

2011-12 Southern Sacramento Valley Small Grains Research Program Cultivar Assessment

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Cooperators: California Wheat Commission; Craig Gnos and Sam Beukelman, E & H Farms; Larry Hunn, Hunn, Merwin & Merwin; Jeannie McCormack and Al Medvitz, McCormack Sheep and Grain; Rick Rominger, Rominger Brothers; John Gilbert, Adams Grain Company, Mark Mezger, Farmers Grain Company, Sarah Hodson, Syngenta Small Grains; Jorge Dubcovsky, Wheat Breeder, UC Davis; Oswaldo Chicaiza, Wheat Breeder UC Davis; Mark Kochi, Field Technician Yolo County.

Summary of Results and Conclusions

This 2011-12 small grains research project evaluated 17 cultivars for their commercial attributes in four environmentally distinct locations in the southern Sacramento Valley. There were 15 cultivars common to all four locations and 2 soft white cultivars unique to the dryland trial. This year's Southern Sacramento Valley Small Grain trials show the effects of a dry November and December.

Average grain yield of the overall locations for 15 cultivars was 6443lbs/acre, which is an increase of 796lbs/ac over last year's average yield. Triticale grain varieties continue to have the highest yields with Triacal Brand 118 at 7775lbs/acre being the highest with a grain protein of 11.7%. WestBred's hard red wheat WB-Rockland brought in the highest average grain protein level at 13.2%, good test weight of 63.0lbs/bu, but a lower yield of 6085lbs/acre. Summit 515 had the best average hard red wheat yield at 6912lbs/acre.

Disease pressure was moderate over all, with Redwing, WB-Cristallo, Sonora and Wilt Wolkoring having a stripe rust problem. Patwin had the highest incidence Barley Yellow Dwarf Virus (BYDV) I have ever seen.

Introduction and Objectives

Southern Sacramento Valley has four distinct small grains growing regions: high quality well drained mineral soils, heavy clay medium quality soils with delta climate, low quality foothill soils, and highly organic peat soils of the delta. Southern Sacramento Valley Small Grains Research program evaluated new small grain cultivars in these unique regions and provided complementary data to the University of California Regional Grain Trials. This program is responsible for helping to describe new cultivar growth characteristics including: plant population, maturity, lodging, shatter, disease resistance, grain quality, and yield. Trial data from this research program has helped to increase the number of commercially available small grain cultivars.

I conducted 4 cereal trials over the 1-year growing period within each of these four growing regions and different irrigation practices. This was an increase of one location made possible by this grant. I provided a grower field meeting at the McCormack trial location during the season so show the effects of the low rainfall and associated diseases and crop damage. I provided 4 newsletters describing current conditions and harvest results with planting recommendations. I also conducted one grower meeting in Rio Vista and one technical seed dealer meeting showing the trial results, alternative uses of small grains, with research and industry updates.

Materials and Methods

I conducted 4 randomized block designed small grains trials each replicated 3 times. Plot widths and lengths varied per location depending on grain drill used. Widths were 9, 11 or 13ft and lengths were 126 to 186 feet. Total acreage of the 4 locations was 7.8 acres.

E & H Farms Small Grain Trial – Located three-quarters mile north of Sievers Rd. on the east side of Curry Rd. about 3.5 mile north of Dixon, CA. Soil: Brentwood clay loam. One irrigation. 15 varieties, 3 replications, planted flat. Tomato-grains-seed crop rotation. Plot width 9ft + 2ft border, length 126 ft.

Hunn, Merwin & Merwin Small Grain Trial – Located on east side of Jefferson Road, 0.1mile north of Central Rd, 2mi. west of Clarksburg, CA. Soil type: Omni silty clay. One sprinkler irrigation, 15 varieties, 3 replications, planted flat. Tomato-grains-alfalfa rotation. Plot width 13ft + 2ft border, length 186 ft.

McCormack Ranches Small Grains Trial – Location on the south side of Montezuma Hills Road 2 miles east of Anderson Rd., west of Rio Vista, CA. Soil type: Clear Lake clay A and Diablo-Ayar on slopes. Dryland hills no irrigation, 17 varieties, 3 replications, planted flat. 2 year Sheep-fallow-grains rotation. Plot width 13ft + 2 ft border, length 155ft.

Rominger Brothers Small Grains Trial – Location Southwest corner of County Roads 29 and 89, north of Winters, CA. Soil type: Marvin silty clay loam & Tehama loam. No irrigation, 15 varieties, 3 replications. Tomato-wheat rotation, 60” beds. Plot width 11ft + 2ft border, length 152 ft.

Data collected at all sites: Plant population, days to heading from planting, head height, lodging, frost, foliar disease ratings for (stripe rust, leaf rust, barley yellow dwarf virus, septoria, powdery mildew), harvest grain moisture, test weight, protein, falling number, full grade, and yield. Data analyzed using UC MSTAT analysis of variance (ANOVA) and Duncan’s Means Separation at 5% tests. Least significant Difference (LSD) test and Coefficient of Variation (CV) provided where appropriate. Factorial analysis was conducted for the over locations comparison.

Budget: \$6,000 – split between Cultivar Assessment and Protein Enhancement trials.

Supplies – steaks, plot signs, paper, equipment, fertilizer:	\$1,000
Transportation – fuel:	\$1,000
Clerical support:	\$4,000

Results

For this research project, I looked at 15 varieties, at 4 locations with an additional 2 soft white varieties at the dryland hills location. There were 15 varieties common to all four locations. I will first discuss the results of the over-locations analysis and highlight particular regional problems during the Regional Results section. The over-locations and regional analysis summary tables are included at end this report.

This season in the southern Sacramento Valley started with very low rainfall: October-1.09in, November-1.25in, and December 0.18in. Low rainfall caused very irregular stand establishment at best with whole field loss in the worst cases. In my test plot in the dryland hills west of Rio Vista the first replication was severely stunted and I considered a loss. With the later rains all the varieties, except the durum Volante, recovered to some extent and were harvested. Volante appears to be very sensitive to low soil moisture stress at planting.

Over-location Results – Table 1

When all four locations are averaged the triticale varieties all have the best yields. This season Syngenta’s Trical Brand 118 came out on top in yield at 7,775lbs/acre with a test weight of 58.5lbs/bu and protein of 11.7%. Significantly lower in yield were the other three triticale varieties. Trical Brand 115 had the best protein of this group, 12.1%. For the wheat varieties Summit 515 had the best yields, 6912lbs/acre. Summit 515 has good test weight, fair protein, but consistently low falling numbers. If you grow this variety, always have your first harvest samples tested for falling numbers. The same is true for Blanca Grande 515, a high quality hard white variety, very good test weights, with slightly lower yields than Summit 515. Cal Rojo is still in the middle of the group for yield and quality wise. I no longer recommend Redwing, it is now too susceptible to stripe rust. Rockland, at nearly 1,000lbs/acre lower in yield is still a variety to consider with its consistently high protein, 13.3%, and bushel weight, 63.0lbs/bu. Patwin has the best protein levels for the hard white wheat varieties and enhanced quality genes for Asian noodle production. It’s weak spot is its susceptibility to Barley Yellow Dwarf Virus. I do not recommend durum production in our area. Yields are consistently lower than other wheats you could grow.

Regional Trial Discussions

E & H Farms Small Grain Trial (Table 2) – Located one mile north of Sievers Rd. on the east side of Curry Rd. about 2 miles north of Dixon, CA. Growing conditions: Brentwood clay loam soil, one irrigation, 15 varieties, 3 replications. The grower applied a total 118.8lbs/ac nitrogen in 2 applications; 100lbs N/ac preplant as NH₃ and 80lbs N/ac urea as a topdress by air in March. I use this location as an indicator of what the maximum yield potential is for each of the varieties grown in the lower Sacramento Valley. This year was no exception with an average yield for the trial of 6871lbs/acre. This is 160lbs/ac lower than last year at this location.

Four **Triticale** varieties topped out at 8255lbs/ac with an average yield of 7853 lbs/ac. These varieties are bred for forage production, but have turned out to be great feed grain producers. Unfortunately, seed availability is questionable at this time. Stripe rust pressure over all was less this season so I did not see very much on any the triticale varieties. Please keep a look out for stripe rust if you grow them.

Summit 515, with the two new stripe rust genes, Yr5 & Yr15, had the best **Hard Red** wheat yields at 7415lbs/ac beating out Camelot. At this location it had 12.1% protein and a good test weight of 62.7lbs/bu. WB-Rockland (WestBred) came in 2nd at 7101lbs/ac, this variety appears to like additional nitrogen and consistently gets the best protein (13.2%) and test weight (63.4lbs/bu). This was the 1st time I've seen Rockland beat Cal Rojo for yield. Redwing is now, in my opinion, too susceptible to stripe rust to plant in this area. Syngenta's new hard red SY314 had some seed contamination, looked like Camelot, and low yields and test weight.

I had four **Hard White** wheat varieties this season. Blanca Grande had the best yield at 6991lbs/ac good protein at 12.4% and the highest test weight in the whole trial of 64.7lbs/bu. Both Summit 515 and Blanca Grande 515 have low Falling Numbers so be sure to test your first harvest samples to make sure you're above the 300min. threshold. Blanca Royale, usually a yield leader did not perform as well this season. This variety is not liked by the mills so it is not recommended. WB-Cristallo and Patwin (UC) are both high quality HW but do not yield very well. Patwin is also the most susceptible variety to BYDV I have seen.

Neither of the **Durum** varieties performed very well in this location and I do not recommend their planting in this area.

Hunn, Merwin & Merwin Small Grain Trial (Table 3) – Located 0.1 miles north of Central Road on the east side of Jefferson Blvd 1mi. southwest of Clarksburg, CA. Growing conditions: Omni silty clay soil, one sprinkler irrigation in December, 15 varieties, 3 replications. The grower applied a total 20lbs N/ac in 1 preplant application using aqua ammonia. This wheat crop was following processing tomatoes. Very marginal soil moisture caused the grower to replant the field around my trial. It appears the mid-December sprinkler irrigation saved my trial. Low Falling Numbers (FN) plagued four varieties at this location. Much better protein levels in this location than other past Clarksburg locations.

Triticale varieties were at the top for yield with an average of 9082lbs/ac with Trical Brand 115 leading the group with 9367lbs/ac. Triticale varieties are a little slow at first as they start developing a deeper root system. This season's poor planting moisture slowed them even more but with the sprinkler irrigation in December all the varieties took off. I saw very little disease in the triticale plots. 158EP had the best test weight of the triticale's, but Camelot the best protein by 1.8%.

Summit 515 topped the **Hard Red** wheat at this site but its low FN would have reduced its value. Cal Rojo, Redwing and Rockland had adequate FN levels for the hard reds at this location. Rockland had the best protein at 13.3 %.

Blanca Royale and Blanca Grande 515 were the top two **Hard White** wheat varieties. They were not significantly different in yield. Blanca Royale the highest HW at 7171lbs/ac. Blanca Grande had low FN of 275 min. All hard white varieties had protein levels of 12% or more, with Patwin one getting the highest at 13.1%.

Fortissimo, a **Durum** wheat, did well here with the test weight of 64.6 lbs/bu, protein at 11.4% and yield of 7553lbs/ac. Protein was still unacceptable for a durum at 11.4%. Durum wheats require protein levels of 13% or greater.

McCormack Small Grain Trial (Table 4) – Location on the south side of Montezuma Hills Road 0.2 miles west of Emigh Rd., west of Rio Vista, CA. Growing conditions: Diablo soil & Ayar soil on slopes, dryland hills no irrigation, 17 varieties, 3 replications. The grower applied a total 21.5lbs N/ac, with 85 units Aqua preplant and 41lbs/ac 11-52-0 at planting. Very poor soil moisture in the first replication led to no stand, the other two reps were very weak until rains in December. The variety Volante never did recover and was lost. Russian wheat aphid also showed itself at this location, but did not create significant losses. Characteristically low yields are common in the dryland hills here, this season with a test average of 4247lbs/ac.

Trical Brand 118 had the best yield, 5772lbs/ac, but ten of the top yielding varieties were not significantly different. Stripe rust was seen in all the **Triticale** varieties, heaviest in 118.

Summit 515 was the highest yielding **Hard Red** wheat in the hills. Rockland again showed its high quality ability with grain protein of 13.6%. Redwing had 100% stripe rust and suffered yield and quality losses.

Three **Hard White** wheats were similar in yield with Blanca Grande 515 on top at 5381lbs/ac. Patwin had the best protein at 12.8%, but also had 25% BYDV.

I had an additional 2 heirloom Soft White wheat varieties at this location. Sonora and Wit Wolkoring are very tall wheat varieties that lodged and are susceptible to stripe rust. They're response to very low soil moisture at planting was to wait and germinate very late in December and therefore had the best stands of the entire trial. Unfortunately, they had the lowest yields at 1055lbs/ac and 1098lbs/ac, respectively.

Rominger Small Grain Trial (Table 5) – Location Southwest corner of County Roads 29 and 89, north of Winters, CA. Soil type: Marvin silty clay loam & Tehama loam, no irrigation, 15 varieties, 3 replications tomato-wheat rotation. The grower applied a total 25lbs N/ac, with 125 units Aqua preplant. This location has slightly warmer minimum temperatures than any other location. Average yield for this trial location was 6778lbs/ac, just under E. & H. Farms, but with much less nitrogen.

The four **Triticale** varieties were the best yielding with Trical Brand 118 having the best yield, 7927lbs/ac. No diseases were found in these varieties at this location. Camelot usually has the best protein of the 4 and set a best ever record at 14%. Test weights are a little low for the triticale averaging 57.7lbs/bu.

Unlike any other location Redwing and Rockland had the best **Hard Red** wheat yields. This is the only location that Rockland did not reach 13% protein, getting 12.3% here. Redwing showed some stripe rust susceptibility here as everywhere else.

Blanca Royale, Cal Rojo and Blanca Grande 515 all had similar yields. Patwin again showed some BYDV susceptibility along with Cal Rojo at this site. Unlike last year Blanca Grande did not lodge anywhere this season.

Discussion, Conclusions and Recommendations

Weather continues to cause problems with our wheat production in the southern Sacramento Valley. This year it was critically low soil moisture following planting. Some fields were lost and all had lower yields than expected. Good winter rains helped us make up some losses and I saw some of the highest grain proteins ever.

Blanca Grande 515 and Summit 515, returning with 2 new stripe rust genes (Yr5 & Yr15), are providing a much need buffer against stripe rust. However, as in the past both these varieties have critically low Falling Numbers. Please make sure to test your first loads for FN. If not too far below 300 you need to wait a week or so and test again. FN's will increase with time.

Table 6. 2005 – 2012 Over Years by Location Small Grains Variety Comparisons

This table is a view of how each of the varieties we have grown commercially in the southern Sacramento Valley has done since 2005. This is when the new strains of stripe rust removed all the old varieties that we knew so well. I have lumped Summit and Summit 515 also Blanca Grande and Blanca Grande 515 together for this comparison, even though very similar they are distinct varieties. I apologize to you purists.

Recommended Small Grain Cultivars for Southern Sacramento Valley

Hard Red varieties

Cal Rojo, Syngenta – good yields and disease resistance, fair protein, good test weight, OK FN

WB-Rockland, WestBred – lower yields, good disease resistance, very good test weight, highest protein, good FN

Summit 515-best average yields, good field adaptability, lower protein, problem with falling numbers.

Hard White varieties – check with buyer before planting

WB-Cristallo, WestBred - OK yield, check for stripe rust, good-fair protein, good test weight, good quality

Blanca Grande 515, Syngenta – best white yield, good disease resistance, very good test weight, fair protein, marginal FN, popular with some mills

Patwin, UC - good yields, good disease resistance, fair protein, good test weight, good FN, high quality

Triticale – check with buyer before planting, seed availability questionable

Trical Brand 118, Syngenta - very good yields, some stripe rust, good protein, OK test weight

Trical Brand 115, Syngenta - very good yields, watch for stripe rust, good protein, OK test weight

Trical Brand 158EP, Syngenta – very good yields and disease resistance, low protein, OK test weight

Camelot, Syngenta - very good yields, some stripe rust, good protein, OK test weight

Durum – Do not plant without a contract

Fortissimo – good yields and disease resistance, fair protein for a Durum, good test weight, fair quality

Table 1 2011-2012 SOUTHERN SACRAMENTO VALLEY SMALL GRAINS RESEARCH

Over Locations Summary by Variety Sorted By Yield											Adams Grading Results (NQI)			Duncan's Means@5% Separation	
University of California Cooperative Extension - Kent L. Brittan											Falling No. (min)	Protein (%)	Test Weight (lbs./bu)		Yield (lbs./ac)
Variety	Grain Color	Stand (Plants/ft ²)	Days to Heading	Plant Height (in)	Lodging (harvest)	Rating (1-8) ¹			Powdery						
						Stripe	Rust	BYDV	Septoria	Mildew					
Trical Brand 118	TR	28	153	40	0	1	1	1	1	1.0	NT	11.7	58.5	7775	A
Trical Brand 115	TR	28	165	38	0	1	1	1	1	1.0	NT	12.1	58.5	7466	B
Trical Brand 158EP	TR	29	165	38	0	1	1	1	1	1.0	NT	11.6	58.4	7449	B
Camelot	TR	26	151	43	0	1	1	1	1	1.0	NT	12.9	57.7	7214	B
Summit 515	HR	26	154	36	0	1	1	1	1	1.3	338	11.7	62.4	6912	C
Blanca Grande 515	HW	25	150	37	0	1	1	1	1	1.0	328	11.9	64.4	6623	D
Blanca Royale	HW	29	153	34	0	1	1	1	1	1.0	417	12.4	61.6	6483	D
Cal Rojo	HR	26	153	33	0	1	1	1	1	1.0	389	12.0	60.6	6363	DE
SY314	HR	25	159	36	0	1	1	1	1	1.0	348	12.0	60.2	6192	E
Redwing	HR	28	155	34	1	4	1	1	1	1.0	385	12.1	59.7	6111	EF
Rockland	HR	28	153	33	0	1	2	1	1	1.0	402	13.2	63.0	6085	EF
Patwin	HW	28	191	36	0	1	3	1	1	1.0	402	12.6	60.0	5890	FG
WB-Cristallo	HW	26	161	37	2	2	2	1	1	1.0	392	11.9	62.0	5775	G
Fortissimo	DR	23	189	33	0	1	1	1	1	1.0	408	12.6	61.3	5624	G
Volante	DR	22	174	33	0	1	1	1	1	1.0	424	12.6	62.1	4687	H
Average		27	162	36	0	1	1	1	1	1.0	385	12.2	60.7	6443	
C.V.		9.9	6.3	1.8	529.9	36	16	7	NA	12.8	5.3	1.3	4.9		
L.S.D @5%		2.1	8.2	0.5	0.8	0.4	0.17	0.1		40.0	0.5	0.6	257.4		
Significance by Location		**	**	**		**	**			**			**		
Significance by Variety		**	**	**	**	**	**			**	**	**	**		
Significance by Interaction		**	**	**	**	**	**				**	**	**		

2 Factor Factorial Analysis - Location, A = Variety

** = significant 99% of the time

* = significant 95% of the time

¹ Foliar Disease Rating (1-8): 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100%

Grain color/type: **HR** = Hard Red Wheat

DR =Hard Durum

TR = Triticale

NT = measurement not taken

No significant Lodging, Shatter, Leaf Rust, Loose Smut detected

NQI = National Quality Inspections, Inc.

Not recommended

Excellent	Dk. Green
Very Good	Lt. Green
Check	Lt. Yellow
Caution	Yellow
Problem	Lt. Red
Not recommended	Dk. Red

Table 2. 2012 UC COOPERATIVE EXTENSION E & H FARMS WHEAT VARIETY TRIAL

Funded by the California Wheat Commission

Cooperators: Craig Gnos, and Sam Beukelman
Experimenters: Kent Brittan, Jorge Dubcovsky, Mark Kochi, Syngenta, West Bread (Monsanto) and John Gilbert of Adams Grain
Soil Type: Brentwood clay loam
Planting Date: November 10-11, 2011
Planting Method: Drilled with 26 row, 6"spacing double disk Great Plains grain drill planted flat
Previous Crop: Processing tomatoes
Fertilizer: Pre-plant 100lbs/ac anhydrous ammonium, topdress 80lbs/ac urea. Total 118.8lbs N/ac applied
Herbicide: 0.5pts MCPA/ac
Location: Three-quarters mile north of Sievers Rd. on Curry Rd. and just to the east of walnut trees along the roadside and north of Dixon.

Harvest Date: June 26, 2012
Irrigation: 1 Irr Dec.
Length of Plots: 126 feet
Plot Width: 9 feet
No.of drill rows: 14 rows
Replications: 3
Field Variety: WB-Cristallo
Planting Rate: 120 Lbs./Acre

2011 to 2012 E & H Farms Wheat Variety Trial Summary Sorted by Yield

Variety	Grain Type	Stand (Plants/ft ²)	Days to Heading	Plant Height (in)	Harvest Lodging (%)	Disease Rating (1-8)				Grain Moisture (%)	Test Weight (lbs./bu)	Falling No. (min.) ²	Adams Grain Grade (NQI)		Yield (lbs./ac)	Duncan's Means@5% Separation	
						Stripe Rust	Leaf Rust	BYDV	Septoria Blotch				Dockage	GRADE (average)			Protein (%)
Trical Brand 158EP	TR	36	152	40	0	1	1	1	1	9.1	57.9	NT	0.6	1 TRITICALE	12.1	8255	A
Trical Brand 118	TR	34	147	40	0	1	1	1	1	9.4	57.7	NT	0.7	2 TRITICALE	11.6	8154	A
Trical Brand 115	TR	34	153	37	0	1	1	1	1	9.0	58.5	NT	0.6	1 TRITICALE	12.6	7674	B
Summit 515	HR	31	152	37	0	1	1	1	1	9.5	62.7	402	0.4	1 HRW	12.1	7415	C
Camelot	TR	28	150	44	0	1	1	1	1	9.0	56.4	NT	0.6	1 TRITICALE	13.1	7328	C
Rockland	HR	34	152	35	0	1	1	1	1	9.5	63.4	435	0.4	3 HRW	13.2	7101	D
Blanca Grande 515	HW	29	148	37	0	1	1	1	1	10.0	64.7	386	0.5	3 HDWH	12.4	6991	DE
Cal Rojo	HR	29	151	36	0	1	1	1	1	10.0	60.7	420	0.5	2 HRW	11.7	6927	EF
Blanca Royale	HW	34	149	34	0	1	1	1	1	9.8	62.0	528	0.4	3 HDWH	12.8	6927	EF
Redwing	HR	33	153	36	0	2	1	1	1	9.0	60.0	446	0.5	2 HRW	12.2	6899	EF
SY314	HR	29	153	39	0	1	1	1	1	9.7	59.3	382	0.5	3 HRW	12.4	6807	F
WB-Cristallo	HW	30	154	38	0	1	1	1	1	9.6	62.7	444	0.6	3 HDWH	11.5	6805	F
Fortissimo	DR	25	154	33	0	1	1	1	1	9.1	61.7	480	1.1	1 HAD	13.4	5628	G
Patwin	HW	34	244	37	0	1	1	2	1	9.3	58.6	443	0.7	2 HDWH	12.9	5623	G
Volante	DR	33	163	33	0	1	1	1	1	9.2	62.7	521	1.4	3 HAD	12.7	4529	H

Average: 31 158 37 0 1 1 1 1 9.4 60.6 444 0.6 12.4 6871

C.V.% 3.9 11.9 1.1 NA 18.3 14 NA NA 1.8 1.6 12.1 75.1 6.9 1

L.S.D @5% 2.6 31.6 0.7 0.3 0.2 0.3 1.6 91.7 0.8 1.4 123

Significance by Variety **

Significance by Rep ** ** **

** = Significant 99% of the time

* = Significant 95% of the time

NA = Not analyzed do to lack of difference

¹Disease Rating (1-8): 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100%

² Falling Number minimum 300 min.

Grain color/type: **HR**= Hard Red **MR**= Medium Hard Red

T=Trical = triticale **DR** = Durum

NT = no measurement taken

NQI = National Quality Inspections, Inc.

Table 3. 2012 UC COOPERATIVE EXTENSION HUNN, MERWIN & MERWIN WHEAT VARIETY TRIAL

Funding: California Wheat Commission

Cooperators: Pete and Larry Hunn

Experimenters: Kent Brittan, Jorge Dubcovsky, Mark Kochi, Syngenta, John Gilbert

Soil Type: Omni silty clay

Planting Date: November 15, 2011

Planting Method: Drilled with 26 row, 6"spacing double disk Great Plains grain drill planted flat

Previous Crop: Processing tomatoes

Herbicide: 1pt/a MCPA + 3oz/a Clarity in 10gal/a water

Fertilizer: Preplant 100 units nitrogen as aqua ammonia. Total 20lbs N/ac applied.

Location: Just north of house north of Central Rd, east side of Jefferson Blvd.

Harvest Date: July 6, 2012

Irrigation: 1 in December

Length of Plots: 186 feet

Plot Width: 13 feet

No.of drill rows: 26 rows

Replications: 3

Planting Rate: 120 Lbs./Acre

2011 to 2012 Hunn, Merwin & Merwin Wheat Variety Trial Summary Sorted by Yield

Variety	Grain Type (Plants/ft ²)	Stand Days to Heading	Plant Height (in)	Harvest Lodging (%)	Shatter (seed/ft ²)	Frost (%)	Stripe Rust	Leaf Rust	BYDV	Septoria Blotch	Grain Moisture (%)	Test Weight (lbs./bu)	Adams Grain Grade (NQI)			Yield (lbs./ac)	Duncan's Means@5% Separation		
							¹ Disease Rating (1-8)						Falling No. (min.) ²	Dockage	GRADE (average)			Protein (%)	
Trical Brand 115	TR	27	189	42	0	0	1	1	1	1	9.1	66.5	NT	0.5	4	TRITICALE	10.7	9367	A
Trical Brand 118	TR	30	154	43	0	0	1	1	1	1	8.9	65.5	NT	1.0	1	TRITICALE	10.9	9246	A
Trical Brand 158EP	TR	26	194	41	0	0	1	1	1	1	9.0	67.1	NT	1.0	1	TRITICALE	11.1	9012	B
Camelot	TR	27	155	45	0	0	1	1	1	1	9.1	63.5	NT	0.4	1	TRITICALE	12.5	8701	C
Fortissimo	DR	24	269	36	0	0	1	1	1	1	9.1	64.6	307	0.3	4	HAD	11.4	7553	D
Summit 515	HR	25	155	40	0	0	1	1	2	1	8.5	68.5	277	0.4	2	HRW	12.1	7525	D
Blanca Royale	HW	27	158	36	0	0	1	1	1	1	9.1	67.2	398	0.5	4	HDWH	12.1	7171	E
Blanca Grande 515	HW	24	157	41	0	0	1	1	1	1	10.0	69.6	275	0.2	4	HDWH	12.0	7164	E
Cal Rojo	HR	28	157	35	0	0	1	1	1	1	8.7	67.4	383	0.3	2	HRW	12.6	6894	F
WB-Cristallo	HW	27	179	39	8	0	2	1	3	1	8.8	66.2	332	0.6	4	HDWH	12.1	6728	G
SY314	HR	24	170	38	0	0	1	1	2	1	8.3	69.4	297	0.4	5	HRW	12.3	6657	G
Redwing	HR	31	158	38	3	0	2	1	2	1	8.1	68.4	376	0.4	2	HRW	12.0	6625	G
Volante	DR	25	209	38	0	0	1	1	1	1	8.6	67.5	401	0.4	4	HAD	12.3	6460	H
Patwin	HW	26	202	38	0	0	1	1	5	1	8.2	67.5	417	0.4	3	HDWH	13.1	6392	HI
Rockland	HR	27	157	35	0	0	1	1	3	1	8.7	68.4	341	0.4	3	HRW	13.3	6307	I
Average		27	177	39	1	0	1	1	2	1	8.8	67.2	346	0.5			12.0	7453	
C.V.%		10.7	4.2	1.1	NA	NA	46.8		8.5	NA	6.5	0.3	20	70.9			3.3	1	
L.S.D @5%		4.8	12.5	0.7			0.9		0.2		1.0	0.3	116	0.6			0.7	126	
Significance by Variety			**	**					**			**					**	**	
Significance by Rep	*								**		**	**		**			**	**	
Non-additivity							**				**	**		**			**	**	

** = Significant 99% of the time

* = Significant 95% of the time

NA = Not analyzed do to lack of difference

¹Disease Rating (1-8): 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100%

²Falling Number minimum 300 min.

Grain color/type: **HR**= Hard Red **MR**= Medium hard Red

T=Trical= triticale

DR = Durum

NT = no measurement taken

NQI = National Quality Inspections, Inc.

Table 4. 2012 UC COOPERATIVE EXTENSION McCORMACK SMALL GRAIN TRIAL - Rio Vista

Funded by the California Wheat Commission

Cooperators: Jennie McCormack, Al Medvitz

Experimenters: Kent Brittan, Jorge Dubcovsky, Mark Kochi, Syngenta, John Gilbert
West Bread and World Wide Wheat LLC. and John Gilbert of Adams Grain

Soil Type: Diablo-Ayar on slopes

Planting Method: Drilled with 26 row, 6"spacing double disk Great Plains grain drill planted flat

Planting Rate: 120 Lbs./Acre

Previous Crop: Fallow grazing for sheep

Fertilizer: 85 units Aqua preplant, plus 41lbs/ac 11-52-0 at planting. Total 21.5lbs N/ac applied.

Herbicide: 2pt/ac Glyphosate at planting, 0.5pt/a MCPA + 4.5oz/a Oberon in 15gal/a water ground

Location: Located on the north side of Montezuma Hills Road 0.78 miles east of Anderson Rd.

Planting Date: November 22, 2011

Harvest Date: June 27, 2012

Irrigation: None

Length of Plots: 155 feet

Plot Width: 13 feet

No.of drill rows: 26 rows

Replications: 3

Field Variety: Cal Rojo

2011 to 2012 McCormack Wheat Variety Trial Summary Sorted by Yield

Variety	Grain Type	Stand (Plants/ft ²)	Days to Heading	Plant Height (in)	Harvest Lodging (%)	Disease Rating (1-8)				Grain Moisture (%)	Test Weight (lbs./bu)	Falling No. (min.) ^z	Adams Grain Grade (NQI)			Yield (lbs./ac)	Duncan's Means@5% Separation
						Stripe Rust	Leaf Rust	BYDV	Septoria Blotch				GRADE (average)	Protein (%)	Dockage		
Trical Brand 118	TR	25	158	37	0	3	1	1	1	8.9	60.2	NT	0.5	5 TRITICALE	12.1	5772	A
Summit 515	HR	22	157	31	0	1	1	1	1	8.9	62.2	311	0.4	3 HRW	11.9	5687	A
Camelot	TR	24	149	42	0	2	1	1	1	8.7	59.6	NT	0.7	4 TRITICALE	12.0	5489	A
Trical Brand 115	TR	21	158	34	0	2	1	1	1	8.6	63.7	NT	0.3	2 TRITICALE	12.2	5445	A
Blanca Grande 515	HW	22	148	36	0	1	1	1	1	9.4	59.4	317	0.4	4 HDWH	11.9	5381	A
Trical Brand 158EP	TR	29	157	34	0	2	1	1	1	8.9	60.0	NT	0.4	3 TRITICALE	11.8	5327	A
Patwin	HW	26	158	33	0	1	1	2	1	8.7	57.6	356	0.4	3 HDWH	12.8	5030	AB
SY314	HR	21	158	32	0	1	1	1	1	8.8	61.7	330	0.4	2 HRW	12.3	4856	ABC
Blanca Royale	HW	24	159	32	0	1	1	1	1	9.0	59.8	311	0.8	1 HDWH	12.9	4848	ABC
Cal Rojo	HR	23	148	31	0	1	1	1	1	9.2	60.2	360	0.4	2 HRW	12.3	4662	ABC
Fortissimo	DR	21	164	31	0	1	1	1	1	8.8	60.3	381	1.0	4 HAD	13.2	4170	BCD
Rockland	HR	24	149	31	0	1	1	1	1	9.2	57.9	385	0.4	1 HRW	13.6	3792	CD
Redwing	HR	22	158	30	0	7	1	1	1	8.3	58.2	309	0.5	1 HRW	12.6	3761	CD
WB-Cristallo	HW	22	159	33	0	3	1	1	1	8.6	58.1	371	0.5	1 HDWH	12.7	3257	DE
Volante	DR	9	164	31	0	1	1	1	1	8.9	58.6	297	1.4	4 HAD	13.2	2578	E
Wit Wolkoring	SW	25	159	50	37	8	1	1	1	9.5	61.2	363	0.2	4 SWW	12.1	1098	F
Sonora	SW	26	177	46	33	7	1	1	1	9.3	62.2	291	0.3	3 SWW	12.2	1055	F
Average		23	158	35	4	3	1	1	1	8.9	60.0	337	0.5		12.5	4247	
C.V.%		18.5	0.4	3.9	NA	NA	28.3	26.0	NA	2.7	1.7	12.3	58.9		5.2	14	
L.S.D @5%		7.0	0.9	2.3			1.2	0.5		0.4	1.7	69.7	0.5		1.1	974	
Significance by Variety		**	**	**			**	*		**	**		**		*	**	
Significance by Rep		**		**			*			**	**				**	**	
Non-additivity				**			**			*							

** = Significant 99% of the time

* = Significant 95% of the time

NA = Not Analyzed do to lack of difference

NT = no measurement taken

¹Disease Rating (1-8): 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100%

^zFalling Number minimum 300 min.

Grain color/type: **HR**= Hard Red **MR**= Medium hard Red

T=Trical= triticale

DR = Durum

SW= Soft White wheat

NQI = National Quality Inspections, Inc.

Table 5. 2012 UC COOPERATIVE EXTENSION ROMINGER WHEAT & TRITICALE VARIETY TRIAL

Funded by the California Wheat Commission

Cooperators: Rick and Bruce Rominger
 Experimenters: Kent Brittan, Jorge Dubcovsky, Mark Kochi, Syngenta (Resource Seeds Int.), West Bread and John Gilbert Adams Grain
 Soil Type: Marvin silty clay loam & Tehama loam
 Planting Date: November 11, 2011
 Planting Method: Drilled with 26 row, 6" spacing double disk Great Plains grain drill planted flat
 Planting Rate: 120 Lbs./Acre
 Previous Crop: Processing tomatoes
 Herbicide: MCPA
 Fertilizer: 125 units Aqua preplant. Total 25lbs N/ac applied.
 Location: Southwest corner of County Roads 29 and 89, Winters, CA

Harvest Date: June 14, 2012
 Irrigation: None
 Length of Plots: 152 ft.
 Plot Width: 11 feet
 No. of drill rows: 26 rows
 Replications: 3

2011 to 2012 Rominger Brothers Wheat Variety Trial Summary Sorted by Yield

Variety	Grain Type	Stand (Plants/ft ²)	Days to Heading	Plant Height (in)	Harvest Lodging (%)	Stripe	Leaf		Septoria	Grain Moisture (%)	Test Weight (lbs./bu)	Adams Grain Grade (NQI)			Yield (lbs./ac)	Duncan's Means@5% Separation	
						Rust	Rust	BYDV	Blotch			Falling No. (min.) ²	Dockage	GRADE (average)			Protein (%)
						Disease Rating (1-8)											
Trical Brand 118	TR	25	153	39	0	1	1	1	1	8.0	58.1	NT	0.6	1 TRITICALE	12.0	7927	A
Trical Brand 115	TR	30	159	37	0	1	1	1	1	8.0	57.7	NT	0.6	1 TRITICALE	12.9	7380	B
Camelot	TR	24	150	41	0	1	1	1	1	7.7	56.8	NT	0.5	1 TRITICALE	14.0	7338	BC
Trical Brand 158EP	TR	27	158	36	0	1	1	1	1	7.8	58.0	NT	0.6	2 TRITICALE	11.5	7203	CD
Redwing	HR	27	153	33	0	2	1	1	1	8.1	61.0	407	0.3	1 HRW	11.7	7158	DE
Rockland	HR	28	152	32	0	1	1	1	1	8.3	63.8	448	0.3	2 HRW	12.6	7143	DE
Summit 515	HR	28	153	36	0	1	1	1	1	8.6	62.5	361	0.4	2 HRW	10.9	7020	EF
Blanca Royale	HW	31	146	33	0	1	1	1	1	8.7	62.9	433	0.3	2 HDWH	11.6	6987	F
Cal Rojo	HR	25	157	32	0	1	1	2	1	8.5	60.9	392	0.5	2 HRW	11.5	6967	F
Blanca Grande 515	HW	26	146	35	0	1	1	1	1	8.9	64.5	336	0.3	2 HDWH	11.4	6955	F
Patwin	HW	27	159	37	0	1	1	3	1	8.2	60.9	393	0.5	2 HDWH	11.6	6514	G
SY314	HR	25	153	36	0	1	1	1	1	8.5	61.1	383	0.4	2 HRW	10.9	6447	GH
WB-Cristallo	HW	24	154	37	0	1	1	1	1	8.6	63.6	421	0.3	1 HDWH	11.4	6310	H
Volante	DR	23	158	33	0	1	1	1	1	8.4	62.4	478	0.5	3 HAD	12.1	5179	I
Fortissimo	DR	20	168	31	0	1	1	1	1	8.4	60.5	466	0.3	2 HAD	12.4	5145	I
Average		26	155	35	0	1	1	1	1	8.3	61.0	411	0.4		11.9	6778	
C.V.%		6.1	0.9	1.2	NA	13.7	NA	17.3	NA	1.0	1.5	8.0	42.8		4.7	1	
L.S.D @5%		2.7	2.3	0.7		0.2		0.3		0.1	1.5	55.6	0.3		0.9	140	
Significance by Variety		**	**	**		**		**		**	**	**			**	**	
Significance by Rep										**		**				*	
Non-additivity							**					*					

** = Significant 99% of the time * = Significant 95% of the time NA = Not Analyzed do to lack of difference

¹Disease Rating (1-8): 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100% ² Falling Number minimum 300 min.

Grain color/type: **HR**= Hard Red **MR**= Medium Hard Red **T**=Trical= triticale **DR** = Durum **NT** = no measurement taken

NQI = National Quality Inspections, Inc.

Table 6. 2005-2012 Over Years By Location Small Grains Variety Comparisons
University of California Cooperative Extension - Kent L. Brittan

Varieties		Dixon			Clarksburg			Esparto & Walnut Grove			Rio Vista		
		Averaged over Years	Yield (lbs/ac)	Protein (%)	Averaged over Years	Yield (lbs/ac)	Protein (%)	Averaged over Years	Yield (lbs/ac)	Protein (%)	Averaged Dryland Hills over Years	Yield (lbs/ac)	Protein (%)
Blanca Fuerte	HW	5	7907	10.9	4	4860	12.3	5	7698	10.5	2	3767	10.0
*Blanca Grande 515	HW	6	6178	12.0	5	5205	12.2	6	5959	10.7	3	4088	11.1
Blanca Royale	HW	7	6806	11.7	5	4491	11.9	6	6762	11.3	1	3202	10.8
Cal Rojo	HR	8	7070	11.6	7	5499	11.8	8	6629	11.1	3	3943	11.1
Camelot	TR	5	7738	11.3	4	6768	11.5	4	7882	11.4	2	4717	11.0
Clear White	HW	5	6110	11.8	4	4366	12.1	3	6403	10.2	1	3461	11.3
Desert King HP	DR	3	7215	10.8	1	4361	10.9	3	6042	11.8	1	3643	10.5
Espresso	HR	6	6382	12.3	5	4141	13.1	7	5964	11.5	2	2984	11.0
Fortissimo	DR	4	7261	11.3	3	6406	11.5	4	6625	11.8	2	3989	11.4
Lassik	HR	4	6769	11.6	3	4391	13.3	3	6704	10.7	0		
Patwin	HW	8	6753	12.2	6	4938	12.9	8	6599	11.6	3	3611	11.4
PR1404	MR	4	5396	11.6	3	5143	11.5	3	5528	10.9	0		
Redwing	HR	7	7252	11.7	6	5068	11.8	7	7154	10.9	3	3458	11.3
Rockland	HR	2	6587	12.6	2	5053	12.8	2	6549	12.7	2	3396	12.5
*Summit 515	HR	6	7314	10.8	6	5860	11.1	6	7148	10.3	3	4167	10.8
Trical Brand 115	TR	1	7674	12.6	1	9367	10.7	1	7380	12.9	1	5445	12.2
Trical Brand 118	TR	7	6542	11.2	6	6021	10.4	7	7257	11.6	3	4760	11.2
Trical Brand 158EP	TR	3	9210	9.9	2	7784	9.9	2	7708	11.2	2	4751	10.4
WB-Cristallo	HW	4	5705	12.7	3	6514	12.7	4	6260	13.3	2	1055	12.2

* Summit and Summit 515 - are similar enough in growth, yield, and quality that I combined them for this comparison.

* Blanca Grande and Blanca Grande 515 - are similar enough in growth, yield, and quality that I combined them for this comparison.

2011-12 Southern Sacramento Valley Small Grains Research Program

Hard Red Wheat Protein Enhancement by Midseason Urea Application

Project Leader: Kent L. Brittan, UC Cooperative Extension Director Yolo County, Farm Advisor.

Cooperators: California Wheat Commission; Craig Gnos and Sam Beukelman, E & H Farms; Larry Hunn, Hunn, Merwin & Merwin; Jeannie McCormack and Al Medvitz, McCormack Sheep and Grain; Rick Rominger, Rominger Brothers; John Gilbert, Adams Grain Company, Mark Mezger, Farmers Grain Company, Sarah Hodson, Syngenta Small Grains; Mark Kochi, Field Technician Yolo County.

Summary of Results and Conclusions

Three additional hard red wheat plot treatments were included within the Cultivar Assessment research program this season. These plots researched protein enhancement with additional nitrogen applications at 4 locations in the southern Sacramento Valley. The additional variety plots were Cal Rojo, WB-Rockland, and Summit 515. Each of these plots were subdivided into 5 nitrogen (N) treatment subplots. These N applications were in addition to whatever fertilizer the grower applied. This nitrogen, in the form of urea fertilizer, was applied at the jointing and flowering growth stages. Nitrogen treatments were: Control – no additional N; 30lbs/ac at jointing; 60lbs/ac at jointing; 30lbs/ac at jointing + 30lbs/ac at flowering; 30lbs/ac at jointing + 60lbs/ac at flowering. Results showed a small increase in plant height, yield and grain protein over the treatments and a slight decrease in test weight.

Introduction and Objectives

In the southern Sacramento Valley daily minimum temperatures decrease the closer you get to the southern “delta” region. Historically, grain protein levels decrease in response to these cooler temperatures. Confusing this response are drought and other stress related responses that increase protein, but also increase dockage. Debate within this cooler region has questioned the ability to offset this response with additional nitrogen applications. This research is an attempt to answer that question.

Materials and Methods

I conducted 4 factorial randomized block designed small grain fertility trials each replicated 3 times. Plot widths and lengths varied per location depending on grain drill used. Widths were 9, 11 or 13ft and plot lengths were 126 to 186 feet with fertility subplots 25ft in length. Total acreage of the 4 locations was 7.8 acres.

E & H Farms Small Grain Trial – Located three-quarters mile north of Sievers Rd. on the east side of Curry Rd. about 3.5 mile north of Dixon, CA. Soil: Brentwood clay loam; one irrigation; 15 varieties + 3 fertility plots; 3 replications; planted flat. Field in a tomato-grains-seed crop rotation. Plot width 9ft + 2ft border, length 126 ft. Grower applied nitrogen: Pre-plant 100lbs/ac anhydrous ammonium; top-dress 80lbs/ac urea. Total 118.8lbs N/ac applied.

Hunn, Merwin & Merwin Small Grain Trial – Located on east side of Jefferson Road, 0.1mile north of Central Rd, 2mi. west of Clarksburg, CA. Soil type: Omni silty clay; One sprinkler irrigation; 15 varieties + 3 fertility plots; 3 replications; planted flat. Field in a tomato–grains-alfalfa rotation. Plot width 13ft + 2ft border, length 186 ft. Grower applied nitrogen: Preplant 100 units nitrogen as aqua ammonia. Total 20lbs N/ac applied.

McCormack Ranches Small Grains Trial – Location on the south side of Montezuma Hills Road 2 miles east of Anderson Rd., west of Rio Vista, CA. Soil type: Clear Lake clay on flats and Diablo-Ayar on slopes; dryland hills no irrigation; 17 varieties + 3 fertility plots; 3 replications; planted flat. Field in a 2 year Sheep-fallow-grains rotation. Plot width 13ft + 2 ft border, length 155ft. Grower applied nitrogen: 85 units Aqua preplant, plus 41lbs/ac 11-52-0 at planting. Total 21.5lbs N/ac applied.

Rominger Brothers Small Grains Trial – Location Southwest corner of County Roads 29 and 89, north of Winters, CA. Soil type: Marvin silty clay loam & Tehama loam; no irrigation; 15 varieties + 3 fertility plots; 3 replications. Field in a tomato-wheat rotation; with 60” beds. Plot width 11ft + 2ft border, length 152 ft. Grower applied nitrogen: 125 units Aqua preplant. Total 25lbs N/ac applied.

Data collected at all sites: Plant population, days to heading from planting, head height, lodging, frost, foliar disease ratings for (stripe rust, leaf rust, barley yellow dwarf virus, septoria, powdery mildew), harvest grain moisture, test weight, protein, falling number, full grade conducted independently by National Quality Inspections, Inc. , and yield. Data analyzed using UC MSTATC factorial analysis of variance. Coefficient of Variation (CV) provided where appropriate.

Budget: \$6,000 – split between Cultivar Assessment and Protein Enhancement trials.

Supplies – steaks, plot signs, paper, equipment, fertilizer:	\$1,000
Transportation – fuel:	\$1,000
Clerical support:	\$4,000

Results

I used 3 hard red wheat varieties and 5 different rates of added nitrogen replicated 3 times at 4 locations to determine if under cooler minimum temperatures I could increase grain protein and yield. Results indicate that additional nitrogen significantly improved yield and protein, slightly increased plant height and slightly decreased test weight, Table 1. Plots were all harvested with large commercial combines so some mixing occurred between plots. I was surprised with the linearity of the yield results despite this mixing. Plant heights with the highest treatment of nitrogen increased one inch for each of the varieties when compared to the control plots. There appeared to be a significant interaction between the location and fertility. With much lower soil moisture and fertility at the dryland hills (McCormack) location I would expect this. According to Table 2 and depicted in Chart 1, when averaged over locations, Cal Rojo had the largest response to increased nitrogen with a 13.3% increase in yield (831lbs/ac) and a 7.2% increase in percent protein (0.9%) over the control levels, going from 12.3% to 13.2%. Rockland had a 9.5% increase in yield (629lbs/ac) and 4.5% gain percent protein (0.6%), going from 13.4% to 14%. Summit 515 increased yields 6.7% (463lbs/ac) and increased grain protein 4.8% (0.6%), going from 11.9% to 12.5%. Interestingly, there was a slight decrease in test weights for each of the varieties: -1.0% for Cal Rojo; -1.3% for Rockland and -0.4% for Summit 515, though not very consistent as seen in Chart 2.

Discussion, Conclusions and Recommendations

It sounds and looks good, but in reality I only, on average, increased yields by 641lbs/ac and increased grain protein by only 0.7% with a total addition of 90lbs/ac nitrogen. This is not cost effective at today’s nitrogen prices. Additionally, it takes rain or irrigation to incorporate these mid-season nitrogen applications. With the weather becoming more unpredictable moisture wise and irrigation costs increasing it is getting harder to make these applications. I am encouraged that I can improve grain protein with nitrogen in the cooler night time environments of the southern Sacramento Valley. I noticed that for each of the varieties the increase in protein would have put it over a quality price increase threshold making it closer to being cost effective. Perhaps with the new protein genes under development growers in this area will be able to consistently get 13% proteins with a little added nitrogen.

Table 1. 2012 Hard Red Wheat Protein Enhancement By Urea Application Summarized Over 4 Locations

University of California Cooperative Extension - Kent L. Brittan

Variety	Urea Fertility ¹	Plant Height (in)	Yield (lbs./ac)	Adams Grain Inc. NQI Grading Facility (300 min.)				Total Defects DEF
				Test Weight (lbs./bu)	Protein (%)	Falling No. FN	Dockage DKG	
Cal Rojo	Control No Additional Urea	33	6261	60.6	12.3	402	0.6	4.2
	30lbs N/ac at jointing	33	6466	60.7	12.5	408	0.4	4.0
	60lbs N/ac at jointing	34	6802	60.1	12.9	422	0.7	4.6
	30lbs N/ac jointing + 30lbs flowering	33	6883	59.8	13.0	409	0.6	4.3
	30lbs N/ac jointing + 60lbs flowering	34	7092	60.0	13.2	410	0.6	4.6
Rockland	Control No Additional Urea	33	6637	62.9	13.4	443	0.4	3.6
	30lbs N/ac at jointing	33	6860	62.0	13.3	409	0.4	3.4
	60lbs N/ac at jointing	34	6979	62.6	13.7	420	0.4	3.4
	30lbs N/ac jointing + 30lbs flowering	34	7057	62.9	13.9	444	0.3	2.4
	30lbs N/ac jointing + 60lbs flowering	35	7267	62.1	14.0	414	0.5	3.2
Summit 515	Control No Additional Urea	36	6931	62.5	11.9	356	0.3	2.8
	30lbs N/ac at jointing	36	6970	62.1	12.3	348	0.4	3.6
	60lbs N/ac at jointing	36	7123	62.1	12.4	354	0.4	3.8
	30lbs N/ac jointing + 30lbs flowering	36	7235	61.9	12.4	361	0.4	3.7
	30lbs N/ac jointing + 60lbs flowering	37	7394	62.3	12.5	362	0.4	3.8
Average		34	6930	61.6	12.9	398	0.5	3.7
Coefficient of Variability C.V. (%)		1.46	1.86	1.14	2.14	7.9	48.7	39.6
Significance by Location		**	**	**	**	**	**	**
Significance by Replication			**		*			
Significance by Variety		**	**	**	**	**	*	
Location x Variety		**	**	**	*	**		
Significance by Fertility		**	**	**	**	**		
Location x Fertility		**	**	**	**	**		
Variety x Fertility			**	**	*			
Location x Variety x Fertility			**					

* Significant 95% to 98% of the time

** Significant 99% or more

NQI = National Quality Inspections, Inc.

Fertility¹

Urea applied over grower's standard nitrogen application

Location 1 Nitrogen applied by grower: 118.8lbs N/acre following processing tomatoes

Location 2 Nitrogen applied by grower: 20lbs N/acre following processing tomatoes

Location 3 Nitrogen applied by grower: 21.5lbs N/acre following 2 years fallow grazing

Location 4 Nitrogen applied by grower: 25lbs N/acre following processing tomatoes

Table 2. Percent Change Induced Through Nitrogen - Over Locations

Control compared to highset Nitrogen treatment

Variety	Test		
	Yield	Weight	Protein
Cal Rojo	13.3	-1.0	7.2
Rockland	9.5	-1.3	4.5
Summit 515	6.7	-0.4	4.8

Chart 1. 2012 Hard Red Wheat Protein Enhancement By Urea Application Summarized Over 4 Locations for Yield and Protein

University of California Cooperative Extension - Kent L. Brittan

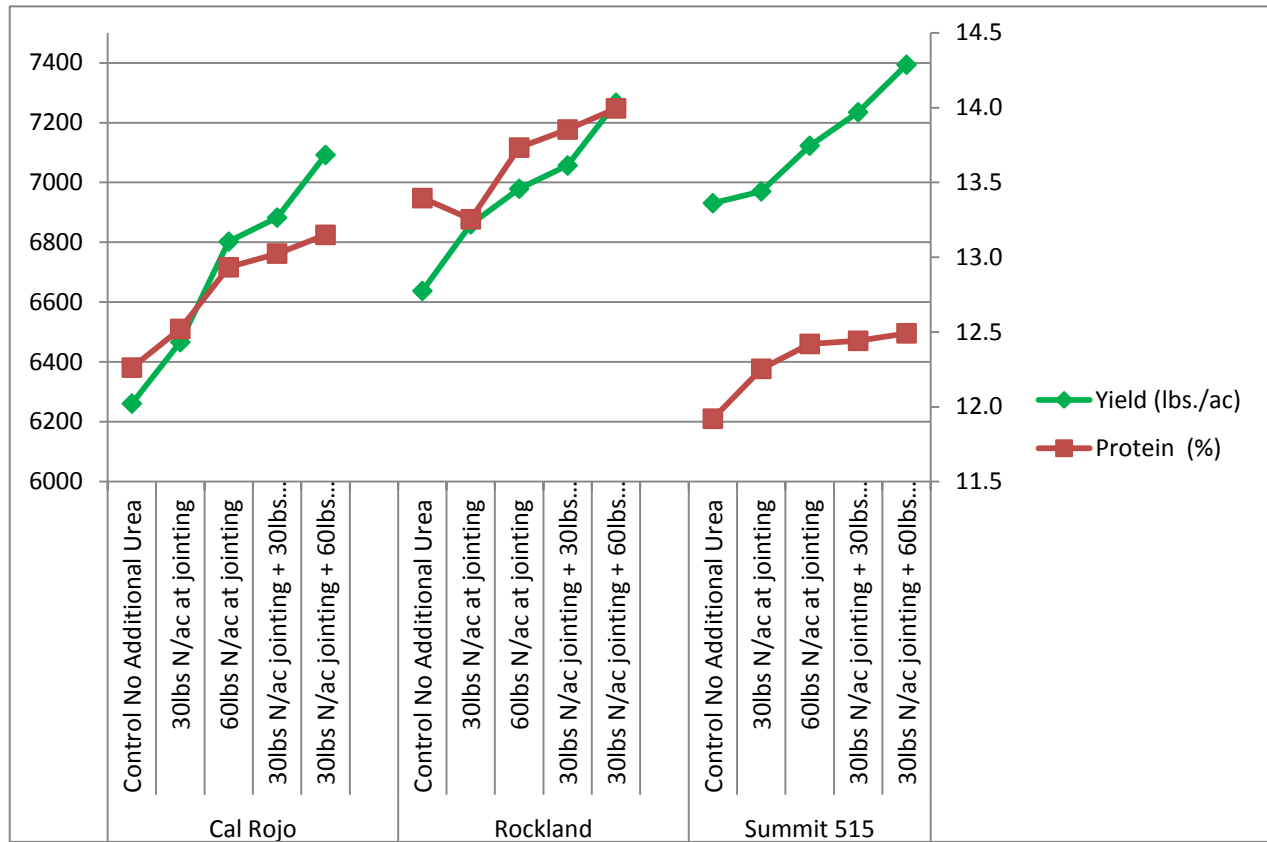


Chart 2. 2012 Hard Red Wheat Protein Enhancement By Urea Application Summarized Over 4 Locations for Grain Test Weight

University of California Cooperative Extension - Kent L. Brittan

