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

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

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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 N. The resulting total N of the five treatments were: 98 (check), 138, 178, 218, and 258 total lbs of N per acre.

Summary:

Highest protein response was achieved at 178 lbs/A N (Figure 1). Protein ranged from 10.28 percent for Alturas to 15.98 percent for Egan (Figure 2, Table 2). Within the hard red spring wheat market class, Egan achieved the highest N whereas Vida had the lowest (Figure 2). No significant differences were observed among the other agronomic traits with N main effect. For rainfed conditions, Vida achieved the highest yield whereas Egan, Solano, and McNeal were equivalent (Figure 3). Refer to Table 3 for yield response - bushels produced per lb of N.

Table 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:	8/24/16
Soil Test:	57-10-95	Julian Date:	237
Fertilizer:	(__)-63-148		

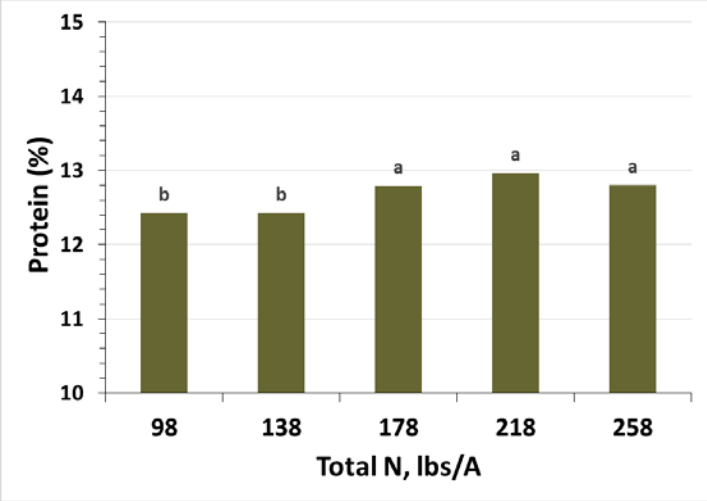

Figure 1. Mean protein response of rainfed wheat on an irrigated fine sandy loam soil – 2016. Same letter assignment denotes nonsignificance at α =0.05.

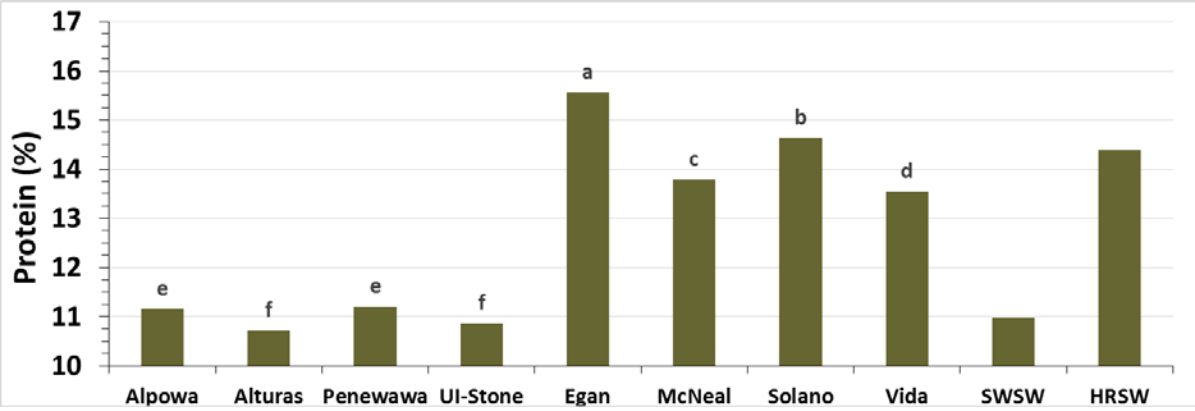

Figure 2. Mean variety protein response of soft white spring wheat (SWSW) and hard red spring wheat (HRSW). Same letter assignment denotes nonsignificance at α = 0.05.

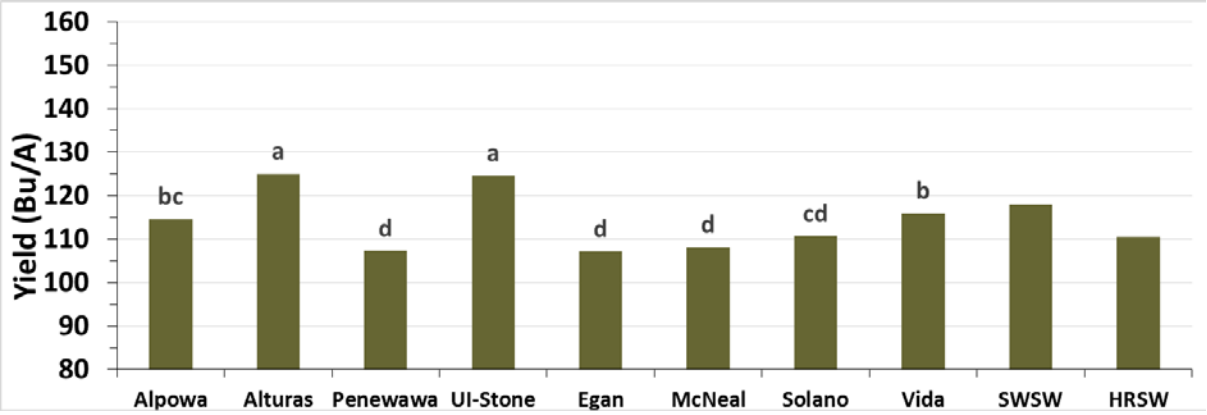

Figure 3. Mean yield response of soft white spring wheat (SWSW) and hard red spring wheat (HRSW). Same letter assignment denotes nonsignificance at α = 0.05

Table 2. Nitrogen effects on dryland 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	35.3	7.5	117.0	11.00	63.0	39.2	413.3	93.5	10.2
Alturas	37.8	0.0	129.0	10.40	62.0	36.9	316.5	95.3	10.2
Penewawa	34.3	0.0	111.1	11.08	62.0	38.8	352.3	92.8	10.2
UI-Stone	35.3	17.5	120.5	10.63	61.9	37.8	344.0	93.8	10.2
Egan	37.8	0.0	108.7	15.20	61.3	38.8	510.0	94.3	10.0
McNeal	37.5	0.0	111.5	13.50	62.4	40.3	537.0	95.0	10.1
Solano	29.3	0.0	107.8	14.35	63.1	41.1	451.5	96.8	10.3
Vida	35.0	0.0	116.8	13.30	62.8	39.3	409.5	96.8	10.5
138 lbs/A Nitrogen									
Alpowa	36.5	10.0	114.8	11.08	62.6	39.9	420.3	93.8	10.2
Alturas	38.0	0.0	125.5	10.28	62.1	38.9	355.0	94.8	10.3
Penewawa	35.0	0.0	108.4	10.88	61.9	38.2	345.3	93.3	10.3
UI-Stone	35.0	1.3	131.8	10.80	62.5	37.4	373.3	95.0	10.3
Egan	38.3	0.0	108.5	15.30	61.3	39.3	489.3	94.0	10.0
McNeal	39.0	0.0	103.7	13.48	62.4	41.5	515.5	95.8	10.1
Solano	30.3	0.0	112.3	14.35	63.1	40.5	411.8	98.3	10.4
Vida	35.8	5.0	115.3	13.28	62.4	38.3	413.8	97.0	10.5
178 lbs/A Nitrogen									
Alpowa	33.5	15.0	113.2	11.35	62.6	39.1	421.8	92.8	10.3
Alturas	37.5	5.0	128.8	10.85	62.2	38.0	313.3	94.8	10.1
Penewawa	34.0	0.0	109.9	11.35	61.4	37.0	362.8	93.8	10.2
UI-Stone	35.8	10.0	122.0	10.90	62.2	38.3	353.3	93.3	10.2
Egan	36.5	5.0	110.8	15.50	61.2	38.2	514.0	94.0	10.0
McNeal	36.8	0.0	107.8	14.13	62.4	42.4	523.0	94.0	10.2
Solano	29.0	0.0	112.5	14.65	62.9	42.8	453.0	97.0	10.3
Vida	34.5	5.0	115.1	13.65	62.2	38.6	413.5	95.5	10.5
218 lbs/A Nitrogen									
Alpowa	34.5	2.5	112.1	11.30	63.0	40.4	388.5	94.3	10.3
Alturas	36.5	0.0	115.8	11.03	62.4	39.0	314.0	95.0	10.2
Penewawa	32.3	0.0	100.3	11.40	62.0	39.4	338.0	94.8	10.3
UI-Stone	34.5	0.0	125.8	11.03	62.8	38.9	342.3	94.3	10.3
Egan	36.8	0.0	100.2	15.98	61.0	39.1	511.8	93.5	10.0
McNeal	36.5	0.0	107.3	14.03	62.5	41.8	515.0	95.3	10.1
Solano	28.5	0.0	108.6	15.03	62.9	41.8	459.3	98.8	10.3
Vida	34.5	0.0	114.7	13.98	62.6	40.4	405.5	97.5	10.5
258 lbs/A Nitrogen									
Alpowa	35.8	0.0	116.0	11.03	62.7	40.0	418.3	93.8	10.4
Alturas	36.0	0.0	126.1	11.03	62.4	38.7	313.0	95.8	10.3
Penewawa	33.5	0.0	106.6	11.35	61.8	38.1	345.8	93.8	10.3
UI-Stone	35.3	0.0	122.9	10.95	62.3	39.1	342.5	93.3	10.3
Egan	37.0	0.0	107.6	15.88	61.0	37.2	487.3	93.3	10.0
McNeal	38.3	0.0	110.4	13.80	62.4	40.8	538.3	95.5	10.1
Solano	30.0	0.0	112.2	14.83	62.9	40.9	442.8	98.8	10.3
Vida	34.5	2.5	117.8	13.55	62.6	39.0	404.5	98.0	10.6
LSD	ns	ns	ns	0.4	ns	ns	ns	ns	ns
$Pr>F_{(0.05)-N}$	0.0558	0.3906	0.4605	0.0055	0.4938	0.1415	0.1549	0.1111	0.2565
$Pr>F_{(0.05)-V}$	<.0001	0.0402	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
$Pr>F_{(0.05)-N\times V}$	0.9579	0.8892	0.9205	0.8236	0.0791	0.8007	0.4477	0.7054	0.7692

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 yield response (Yield per lb N) of dryland soft white spring wheat (SWSW) and hard red spring wheat (HRSW)

	98	138	178	218	258
Variety			Total N (lbs/A)		
			SWSW		
Alpowa	1.17	0.83	0.64	0.53	0.44
Alturas	1.28	0.91	0.70	0.57	0.48
Penewawa	1.09	0.78	0.60	0.49	0.42
UI-Stone	1.27	0.90	0.70	0.57	0.48
Average	**1.20**	**0.85**	**0.66**	**0.54**	**0.46**
			HRSW		
Egan	1.09	0.78	0.60	0.49	0.42
McNeal	1.10	0.78	0.61	0.50	0.42
Solano	1.13	0.80	0.62	0.51	0.43
Vida	1.18	0.84	0.65	0.53	0.45
Average	**1.13**	**0.80**	**0.62**	**0.51**	**0.43**