns	ns	ns	ns
Pr>F _{(0.05) - N}	0.8506	0.6023	0.6953	0.0441	0.3877	0.8374	0.3642	0.6523	0.1937
Pr>F _{(0.05) - V}	<.0001	0.0266	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Pr>F _{(0.05) - N x V}	0.6691	0.2489	0.1062	0.7361	0.8687	0.0041	0.2922	0.4980	0.0853

FN: falling number, HT: height, LOD: lodging, MC: moisture content, PM: physiological maturity, PRO: protein, TKW: thousand kernel weight, TWT: test weight, YLD: yield, V: variety.

Table 3. Nitrogen productivity (Bushels per lb N) of irrigated soft white spring wheat (SWSW) and hard red spring wheat (HRSW)

	98	138	178	218	258
Variety	Total N (lbs/A)				
	SWSW				
Alpowa	1.34	0.95	0.74	0.60	0.51
Alturas	1.45	1.03	0.80	0.65	0.55
Penewawa	1.31	0.93	0.72	0.59	0.50
UI-Stone	1.42	1.01	0.78	0.64	0.54
Average	1.38	0.98	0.76	0.62	0.52
	HRSW				
Egan	1.25	0.89	0.69	0.56	0.47
McNeal	1.32	0.94	0.73	0.59	0.50
Solano	1.26	0.89	0.69	0.57	0.48
Vida	1.32	0.93	0.72	0.59	0.50
Average	1.29	0.91	0.71	0.58	0.49