

STATE-WIDE CEREAL VARIETY TESTING PROGRAM TRIALS IN CENTRAL OREGON

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Abstract

Grain variety trials were conducted at Madras, Oregon, as part of the seventh year of a state-wide variety testing program. Winter and spring wheat, triticale, and spring barley were grown. As groups, winter triticale (24 varieties) had the highest average yield (9,660 lb/acre) followed by winter wheat (38 varieties) (8,460 lb/acre), spring wheat and triticale (50 varieties) (6,900 lb/ac), and spring barley (15 varieties) (4,257 lb/acre). Spring wheat yields were again among the highest they have been in 6 years of testing. Lodging was a problem in all trials, though there were differences among varieties within trials. Within each grain class, several varieties appear to be top performers across years. Growers are encouraged to carefully review prospective varieties for both yield and other desirable characteristics, such as grain quality and resistance to disease and lodging.

Introduction

Public, and private Pacific Northwest plant breeders release new cereal varieties each year. To provide growers with accurate, up-to-date information on variety performance, a statewide variety-testing program was initiated in 1993 with funding provided by the Oregon State University (OSU) Extension Service, OSU Agricultural Experiment Station, Oregon Wheat Commission, and Oregon Grains Commission. Ten sites are included in the testing network. More than 50 varieties are tested each year at each site. Height, lodging, yield, test weight, and protein data are determined for all plots in Madras, Oregon. Other information is collected as time and labor allows. Data are summarized in extension publications and county extension newsletters as well as in other popular press media. Data for all trials are on the OSU Cereals Extension web page (<http://www.css.orst.edu/cereals>). For future reference, use the web page for earliest access to data, as trial results are posted as soon as they are available.

Materials and Methods

Plots (5 ft x 20 ft) were planted at a rate of 30 seeds/ft² using an Oyjord plot drill. Winter trials were planted on October 15, 1999. Spring trials were planted on April 7 and 8, 2000. The nitrogen supply goal for winter wheat and triticale is 200 lb N/acre. The nitrogen supply goal for spring wheat and triticale is 160 lb N/acre. The nitrogen target for spring barley is 100 lb N/acre.

Table 1. Soil test results from samples taken on March 16, 2000, for the winter wheat and triticale, and spring wheat and triticale state-wide variety test trial, at COARC, Madras, Oregon.

Soil Depth	pH	NO ₃ (lb/a)	NH ₄ (lb/a)	P (ppm)	K (ppm)	S (ppm)
0-12	7.2	25	21	24	392	8.8
12-24	8.0	28	19	11	235	12.7
0-24 Total		53	40			

Table 2. Soil test results from samples taken on March 8, 2000, for the spring barley state-wide variety test trial at COARC, Madras, Oregon.

Soil Depth	pH	NO ₃ (lb/a)	NH ₄ (lb/a)	P (ppm)	K (ppm)	S (ppm)
0-12 in.	6.8	24	22	27	463	9.7
12-24 in.	7.3	62	17	11	288	9.9
0-24 in. Total		86	39			

The winter wheat and triticale variety trials were fertilized with 450 lb/a of 30-10-0-7 on April 5, 2000. Total nitrogen (soil + fertilizer N) available to the plants was 188 lb/a. The spring wheat and triticale variety trial was fertilized with 400 lb/a of 30-10-0-7 on April 23, 2000. Total nitrogen (soil + fertilizer N) available to the plants was 173 lb/a. The spring barley variety trial was fertilized with 42 lb/a of 34-0-0-0 on April 5, 2000. Total nitrogen (soil + fertilizer N) available to the plants was 100 lb/a. Only soil NO₃ is used for the nitrogen budget, in addition to the applied nitrogen.

Weed control for the trials included: applying 1.5 pints/acre Buctril and 0.5 pint/acre of 2,4-D, on April 4, 2000 on the winter wheat and triticale variety trial; applying 2.0 pints/acre of Bronate on May 22, 2000 to the spring wheat and triticale variety trial; and applying 2.0 pints/acre on April 6, 2000 to the spring barley variety trial. Broadleaf weed control was excellent in all of the variety trials. The spring wheat and triticale variety trial had some problems with wild oats in one of the reps.

The trials were irrigated as needed with a 30 feet x 40 feet spacing solid set irrigation system. Date of first irrigation for the a) winter wheat and triticale variety trial, b) spring wheat and triticale variety trial, and c) spring barley variety trial occurred on April 17, April 17, and April 17, 2000. The last irrigation for the a) winter wheat and triticale variety trial, b) spring wheat and triticale variety trial, and c) spring barley variety trial occurred on July 27, July 27 and July 25, 2000.

Heading dates were recorded when 50 percent heading occurred. Just prior to harvest, lodging scores (%) and plant height (inches) measurement were taken. The trials were harvested with a Hege plot combine. Harvest dates for the a) winter wheat and triticale variety trial, b) spring wheat and triticale variety trial, c) spring barley variety trial are August 17, August 18, and August 18, 2000. The grain samples were shipped to the OSU Hyslop Farm at Corvallis and the grain was cleaned on a Peitz rub-bar cleaner. Plot yield, test weight, protein, moisture, and 1000 kernel weight were all determined on cleaned grain samples. Wheat and triticale yields are reported on 10 percent moisture, bu/acre basis (60 lb/bu). Barley yields are reported as lb/acre at 10 percent moisture. Protein and moisture levels were determined using a whole-grain, near infrared protein analyzer. Proteins are reported on a 12 percent moisture basis.

Results and Discussion

Winter Wheat and Triticale Trial

The winter wheat and triticale trial average yield was 141 bu/acre and yields ranged from 106 to 162 bu/acre (table 3). For the top yielding 15 entries, Madsen/Stephens mix to MacVicar (a range of 162 bu/a to 149 bula, PLSD 0.10 = 14 bula for significance), there were no significant difference between these varieties. The top two yielding varieties in the trial were triticale varieties. Given the similarity in yields for the leading varieties, selections should be made

based on traits such as disease and lodging resistance, plant height, grain quality, or other desired characteristics.

Lodging returned as a problem in the 2000 winter grain trials. Lodging had been a problem from 1993-1995 but had lessened with more careful nitrogen management in 1996 to 1999. Average plant height was 38 inches and average grain protein was 8.8 percent compared to 9.5 percent in 1999. Optimum grain yield occurs at approximately 9.5 percent protein for soft white winter wheat and is an indicator of nitrogen supply. Optimum hard red wheat yield is thought to occur at approximately 11.5 percent protein.

One interesting entry in the winter wheat and triticale trial is the rye variety, Rifle. Plant height is 38 inches (only three inches taller than Stephens), had a lodging score of only five percent, and yielded 121 bu/a. It is a breakthrough variety for rye, compared to previous rye varieties tested.

Winter Triticale Trial

The winter triticale variety trial average yield was 161 bu/acre and yields ranged from 128 to 188 bu/acre (Table 4). The winter triticale varieties averaged 20 bu/a more than did the winter wheat varieties. Alzo, a Polish triticale introduced to Oregon by Dr. Robert Metzger, was the top yielder and lodged considerably less than previous years. There were no statistical significant differences between the top eight yielding varieties (Alzo, at 188 bu/a, to RSI 5420, at 175 bu/a). There were three triticale varieties that had test weights of 60 lb/bu or greater; and 14 varieties with test weights between 58.0 to 59.9 lb/bu. The test weights, on released varieties and experimental lines, have increased dramatically over the years. For the second year in a row, Migo, a spring triticale variety, was one of the top yielders. It has been "burned" back by freezes during the winter and spring. Madsen, soft white winter wheat variety and the second lowest yielding entry in the trial, was used as the check variety, because it is one of the most disease resistant wheat variety.

Spring Wheats and Triticales

The spring wheat and triticale trial average yield was 115 bu/acre and ranged from 92 to 142 bu/acre (Table 5). 2000 was the fourth consecutive year of high spring grain yields. Migo was the highest yielding entry and triticale variety entry. There was no significant difference (P = 0.10 level) though between the top 16 yielding entries.

In contrast to the winter trials where soft white varieties dominate, hard white and hard red lines tend to have higher yields in the spring trials. While yields are high for the hard classes, protein levels have been marginal. The nitrogen fertility program is managed for soft white wheat. Marketing hard red wheat with low protein is not possible in present market conditions. Alternate fertilization strategies were investigated for hard spring wheat in 1999 and 2000, and a third year is planned for 2001.

Among soft white lines, there has been high yield variability from year to year. Pomerelle has been among the most consistent of the high-yielding varieties. Pomerelle is later than most other soft white lines and has slightly lower test weight and protein. Pomerelle has also shown some susceptibility to lodging. IDO 506, Penawawa, and Alpowa are other soft white lines that have good yield potential in central Oregon. Multiple seeding rates were evaluated for Penawawa for

a second year. It appears seeding rate had no significant effect on yield or test weight, but did show a slightly higher protein level with the higher seeding rate, though was not significantly different.

A number of new hard white, soft white, and hard red lines from Idaho and Oregon yielded well in 2000. Winsome, hard white wheat variety, yielded very well, and there were two Idaho experimental hard white lines that yielded greater than Winsome. There was no significant difference between the top yielding hard red variety or experimental line to the lowest yielding variety or experimental line, except for Hank. Most of the hard red varieties and experimental lines had excellent lodging resistance this year, except for Hank, Jefferson, Iona, WA 7824, and Scarlet; these entries had much higher lodging scores.

M94-4393 triticale (a Dr. Robert Metzger introduced line from CYMMIT), is an awnleted triticale with excellent test weight, excellent lodging resistance (even though it is a tall line), and average to above average yield potential, will be discontinued. There are some true awnless experimental triticale lines from other sources, for forage purposes, that should be released in the next five years.

Spring Barley

Spring barley data are presented in Table 6. The average yield for spring barleys was 4,257 lb/acre and ranged from 1,722 to 5,273 lb/acre. Yield was down considerably from last year. This is attributed to uneven nitrogen fertility and possible soil compaction across the trial area. Even though there were problems in the field, CV's were not nearly as high as expected and were in line with previous years. There were no significant differences between the top six yielding barley varieties (Baronesse (2RF), Garnet (2RF), Xena (2RF), Tango (6RF), and Valier (2RF), and Othello (2RF/M) in the trial. Valier is a new Montana release that was selected for feed quality through increased animal performance documented in feeding trials.

Baronesse has been a consistent top yielder over the years. Baronesse has above-average test weight and good lodging resistance, as long as nitrogen fertility is properly managed. Only the variety Belford had significant lodging problems. All of the high yielding spring varieties have "good" lodging resistance, which probably contributes to their yield potential.

Table 3. Statewide variety testing program for winter wheat, Madras, OR, 2000.

Variety or line ¹	Market	Yield (bu/ac)			2000 Data					
		class ²	2000	1999	1998	Test wt. (lb/bu)	Protein (%)	Heading (doy)	Height (inch)	Lodging (% of plot)
Alzo	Triticale		179	155		58.7	7.3	142	45	3
Bogo	Triticale		163	190	151	55.7	8.4	141	41	15
Madsen + Stephens mix	SW		162	166	136	61.6	8.9	147	36	35
Hybritech 5019	SW		158	-		61.9	8.9	148	37	28
Rod	SW		156	165	126	61.7	8.0	154	37	30
Hybritech 7415	SW		154	-		62.1	9.3	143	37	42
OR 939528	SW		153	161		61.1	8.6	149	37	23
Stephens (40 seeds/ft ²)	SW		153	160		60.8	8.8	145	35	32
Stephens (no Gaucho)	SW		152	164		59.8	8.2	146	35	23
Stephens (untreated seed)	SW		152			60.9	8.7	145	34	35
ID-52814A	SW		151	-		62.3	8.4	154	37	80
Stephens (20 seeds/ft ²)	SW		151	158		61.4	9.3	146	35	23
Stephens (30 seeds/ft ²)	SW		151	178		61.3	8.5	149	35	22
Weatherford	SW		150	150	140	61.8	9.0	152	39	12
OR 939526	SW		149			61.4	8.5	151	37	13
Basin	SW		149			63.0	7.7	153	31	2
Macvicar	SW		149	-	147	61.0	8.8	148	37	52
OR 943575	HW		145	150	-	60.7	8.9	154	37	27
Madsen	SW		145	151	147	61.7	9.2	155	38	25
ID-B-96	SW		145	-		60.9	8.8	150	36	8
Hiller	Club		138	147	113	58.8	9.0	150	40	25
Bruehl	Club		137	-		58.4	9.0	156	40	72
Connie	Durum		137	80		64.0	10.8	145	35	33
Foote	SW		136	145	81	60.9	9.8	148	39	33
OR 850513-8	HW		133			61.2	8.5	147	34	0
OR 943560	SW		132		-	61.7	8.8	153	38	27
Gene	SW		131	129	139	59.9	10.1	146	32	0
Coda	Club		130	139	96	61.2	9.7	155	41	50
OR 850513-9	HW		127		-	63.2	8.6	147	39	88
Temple	Club		127	143	98	61.2	8.5	147	38	88
Celia	Triticale		126	155	130	58.2	10.5	147	38	1
Rohde	Club		124	147	118	61.0	8.6	150	37	73
Rely	Club		122	140	99	60.7	8.5	155	42	85
Rifle	Rye		121	119		58.7	6.7	138	38	5
Boundary	HR		120			62.8	10.3	148	38	92
IDO 513	SW		118			61.3	9.2	152	38	65
IDO 550	HW		115			61.6	8.8	150	43	95
Edwin	Club		106			62.3	9.5	155	47	88
Trial Mean			141	153	116	60.9	8.8	149	38	38
PLSD 0.05			17	15	13	1.0	0.9	avg	avg	avg
PLSD 0.10			14	7	10	1.0	1.0			
CV (%)			7	7	10	1.2	7.5			
P > F			0.00	0.00	0.00	0.00	0.00			

All seed treated with fungicide and Gaucho (insecticide) prior to planting unless otherwise noted. Seeding rate was 30 seeds per ft² unless otherwise noted.
 HR=hard red, HW= hard white, SW =soft white, doy=day of year

Table 4. Statewide variety testing program for winter triticale, Madras, OR, 2000.

Variety or line ¹	Market	Yield (bu/ac)			2000 Data					
		class ²	2000	1999	1998	Testwt (lb/bu)	Protein (%)	Heading (doy)	Height (inch)	Lodging (% of plot)
Alzo	Wtrit		188	155		58.1	9.6	142	48	29
Kitaro	Wtrit		181	-		59.9	9.6	138	44	2
Migo	SPtrit		179	179		56.0	10.2	138	46	63
Lamberto	Wtrit		178			58.3	8.6	140	47	35
Titan	Wtrit		178	186		57.5	10.0	138	43	14
Iceberg	Wtrit		177	161		58.4	10.3	149	45	16
RSI 5616	Wtrit		177			58.2	10.0	139	43	13
RSI 5420	Wtrit		175			59.2	9.0	141	47	4
Bogo	Wtrit		164	175		55.4	9.4	142	45	59
B86-3335*2/Tatu	Wtrit		162	145		58.8	9.2	138	37	2
Mieszko	SPtrit		161			57.2	10.1	137	48	58
FT31 Kansas	Wtrit		160	158		60.7	10.6	136	45	6
Celia	Wtrit		157	139	130	58.6	10.5	146	39	3
Presto	Wtrit		157	138		60.2	9.8	138	45	82
B86-3335*2/Presto	Wtrit		156	161		58.0	9.0	143	41	4
Prado	Wtrit		156			58.3	8.7	141	50	70
RSI MAL-366	Wtrit		155			58.8	11.0	136	42	1
RSI VIC-1439	Wtrit		152			60.6	9.6	139	47	8
Trical 815	Wtrit		148			57.8	9.3	140	51	35
RSI L989	Wtrit		147			58.6	8.7	138	49	8
KT95G06	Wtrit		144			58.4	9.3	143	51	83
Wanad	Sp Trit		143	152		58.0	11.1	137	47	72
Madsen	WSWW		141	156		60.8	10.4	155	38	20
Bobcat	Wtrit		128			55.7	10.9	137	54	92
Trial Mean			161	149		58.3	9.7	140	45	32
LSD (0.05)			25	19		0.9	1.4	avg	avg	avg
LSD (0.10)			21	16		0.8	1.2			
CV (%)			10	8		1.0	9.0			
P > F			0.00	0.00		0.00	0.02			

¹All seed treated with fungicide and Gaucho (insecticide) prior to planting unless otherwise noted. Seeding rate was 30 seeds per ft unless otherwise noted ²

Wtrit winter triticale, Sptrit= spring triticale, WSWW =soft white winter wheat, doyr=day of year

Table 5. Statewide variety testing program for spring wheat, Madras, OR, 2000.

Variety or line ¹	Market class ²	Yield (bu/ac)			2000 Data				
		2000	1999	1998	Test wt. (lb/bu)	Protein (%)	Height (inch)	Heading (doy) ²	Lodging (% of plot)
Migo	Triticale	142	179		54.6	9.1	45	173	5
PG 12111	Triticale	133	-		59.3	10.1	43	170	9
IDO 377S	HW	133	107		63.7	12.2	35	172	57
Whitebird	SW	130	105	107	62.8	11.5	39	172	7
IDO 560	HW	129			63.1	10.3	39	175	10
IDO 506	SW	129	115		62.9	9.1	38	173	2
Kargo	Triticale	128			59.5	8.5	46	169	1
Gabo	Triticale	128			57.9	8.9	45	171	31
Winsome	HW	127	-	-	63.0	10.6	37	176	1
Alpowa (no Gaucho)	SW	126	108	103	62.7	8.8	41	175	30
Pomerelle	SW	126	132	105	61.8	9.0	36	175	7
M94-4393	Triticale	126	135	103	60.0	9.0	48	168	3
OR 4870410	HR	123	-		62.9	10.9	39	175	1
IDO 533	HW	122	117	113	64.8	10.8	36	171	0
Bonus	HR	122			63.6	10.6	29	169	0
Chalis	SW	122			61.8	8.3	36	173	13
Express	HR	121	-		62.9	12.7	37	175	1
Penawawa (30seeds/ft ²)	SW	121	133		63.3	8.9	37	172	0
Brooks	HR	119			64.8	10.7	26	168	0
OR 4920311	HW	119			64.1	10.1	38	175	1
Standard	HR	118	-		63.5	9.8	28	168	0
Alpowa (untreated)	SW	118	-		62.9	9.8	40	176	4
IDO 525	SW	117	126		63.0	9.2	40	172	6
WPB 936	HR	117	144	111	63.3	11.1	32	170	0
Penawawa (40 seeds/ft ²)	SW	116	127		62.6	9.6	37	172	7
IDO 526	SW	116	124		63.3	8.7	37	173	2
Alpowa	SW	114	109	101	63.0	9.7	38	176	28
Yecora Rojo	HR	114	143		64.5	11.4	27	169	0
Penawawa (20 seeds/ft ²)	SW	113	136		63.0	8.9	35	174	0
Jefferson	HR	112	113		64.0	11.2	38	171	23
OR 4970039	SW	111			61.4	9.6	38	173	17
Treasure	SW	111			62.6	9.3	37	176	2
WA 7824	HR	111			64.0	11.5	40	169	45
ML 107-3,1	HW	110			63.0	11.2	39	178	18
PG 2166	Triticale	110			58.1	9.3	36	170	0
PG 303	Triticale	110			59.4	9.2	34	168	0
OR 4970062	SW	110			62.7	10.0	38	172	0
Wanad	Triticale	110			57.7	8.2	48	169	1
Zak (WA7850)	SW	108	90		62.4	9.2	36	176	27
PG 40611	Triticale	107			59.0	8.9	34	168	0
OR 942885	SW	107			63.2	10.4	39	173	28
Scarlet	HR	106	100		63.3	12.3	42	170	58
ML 107-184(2)	HW	106	-		62.8	10.8	38	178	1
OR 4880189	HR	106			64.2	10.7	33	170	0
Wawawai	SW	106	105	86	63.8	10.4	38	170	55

Table 5 cont.

Variety or line'	Market class ²	Yield (bu/ac)			Test wt. (lb/bu)	Protein (%)	2000 Data		
		2000	1999	1998			Height (inch)	Heading (doy) ²	Lodging (% of plot)
Iona	HR	105			63.5	13.1	39	172	78
ML 037A(5-2)	SW	103			62.1	9.2	35	176	0
ML 455	HW	99	92		62.6	10.0	35	179	13
Hank	HR	98			63.2	10.7	33	170	0
Trical 2700	Triticale	95			55.6	9.2	58	174	47
OR 4970025	SW	93			62.2	11.1	39	175	63
PG 61307	Triticale	92			57.2	8.7	35	170	0
Trial Mean		115	116	104	62.0	10.0	38	172	14
LSD (0.05)		24	21	16	1.2	1.7	avg	avg	avg
LSD (0.10)		20	18	13	1.0	1.4			
CV (%)		10	11	9					
P > F		0.02	0.00	0.00	0.00	0.00			

¹ All seed treated with fungicide and Gaucho (insecticide) prior to planting unless otherwise noted. Seeding rate was 30 seeds per sq. ft. unless otherwise noted

² HR=hard red, HW= hard white, SW =soft white, doy=day of year. KWT= weight of 1000 kernels

Table 6. Statewide variety testing program for spring barley, Madras, OR, 2000.

Variety or line'	Market class ²	Yield (bu/ac)			Test wt. (lb/bu)	Protein (%)	2000 Data		
		2000	1999	1998			Height (inch)	Heading (doy) ²	Lodge (% of plot)
Baronesse	2RF	5273	6921	4083	57.2	8.7	27	168	2
Garnet	2RF	4854			57.0	10.3	29	169	5
Xena	2RF	4837	6798		57.2	8.6	27	168	0
Tango	6RF	4736	5984	4022	54.4	10.8	35	163	2
Valier	2RF	4676			57.7	8.7	30	168	1
Othello (BCD 47)	2RF/M	4497			56.8	11.0	18	168	0
Harrington	2RM	4481			57.6	10.0	25	167	2
Step toe	6RF	4417	6227	3922	54.2	10.4	27	167	1
WA9504-94	2R	4412	6416		56.6	9.3	24	173	0
Chinook	2RM	4309	6101	3319	56.7	12.1	24	168	0
H3860224	2RF/M	4265			57.0	11.9	24	171	0
Bancroft	2RM	4097	4946		56.8	11.3	25	167	5
Orca	2RF	3772	4898	2663	55.4	12.6	30	164	3
Belford	Hooded	3503			51.6	11.1	36	166	42
Sara-I	Hooded	1722			51.3	12.3	34	165	10
Trial Mean		4257	5953	4411	55.8	10.6	28	168	5
LSD (0.05)		944	1064	982	0.8	1.7	avg	avg	avg
LSD (0.10)		784	884	815	0.7	1.4			
CV (%)		13	11	13	0.9	9.8			
Pr>F		0.00	0.00	0.00	0.00	0.00			

All seed was treated with fungicide and unless otherwise noted.

² 2R= two row; 6R = six row; F= feed; M

Gaucho (insecticide) prior to planting unless otherwise noted. Seeding rate was 30 seeds per sq. ft

considered for malt; DOY = day of year;