

Oregon Forage and Turf Grass Variety Seed Yield Trial, 1988-89

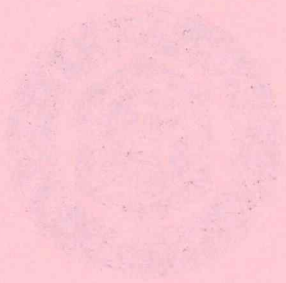
**Department of Crop and Soil Science
Oregon State University**



**Ext/CrS 84
July 1991**

Oregon Forage and Hay
Grass Variety Seed
Yield Trial 1988-89

Department of Plant and Soil Science
Oregon State University



1988-89
1989



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OREGON FORAGE AND TURF GRASS VARIETY SEED YIELD TRIAL, 1988-89

William C. Young III and Thomas B. Silberstein¹

ABSTRACT

Forty-one perennial and six annual grass varieties were evaluated for seed production potential at Corvallis, Oregon. Perennial ryegrass, orchardgrass, Kentucky bluegrass, red fescue, Chewings fescue, tall fescue, and Italian (annual) ryegrass were included in the study. Results of 1988 and 1989 harvest years are reported.

INTRODUCTION

Private and public plant breeding programs release many new varieties for commercial production each year. In many cases, seed producers are requested to produce seed of a new variety with very limited information about the comparative seed yield. Since 1981, a seed yield evaluation program has been conducted at Oregon State University. Seed yield and other characteristics of these varieties growing under western Oregon conditions were observed for two years and previously reported (Youngberg et al., 1985; 1986; and Youngberg and Young, 1990). A fee is charged for the service.

In this study, 47 entries and standards for each species were planted for evaluation. Species included: perennial ryegrass (*Lolium perenne*), Italian ryegrass (*Lolium multiflorum*), fine-leaf (Chewings and red) fescue (*Festuca rubra*), Kentucky bluegrass (*Poa pratensis*), orchardgrass (*Dactylis glomerata*), and tall fescue (*Festuca arundinacea*).

METHODS

The trial was conducted at Hyslop Crop Science Field Laboratory, Corvallis, on a Woodburn silt loam soil and designed to follow commercial field practices of Willamette Valley seed growers. Perennial species in this trial were planted in May 5 to 8, 1987. The Italian ryegrass was planted on September 25, 1987 and September 29, 1988.

Seeding rates were adjusted for germination percentage to plant an equal number of pure live seed per length of row. Row spacing was 12 inches (30 cm) for all species except tall fescue and orchardgrass, which were spaced 18 inches (45 cm) apart. Four replications of each entry were established using a cone planter in either 2- or 3-row plots (depending on row spacing) so that all plots were 3 feet (0.9 m) wide and 15.6 feet (4.75 m) in length. A blank row was used to separate entries within blocks. Border plots were planted at the boundary of each species. A standard variety was included for each species. Seeding rates and dates, and row width for each species are given in Table 1.

¹Assistant Professor and Extension Agronomist, and Research Assistant, respectively. Address: Department of Crop and Soil Science, Oregon State University, Corvallis, OR 97331.

Table 1. Seeding rate, mean number of seeds per row, row width, and seeding date for seed yield evaluation trial

Species	Seeding rate		Mean number seeds per:		Row width		Seeding date	
	(lb/a)	(kg/ha)	(ft)	(m)	(in)	(cm)	1987	1988
Perennial ryegrass	10.7	12.0	58	190	12	30	5 May	--
Fine-leaf fescue	4.5	5.0	61	200	12	30	6 May	--
Kentucky bluegrass	2.0	2.2	61	200	12	30	6 May	--
Orchardgrass	4.5	5.0	64	210	18	45	8 May	--
Tall fescue	8.9	10.0	61	200	18	45	8 May	--
Italian ryegrass	13.4	15.0	55	180	12	30	25 Sept.	29 Sept.

Crop Management During the Establishment Season, 1987-1988

Italian ryegrass varieties were seeded on September 25, 1987 following a surface application and incorporation of 185 lb/a (207 kg/ha) of 16-20-0 fertilizer into the seedbed on September 16, 1987. All Italian ryegrass varieties were treated with the herbicide Nortron GS (ethofumesate) at 1.0 lb active ingredient (ai/a) (1.12 kg ai/ha) on November 10, 1987. A tank mix of MCPA and bromoxynil herbicides, each at 0.375 lb acid equivalent per acre (ae/a) (0.42 kg ae/ha), was also applied on November 10, 1987.

Weed control following establishment of perennial varieties included a tank mix of MCPA and bromoxynil herbicides, each at 0.375 lb acid equivalent per acre (ae/a) (0.42 kg ae/ha), on June 4, 1987. Additional autumn chemical weed control was applied on November 19 as shown in Table 2.

All perennial and annual varieties were sprayed with a tank mix of 2,4-D low volatile (LV) ester at 0.75 lb ae/a (0.84 kg ae/ha) and dicamba at 0.25 lb ae/a (0.28 kg ae/ha) on February 27, 1988.

Table 2. Autumn 1987 and 1988 herbicide application and rate

Species	Herbicide	Rate (ai) ¹	
		(lb/a)	(kg/ha)
Perennial ryegrass	AAtrex 80W (atrazine)	1.2	1.35
Fine-leaf fescue	Princep 80W (simazine)	2.0	2.24
Kentucky bluegrass, Orchardgrass and Tall Fescue	Karmex 80W (diuron)	2.5	2.80

¹Applied November 19, 1987 and November 16, 1988

Rainfall on May 12 [0.3 in (0.8 cm)] and May 31, 1987 [0.4 in (1.0 cm)] resulted in good stand establishment of all perennial species. However, an additional 2.5 inches (6.4 cm) of irrigation was applied June 9-10, 1987.

Spring fertilizer was applied as urea to all species on February 19, 1988 (Table 3).

Table 3. Spring 1988 and 1989 fertilizer application and rate

Species	Rate ¹		Nitrogen (au)	
	(lb/a)	(kg/ha)	(lb/a)	(kg/ha)
Perennial ryegrass, Italian ryegrass, Fine-leaf fescue, Tall fescue, Orchardgrass and Kentucky bluegrass	261	292	120	134

¹46-0-0 for all species applied on February 19, 1988 and March 21, 1989

A single fungicide application of Bravo 500 at 3 pt/a (3.6 l/ha) was made to orchardgrass on April 25, 1988. Tilt fungicide was applied at 4 fluid oz/a (0.3 l/ha) for rust control on Kentucky bluegrass and perennial ryegrass. Five applications were made to Kentucky bluegrass: April 25, May 4, 16, June 4 and 16; while two were used on perennial ryegrass: June 7 and 21, 1988.

Plots were checked weekly from late March until maturity for heading date (approximately 50% of the stand had headed), anthesis date (first appearance of exerted anthers), lodging date (when lodging first became apparent), area lodged (estimate of area lodged), and the severity of lodging (based on a scale of 1-5). Plant height measurements were recorded at peak anthesis.

Autumn 1988 and Spring 1989 Management

Italian ryegrass varieties were reseeded in the fall of 1988 for evaluation in 1989. Establishment methods previously reported were used for row spacing, seeding rate and plot size. Italian ryegrass varieties were seeded on September 29, 1988 following a surface application and incorporation of 185 lb/a (207 kg/ha) of 16-20-0 fertilizer into the seedbed on September 26, 1988. An autumn herbicide treatment of Nortron GS at 1.0 lb ai/a (1.12 ai kg ai/ha) was made to all Italian ryegrass on November 16, 1988. Italian ryegrass plots also received a spring application of a tank mix of 2,4-D LV ester at 0.75 lb ae/a (0.84 kg ae/ha) and dicamba at 0.25 lb ae/a (0.28 kg ae/ha) on February 27, 1989.

Following the first seed harvest of the perennial species straw was removed from all plots. Stubble remaining on the plots was burned two times with a propane flamer on August 26 and 30. An application of 185 lb/a (207 kg/ha) of 16-20-0 was broadcast on all perennial species on November 18, 1988. Herbicide sprays for fall and winter weed control were applied on November 16, 1988 at rates shown in Table 2.

All plots (perennial species and Italian ryegrass) were sprayed with a tank mix of 2,4-D LV ester at 0.75 lb ae/a (0.84 kg ae/ha) and dicamba at 0.25 lb ae/a (0.28 kg ae/ha) on February 27, 1989 for broadleaf weed control.

Spring fertilizer was applied as urea to all entries on March 21, 1989 as shown in Table 3.

Tilt was applied at 4 fluid oz/a (0.3 l/ha) for rust control on Kentucky bluegrass and perennial ryegrass. Three applications were made on Kentucky bluegrass: April 21, May 3, and 13; while two were used on perennial ryegrass: May 3 and 13, 1989. In addition, A single fungicide application of Bravo 500 at 3 pt/a (3.6 l/ha) was made to orchardgrass on April 21, 1989.

As reported for the first crop year, plots were checked weekly from late March until maturity for heading date, anthesis date, lodging date, area lodged, and the severity of lodging. Plant height measurements were recorded at peak anthesis.

Harvest maturity was determined by seed moisture content. When mature, the entire plot was harvested with a small plot harvester incorporating a sickle bar cutter and draper designed for efficient bagging of harvested plant biomass (reported as total dry weight). The bagged material was air- and oven-dried, threshed, cleaned, and

weighed to calculate seed yield. A 3 to 5-gram seed sample from each plot was taken with a seed divider to determine the 1000-seed weight. Harvest index, expressed as a percentage, was calculated for each entry:

$$\text{Harvest index} = \frac{\text{Clean seed weight}}{\text{Total dry weight harvested}} \times 100$$

Data from each species were subjected to a randomized block analysis of variance and Least Significant Difference test to determine differences among variety means.

RESULTS AND DISCUSSION

The planting method and irrigation during the seedling development period produced a good stand of all species in 1987. Kentucky bluegrass was less uniform in emergence due to some crusting of soil, however, by mid-June planted rows of all entries were easily identified. Rainfall during July 1987 was above normal and resulted in well established plants that were able to tolerate the extended dry fall during the first seed crop season (Table 4). A warm (March-April) and wet (April-May) spring, 1988, contributed to severe rust development in some entries of Kentucky Bluegrass requiring additional fungicide use. The rust control program was not completely effective. Rust developed later in perennial ryegrass and was effectively controlled with two fungicide applications. Some rust was also observed in tall fescue in mid-June, but this species was not treated with fungicide.

Dry fall conditions in both crop years resulted in later than average applications of fertilizer and herbicide programs. Spring (April, May and June) temperatures in the second crop year (1989) were significantly above the 30-year mean (Table 4). Precipitation during this period was slightly below average. This combination of higher temperatures and below normal precipitation resulted in earlier heading, anthesis, and harvest maturity in 1989.

Table 4. Monthly mean minimum and maximum temperatures, total precipitation in Corvallis, Oregon; data shown for 1987, 1988, 1989 and 30-year averages

Month	Temperature (° F)											
	Minimum				Maximum				Precipitation (inches)			
	30 Yr				30 Yr				30 Yr			
	avg ¹	1987	1988	1989	avg ¹	1987	1988	1989	avg ¹	1987	1988	1989
Jan.	32.9	33.1	33.2	34.8	45.1	46.2	44.8	47.0	7.6	8.2	7.1	4.2
Feb.	35.0	36.6	34.9	28.0	50.4	51.6	52.1	42.4	4.9	4.5	1.7	3.2
Mar.	36.1	38.6	36.5	38.1	53.8	56.2	56.3	53.1	4.6	3.7	3.9	6.8
Apr.	38.8	40.3	42.1	43.2	59.3	65.3	60.9	65.8	2.5	1.6	3.3	1.4
May	43.2	46.1	43.8	44.1	66.2	70.2	64.2	66.8	1.9	1.4	3.8	1.5
June	48.3	49.2	48.6	50.5	72.6	77.8	71.6	76.1	1.2	0.3	1.8	1.1
July	50.6	52.7	51.8	51.6	80.7	77.6	82.4	76.6	0.3	2.2	0.1	0.3
Aug.	50.7	51.8	50.1	51.2	80.5	83.9	82.5	78.0	0.8	0.2	0.0	0.9
Sept.	47.7	46.8	46.4	47.9	75.5	78.8	78.7	80.6	1.5	0.1	0.7	0.6
Oct.	41.7	41.5	46.6	40.6	64.3	73.4	68.2	63.9	3.4	0.3	0.1	2.7
Nov.	37.2	40.8	40.6	38.6	52.3	53.8	52.6	54.2	6.2	3.9	10.9	3.9
Dec.	34.6	34.5	34.2	34.1	46.5	43.7	45.8	45.2	7.8	11.4	4.0	3.1
Year	41.4	42.7	42.4	41.9	62.3	64.9	63.3	62.5	42.6	37.7	37.5	29.6

¹1951-1980 Average

Harvest dates and other observations for the various species are presented in Tables 5-16. Seed yields from these research plots should be compared with known standard varieties rather than using the absolute figures to estimate potential yields under commercial production conditions. Plot harvest methods reduce shattering and other harvest losses that normally occur in commercial production.

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Table 5. Seed yield, total dry weight, thousand-seed weight, and heading date of perennial ryegrass, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
Sheriff	1293	1083	1188	87	4.05	3.73	3.89	1.68	1.68	1.68	13 May	12 May
Chief	1450	1298	1374	101	4.17	4.19	4.18	1.90	2.28	2.09	4 May	3 May
Opinion	1106	650	878	65	4.39	2.92	3.66	1.28	1.38	1.33	31 May	30 May
Boston	1297	635	966	71	5.29	2.95	4.12	1.40	1.50	1.45	1 June	31 May
Bar LP 82-LO	1038	470	754	55	5.41	3.12	4.26	1.29	1.43	1.36	6 June	5 June
Bargold	1209	1046	1128	83	5.56	4.02	4.79	1.39	1.42	1.41	26 May	25 May
Barcredo	865	272	569	42	4.15	1.26	2.70	.93	1.33	1.13	31 May	30 May
BAR ER 6K	1093	706	900	66	4.87	3.47	4.17	1.14	1.27	1.21	1 June	31 May
Linn (Std)	1473	1251	1362	100	4.61	4.28	4.44	1.90	2.25	2.08	4 May	3 May
Barcolte	1280	586	933	69	5.44	2.43	3.93	1.77	1.97	1.87	26 May	25 May
BAR DK 4GEL	1532	878	1205	89	5.89	4.00	4.95	1.75	1.65	1.70	23 May	22 May
Mean	1240	807	1023	--	4.89	3.31	4.10	1.49	1.65	1.57	23 May	23 May
LSD 0.05	355	201	--	--	1.06	0.98	--	0.19	0.14	--	--	--

Table 6. Anthesis date, harvest date, harvest index, lodging rate and plant height of perennial ryegrass, 1988 and 1989

Variety name	Anthesis date		Harvest date		Harvest index (%)			First lodging (1988)			First lodging (1989)			Plant height (cm)		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
Sheriff	31 May	2 June	15 July	1 July	16	15	16	12 May	65	3	4 June	38	3	78	59	69
Chief	31 May	22 May	8 July	1 July	18	16	17	5 May	33	3	4 May	43	3	81	68	75
Opinion	16 June	11 June	22 July	18 July	13	12	13	17 June	43	3	19 July	45	4	77	50	64
Boston	17 June	12 June	22 July	18 July	12	11	12	30 May	50	3	18 July	45	3	73	54	64
Bar LP 82-LO	20 June	12 June	27 July	27 July	10	8	9	17 June	28	3	27 July	53	3	73	54	64
Bargold	12 June	11 June	22 July	18 July	11	13	12	21 May	60	3	12 June	30	3	76	62	69
Barcredo	26 June	12 June	27 July	27 July	10	11	11	17 June	50	3	27 July	100	1	65	38	52
BAR ER 6K	14 June	12 June	22 July	18 July	11	10	11	8 June	60	3	12 June	43	4	73	60	67
Linn (STD)	31 May	20 May	8 July	1 July	16	15	16	5 May	44	3	4 May	55	4	80	68	74
Barcolte	13 June	7 June	8 July	1 July	12	12	12	12 May	30	3	1 July	55	3	106	63	85
BAR DK 4GEL	13 June	2 June	15 July	1 July	13	11	12	7 May	23	3	7 June	65	3	86	69	78
Mean	12 June	6 June	18 July	12 July	13	12	13	21 May	44	3	20 June	75	3	79	59	69
LSD 0.05	--	--	--	--	1	3	--	--	NS	NS	--	NS	1	9	11	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

Table 7. Seed yield, total dry weight, thousand- seed weight, and heading date of fine-leaf fescue, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
Molinda	1775	936	1356	126	3.89	3.07	3.48	1.04	1.10	1.07	21 April	21 April
Camaro	1594	866	1230	114	3.98	2.73	3.35	.98	1.00	.99	17 April	25 April
Koket	1483	719	1101	102	3.33	2.51	2.92	1.18	1.20	1.19	21 April	25 April
Baruba	861	553	707	66	2.27	2.66	2.46	1.00	.99	1.00	22 April	21 April
Barnica	1434	738	1086	101	3.31	2.71	3.01	1.07	1.10	1.09	22 April	21 April
Flemo	1798	1183	1491	138	3.99	4.07	4.03	1.20	1.16	1.18	19 April	19 April
Victor	2161	1294	1728	160	4.40	4.36	4.38	1.20	1.15	1.18	18 April	19 April
Hector	2550	1460	2005	186	5.08	4.36	4.72	1.20	1.12	1.16	20 April	21 April
Barcrown	1222	435	829	77	3.13	2.45	2.79	1.00	1.02	1.01	13 May	10 May
Pennlawn (STD)	1522	631	1077	100	3.23	2.79	3.01	1.03	1.02	1.03	2 May	1 May
Mean	1640	881	1261	--	3.66	3.17	3.42	1.09	1.08	1.09	22 April	24 April
LSD 0.05	273	183	--	--	0.93	0.50	--	0.06	0.06	--	--	--

Table 8. Anthesis date, harvest date, harvest index, lodging rate and plant height of fine-leaf fescue, 1988 and 1989

Variety name	Anthesis date		Harvest date		Harvest index (%)			First lodging (1988)			First lodging (1989)			Plant height (cm)		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
Molinda	27 May	12 May	1 July	23 June	23	15	19	12 May	50	3	26 May	43	3	83	73	78
Camaro	27 May	12 May	1 July	23 June	20	16	18	12 May	70	3	23 May	33	3	79	69	74
Koket	31 May	12 May	1 July	23 June	22	14	18	5 May	15	2	15 May	33	2	87	69	78
Baruba	31 May	12 May	1 July	23 June	20	10	15	7 May	30	3	15 May	68	4	80	64	72
Barnica	6 June	12 May	1 July	23 June	22	14	18	10 May	28	4	21 May	58	3	76	61	69
Flemo	30 May	8 May	8 July	23 June	23	15	19	5 May	45	3	15 May	30	3	86	80	83
Victor	27 May	8 May	8 July	23 June	25	15	20	7 May	25	3	15 May	23	3	79	72	76
Hector	27 May	10 May	8 July	27 June	25	17	21	9 May	43	3	23 May	45	3	86	75	81
Barcrown	31 May	26 May	8 July	23 June	22	9	16	18 May	38	3	23 June	100	1	88	68	78
Pennlawn (STD)	30 May	26 May	8 July	23 June	24	11	18	10 May	58	3	23 May	23	3	86	67	77
Mean	30 May	14 May	5 July	23 June	23	14	18	9 May	40	3	23 May	45	3	83	70	77
LSD 0.05	--	--	--	--	NS	2	--	--	26	1	--	26	1	7	5	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

Table 9. Seed yield, total dry weight, thousand- seed weight, and heading date of Kentucky bluegrass, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
Caroline	1039	1025	1032	205	4.63	3.92	4.27	0.28	0.35	0.32	3 May	4 May
Lucia	415	656	536	107	2.12	1.08	1.60	0.23	0.36	0.30	3 May	9 May
Miranda	556	889	723	144	3.56	2.27	2.91	0.29	0.38	0.34	13 May	10 May
BAR VB 577	971	1140	1056	143	3.31	2.41	2.86	0.22	0.31	0.27	5 May	4 May
BAR VB 534	1017	1308	1163	231	3.84	2.83	3.33	0.26	0.35	0.31	28 April	4 May
BAR VB 7034	473	427	450	90	3.05	1.61	2.33	0.32	0.39	0.36	15 May	15 May
BAR VB 7251	532	856	694	138	3.05	2.22	2.63	0.21	0.28	0.25	28 April	1 May
BAR VB 6611	541	471	506	101	2.62	1.86	2.24	0.33	0.39	0.36	15 May	15 May
Newport (STD)	461	544	503	100	2.75	1.66	2.21	0.26	0.35	0.31	28 April	4 May
Mean	667	813	740	--	3.21	2.21	2.71	0.27	0.35	0.31	4 May	7 May
LSD 0.05	237	326	--	--	1.04	0.59	--	0.05	0.03	--	--	--

Table 10. Anthesis date, harvest date, harvest index, lodging rate and plant height of Kentucky bluegrass, 1988 and 1989

Variety name	<u>Anthesis date</u>		<u>Harvest date</u>		<u>Harvest index (%)</u>			<u>First lodging (1988)</u>			<u>First lodging (1989)</u>			<u>Plant height (cm)</u>		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
Caroline	6 June	10 May	12 July	5 July	11	13	12	6 June	45	4	5 July	100	1	69	61	65
Lucia	31 May	10 May	12 July	5 July	10	31	21	6 June	83	4	5 July	100	1	53	41	47
Miranda	31 May	15 May	12 July	5 July	9	20	15	24 June	83	2	5 July	100	1	70	50	60
BAR VB 577	27 May	12 May	12 July	5 July	15	23	19	6 June	68	4	5 July	100	1	64	48	56
BAR VB 534	31 May	8 May	12 July	5 July	13	23	18	18 May	73	3	2 June	100	2	60	47	54
BAR VB 7034	31 May	22 May	12 July	5 July	8	13	11	6 June	63	3	5 July	100	1	69	39	54
BAR VB 7251	31 May	15 May	12 July	5 July	9	20	10	11 May	50	4	26 May	26	3	69	51	60
BAR VB 6611	31 May	22 May	12 July	5 July	10	13	12	6 June	70	4	5 July	100	1	66	39	53
Newport (STD)	31 May	15 May	12 July	5 July	8	17	13	31 May	90	4	5 July	100	1	66	41	54
Mean	31 May	17 May	12 July	5 July	10	19	15	2 June	69	3	28 June	92	1.3	65	46	56
LSD 0.05	--	--	--	--	3	5	--	--	NS	1	--	2	0.3	7	6	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

Table 11. Seed yield, total dry weight, thousand- seed weight, and heading date of orchardgrass, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
BAR OGL 71	1295	1077	1186	91	3.66	4.13	3.89	0.85	0.81	0.83	18 May	15 May
Syn 8501	1192	1695	1444	111	4.14	4.61	4.37	0.84	1.09	0.97	3 May	25 April
DS - 7	1236	1004	1120	86	4.78	4.44	4.61	0.95	1.00	0.98	13 May	15 May
Hallmark	1133	1743	1438	111	5.15	5.20	5.17	0.86	1.02	0.94	30 April	25 April
Paiute	987	1679	1333	103	4.75	4.90	4.82	0.86	1.06	0.96	5 May	25 April
Potomac (STD)	1036	1562	1299	100	4.49	4.57	4.53	0.90	1.01	0.96	3 May	25 April
Mean	1144	1460	1302	--	4.49	4.64	4.57	0.90	1.00	0.95	7 May	2 May
LSD 0.05	209	227	--	--	0.95	0.44	--	0.05	0.07	--	--	--

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Table 12. Anthesis date, harvest date, harvest index, lodging rate and plant height of orchardgrass, 1988 and 1989

Variety name	Anthesis date		Harvest date		Harvest index (%)			First lodging (1988)			First lodging (1989)			Plant height (cm)		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
BAR OGL 71	10 June	31 May	11 July	1 July	18	13	16	17 June	33	3	1 July	68	2	133	124	129
Syn 8501	2 June	10 May	1 July	21 June	15	18	17	10 May	38	3	26 May	100	1	113	125	119
DS - 7	8 June	30 May	11 July	1 July	13	11	12	21 June	45	2	1 July	100	1	134	126	130
Hallmark	31 May	10 May	1 July	21 June	11	17	14	10 May	34	3	26 May	83	2	119	119	119
Paiute	27 May	10 May	1 July	21 June	10	17	14	10 May	36	4	26 May	63	2	121	127	124
Potomac (STD)	23 May	11 May	1 July	21 June	12	17	15	12 May	38	4	26 May	78	2	124	124	124
Mean	1 June	17 May	4 July	24 June	13	16	15	24 May	37	3	7 June	87	2	124	124	124
LSD 0.05	--	--	--	--	2	2	--	--	NS	1	--	NS	NS	10	NS	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

Table 13. Seed yield, total dry weight, thousand- seed weight, and heading date of tall fescue, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
BAR FA 7851	1541	1857	1699	120	4.78	5.21	4.99	2.21	2.34	2.28	7 May	4 May
Barcel	1253	1393	1323	93	5.52	5.45	5.48	2.34	2.65	2.50	13 May	4 May
Syn W	961	1328	1145	81	4.91	5.07	4.99	2.67	2.63	2.65	28 April	27 April
Fawn (STD)	1363	1470	1417	100	5.46	4.96	5.21	2.58	2.84	2.71	27 April	21 April
Trbl	1194	1140	1167	82	3.69	3.10	3.39	2.02	2.31	2.17	13 May	4 May
Mean	1262	1438	1350	--	4.87	4.76	4.81	2.36	2.55	2.46	6 May	30 April
LSD 0.05	NS	262	--	--	1.18	0.68	--	0.21	0.11	--	--	--

Table 14. Anthesis date, harvest date, harvest index, lodging rate and plant height of tall fescue, 1988 and 1989

Variety name	Anthesis date		Harvest date		Harvest index (%)			First lodging (1988)			First lodging (1989)			Plant height (cm)		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
BAR FA 7851	25 May	28 May	7 July	1 July	16	18	17	12 May	44	3	26 May	40	3	120	110	115
Barcel	7 June	30 May	7 July	1 July	12	13	13	12 May	38	4	30 May	25	3	122	118	120
Syn W	31 May	27 May	7 July	21 June	10	13	12	12 May	48	4	30 May	35	3	125	125	125
Fawn (STD)	25 May	12 May	29 June	21 June	12	15	14	12 May	50	4	26 May	50	3	120	123	122
Trbl	31 May	30 May	7 July	1 July	17	19	18	12 May	65	3	1 July	100	2	107	105	106
Mean	30 May	25 May	5 July	27 June	13	16	15	12 May	49	3	4 June	50	3	119	116	118
LSD 0.05	--	--	--	--	5	3	--	--	NS	0.7	--	29	1	11	8	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

Table 15. Seed yield, total dry weight, thousand- seed weight, and heading date of Annual ryegrass, 1988 and 1989

Variety name	Seed yield (lb/a)				Total dry weight (t/a)			1000-seed wt. (g)			Heading date	
	1988	1989	Mean	% Std.	1988	1989	Mean	1988	1989	Mean	1988	1989
Bartolini	1155	934	1045	46	4.03	2.43	3.23	2.48	2.47	2.48	21 May	16 May
Bartissimo	924	566	745	33	4.08	2.66	3.37	2.29	2.23	2.26	20 May	15 May
Bar LM 411	881	354	618	27	3.90	2.11	3.01	2.29	2.31	2.30	20 May	15 May
Bar LM 4990	914	542	728	32	4.15	2.23	3.19	2.37	2.31	2.34	21 May	22 May
Lunar	1427	*	1427	62	5.84	*	5.84	4.49	*	4.49	20 May	*
Marshall (STD)	2712	1877	2295	100	5.99	3.02	4.51	3.07	2.77	2.92	20 May	17 May
Mississippi	*	1510	1510	66	*	2.49	2.49	*	2.75	2.75	*	10 May
Mean	1335	964	1150	--	4.67	2.49	3.58	2.83	2.47	2.65	20 May	15 May
LSD 0.05	608	281	--	--	1.41	NS	--	0.19	0.19	--	--	--

*Variety entered for planting one year only.

Table 16. Anthesis date, harvest date, harvest index, lodging rate and plant height of Annual ryegrass, 1988 and 1989

Variety name	<u>Anthesis date</u>		<u>Harvest date</u>		<u>Harvest index (%)</u>			<u>First lodging (1988)</u>			<u>First lodging (1989)</u>			<u>Plant height (cm)</u>		
	1988	1989	1988	1989	1988	1989	Mean	Date	Area ¹	Score ²	Date	Area	Score	1988	1989	Mean
Bartolini	12 June	31 May	11 July	1 July	14	17	16	12 May	78	3	1 July	50	4	104	82	93
Bartissimo	12 June	31 May	7 July	1 July	10	14	12	12 May	48	4	26 May	40	3	97	80	89
Bar LM 411	7 June	26 May	7 July	1 July	12	9	11	12 May	60	3	1 July	33	3	98	78	88
Bar LM 4990	7 June	31 May	7 July	1 July	10	12	11	12 May	35	4	26 May	45	4	105	82	94
Lunar	7 June	*	7 July	*	11	*	11	12 May	33	3	*	*	*	121	*	121
Marshall (STD)	9 June	2 June	7 July	1 July	20	22	21	12 May	70	4	26 May	43	4	130	89	110
Mississippi	*	28 May	*	1 July	*	23	23	*	*	*	26 May	43	3	*	81	81
Mean	9 June	27 May	8 July	1 July	13	16	15	12 May	54	3	7 June	42	3	109	82	96
LSD 0.05	--	--	--	--	NS	2	--	--	26	NS	--	NS	NS	16	5	--

¹Percentage

²Lodging score 1-5; 1 = no lodging and 5 = flat

*Variety entered for planting one year only.