2024 Small Grain Variety Trial Report

University of California
Agriculture and Natural Resources
Research and Extension Center System

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Introduction

This report summarizes grain yield and agronomic characteristics for public and private entries evaluated at IREC in 2024.Winter grain variety trials were a cooperative effort between IREC and Oregon State University's Cereal Variety Testing organized by Dr. Ryan Graebner. Spring wheat and triticale variety trials were part of the UC Davis Smalls Grains Breeding program organized by Dr. Xiaofei Zhang and Dr. Josh Hegarty. IREC staff also performed some informal spring strip trials using Westbred wheat varieties of local interest.

Grain yield and agronomic data was collected by IREC staff. Grain protein and test weights were generated in collaboration with Ryan Graebner, Oregon State University and Joshua Hegarty of University of California, Davis. OSU grain tables can be viewed online at: https://cropandsoil.oregonstate.edu/wheat/osu-wheat-variety-trials/2024-oregon-wheat-and-barley-yield-trial-data

UC small grain variety trial summaries for multi-year and multi-trial data can be found at http://smallgrainselection.plantsciences.ucdavis.edu/.

Late freeze at the boot stage in 2024 causes blank seed kernels on several grain heads.

2024 General Trial Information for all trials

Location:	Intermountain Research and Extension Center, Tulelake, CA
Soil Type:	Tulebasin mucky silty clay loam
Weed Control:	Rhomene MCPA @ 1 pt. /Acre; Detonate @ 2 fl oz./Acre; Express 0.5 oz./Acre
Replicated Plot size:	Winter Trials 100 ft^2; Spring Trials 75ft^2
Seeding Rate:	100 lbs./Acre
Row Spacing:	6 Inches
Number of Reps:	4

2024 Hard Winter Wheat Trial

Planting Date: 10/17/2023
Previous Crop: Sudan Grass
Spring 2022 Soil Test N: 5.9 ppm (21 lbs. N/Acre)
Nitrogen Fertilizer: Season total applied Nitrogen was 201 lbs. N/Acre applied through the season. 21 lbs. N/A at planting (10/17/2023), 50 lbs. N/A early through late tillering (4/1/2024), 100 lbs. N/A through stem elongation (5/9/2024), 30 lbs. N/A at flowering (6/12/2024) to raise protein in the seed.
Irrigation Quantity: Solid-set sprinklers 13.23 Acre inches (final irrigation 6/12/2024)
Harvest Date: 8/12/2024

Variety Highlights: Winter hard red (HRW) varieties were fertilized with an additional 30 lbs. of nitrogen applied at flowering to increase grain protein. Unfortunately, this late season N application did not increase grain protein over 12% for any variety. IREC staff have struggled to get winter hard red wheat proteins over 12% for several years. This outcome is likely due to several factors including the high yield potential of winter varieties and our unique soil and growing conditions. The HRW variety OR323001OH had the highest grain yield for the 2024 trial at 175 bu/acre. The three varieties with the highest 4-Year average yield were WB4394, Millie, and LCS Jet. WB4394 has acceptable baking quality and an average 4-year yield of 171 bu/A.

Oregon State University

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2024 OREGON HARD WINTER WHEAT YIELD RESULTS

Tulelake (Irrigated)

Site Description: Trial was relatively uniform.

This trial was a collaboration between OSU and the UC-Davis Intermountain Research and Extension Center.

Variety	Herbicide Traits	Quality*	Class	Yield (bu/acre) 2024 Yield	2024 Rank	2-Year Average	3-Year Average	4-Year Average	5-Year Average	Best Estimate**
OR3230010H (OR3001)	AX		HRW	175	1					**187 ± 22**
WB4394		A	HRW	154	5	163	169	171		**171 ± 11**
LCS Blackbird		LD	HRW	141	13	158	161			**167 ± 12**
Millie		MD	HWW	149	9	163	165	166		**166 ± 11**
LCS Jet		A	HRW	161	2	162	156	164		**164 ± 11**
WB4303		A	HRW	144	12					**164 ± 15**
LCS Eclipse AX	AX		HRW	152	6					**164 ± 22**
WB4510 CLP	CL+		HRW	151	8					**163 ± 22**
OR2190064R			HRW	151	7	158				**163 ± 15**
LWH21-5281			HRW	149	10					**161 ± 22**
Keldin		D	HRW	140	14	155				**161 ± 12**
LCS Missile		MD	HRW	159	3	153	152			**158 ± 12**
OR3230015H (OR3002)	AX		HRW	146	11					**158 ± 22**
Scorpio		MD	HRW	158	4	157	149	157		**157 ± 11**
WA8399			HRW	139	15					**151 ± 22**
OR2190160R			HRW	138	16					**150 ± 22**
WA8401			HRW	130	17					**142 ± 22**
OR2190165R			HRW	124	18					**136 ± 22**
		Average		148		159	159	165		**160**
		LSD (0.05)		15						
		CV (%)		7.4						

*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.
Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses
**Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to five years of data.

2024 OREGON HARD WINTER WHEAT PLANT CHARACTERISTICS

Tulelake (Irrigated)

Site Description: Trial was relatively uniform.

Variety	Class	Height (in)	Test Weight (lb/bu)	Protein (%)	Heading Date
OR3230010H (OR3001)	HRW	40.7	59.1	9.3	6/5
WB4394	HRW	40.0	62.3	9.6	6/7
LCS Blackbird	HRW	34.1	56.9	10.8	6/6
Millie	HWW	37.1	61.4	10.1	6/6
LCS Jet	HRW	36.1	60.0	9.8	6/5
WB4303	HRW	33.5	58.1	9.7	6/5
LCS Eclipse AX	HRW	39.4	58.7	8.9	6/7
WB4510 CLP	HRW	38.1	61.6	9.3	6/5
OR2190064R	HRW	36.4	60.3	9.9	6/7
LWH21-5281	HRW	39.7	60.8	10.5	6/9
Keldin	HRW	37.1	55.2	9.4	6/6
LCS Missile	HRW	38.7	60.6	9.7	6/7
OR3230015H (OR3002)	HRW	39.7	58.5	9.7	6/7
Scorpio	HRW	35.4	59.6	10.0	6/6
WA8399	HRW	34.8	58.7	9.2	6/9
OR2190160R	HRW	34.4	59.5	10.7	6/7
WA8401	HRW	35.8	58.9	9.2	6/8
OR2190165R	HRW	36.1	58.1	10.6	6/7
	Average	37.1	59.3	9.8	6/7
	LSD (0.05)	4.1	3.8	0.4	1.1
	CV (%)	8.0	4.6	2.7	0.0

2024 Soft White Winter Wheat Trial

Planting Date: 10/17/2023
Previous Crop: Sudan Grass
2024 Soil Test N: 5.9 ppm (21 lbs. N/Acre)
Nitrogen Fertilizer: Season total applied Nitrogen was 171 lbs per acre applied through the season. 21 lbs. N/A at planting (10/17/2023), 50 lbs. N/A early through late tillering (4/1/2024), 100 lbs. N/A through stem elongation (5/9/2024).
Irrigation Quantity: Solid-set sprinklers 13.23 Acre inches (final irrigation 6/11/2024)
Harvest Date: 8/13/2024
Variety Highlights: Winter wheat continues to be the highest yielding wheat raised at IREC under full irrigation. Wheat is a cool season grass and winter varieties mature earlier than spring planted types. This usually means winter wheat can more effectively utilize winter/spring soil moisture and avoid maturing during the hottest part of the growing season. LWW20-2867 was the highest yielding variety in 2024. LCS Blackjack and AP Exceed were the highest yielding varieties for the 3-year trial average with yields over 171 bushels/acre. LCS Blackjack has the advantage of being awnless, making it a dual-purpose type.

Oregon State University

2024 OREGON SOFT WINTER WHEAT YIELD RESULTS

Tulelake (Irrigated)

UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources

Site Description: Trial was relatively uniform.

This trial was a collaboration between OSU and the UC-Davis Intermountain Research and Extension Center.

Variety	Herbicide Traits	Quality	Class	2024 Yield	2024 Rank	2-Year Average	3-Year Average	4-Year Average	5-Year Average	Best Estimate**
VI Gem (UIL 13-046145A)			SWW	159	4					**182 ± 16**
AP Exceed		MD	SWW	162	2	171	177	177		**181 ± 12**
LWW20-2867			SWW	163	1					**178 ± 23**
LCS Blackjack		D	SWW	162	3	174	172	171	177	**177 ± 10**
WB1545			SWW	158	5					**174 ± 23**
LWWC21-0331	CL+		SWW	157	8					**172 ± 23**
OR2180350			SWW	155	10					**171 ± 23**
OR5180072			Club	157	7	162				**169 ± 16**
WA8397			SWW	153	14					**168 ± 23**
LWWC21-0317	CL+		SWW	152	16					**167 ± 23**
WA8398			SWW	152	17					**167 ± 23**
LCS Scorpion AX	AX		SWW	147	20	159				**166 ± 16**
OR2180149			SWW	154	12					**165 ± 16**
Sockeye CL+	CL+	MD	SWW	157	6	157				**165 ± 16**
LCS Hydra AX	AX		SWW	131	40	156				**163 ± 16**
AP Olympia			SWW	148	18					**163 ± 23**
WB1922		D	SWW	143	25	162	159			**163 ± 13**
WB1621		MD	SWW	152	15	159	157			**161 ± 13**
LCS Jefe		D	SWW	157	9	154	162	156		**160 ± 12**
Nova AX (WA8346 AX)	AX	MD	SWW	137	32	152				**160 ± 16**
LCS Shine		MD	SWW	121	47	145	156	156	159	**159 ± 10**
WA8404			SWW	141	28					**156 ± 23**
Rosalyn		A	SWW	125	44	144	149	148	155	**155 ± 10**
Stephens		D	SWW	144	22	148				**155 ± 13**
OR2200083 CL+	CL+		SWW	147	19	147				**155 ± 16**
LWW20-2383			SWW	139	29					**155 ± 23**
TMC M-Pire		D	SWW	144	23	147				**155 ± 16**
LCS Kamiak		A	SWW	142	27	140	148	150		**154 ± 12**
Piranha CL+	CL+	D	SWW	132	39	146				**153 ± 16**
Gale (OR2180377)			SWW	147	21	152	150			**153 ± 13**
OR3230026 AX	AX		SWW	137	31					**153 ± 23**
OR5180071			Club	139	30	156	154	147		**151 ± 12**
Mallory CL+ (ORI2190025	CL+		SWW	153	13	149	147			**151 ± 13**
Calypso (ARS09500-17CBW)			Club	155	11	151	147			**151 ± 13**
ORI2190027 CL+	CL+		SWW	142	26	145	147			**150 ± 13**
WA8405			SWW	135	34					**150 ± 23**
LWW21-1834			SWW	134	36					**150 ± 23**
VI Voodoo CL+	CL+	D	SWW	127	42	141				**148 ± 16**
Nimbus		MD	SWW	134	35	143	142	144		**148 ± 12**
LWWC21-0119	CL+		SWW	133	38					**148 ± 23**
AP Iliad		A	SWW	126	43	135	144			**148 ± 13**
TMC M-Press		D	SWW	119	48	140				**147 ± 12**
OR2170559			SWW	135	33	140	144	140		**144 ± 12**
Cameo		MD	Club	113	49	130	138	139		**143 ± 12**
LCS Drive		D	SWW	133	37	134	138	138		**142 ± 12**
VI Encore CL+ (UIL 17-7706	CL+	D	SWW	127	41	134				**142 ± 16**
Appleby CL+	CL+	D	SWW	143	24	132				**140 ± 16**
ARS Crescent		MD	Club	123	45					**139 ± 23**
OR5190014			Club	123	46					**138 ± 23**
SY Assure		D	SWW	108	52	105	120	127		**131 ± 12**
Norwest Tandem		A	SWW	110	51	118	125	126		**130 ± 12**
LWWA22-D33	AX		SWW	113	50					**128 ± 23**
LCS Reaper II AX	AX		SWW	105	53					**120 ± 23**
ARS Castella		MD	Club	80	54					**112 ± 16**
		Average		139		146	149	148	164	**154**
		LSD		23						
		CV (%)		12.0						

*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.
Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses

**Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to five years of data.

2024 OREGON SOFT WINTER WHEAT PLANT CHARACTERISTICS

Tulelake (Irrigated)

Oregon State University

UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources

Site Description: Trial was relatively uniform.

Variety	Class	Height (in)	Test Weight (lb/bu)	Protein (%)	Heading Date
VI Gem (UIL 13-046145A)	SWW	41.0	60.7	10.2	6/7
AP Exceed	SWW	39.7	60.1	10.3	6/7
LWW20-2867	SWW	40.0	58.9	9.5	6/9
LCS Blackjack	SWW	36.5	54.2	10.6	6/8
WB1545	SWW	38.3	61.3	11.1	6/5
LWWC21-0331	SWW	40.0	60.6	11.4	6/10
OR2180350	SWW	36.1	58.4	9.7	6/7
OR5180072	Club	36.4	59.7	10.9	6/7
WA8397	SWW	38.0	59.5	10.2	6/10
LWWC21-0317	SWW	41.4	60.6	10.9	6/8
WA8398	SWW	37.7	59.4	10.5	6/10
LCS Scorpion AX	SWW	38.1	60.4	9.7	6/7
OR2180149	SWW	42.3	59.3	10.5	6/8
Sockeye CL+	SWW	43.6	58.1	9.5	6/10
LCS Hydra AX	SWW	39.0	60.6	10.0	6/10
AP Olympia	SWW	39.0	60.0	10.1	6/9
WB1922	SWW	43.4	61.3	10.6	6/11
WB1621	SWW	42.3	60.3	10.4	6/9
LCS Jefe	SWW	39.0	60.1	9.6	6/9
Nova AX (WA8346 AX)	SWW	45.0	59.9	9.4	6/9
LCS Shine	SWW	34.1	59.4	10.9	6/8
WA8404	SWW	39.1	59.6	10.7	6/10
Rosalyn	SWW	39.0	59.0	10.2	6/10
Stephens	SWW	41.1	58.1	10.3	6/7
OR2200083 CL+	SWW	38.1	56.9	11.3	6/8
LWW20-2383	SWW	39.0	60.7	10.4	6/7
TMC M-Pire	SWW	35.4	60.9	11.0	6/8
LCS Kamiak	SWW	38.7	61.0	10.6	6/7
Piranha CL+	SWW	41.1	56.8	10.1	6/9
Gale (OR2180377)	SWW	37.5	56.0	10.8	6/10
OR3230026 AX	SWW	38.1	58.9	10.5	6/7
OR5180071	Club	39.7	57.6	10.7	6/11
Mallory CL+ (ORI2190025 CL+)	SWW	38.5	57.9	10.4	6/7
Calypso (ARS09500-17CBW)	Club	41.7	60.9	10.8	6/10
ORI2190027 CL+	SWW	37.5	59.0	10.6	6/7
WA8405	SWW	39.4	58.7	11.2	6/11
LWW21-1834	SWW	40.3	58.8	10.0	6/7
VI Voodoo CL+	SWW	34.4	60.2	10.7	6/9
Nimbus	SWW	46.2	60.5	10.7	6/9
LWWC21-0119	SWW	39.1	59.8	11.0	6/9
AP Iliad	SWW	34.8	57.8	11.2	6/8
TMC M-Press	SWW	39.0	59.5	10.7	6/10
OR2170559	SWW	39.0	58.9	11.2	6/9
Cameo	Club	39.0	58.7	11.5	6/9
LCS Drive	SWW	32.1	56.4	10.8	6/8
VI Encore CL+ (UIL 17-7706 CL+)	SWW	38.8	60.3	11.8	6/9
Appleby CL+	SWW	41.4	60.3	10.6	6/9
ARS Crescent	Club	43.2	60.3	10.2	6/11
OR5190014	Club	38.0	58.7	10.3	6/10
SY Assure	SWW	33.5	58.9	12.3	6/5
Norwest Tandem	SWW	39.0	58.2	10.5	6/7
LWWA22-D33	SWW	34.4	57.6	10.8	6/9
LCS Reaper II AX	SWW	36.1	60.4	11.6	6/7
ARS Castella	Club	40.4	57.5	11.5	6/9
	Average	39.0	59.2	10.6	6/9
	LSD (0.05)	2.5	1.9	0.8	1.5
	CV (%)	4.7	2.2	5.6	0.0

2024 UC Davis Spring Elite Grain Trial

Planting Date: 4/26/2024
Previous Crop: Sudan Grass
2024 Soil Test N: 11.4 ppm (41 lbs. N/Acre)
Nitrogen Fertilizer: Season total applied Nitrogen was 180 lbs per acre applied through the season. 50 lbs. N/A at planting (4/23/2024) urea, 100 lbs. N/A early tillering through late tillering (6/13/2024), 30 lbs. N/A at flowering to increase protein (7/5/2024).
Irrigation Quantity: Solid-set sprinklers 14.49 Acre inches (final irrigation 7/5/2024)
Harvest Date: 8/29/2024

Trial information and Variety Highlights: This trial was organized by the University of California, Davis Small Grains Breeding Program. It included released named varieties of both hard spring wheats and triticale grain classes. UC1991 was the highest yielding entry among the spring wheats yielding around 4 tons/A. Over the past couple of years, UC Central Red, WB9668 and WB9727 produced higher grain yields and similar protein (>14%) compared to Yecora Rojo. WB9990 and WB Patron are awnless hard red spring types that can be harvested for forage; neither had grain protein over 14%. As for triticale types, UC Atrea and UC Bopak are University of California releases with high feed grain and silage yields. More information on both these releases can be found at: https://dubcovskylab.ucdavis.edu/sites/default/files/upload_files/UCAtrea_Summary_CJ_5_19_2021.pdf

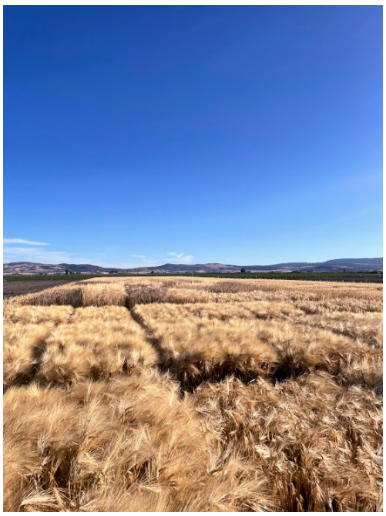
UC Small Grains Spring Elite Trial

Tulelake, CA (Irrigated)

Variety	Avg Height (CM)	% Lodging (8-26-24)	Tons/A
Wheat Types			
UC CENTRAL WHITE	79.4	0	3.86
UC CENTRAL RED	77.5	0	3.75
YECORA ROJO 515	66.9	0	2.77
YECORA ROJO	68.8	0	3.44
WB PATRON	78.1	0	3.88
WB 9990	75.0	0	3.80
WB 9727	76.9	0	3.84
WB9749	84.4	0	3.57
WB9668	76.3	0	3.67
UC 1975	80.0	0	3.77
UC 1988	79.4	0	4.01
UC 1989	80.0	0	3.97
UC 1990	86.3	0	3.60
UC 1991	76.3	0	4.10
UC 1992	86.9	0	3.21
UC 1993	63.1	0	3.61
Triticale Types			
UC ATREA	96.3	0	4.45
UC BOPAK	99.4	0	4.24
Merlin Max	123.1	0	3.66
Gunner	141.3	8.25	3.41
Legend	79.4	0	4.32
UC 3198	106.3	0	3.62
UC 3199	90.6	0	3.63
UC 3200	120.6	0	4.00
UC 3201	111.9	0	3.89
UC 3202	106.9	0	4.23
Average			**3.78**

2023 and 2024 Spring West Bred Wheat Strip Trials

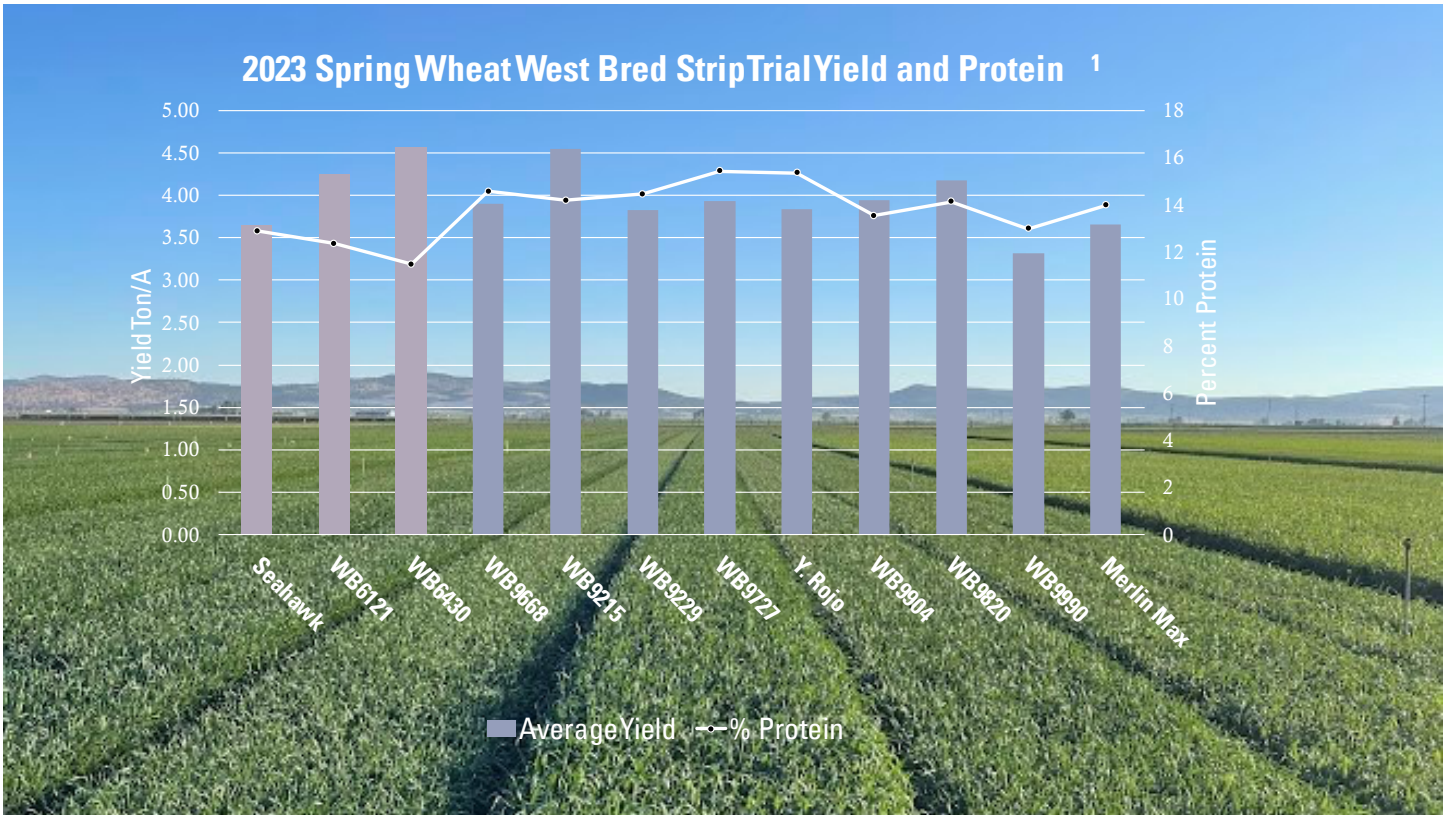
Planting Date: 4/24/2024
Previous Crop: Sudan Grass
2024 Soil Test N 11.4 ppm (41 lbs. N/Acre)
Nitrogen Fertilizer: Season total applied Nitrogen was 180 lbs per acre applied through the season on hard red types and 150 lbs. per acre for soft white types. 50 lbs. N/A at planting (4/23/2024) urea, 100 lbs. N/A early tillering through late tillering (6/13/2024), 30 lbs. N/A at flowering to increase protein (7/5/2024) in hard red types.
Irrigation Quantity: Solid-set sprinklers 14.49 Acre inches (final irrigation 7/5/2024)
Harvest Date: 8/29/2024



Trial Information: The Intermountain Research and Extension Center has lacked funding to conduct regional, replicated spring grain trials the last two years. WestBred spring wheat lines have historically produced high yields in Tulelake. To maintain some local yield information with minimal cost to the Center, we planted several WestBred lines in unreplicated strips in 2023 and 2024. These strips were maintained using our typical grain rotation and irrigated using solid set sprinklers. In 2023, the trial included three soft white wheat, eight hard red wheat, and one triticale grain type. The UC Davis Small Grains Program provided protein levels for the 2023 trial.

Variety Highlights: In 2023, WB6121 and WB6430 were the best performing spring soft white wheat varieties producing over 4.25 tons/acre. Protein levels for both were above 11%, meaning we likely applied to much nitrogen trying to maximize yield. In 2023 and 2024, West Bred hard red varieties WB9668, WB9215 and WB9727 had protein over 14% and higher grain yield compared toYecora Rojo. See graphs below for a snapshot of results for each year.**Grain Protein Managemen**t:
Recently there have been a lot of questions regarding management of protein in different types of grain. The grain protein content in wheat is directly related to the amount of nitrogen plants obtain from the soil and grain yield. To avoid dockage in payment, grain markets have protein standards for spring hard red wheats set at 14% or above, while spring soft wheat need to be below 11%. Growers wanting red wheat protein above 14% will need roughly 20-30 percent more nitrogen available to the plant during the flowering growth stage compared to soft white wheat.

A general rule of thumb is wheat requires about 50 lbs. of available nitrogen in the soil for every ton of grain yield. For example, if you have a grain yield goal of 3 tons, the crop will need roughly 150 lbs. of nitrogen. Fortunately, most soils have residual nitrogen from the previous season and naturally mineralize nitrogen from organic matter. Thus, it's rare a grower needs to apply all 150 lbs of nitrogen as nitrogen fertilizer. If you consider soil residual nitrogen along with organic matter, nitrogen fertilizer amounts can be reduced by more than 50% especially in Tulelake soils with high organic matter. Organic matter is rich in nutrients. Many Tulelake soils have an organic matter content of 4-8%, and these soils can release 50-100 lbs. of nitrogen per acre to spring grain crops. ***Daniel Geissler, a University of California Cooperative Extension Specialist in nutrient management, has conducted multiple years of soil nitrogen mineralization research at IREC. His lab produced an online nitrogen calculator for spring wheat grown for grain.*** The calculator, http://geisseler.ucdavis.edu/Crop_N_Calculator_2025_01_06.html accounts for most factors related to wheat nitrogen needs such as planting date, residual soil nitrate from the previous crop, expected yield, soil organic matter %, irrigation, and soil type. This calculator is a great way to closely estimate spring wheat nitrogen fertilizer amounts. Lastly, hard red wheat growers that want protein over 14% should apply additional nitrogen fertilizer at heading to bump grain protein. For IREC trials, we applied an additional 30 lbs. of nitrogen in the last irrigation.



[1]*Trial conducted on both spring soft white wheat and hard red wheat. Soft white types in lighter color (Seahawk, WB6121, and WB6430).*