

SPRING CEREAL FORAGE VARIETIES FOR CENTRAL OREGON

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Abstract

Spring cereal forages offer an alternative forage crop potential for central Oregon forage producers. The last spring cereal forage trial was conducted in 1977-1978. A spring cereal forage variety trial was initiated in 1990. Forty-eight varieties of barley, oat, triticale, wheat, and rye varieties were tested over 4 years at Central Oregon Agricultural Research Center (COARC), Powell Butte. Yield, quality, plant height, lodging, harvest date (late boot and soft dough calendar date), and nitrogen uptake were recorded. The agronomic and quality data will help aid producers in selecting the right species and variety for their forage needs based on availability of water and irrigation system. Triticale has the highest yield potential of all of the species, for both late boot and soft dough harvest. All of the species and varieties have the potential to work for reasons of crop rotation, water or precipitation availability, irrigation system, market, and forage yield and quality requirements needed by the producers.

Introduction

Cereals, grown for forage, are of great interest to producers in central and eastern Oregon. Cereal forage offers some advantages for medium to large yields of high-to low-quality hay, silage, or pasture. These trials were conducted because of the drought that was occurring in the early 1990's and to document the value of cereal forage as an alternative forage crop for the future with limited or full irrigation water availability. With the seed of cereal crops being fairly large (compared to grass and legume seed), the seed germinates and establishes very quickly. Cereals have a very fast growth rate compared to other forage plants. One can produce medium to high yields of forage with limited irrigation water, by using the water supply early in the growing season in combination with any spring and early summer precipitation.

The last cereal variety test for forage in central Oregon occurred in 1977-1978 at the Central Oregon Experiment Station at Redmond, Oregon. There have been many new releases of cereal varieties since then and there was need to test new varieties of spring oat, wheat, barley, rye, and triticale for forage. The information generated is useful for selection of the right variety for the right situation. Knowing potential yield, quality, harvest date at late boot and soft dough, plant height at late boot or soft dough, and lodging potential will aid producers in selecting the right species and variety for each individual situation. All of these agronomic factors will aid in better selection based on irrigation system, side-roll wheel height, water availability, nurse crop/companion planting, double cropping, crop rotation, situations and opportunities.

Materials and Methods

There were no soil samples taken or fertility tests run on the trials (with exception of the 1992 trial). Fertilizer applications made to the trials in the spring are presented in Table 1. Forty pounds of nitrogen per acre were re-applied to the late boot harvest areas to aid regrowth in 1992 and 1993.

The trials were planted on April 6, 1990, April 22, 1991, April 6, 1992, and May 4, 1993. The trials were planted with a six-row, 8-inch-row spacing, Oyjard small-plot drill. Seeding rates were 30 seeds/ft² (seeding rates in pounds per acre are presented in Table 2). The trials were laid out as a randomized block design with three replications

The only weather influence on any of the trials was hail that occurred on June 22, 1990. Black birds ate the heads on some of the varieties, and were a problem over the years for the trial, especially in 1991.

Weed control was controlled with herbicides. Bronate® (2 pints/acre) was applied on June 5, 1990. Banvel® (1.5 pints/acre) and 2,4-D (0.25 pints/acre) were applied on April 22, 1991. Buctril® (1.5 pints/acre) and 2,4-D® (1 pint/acre) were applied on May 18, 1992. Roundup® (2 ton/acre) was applied to the alfalfa on April 24, 1993, and 2,4-D® (0.75 pints/acre) and Buctril® (1.5 pints/acre) were applied on May 25, 1993.

Irrigation was by solid-set sprinkler system with a spacing of 30 by 40 ft, with 9/64-inch Rainbird® nozzles, and was irrigated once or twice per week as needed.

Once harvest was initiated, the entries were checked every other day. On the day of the harvest plant height was measured and lodging was recorded. Harvest date is presented as day of year (days from January 1st). Harvest was with a Jari-mower with sickle bar. In 1990, whole plots were harvested of approximately 15 by 5 ft at late boot or soft dough growth stage. In 1991, the center-four-rows were harvested, either at late boot or soft dough growth stage. Half-plots (three rows) were harvested at late boot and soft dough growth stage in 1992 and 1993. Clipping height was about ½ - ¾ inch for the 1990-1991 trials and approximately 2 inches for the 1992-1993 trials.

Plot weights were determined by weighing the wet forage yield on a tripod and electronic scale to tenths of a pound. One to 1.5 lb samples were taken for moisture and quality samples, weighed wet and dried at 149° F until no further change in weight, and then reweighed on a Mettler balance. Moisture content was determined and yield is presented on an oven-dry, dry matter basis.

The samples were ground through a 1.0-mm screen Wiley mill. The samples were transported to the Crop Science Department at Oregon State University. The samples were reground through a 0.1 mm screen Udy mill and the samples were run through near infrared spectroscopy (NIRS) to predict protein, acid detergent fiber (ADF), neutral detergent fiber (NDF), total digestible nutrients (TDN), and relative feed value (RFV). Protein contents were converted to percent nitrogen by dividing with the factor of 6.25 and multiplied by yield to calculate total nitrogen uptake (lb/acre) on an oven-dry moisture basis.

All discussion in the results and discussion section will be based on protected least significance difference (PLSD) and at the 10 percent level of confidence (PLSD 0.10), although PLSD 0.05 also will be presented in the tables. A simple way of looking at PLSD 0.10, is that there is

confidence that the result can be repeated 90 percent of the time. With PLSD 0.05, one can have confidence that the result can be repeated 95 percent of the time.

Table 1. Fertilizer applications for the 1990-1993 spring cereal forage variety trials conducted at the COARC, Powell Butte, OR.

Date Applied	N (lb/acre)	P (lb/acre)	K (lb/acre)	S (lb/acre)
4/05/1990	110	0	0	70
4/10/1991	135	0	0	87
1992 ¹	0 (270) ²	0	0	0
1993 ²	0	0	0	0

¹ 1992 – Soil test for nitrate nitrogen in top foot of soil from winter rape green manure crop plowed down Fall, 1991.

² 1993 – No fertilizer applied; alfalfa was the previous crop for 5 years.

Species may be presented in the tables as: WHT = wheat, Bar = barley, Oat = oat, Trit = triticale, Rye = rye, HRW = hard red wheat, SWW = soft white wheat.

Table 2. Seeding rates (lb/acre), based on 30 seeds/ft², for the 1990, 1991, 1992, and 1993 spring cereal forage variety trials conducted at COARC, Madras, OR.

Variety	Species	1990 Seeding Rates (lb/acre)	1991 Seeding Rates (lb/acre)	1992 Seeding Rates (lb/acre)	1993 Seeding Rates (lb/acre)	Average Seeding Rates (lb/acre)
Alberta	Bar	-	-	100	100	100
Belford	Bar	126	125	124	126	125
Chopper	Bar	-	-	106	-	106
Eureka	Bar	150	-	96	96	114
Faust	Bar	-	-	96	96	96
Haybet	Bar	99	116	-	87	101
Kolding	Bar	120	107	-	-	114
Meloy	Bar	-	-	111	111	111
Nepal	Bar	-	-	103	103	103
Rid Awn	Bar	129	-	-	99	114
Weimer	Bar	-	93	113	-	103
Westford	Bar	87	116	108	108	105
Whitford	Bar	98	122	-	-	110
Ajay	Oat	-	-	-	77	77
Cayuse	Oat	92	89	-	88	90
Eusiler	Oat	-	-	-	77	77
Grizzly	Oat	-	102	108	-	105
Kanota	Oat	98	115	102	-	105
Magnum	Oat	-	-	-	68	68
Mangum II	Oat	-	-	-	65	65
Monida	Oat	-	82	86	70	79
Montezuma	Oat	-	120	114	97	110
Otana	Oat	71	85	-	76	77
Park	Oat	-	80	83	83	82
Riel	Oat	-	101	92	-	97
Sierra	Oat	107	110	102	-	106
Stampede	Oat	-	104	104	105	104
Swan	Oat	118	130	95	95	110
Texas Red	Oat	-	63	64	-	64
Winter Grey ¹	Oat	-	83	79	-	81
Bedortha ¹	Rye	-	-	46	-	46
Arnzt ¹	Rye	-	-	44	-	44
Common	Rye	-	59	60	-	60
Gazelle	Rye	-	93	97	75	88
Fortuna	HRW	-	-	132	120	126
Glenman	HRW	-	-	102	107	105
Lew	HRW	-	-	90	110	100
Dirkwin	SWW	123	136	106	136	125
Twin	SWW	105	107	107	107	107
Trical 2700	Trit	-	-	159	108	134
Alomos 83	Trit	-	89	138	-	114
Eronga 83	Trit	-	107	173	104	128
Florida 201	Trit	-	-	-	155	155
Frank	Trit	-	-	-	121	121
Grace	Trit	-	138	132	-	135
Juan	Trit	129	126	171	171	149
Karl	Trit	150	126	-	-	138
Whitman	Trit	-	-	-	103	103

Table 2 (Continued)

Variety	Species	1990 Seeding Rates (lb/acre)	1991 Seeding Rates (lb/acre)	1992 Seeding Rates (lb/acre)	1993 Seeding Rates (lb/acre)	Average Seeding Rates (lb/acre)
Mean & Range	Overall	112 (71-150)	105 (59-138)	108 (44-173)	102 (65-171)	= 107 (59-173)
Mean & Range	Rye	N/A	76 (59-93)	62 (44-97)	75 (75-75)	= 71 (44-97)
Mean & Range	Trit	140 (129-150)	117 (89-138)	167 (132-173)	127 (103-171)	= 138 (89-173)
Mean & Range	Wheat	114 (105-123)	122 (107-136)	107 (90-132)	116 (107-136)	= 115 (90-136)
Mean & Range	Barley	106 (87-126)	113 (93-125)	106 (96-124)	108 (96-126)	= 108 (87-126)
Mean & Range	Oat	85 (79-118)	97 (63-130)	96 (64-114)	82 (65-105)	= 90 (63-130)

¹ Common, not a variety

General Results and Discussion

It is important to use the right seeding rate. Based on the 30 seeds/ft² seeding rate (in Table 2), rye, triticale, wheat, barley, and oat varieties can be under-planted or over-planted by 61, 55, 28, 24, and 43 percent respectively, if an average seeding rate is used for a species. It is important to calibrate the right seeding rate. Over-planting can cause unnecessary lodging and expense.

The yield (ton/acre) data for the 1990 - 1993 cereal forage variety yield trials are presented in Table 3. The data are presented with the species separated, while all of the other tables are sorted by highest yielding to lowest yielding or highest quality to lowest quality (based on RFV).

Table 3. Dry matter (oven dry basis) yield (ton/acre) comparisons of cereals species and varieties harvested for hay at Powell Butte, OR, from 1990 to 1993.

Species/ Variety	1990 Soft dough (ton/acre)	1991 Late boot (ton/acre)	1991 Soft dough (ton/acre)	1992 Late boot (ton/acre)	1992 Soft dough (ton/acre)	1993 Late boot (ton/acre)	1993 Soft dough (ton/acre)
<i>Wheat</i>							
Dirkwin	6.00	-	5.50	2.71	7.62	2.28	6.62
Fortuna	-	-	-	3.70	7.87	1.98	6.40
Glenman	-	-	-	3.08	8.13	1.57	6.00
Lew	-	-	-	3.50	7.80	1.85	6.00
Twin	6.13	-	5.41	-	-	2.35	6.32
<i>Barley</i>							
Koldbar ¹	5.58	-	4.09*	-	-	-	-
Weimar ²	-	-	-	2.97	5.25	-	-
Alberta	-	-	-	-	-	1.67	4.34
Belford	4.40	-	4.16*	3.24	6.37	2.09	6.03
Chopper	-	-	-	3.28	6.19	-	-
Eureka	-	-	-	-	-	2.06	5.59
Faust	-	-	-	-	-	2.01	4.88
Haybet	5.81	-	4.04*	-	-	2.51	5.26
Meloy	-	-	-	-	-	1.64	5.51
Nepal	-	-	-	-	-	1.93	5.03
Ridawn	-	-	-	-	-	2.08	5.62
Westford	5.84	-	3.29*	4.68	7.20	3.15	6.66
Whitford	4.80	-	3.21*	-	-	-	-
<i>Triticale</i>							
Trical 2700	-	-	-	3.47	10.49	2.57	9.03
Alamos 83	-	1.40	-	1.79	7.81	-	-
Eronga 83	-	1.99	-	2.02	10.30	1.70	9.37
Florida 201	-	-	-	-	-	1.73	8.60
Frank	-	-	-	-	-	1.68	8.78
Grace	-	2.01	-	2.90	10.52	-	-
Juan	7.25	2.19	-	2.53	11.79	1.94	9.25
Karl	7.04	1.64	-	3.28	8.42	-	-
Whitman	-	-	-	-	-	2.60	6.75
<i>Oat</i>							
Ajay	-	-	-	-	-	2.33	6.74
Cayuse	6.06	-	3.54	-	-	3.28	6.98
Ensiler	-	-	-	-	-	3.35	7.63
Grizzly	-	-	3.95	4.11	7.91	-	-
Kanota	5.49	-	4.40	-	-	-	-
Magnum	-	-	-	-	-	4.54	7.66
Magnum II	-	-	-	-	-	2.88	7.45
Monida	7.11	-	4.96	3.62	8.49	3.08	7.37
Montezuma	-	-	4.82	2.58	5.49	2.15	6.19
Otana	6.85	-	5.47	-	-	3.15	6.70
Park	-	-	4.10	-	-	3.18	7.27
Riel	-	-	4.81	3.29	7.70	-	-
Sierra	5.33	-	3.67	-	-	-	-
Stampede	-	-	4.13	4.34	8.40	4.36	6.87
Swan	6.28	-	4.61	-	-	1.88	5.53
Texas Red	-	-	4.85	3.89	8.03	-	-
Winter Grey ²	-	-	4.07	4.65	6.74	-	-

Table 3 (Continued)

Species/ Variety	1990 Soft dough (ton/acre)	1991 Late boot (ton/acre)	1991 Soft dough (ton/acre)	1992 Late boot (ton/acre)	1992 Soft dough (ton/acre)	1993 Late boot (ton/acre)	1993 Soft dough (ton/acre)
<i>Rye</i>	-	-	-	-	-	-	-
Arnzt ²	-	-	-	1.83	8.39	-	-
Bedortha ²	-	-	-	2.06	7.62	-	-
Common	-	2.13	-	-	8.07	-	-
Gazelle	-	2.46	-	2.56	7.24	1.89	7.60
	-	-	-	-	-	-	-
Mean	5.92	1.98	4.33	3.08	8.00	2.43	6.75
PLSD 0.10	1.11	0.58	0.86	0.45	1.18	0.44	0.95
CV%	13.6	20.2	14.4	10.7	10.8	13.1	10.4
Harvest Date Range (days)	15	11	17	31	35	26	40

* Birds stripped the heads to varying degrees.

¹ Experimental line

² Common, not a variety

1990 Results and Discussion

Yield, dry matter, moisture, height, lodging, and harvest date data for the 1990 spring cereal forage variety trial (harvested at soft dough) are presented in Table 4.

The two triticale varieties, ‘Juan’ and ‘Karl’, and oat varieties ‘Monida’, ‘Otana’, and ‘Swan’ were the top-yielding entries. Normally one would not want to harvest these two triticale varieties at soft dough because of the long barbed awns. Triticale varieties should be harvested at late boot for hay. It appeared that triticale was the most palatable of the species. The plots were grazed by deer, early in the growing season, and there was very notable preference for the triticale. Comparing yield differences between varieties, there needed to be 1.11 ton/acre difference (PLSD 0.10). The two wheat entries, ‘Twin’ and ‘Dirkwin’, were medium yielding, along with ‘Cayuse’ oat, and ‘Westford’, ‘Haybet’, and ‘Koldbar’ (an experimental line) barley. The lower yielding group included ‘Kanota’ and ‘Sierra’ oat, and ‘Whitford’ and ‘Belford’ barley. Some varieties within each group that were not significantly different from varieties in other yield groups.

There were large differences between plant height and lodging. The range in plant height was 38 - 54 inches, and the range in lodging was from 0 to 92 percent. This information can aid in selecting the right variety for the irrigation system to be used. There was a range of 15 days between harvest dates (days from January 1). If the irrigation water cut-off date will be premature one would select one of the earlier maturing entries. The producer would still produce in the range of 4.5 - 5.8 ton/acre for the earliest harvest dates of 198 (doy) to 202 (doy). While not realizing full yield, knowing that one less irrigation would be required would be very applicable in making the decision to plant a lower yielding variety.

The protein, acid detergent fiber (ADF), neutral detergent fiber (NDF), total digestible nutrients (TDN), relative feed value (RFV), and nitrogen uptake data for the 1990 spring cereal forage variety trial are presented in Table 5. The table is ranked on basis of RFV, which takes into account a number that represents both ADF and NDF. The better quality entries were the wheat

and triticale varieties. ‘Juan’ and ‘Karl’ triticale, and ‘Twin’ and ‘Dirkwin’ wheat, along with ‘Belford’ barley, were the only entries with NDF’s lower than 50.0. There was no difference between the five entries for ADF and TDN as well. ‘Juan’ tritrital was significantly lower in protein than the other four entries. In general, barley entries as a group tended to fall into the medium quality ranking and the oat entries tended to fall into the lower quality ranking. The range of nitrogen uptake was from 133 - 221 lb/acre. To produce the forage yields, the amount of nitrogen, in the soil and applied, would have to be more than harvested. ‘Juan’ triticale had the lowest protein content. Four oat varieties were the next lowest in protein (<9.0 percent).

Table 4. Soft dough growth stage harvest agronomic data (yield, dry matter, moisture, height, lodging, and harvest date) for the 1990 spring cereal forage variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest date (day of year)
Juan	Trit	7.25	45.3	54.7	54	0	213
Monida	Oat	7.11	38.2	61.8	49	52	211
Karl	Trit	7.04	47.1	52.9	41	8	212
Otana	Oat	6.85	37.6	62.4	51	73	210
Swan	Oat	6.28	38.6	61.4	47	65	209
Twin	SWW	6.13	50.2	49.8	40	12	213
Cayuse	Oat	6.06	37.8	62.2	46	47	207
Dirkwin	SWW	6.00	43.6	56.4	38	8	213
Westford	Bar	5.84	31.3	68.7	45	37	202
Haybet	Bar	5.81	34.9	65.1	38	53	198
Koldbar ¹	Bar	5.58	36.6	63.4	42	92	202
Konota	Oat	5.49	35.3	64.7	49	27	207
Sierra	Oat	5.33	39.5	60.5	47	40	212
Whitford	Bar	4.80	31.0	69.0	46	53	198
Belford	Bar	4.40	38.8	61.2	42	75	204
Mean		5.92	38.8	61.2	45	41	207
PLSD 0.10		1.11	6.4	6.4	3.4	30	4.7
PLSD 0.05		1.34	7.7	7.7	4.1	36	5.7
CV%		13.6	11.8	7.5	5.4	52.6	1.7

¹ Experimental line

Table 5. Soft dough growth stage harvest quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data from the 1990 spring forage cereal variety trail conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen uptake (lb/acre)
Karl	Trit	9.7	29.5	46.2	66.0	133.0	220.8
Twin	SWW	10.1	29.9	46.9	65.6	130.4	200.3
Dirkwin	SWW	10.3	30.9	47.8	64.8	126.9	202.5
Juan	Trit	7.3	31.4	48.2	64.4	124.4	169.4
Belford	Bar	10.2	31.4	49.4	64.4	121.4	144.0
Westford	Bar	9.3	34.2	52.0	62.3	111.6	172.8
Koldbar ¹	Bar	9.3	33.9	52.7	62.5	110.8	169.3
Sierra	Oat	9.4	35.3	52.7	61.4	108.6	159.2
Monida	Oat	8.3	35.3	53.2	61.4	107.4	187.1
Whitford	Bar	10.3	34.9	53.5	61.7	107.2	157.9
Kanota	Oat	9.0	35.9	53.7	60.9	105.7	159.4
Haybet	Bar	9.3	34.8	54.7	61.6	105.0	172.8
Park	Oat	9.1	36.6	55.1	60.4	102.2	180.9
Otana	Oat	8.2	37.4	55.7	59.8	100.1	179.3
Cayuse	Oat	8.2	37.6	55.6	59.6	100.0	146.6
Swan	Oat	8.6	37.8	57.2	59.4	97.8	133.4
Mean		9.1	34.2	52.2	62.3	112.0	172.2
PLSD 0.10		1.7	2.3	3.1	1.8	9.7	NS
PLSD 0.05		NS	2.7	3.7	2.1	11.7	NS
CV%		13.8	4.8	4.3	2.1	6.3	21.1

¹ Experimental line

1991 Results and Discussion

Late Boot Harvest

The yield, dry matter, moisture, height, lodging, and harvest date (days from January 1) for late boot growth stage harvest are presented in Table 6. There was no difference in yield between the top five entries. The difference in yield needed to be greater than 0.58 ton/acre (PLSD 0.10). ‘Gazelle’ rye was significantly earlier in reaching late boot growth stage. It was difficult determining late boot growth stage for triticale. Triticale does not exhibit synchronized heading like other spring cereal species.

The protein, ADF, NDF, TDN, RFV, and nitrogen uptake data are presented in Table 7. The two rye entries, ‘Gazelle’ and ‘Common’, were significantly lower in quality (higher ADF, NDF, RFV, and lower TDN) than the triticale entries. ‘Karl’ triticale was significantly lower in quality than the rest of the triticale entries, but higher than the rye entries. ‘Juan’ triticale and ‘Common’ rye had significantly higher protein contents than the rest of the entries. There were no significant differences among the varieties for nitrogen uptake (around 90 lb/acre N).

Soft Dough Harvest

The yield, dry matter, moisture, height, lodging, harvest date, and heads stripped data are presented in Table 8. The top seven entries were not significantly different in yield (0.86 ton/acre PLSD 0.10). 'Dirkwin' and 'Twin' wheat and 'Otana' oat, yielded above 5 ton/acre) 'Monida', 'Texas Red', 'Montezuma', and 'Riel' oat, were statistically equal in yield. The barley entries, as well as the other oat entries, were in the lower half ranking for yield. The barley entries suffered substantial bird damage. Black birds stripped the heads and ate seed, which more than likely had an effect on yield and quality. In general the higher yielding varieties were also the latest maturing, with some exceptions. There were significant differences between varieties for plant height and lodging.

Protein, ADF, NDF, TDN, RFV, and nitrogen-uptake data are presented in Table 9. There were large significant differences in quality between the entries. 'Twin' and 'Dirkwin' wheat, and 'Common beardless' barley were the top three entries for general quality based on RFV. There was a strong trend for the two wheat entries to be lower in ADF than the other entries, and significantly lower than all oat entries and most barley entries. Average nitrogen uptake was around 114 lb/acre. There were significant differences between varieties.

Regrowth Harvest

Regrowth yield, dry matter, moisture, height, lodging, and harvest date data are presented in table 10. 'Common' and 'Gazelle' rye, 'Montezuma' and 'Sierra' oat regrew the best. The rye entries grew back from a late boot growth stage harvest, while the two oat entries grew back from soft dough harvest. There were significant differences in yield between these four entries too. 'Stampede' oat did not regrow back at all, so it reacted very differently from the other oat varieties. 'Kanota' oat to 'Riel' oat were in the next grouping for ability to regrow. If pasture regrowth is a factor, then the top four yielding entries should be considered, although there may be other reasons that other entries would be chosen. There was no lodging, but there were differences in height of the regrowth. One might argue that there would be more useable forage (leafier) on regrowth for oat varieties compared to the rye varieties. The barley varieties did not regrow. Regrowth quality was not tested.

Table 6. Late boot agronomic data (yield, dry matter, moisture, height, lodging, and harvest date) for the 1991 spring forage cereal variety trial established at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest date (day of year)
Gazelle	Rye	2.46	18.9	81.1	41	0	177
Juan	Trit	2.19	18.4	81.6	27	0	186
Common	Rye	2.13	17.8	82.2	42	0	183
Grace	Trit	2.01	19.6	80.4	25	0	186
Eronga 83	Trit	1.99	18.6	81.4	25	0	184
Karl	Trit	1.64	22.5	77.5	24	0	183
Alamos 83	Trit	1.40	22.2	77.8	21	0	183
Mean		1.98	19.7	80.3	29	0	183
PLSD 0.10		0.58	1.8	1.8	2.5	--	1.0
PLSD 0.05		NS	2.2	2.2	3.1	--	1.2
CV%		20.2	6.3	1.5	6.0	0	0.4

Table 7. Late boot quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data for the 1991 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein %	ADF %	NDF %	TDN %	RFV	Nitrogen uptake (lb/acre)
Alamos 83	Trit	13.6	28.4	49.3	63.7	126.1	61.0
Eronga 83	Trit	14.0	28.2	50.2	63.9	124.3	92.7
Grace	Trit	14.5	28.2	50.4	63.9	123.7	94.0
Juan	Trit	16.2	28.2	51.8	63.9	120.1	113.0
Karl	Trit	12.5	31.1	54.5	60.6	110.5	67.3
Gazelle	Rye	11.8	35.4	58.2	55.6	98.0	93.3
Common	Rye	16.2	34.9	60.6	56.2	94.8	110.3
Mean		14.1	30.6	53.6	61.1	113.9	90.2
PLSD 0.10		2.5	1.2	2.4	1.3	6.8	NS
PLSD 0.05		NS	1.4	3.0	1.6	8.3	NS
CV%		12.1	2.6	3.1	1.5	4.1	28.0

Table 8. Soft dough agronomic data (yield, dry matter, moisture, height, lodging, harvest date, and heads stripped) for the 1991 spring forage cereal variety trial established at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry matter (%)	Moist. (%)	Height (in.)	Lodging (%)	Harvest date (day of year)	Heads stripped (%)
Dirkin	SWW	5.50	39.8	60.2	35	0	221	0
Otana	Oat	5.47	29.2	70.8	48	12	215	0
Twin	SWW	5.41	41.2	58.8	36	0	221	0
Monida	Oat	4.96	29.0	71.0	46	10	214	0
Texas Red	Oat	4.85	28.1	71.9	52	70	217	0
Montezuma	Oat	4.82	31.4	68.6	37	0	214	0
Riel	Oat	4.81	27.7	72.3	44	52	216	0
Swan	Oat	4.61	30.2	69.8	42	0	214	0
Kanota	Oat	4.40	32.6	67.4	46	0	214	0
Belford	Bar	4.16	30.7	69.3	38	75	204	32
Stampede	Oat	4.13	24.4	75.6	43	0	221	0
Park	Oat	4.10	32.0	68.0	44	0	216	0
Koldbar ¹	Bar	4.09	31.6	68.4	34	63	204	5
Winter Grey ²	Oat	4.07	26.6	73.4	52	5	221	0
Haybet	Bar	4.04	33.3	66.7	37	40	204	93
Grizzley	Oat	3.95	25.7	74.3	45	0	217	0
Unknown	Bar	3.83	34.0	66.0	37	62	204	43
Sierra	Oat	3.67	32.1	67.9	43	10	215	0
Cayuse	Oat	3.54	28.5	71.5	42	0	214	0
Westford	Bar	3.29	30.0	70.0	37	12	204	76
Whitford	Bar	3.21	36.2	63.8	38	5	204	87
Mean		4.33	3.12	68.8	41.5	20	213	16
PLSD 0.10		0.86	3.0	3.0	3.4	22	.99	11
PLSD 0.05		1.03	3.7	3.7	4.1	26	1.20	13
CV%		1.44	7.3	3.3	6.0	80.1	0.3	49

¹ Experimental line

² Common, not a variety

Table 9. Soft dough quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data for the 1991 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen Uptake (lb/acre)
Twin	SWW	8.1	30.5	47.7	61.3	127.3	140.0
Dirkwin	SWW	9.0	30.7	48.1	61.1	125.6	164.7
Common	Bar	8.8	32.2	48.3	59.4	123.0	109.0
Koldbar ¹	Bar	8.2	33.1	51.4	58.3	114.3	107.0
Whitford	Bar	7.2	35.4	50.8	55.7	112.5	75.7
Kanota	Oat	6.7	36.1	51.3	54.9	110.5	94.3
Riel	Oat	9.5	35.4	52.2	55.6	109.7	149.0
Monida	Oat	9.1	35.2	52.5	55.8	109.1	144.0
Westford	Bar	8.8	34.7	53.1	56.4	109.0	93.0
Swan	Oat	7.6	36.4	52.1	54.5	108.3	111.7
Montezuma	Oat	7.3	35.9	52.5	55.1	108.3	112.0
Sierra	Oat	7.1	36.4	52.2	54.5	108.2	84.3
Park	Oat	6.2	36.5	52.7	54.4	107.8	80.7
Haybet	Bar	9.2	35.3	53.2	55.7	107.4	120.3
Cayuse	Oat	10.2	35.8	54.1	55.1	105.0	116.0
Belford	Bar	8.8	35.6	54.4	55.4	104.8	118.0
Otana	Oat	6.7	36.8	53.7	54.0	104.4	115.7
Texas Red	Oat	9.0	37.3	54.6	53.5	102.0	136.3
Winter Grey ²	Oat	8.7	38.2	57.1	52.4	96.6	113.0
Grizzley	Oat	6.5	41.0	58.3	49.2	91.4	82.7
Stampede	Oat	9.1	40.1	60.2	50.3	89.2	120.7
Mean		8.2	35.6	52.9	55.4	108.3	113.7
PLSD 0.10		1.9	2.0	3.56	2.3	9.6	34.3
PLSD 0.05		2.2	2.3	4.4	2.7	11.6	41.1
CV%		16.5	4.0	5.0	3.0	6.5	21.9

¹ Experimental line

² Common, not a variety

Table 10. Regrowth agronomic data (yield, dry matter, moisture, height, lodging, and harvest date) from the 1991 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Regrowth from ³	Yield (ton/acre)	Dry matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Common	Rye	LB	1.49	43.4	56.6	52	0	255
Gazelle	Rye	LB	1.29	45.1	54.9	44	0	242
Montezuma	Oat	SD	1.11	48.7	51.3	20	0	271
Sierra	Oat	SD	1.09	41.9	58.1	26	0	271
Kanota	Oat	SD	0.79	43.6	56.4	25	0	271
Grace	Trit	LB	0.78	40.0	60.0	32	0	255
Otana	Oat	SD	0.74	33.4	66.6	23	0	271
Swan	Oat	SD	0.66	48.5	51.5	19	0	271
Monida	Oat	SD	0.61	32.5	67.5	22	0	271
Eronga 83	Trit	LB	0.61	42.2	57.8	29	0	242
Riel	Oat	SD	0.56	36.2	63.8	25	0	271
Park	Oat	SD	0.51	41.6	58.4	21	0	271
Cayuse	Oat	SD	0.46	39.7	60.3	22	0	271
Winter Grey ¹	Oat	SD	0.46	35.4	64.6	21	0	271
Texas Red	Oat	SD	0.43	36.0	54.0	24	0	271
Alamos 83	Trit	LB	0.40	49.1	50.9	23	0	242
Grizzley	Oat	SD	0.36	33.7	66.3	22	0	271
Juan	Trit	LB	0.19	49.6	50.4	24	0	255
Karl	Trit	LB	0.17	51.4	48.6	23	0	242
Stampede	Oat	SD	0.00	--	--	--	--	--
Belford	Bar	SD	0.00	--	--	--	--	--
Koldbar ²	Bar	SD	0.00	--	--	--	--	--
Haybet	Bar	SD	0.00	--	--	--	--	--
Unkown	Bar	SD	0.00	--	--	--	--	--
Westford	Bar	SD	0.00	--	--	--	--	--
Whitford	Bar	SD	0.00	--	--	--	--	--
Mean			0.67	41.7	58.3	26	0	262
PLSD 0.10			0.27	4.0	4.0	2.6	0	---
PLSD 0.05			0.33	4.8	4.8	4.3	0	---
CV%			29.50	7.0	5.0	9.9	0	0

¹ Common, not a variety

² Experimental line

³ SD = oats are regrowth from soft dough harvest; LB = rye and triticale are regrowth from late boot harvest.

1992 Results and Discussion

Late Boot Harvest

Late boot growth stage harvest yield, dry matter, moisture, height, lodging, and harvest date data for the 1992 spring cereal forage variety trial are presented in Table 11. ‘Westford’ barley and ‘Winter Grey’ and ‘Stampede’ oat are the top three yielding entries. These three entries yielded close to 4.50 ton/acre. The range of yield was 1.79 ton/acre to 4.68 ton/acre. There was a significant difference in time when the yield was harvested – a difference of 19 days. That could

represent one or two irrigations difference for early forage production. The range in harvest time for late boot was 156 - 189 days, 33 days difference. 'Fortuna', a hard red spring wheat from Montana, was the highest yielding wheat, 'Trical 2700' stood out as the highest yielding triticale variety. 'Gazelle' was the highest yielding rye, significantly higher than the other two entries. Interestingly, three triticale and three rye varieties were the lowest yielding, but they were significantly among the earliest harvest dates. Most of the varieties did not lodge. 'Texas Red' oat and 'Belford' barley lodged significantly more than all of the other varieties, with the exception of 'Winter Gray' oat (second highest yielding), which had significantly more lodging than Texas Red Oat and Belford barley.

The protein, ADF, NDF, TDN, RFV, and nitrogen uptake data for the 1992 spring cereal forage variety trial are presented in Table 12. The top four entries were triticale varieties ('Juan', 'Grace', 'Alamos 83', and 'Eronga 83', based on RFV and TDN. 'Juan' and 'Grace' were significantly higher for TDN and the trend was there for ADF, NDF and protein. These varieties were also among the lowest yielding entries. There was a large range in quality between the varieties for the different parameters. The next best three entries were a hard red wheat and two rye entries. Nitrogen uptake averaged approximately 194 lb/acre with a range of 134 ('Common rye') to 258 lb/acre ('Westford' barley).

Soft Dough Harvest

The soft dough harvest yield, dry matter, moisture, height, lodging, and harvest date for the 1992 spring cereal forage variety trial are presented in Table 13. The top four yielding varieties were all triticale varieties. 'Juan' was higher yield than the next two varieties ('Grace' and '2700'), and was higher yielding than 'Eronga 83', which was significantly higher yielding than 'Karl' triticale. Harvest dates for these five entries were about the same day. 'Stampede' oat, 'Arnzt' rye, 'Glenman' wheat, and 'Westford' barley were the highest yielding respective species.

The difference in harvest dates was 36 days for the entries, or a range of 183 – 219 days from January first. Again if one was trying to conserve water, choosing an earlier maturing variety could make a big difference in water savings. The barley, and rye varieties are the earliest maturing, although there was one oat variety, 'Montezuma', that was ready to harvest just as early.

There were large differences in lodging and plant height. The varieties ranged from 0 - 97 percent lodged. The triticale varieties lodged very little. 'Stampede' oat did not lodge very much and had significantly better lodging resistance than did the rest of the oat varieties and better than all of the barley varieties with the exception of 'Chopper' barley. 'Westford' barley had significantly less lodging than did 'Belford'. 'Dirkwin' wheat did not lodge and had significantly better lodging resistance than did the three hard red wheat varieties from Montana. Some the varieties lodged very badly. Plant heights ranged from 38 - 66 inches. The taller varieties would be difficult, if not impossible to raise under a short-wheel, side-roll irrigation system. The tall varieties could work under a pivot.

Out of the top 10 varieties for quality, there were six triticale and three wheat varieties. The top four were triticale varieties ('Karl', 'Eronga 83', 'Juan', and 'Alamos 83'. The seven oat

varieties were ranked as the lowest seven entries for quality. The seven oat varieties had the highest ADF and NDF, and the lowest TDN and RFV. The barley and rye varieties were interspersed in the middle of the ranking for quality. ‘Belford’ barley was significantly better for NDF quality than ‘Westford’ barley. Protein content ranged from 7.0 to 12.9 percent. Average nitrogen uptake was 238 lb/acre and the range was a low of 169 lb/acre for Winter Grey oat to 348 lb/acre for ‘Juan’ triticale.

Table 11. Late boot harvest agronomic (yield, dry matter, moisture, height, lodging, and harvest date) data for the 1992 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Westford	Bar	4.68	14.9	85.1	40	0	170
Winter Grey	Oat	4.65	13.5	86.5	39	62	183
Stampede	Oat	4.34	13.0	87.0	41	0	189
Grizzley	Oat	4.11	12.4	87.6	40	0	175
Texas Red	Oat	3.89	15.2	84.8	37	22	173
Fortuna	HR	3.70	18.4	81.6	33	0	168
Monida	Oat	3.62	14.3	85.7	30	7	168
Lew	HR	3.50	17.0	83.0	32	0	170
Trical 2700	Trit	3.47	16.2	83.8	39	0	170
Riel	Oat	3.29	15.5	84.5	33	10	171
Chopper	Bar	3.28	16.6	83.4	33	0	159
Karl	Trit	3.28	18.3	81.7	23	0	161
Belford	Bar	3.24	15.5	84.5	33	28	162
Glenman	HR	3.08	18.2	81.8	26	0	169
Weimar ¹	Bar	2.97	16.3	83.7	35	0	159
Grace	Trit	2.90	16.4	83.6	30	0	169
Dirkwin	SWW	2.71	17.9	82.1	25	0	170
Montezuma	Oat	2.58	17.0	83.0	28	0	159
Gazelle	Rye	2.56	16.3	83.7	35	0	156
Juan	Trit	2.53	17.6	82.4	30	0	168
Bedortha ¹	Rye	2.06	15.6	84.4	32	0	158
Eronga 83	Trit	2.02	16.7	83.3	26	0	162
Arnzt ¹	Rye	1.83	18.6	81.4	34	0	159
Alamos 83	Trit	1.79	19.6	80.4	24	0	161
Mean		3.08	16.3	83.7	33	5	167.0
PLSD 0.10		0.45	1.2	1.2	3.2	14.0	1.8
PLSD 0.05		0.54	1.5	1.5	3.8	16.8	2.2
CV%		10.7	5.5	1.1	7.1	199.7	0.8

¹ Common, variety unkonwn

Table 12. Late boot harvest quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data for the 1992 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen Uptake (lb/acre)
Juan	Trit	22.9	25.2	46.7	67.4	138.0	186.1
Trical Grace	Trit	22.8	26.3	47.2	66.1	134.9	210.7
Alamos 83	Trit	22.3	28.4	47.9	63.7	129.8	124.3
Eronga 83	Trit	21.2	27.6	48.3	64.6	129.8	137.4
Common	Rye	23.4	27.8	49.0	64.4	127.7	133.9
Glenman	HRW	23.0	28.2	49.1	64.0	127.0	226.9
Arnzt ¹	Rye	23.1	28.2	49.4	64.0	126.1	136.0
Bedortha ¹	Rye	24.4	28.0	50.3	64.1	124.4	159.9
Monida	Oat	19.4	28.8	50.4	63.2	124.0	222.6
Belford	Bar	19.0	30.4	50.0	61.4	121.4	194.5
Chopper	Bar	19.5	29.5	51.2	62.4	119.8	204.3
Weimar ¹	Bar	19.4	30.0	51.0	61.9	119.7	183.4
Riel	Oat	17.9	30.5	51.7	61.3	118.0	189.1
Westford	Bar	17.0	31.4	51.5	60.3	116.9	257.5
Dirkwin	SWW	21.1	31.2	51.6	60.5	116.5	183.9
Gazelle	Rye	21.3	30.3	53.0	61.5	114.8	174.7
Trical 2700	Trit	19.5	31.5	53.8	60.1	111.4	216.1
Grizzley	Oat	19.2	32.2	53.7	59.4	110.8	252.6
Montezuma	Oat	17.8	31.9	54.3	59.7	110.0	147.1
Fortuna	HRW	19.4	32.5	54.8	59.0	107.8	230.0
Texas Red	Oat	18.5	33.2	55.1	58.2	106.7	230.9
Winter Grey ¹	Oat	16.6	34.8	54.5	56.4	105.5	245.7
Lew	HRW	19.2	34.7	57.0	56.5	101.1	215.5
Stampede	Oat	16.1	34.7	58.0	56.5	99.4	223.3
Mean		20.3	30.2	51.5	61.6	118.8	193.9
PLSD 0.10		2.1	2.1	2.9	2.4	9.1	32.2
PLSD 0.05		2.5	2.5	3.5	2.8	10.9	38.7
CV%		7.7	5.0	4.1	2.8	5.6	12.1

¹ Common, variety unknown.

Table 13. Soft dough harvest agronomic (yield, dry matter, moisture, height, lodging, and harvest date) data for the 1992 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Yield ton/acre	Dry Matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Juan	Trit	11.79	34.9	65.1	54	0	218
Trical Grace	Trit	10.52	36.1	63.9	53	10	217
Trical 2700	Trit	10.49	39.2	60.8	62	13	218
Eronga 83	Trit	10.30	37.8	62.2	52	13	219
Karl	Trit	8.42	38.4	61.6	41	14	216
Stampede	Oat	8.40	20.3	79.7	50	7	212
Arnzt ¹	Rye	8.39	40.3	59.7	65	47	219
Glenman	HRW	8.13	43.2	56.8	39	37	216
Monida	Oat	8.09	23.5	76.5	48	50	199
Common	Rye	8.07	40.1	59.9	66	65	219
Texas Red	Oat	8.03	24.7	75.3	50	97	199
Grizzley	Oat	7.91	20.1	79.9	52	82	199
Fortuna	HRW	7.87	37.0	63.0	47	62	199
Alamos 83	Trit	7.81	39.6	60.4	40	3	216
Lew	HRW	7.80	39.1	60.9	44	70	209
Riel	Oat	7.70	25.6	74.4	47	88	199
Dirkwin	SWW	7.62	35.9	64.1	38	0	216
Bedortha ¹	Rye	7.62	40.2	59.8	62	57	218
Gazelle	Rye	7.24	42.8	57.2	60	38	219
Westford	Bar	7.20	20.3	79.7	48	57	184
Winter Grey ¹	Oat	6.74	24.1	75.9	59	78	212
Belford	Bar	6.37	25.6	74.4	43	92	184
Chopper	Bar	6.19	26.6	73.4	48	20	183
Montezuma	Oat	5.94	26.4	73.6	41	52	184
Weimar ¹	Bar	5.25	25.1	74.9	43	96	184
Mean		8.00	32.3	67.7	50	46	206
PLSD 0.10		1.18	3.3	3.3	3.3	26.4	2.8
PLSD 0.05		1.42	4.0	4.0	4.0	31.7	3.4
CV%		10.8	7.6	3.6	4.8	42.1	1.8

¹ Common, variety unknown.

Table 14. Soft dough quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data for the 1992 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen Uptake (lb/acre)
Karl	Trit	10.3	30.0	46.0	61.8	132.4	281.1
Eronga 83	Trit	8.9	31.6	47.0	60.0	127.5	291.2
Juan	Trit	9.2	31.6	48.7	60.0	123.0	347.5
Alamos 83	Trit	9.5	33.5	47.1	57.9	121.9	231.0
Glenman	HRW	9.9	32.9	49.8	58.5	118.3	259.5
Grace	Trit	8.3	33.0	50.5	58.4	116.8	277.1
Dirkwin	SWW	10.9	34.0	50.4	57.3	115.4	265.9
Weimar ¹	Bar	11.6	35.0	54.0	56.1	106.3	193.9
Trical 2700	Trit	7.0	36.2	53.8	54.7	105.0	236.0
Fortuna	HRW	9.3	37.1	54.8	53.7	101.9	233.6
Belford	Bar	9.7	37.2	55.3	53.6	101.2	199.4
Gazelle	Rye	8.4	37.5	55.2	53.3	100.8	193.7
Bedortha ¹	Rye	8.3	37.9	56.1	52.7	98.7	204.8
Arnzt ¹	Rye	7.7	38.3	57.1	52.3	96.3	207.0
Lew	HRW	9.0	39.1	57.3	51.4	95.0	225.7
Westford	Bar	12.9	37.8	58.8	52.9	94.6	297.5
Chopper	Bar	9.1	39.4	57.6	51.1	94.2	181.4
Common	Rye	7.0	40.1	58.6	50.3	91.8	179.3
Riel	Oat	10.5	39.8	58.8	50.5	91.6	259.8
Monida	Oat	9.7	41.5	62.1	48.7	84.9	249.0
Stampede	Oat	10.5	41.9	62.0	48.2	84.5	282.4
Texas Red	Oat	9.7	42.4	62.0	47.7	84.0	244.1
Winter Grey ¹	Oat	7.9	43.5	63.5	46.3	84.0	169.4
Montezuma	Oat	9.9	41.8	62.9	48.3	83.5	188.2
Grizzley	Oat	9.5	45.0	65.4	44.6	76.8	238.5
Mean		9.4	37.5	55.8	53.2	101.2	237.5
PLSD 0.10		9.4	37.5	55.8	53.2	7.9	57.4
PLSD 0.05		2.0	2.4	3.2	2.7	9.4	68.9
CV%		13.3	3.8	3.5	3.1	5.7	17.7

¹ Common, variety unknown.

1993 Results and Discussion

Late Boot Harvest

The yield, dry matter, moisture, height, lodging, and harvest date for the late boot harvest of the 1993 spring cereal forage variety trial are present in Table 15. Nine out of the top 10 yielding entries were oat varieties and there was a 17-day harvest date difference. 'Magnum' and 'Stampede' were significantly higher yielding than the next group, 'Ensiler' to 'Monida'. 'Westford' barley was the only other specie ranked in the top 10. There was yield range of 1.57 - 4.54 ton/acre, and there were significant yield differences between varieties within species. There was a significant difference between harvest dates, which ranged from 179 to 206 days from January first. No lodging occurred. Magnum plant height at 47 inches was significantly taller than all other varieties. The shortest entry ('Glenman' wheat) was measured at 21 inches at late boot.

The protein, ADF, NDF, TDN, RFV, and nitrogen uptake data for the late boot harvest of the 1993 spring cereal forage variety trial are presented in Table 16. The top-ranked variety was 'Nepal' hull-less barley. Out of the top 10 ranking varieties for quality (RFV), five are triticale varieties ('Florida 201', 'Frank', 'Whitman', 'Eronga 83', and 'Juan'), ranked second through sixth. 'Belford' barley, 'Glenman' wheat, 'Meloy' barley, and 'Montezuma' oat round out the top, which were not significantly different from each other. 'Glenman', a hard red wheat, was significantly higher from the other two hard red wheat varieties for RFV quality, but not different from the soft white wheat varieties 'Dirkwin' and 'Twin'. 'Magnum' oat is ranked at the bottom for quality with the lowest protein, RFV, second-to-highest ADF, and the highest NDF. 'Haybet' barley had the highest ADF of all of the varieties. The average nitrogen uptake was 113 lb/acre with a range of 77 lb/acre for 'Swan' oat to a high of 174 lb/acre for 'Stampede' oat, which was the second highest yielding entry.

Soft Dough Harvest

The yield dry matter, moisture, height, lodging, and harvest date for the soft dough harvest of the 1993 spring cereal forage variety trial are presented in Table 17. The top-ranked five varieties statistically were 'Eronga 83', 'Juan', 'Trical 2700', 'Frank', and 'Florida 201', all triticale varieties. The next grouping of 10, that were statistically different from the triticale varieties included eight oat varieties ('Magnum', 'Ensiler', 'Magnum II', 'Monida', 'Park', 'Cayuse', 'Stampede', and 'Ajay' oat, and 'Gazelle' rye and 'Whitman' triticale. The difference in height between 'Magnum' and 'Ajay' is 19 inches. There was a height range of 36 to 64 inches between all entries. Lodging average was 20 percent for the trial. None of the triticale varieties lodged. The oat and barley varieties had the most lodging problems in general. 'Westford', 'Alberta' and 'Rid Awn', barley did not lodge. 'Ensiler' and 'Ajay' oat did not lodge. 'Glenman', 'Fortuna', and 'Lew', hard red spring wheat varieties, lodged significantly more than 'Dirkwin' and 'Twin', soft white wheat varieties. The range in harvest dates was a low of 209 days to 249 days from January first, a 30 day difference.

The protein, ADF, NDF, TDN, RFV, and nitrogen uptake for the soft dough harvest of the 1993 spring cereal forage variety trial are presented in Table 18. The top five entries have

significantly higher quality (RFV) than the rest of the entries. Four of the five are triticale varieties ('Frank', 'Florida 201', 'Eronga 83', and 'Juan'). 'Faust' barley was ranked in the top five and did have one of the highest TDN percentages. 'Whitman' triticale, 'Glenman' wheat, and '2700' triticale followed in the next three positions. Out of the top 11 ranked for RFV, 9 were triticale and wheat varieties. Nine out of the lowest ranking 11 entries were oat varieties, including the bottom eight. The average nitrogen uptake was 175 lb/acre with a range of 132 lb/acre ('Gazelle' rye) to 231 lb/acre ('Frank' triticale).

Regrowth from Late Boot Harvest

The yield, dry matter, moisture, height, lodging, and harvest date for the regrowth harvest from the late boot harvest for the 1993 spring cereal forage variety trial are presented in Table 18. There was no difference between the top nine varieties for yield. Six were oat ('Montezuma', 'Swan', 'Monida', 'Ajay', 'Otana', and 'Cayuse') varieties. 'Florida 201', and 'Eronga 83' triticale and 'Gazelle' rye were the other top three yielders. From 'Magnum II' to 'Westford' there was no significant difference between those varieties. 'Magnum' and 'Stampede' were ranked at the bottom for regrowth potential.

Table 15. Late boot agronomic (yield, dry matter, moisture, height, lodging, and harvest date) data for the 1993 spring forage cereal variety trial established at COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Magnum	Oat	4.54	18.0	82.0	47	0	202
Stampede	Oat	4.36	15.2	84.8	33	0	205
Ensiler	Oat	3.35	15.3	84.7	35	0	192
Cayuse	Oat	3.28	17.7	82.3	30	0	188
Park	Oat	3.18	18.2	81.8	33	0	192
Westford	Bar	3.15	17.5	82.5	37	0	195
Otana	Oat	3.15	17.2	82.8	32	0	189
Monida	Oat	3.08	16.9	83.1	30	0	189
Magnum II	Oat	2.88	15.5	84.5	30	0	188
Ajay	Oat	2.79	16.8	83.2	24	0	188
Whitman	Trit	2.60	17.1	82.9	32	0	206
Trical 2700	Trit	2.57	17.4	82.6	36	0	195
Haybet	Bar	2.51	19.9	80.1	32	0	186
Twin	SWW	2.35	19.9	80.1	22	0	190
Dirkwin	SWW	2.28	17.8	82.2	22	0	189
Montezuma	Oat	2.15	19.0	81.0	26	0	179
Belford	Bar	2.09	16.6	83.4	29	0	188
Rid Awn	Bar	2.08	19.3	80.7	31	0	191
Eureka	Bar	2.06	16.4	83.6	32	0	186
Faust	Bar	2.01	16.4	83.6	31	0	181
Fortuna	HRW	1.98	20.2	79.8	28	0	186
Juan	Trit	1.94	16.7	83.3	27	0	190
Nepal	Bar	1.93	17.0	83.0	33	0	186
Gazelle	Rye	1.89	18.6	81.4	41	0	179
Swan	Oat	1.88	20.2	79.8	30	0	179
Lew	HRW	1.85	20.3	79.7	24	0	188
Florida 201	Trit	1.73	16.6	83.4	24	0	188
Eronga 83	Trit	1.70	16.8	83.2	24	0	188
Frank	Trit	1.68	17.7	82.3	26	0	188
Alberta	Bar	1.67	19.5	80.5	28	0	183
Meloy	Bar	1.64	17.1	82.9	31	0	186
Glenman	HRW	1.57	19.5	80.5	21	0	187
Mean		2.43	17.8	82.2	30	0	189
PLSD 0.10		0.44	1.3	1.3	3.1	--	2.2
PLSD 0.05		0.52	1.5	1.5	3.7	--	2.6
CV%		13.1	5.3	1.1	75		0.9

Table 16. Late boot quality (protein, ADF, NDF, TDN, and RFV) and nitrogen uptake data for the 1993 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen uptake (lb/acre)
Nepal	Bar	18.2	26.9	47.4	65.4	133.9	111.5
Florida	Trit	18.8	28.3	48.5	63.8	128.5	104.1
Frank	Trit	17.6	28.3	48.7	63.8	127.8	94.6
Whitman	Trit	17.4	29.3	48.5	62.6	126.9	144.7
Eronga 83	Trit	17.0	29.0	48.8	62.9	126.5	91.9
Juan	Trit	17.6	28.4	49.3	63.8	126.3	108.9
Belford	Bar	16.1	29.9	48.4	62.0	126.2	107.4
Glenman	HRW	18.3	28.9	49.6	63.1	124.5	91.2
Meloy	Bar	15.4	29.4	49.6	62.6	124.0	80.3
Montezuma	Oat	13.5	29.6	49.6	62.3	123.5	93.3
Faust	Bar	15.8	30.2	49.9	61.6	122.0	101.5
Alberta	Bar	15.1	30.5	50.6	61.3	120.1	80.4
Dirkwin	SWW	17.9	30.1	51.2	61.7	119.0	128.7
Twin	SWW	15.9	29.8	51.6	62.1	118.6	120.2
Swan	Oat	12.7	30.7	51.2	61.0	117.9	76.9
Monida	Oat	12.5	30.8	51.6	61.0	117.4	123.5
Ajay	Oat	14.1	29.3	52.8	62.7	116.6	125.2
Rid Awn	Bar	15.6	31.1	52.4	60.6	114.9	105.0
Gazelle	Rye	15.5	30.5	52.9	61.3	114.8	93.6
Trical 2700	Trit	15.9	31.9	52.9	59.7	113.4	129.5
Cayuse	Oat	12.4	31.4	53.1	60.2	113.0	130.1
Westford	Bar	12.8	32.9	52.5	58.5	112.2	129.0
Magnum II	Oat	13.9	32.7	53.2	58.8	111.1	128.5
Lew	HRW	14.4	33.5	53.4	57.9	109.4	85.0
Otana	Oat	13.1	33.5	53.4	57.9	109.4	131.6
Fortuna	HRW	15.1	32.2	54.4	59.3	109.3	95.9
Park	Oat	12.4	32.9	55.1	58.6	107.1	125.0
Stampede	Oat	12.6	33.8	55.1	57.4	105.7	174.3
Ensiler	Oat	10.7	35.6	56.7	55.5	100.6	114.4
Haybet	Bar	14.7	40.7	55.2	49.5	98.9	119.1
Magnum	Oat	10.1	36.5	57.6	54.3	97.8	146.7
Mean		15.0	31.2	51.7	60.5	116.9	112.7
PLSD 0.10		1.7	4.7	2.9	5.4	10.8	23.4
PLSD 0.05		2.0	5.6	3.4	6.4	122.9	28.0
CV%		8.3	11.0	4.0	6.5	6.8	15.2

Table 17. Soft dough agronomic (yield, dry matter, moisture, height, lodging, and harvest date) data for the 1993 spring forage cereal variety trial established at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry Matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Eronga 83	Trit	9.37	38.9	61.1	56	0	242
Juan	Trit	9.25	39.6	60.4	57	0	244
Trical 2700	Trit	9.03	42.1	57.9	58	0	249
Frank	Trit	8.78	38.8	61.2	48	0	242
Florida 201	Trit	8.60	39.3	60.7	55	0	242
Magnum	Oat	7.66	32.2	67.8	59	20	225
Ensiler	Oat	7.63	26.5	73.5	58	0	217
Gazelle	Rye	7.60	40.6	59.4	64	0	228
Magnum II	Oat	7.45	28.5	71.5	54	2	217
Monida	Oat	7.37	28.5	71.5	49	2	217
Park	Oat	7.27	30.1	69.9	51	30	217
Cayuse	Oat	6.98	28.0	72.0	50	45	214
Stampede	Oat	6.87	23.0	77.0	43	5	225
Whitman	Trit	6.75	33.4	66.6	53	0	249
Ajay	Oat	6.74	26.9	73.1	40	0	214
Otana	Oat	6.70	25.0	75.0	50	53	217
Westford	Bar	6.66	29.5	70.5	45	0	217
Dirkwin	SWW	6.62	34.6	65.4	42	5	231
Fortuna	HRW	6.40	38.9	61.1	45	38	225
Twin	SWW	6.32	36.8	63.2	36	3	230
Montezuma	Oat	6.19	31.8	68.2	42	77	209
Glenman	HRW	6.10	35.9	64.1	37	23	231
Belford	Bar	6.03	29.6	70.4	45	48	217
Lew	HRW	6.00	36.2	63.8	42	33	231
Rid Awn	Bar	5.62	29.5	70.5	43	0	216
Eureka	Bar	5.59	31.1	68.9	40	82	213
Swan	Oat	5.53	28.1	71.9	45	18	209
Meloy	Bar	5.51	29.5	70.5	45	65	213
Haybet	Bar	5.26	33.8	66.2	43	33	213
Nepal	Bar	5.03	30.4	69.6	39	28	213
Faust	Bar	4.88	31.1	68.9	40	40	209
Alberta	Bar	4.34	31.3	68.7	37	0	209
Mean		6.75	32.5	67.5	47	20	223
PLSD 0.10		0.95	2.6	2.6	3.5	22	3.1
PLSD 0.05		1.14	3.2	3.2	4.2	26	3.7
CV%		10.4	6.0	2.9	5.4	78.5	1.0

Table 18. Soft dough quality (protein, ADF, NDF, TDN, and RFV) data for the 1993 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Protein (%)	ADF (%)	NDF (%)	TDN (%)	RFV	Nitrogen Uptake (lb/acre)
Frank	Trit	8.2	27.8	42.3	64.3	147.9	231.1
Florida	Trit	7.1	27.1	44.1	65.1	143.1	195.8
Eronga 83	Trit	7.5	28.9	44.1	63.1	140.2	223.6
Faust	Bar	9.7	27.0	45.4	65.3	139.1	151.1
Juan	Trit	7.3	30.9	43.6	60.8	138.5	213.7
Whitman	Trit	9.7	29.7	46.6	62.2	131.6	209.8
Glenman	HRW	9.7	30.1	48.1	61.7	126.6	189.8
Trical 2700	Trit	7.8	30.2	48.9	61.6	124.5	223.9
Alberta	Bar	10.7	32.2	49.0	59.3	121.3	149.1
Lew	HRW	9.4	32.4	49.4	59.1	120.4	180.2
Twin	SWW	9.6	30.8	50.4	60.9	120.2	193.5
Nepal	Bar	10.1	31.2	50.3	60.5	119.6	162.2
Haybet	Bar	7.9	32.4	49.8	59.1	119.3	134.0
Meloy	Bar	8.6	31.4	50.4	60.3	119.1	152.2
Fortuna	HRW	8.7	33.4	50.4	58.0	116.3	177.5
Eureka	Bar	8.2	32.1	51.8	59.4	115.0	148.1
Dirkwin	SWW	8.6	34.2	51.1	57.0	113.7	182.0
Montezuma	Oat	8.3	32.4	52.3	59.2	113.6	165.2
Westford	Bar	8.8	35.4	52.7	55.7	108.5	190.3
Belford	Bar	7.9	34.7	54.2	56.4	106.4	152.0
Rid Awn	Bar	9.5	34.7	55.5	56.5	103.7	171.4
Swan	Oat	8.1	35.7	56.2	55.3	102.2	145.2
Cayuse	Oat	8.4	36.0	58.0	54.9	97.7	186.5
Gazelle	Rye	5.5	39.1	57.6	51.5	94.5	132.1
Ajay	Oat	8.6	38.3	58.6	52.4	94.0	187.1
Magnum	Oat	5.9	39.1	58.4	51.4	93.1	144.9
Park	Oat	7.5	37.7	60.3	53.0	92.4	173.2
Magnum II	Oat	7.7	39.8	60.2	50.6	89.8	183.4
Monida	Oat	6.2	40.8	59.6	49.5	89.2	145.9
Stampede	Oat	8.7	40.3	60.6	50.0	88.4	196.6
Otana	Oat	8.1	42.7	63.9	47.3	81.0	171.4
Ensiler	Oat	5.7	44.6	65.2	45.1	77.4	139.0
Mean		8.2	34.2	52.8	57.0	112.1	174.9
PLSD 0.10		1.41	4.0	3.1	4.6	10.9	42.3
PLSD 0.05		1.6	4.8	3.7	5.5	13.0	50.6
CV%		12.0	8.6	4.3	5.9	7.1	17.7

Table 19. From Late boot regrowth agronomic (yield, dry matter, moisture, height, lodging, and harvest date) data for the 1993 spring forage cereal variety trial conducted at the COARC, Powell Butte, OR.

Variety	Species	Yield (ton/acre)	Dry Matter (%)	Moisture (%)	Height (in.)	Lodging (%)	Harvest Date (day of year)
Montezuma	Oat	2.55	31.2	68.8	27	0	237
Swan	Oat	2.49	28.0	72.0	32	0	237
Monida	Oat	2.42	28.2	71.8	28	0	243
Florida	Trit	2.40	45.5	54.5	38	0	255
Ajay	Oat	2.33	26.4	73.6	24	0	243
Otana	Oat	2.25	26.7	73.3	30	0	243
Eronga 83	Trit	2.13	46.5	53.5	35	0	255
Cayuse	Oat	1.93	27.2	72.8	27	0	243
Gazelle	Rye	1.82	37.1	62.9	42	0	249
Magnum II	Oat	1.54	25.8	72.0	29	0	243
Glenman	HRW	1.47	39.5	60.5	27	0	249
Park	Oat	1.37	29.8	70.2	25	0	243
Frank	Trit	1.30	44.0	56.0	29	0	255
Ensiler	Oat	1.24	25.1	74.9	24	0	247
Whitman	Trit	1.14	28.5	71.5	33	0	255
Rid Awn	Bar	1.08	35.8	64.2	25	0	241
Dirkwin	SWW	1.06	37.1	62.9	25	0	249
Meloy	Bar	1.05	36.2	63.8	27	0	237
Twin	SWW	0.96	39.2	60.8	26	0	249
Belford	Bar	0.96	33.9	66.1	26	0	237
Lew	HRW	0.94	37.5	62.5	28	0	249
Juan	Trit	0.92	38.1	61.9	34	0	255
Faust	Bar	0.88	30.5	69.5	29	0	237
Fortuna	HRW	0.85	41.8	58.2	27	0	249
Westford	Bar	0.82	27.7	72.3	25	0	237
Haybet	Bar	0.69	36.5	63.5	28	0	239
Trical 2700	Trit	0.67	33.1	66.9	35	0	255
Alberta	Bar	0.62	40.0	60.0	24	0	237
Nepal	Bar	0.60	36.5	63.5	24	0	237
Eureka	Bar	0.57	32.6	67.4	23	0	237
Stampede	Oat	0.46	23.4	76.6	17	0	255
Magnum	Oat	0.33	28.0	72.0	16	0	255
Mean		1.31	33.7	66.3	28	0	245
PLSD 0.10		0.74	NS	NS	4.1	NS	1.3
PLSD 0.05		0.89	NS	NS	4.9	NS	1.6
CV%		41.5	29.0	14.7	10.9	0	.04

¹Mean separation with LSD Test at $P \leq 0.05$.