

PROGRESS REPORT ON SEED PRODUCTION RESEARCH

prepared by

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for

**PRESENTATION AT THE GRASS-LEGUME SEED INSTITUTE
Roseau, Minnesota**

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Weather:

Table 1. Monthly Precipitation at Roseau, MN 1967-1991.

Kentucky Bluegrass:

Table 2. Performance of Kentucky Bluegrass Varieties seeded in 1990.

Table 3. Irrigation effects on Kentucky bluegrass seed yield and seed yield components, 1990-1992.

Table 4. Fertility effects on 5 Kentucky bluegrass varieties in 1992.

Timothy:

Table 5. Performance of Timothy Varieties seeded in spring 1990.

Table 6. Performance of Timothy Varieties seeded in fall 1990.

Other Grasses and Legumes:

Table 7. 1990 National Perennial Ryegrass Test - Winter hardiness, 1992

Table 8. Performance of Perennial Ryegrass Test 1, 1990.

Table 9. Performance of Perennial Ryegrass Test 2, 1990B.

Table 10. Performance of Native Grasses seeded in 1988.

Table 11. Performance of Kura Clover varieties transplanted in 1990.

Kentucky Bluegrass

Abnormally cool, wet conditions in the fall and spring of 1991 and 1992 were generally favorable for Kentucky bluegrass. Several light frosts, limited soil nutrient uptake and wet harvesting conditions limited seed production to widely varying degrees.

Overall seed yields on the experimental plots near Roseau were very high. There were some interesting differences that showed up in the Kentucky bluegrass variety trial seeded in 1990. Earlier varieties generally produced yields that were relatively low compared to later strains. Examples of this are the early strains Park at 636 lb/A and 2405 at 676 lb/A versus later strains Midnight at 1032 lb/A and Abbey at 1204 lb/A. Frost and wet conditions during pollination of these early varieties may explain some of these differences. Other data for this trial is summarized in table 2.

The Kentucky bluegrass irrigation x variety x fertility study was continued in 1992 and data is reported in tables 3 and 4. Irrigation did not produce any seed yield advantage with the exception of the later variety, Midnight. In fact Abbey, Aspen and particularly Park showed a yield decrease. This was probably caused by additional lodging of irrigated plots during pollination and seed set. Dry matter production was increased on all varieties with irrigation.

Nitrogen levels of 150 lb/A produced increases in dry matter on all varieties over the 100 lb/A rate. Seed yield was increased significantly on Abbey with the higher fertility and the other 3 elite varieties (Midnight, Aspen and Rugby) tended to have higher yields also. Park produced slightly higher seed yields with the lower nitrogen level. Split fall and spring applications had a lesser effect but tended to increase yields.

Timothy

Weather conditions were nearly ideal for timothy growth in 1992. Some areas of disease, excess moisture and harvesting difficulty reduced yields in some areas.

Seed yields on the 1990 variety trials were probably as high as can be expected in Minnesota. Almost one half of the varieties yielded over 900 lb/A in the May 1990 planting. Harvest height on many varieties exceeded 50 inches also indicating favorable growing conditions. Data for these trials are in tables 5 and 6.

Perennial Ryegrass

Two perennial ryegrass variety trials were seeded in May 1991 under spring wheat. Yields were good on all varieties but some differences were observed. Data summaries are in tables 7 and 8.

Native Warm Season Grasses

Relatively poor growth and seed yields were noted on the 1988 seeding of warm season grasses in 1992. Cool temperatures produced no mature seed on marginally adapted varieties and reduced yields on others. Many of these strains had produced good yields in 1989-1991, however. Data is presented in table 9.

Kura Clover and Other Legumes

Kura clover, birdsfoot trefoil and other legumes generally produced less than average seed yields in 1992. Lack of warm, dry weather to induce good uniform flowering was the main factor. The 1990 Kura clover seed yield trial has results in table 10. More work is being planned with kura clover to increase seedling vigor and other factors affecting seed yield.

Table 1. Monthly precipitation and average Park Kentucky bluegrass seed yields at Roseau, MN from 1967 to 1990.

Year	MONTHLY PRECIPITATION (inches)												TOTAL	DEPARTURE FROM NORMAL	Park Seed ¹ Yield lbs/A
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC			
1967	1.13	.39	.59	2.89	.89	2.23	4.95	1.69	.83	1.11	.70	1.76	19.16	-1.28	650
1968	.62	T	1.25	.63	1.46	6.47	6.13	8.49	2.35	1.26	1.06	.21	29.98	+9.54	488
1969	3.07	.11	.05	1.27	3.31	2.29	3.70	4.28	3.29	1.91	.30	.73	24.31	+3.87	673
1970	.71	.41	1.38	2.56	5.93	4.07	3.55	.83	2.77	1.49	1.21	.37	25.28	+4.84	492
1971	.54	.13	.26	1.50	2.24	2.29	3.58	.69	3.33	2.97	.29	.50	19.02	-1.42	405
1972	.68	.76	.50	.70	1.66	5.03	1.92	1.53	4.22	1.4	.38	.32	19.10	-1.34	422
1973	.09	.17	1.18	.90	2.46	2.21	4.04	2.09	5.67	1.19	.67	.75	21.40	+0.96	642
1974	.88	.87	.16	2.72	4.12	1.56	2.56	10.97	.42	.66	.15	1.4	26.47	+6.03	504
1975	1.10	.29	.64	1.40	1.52	4.96	2.26	1.75	1.79	1.49	.20	.65	18.05	-2.39	146
1976	1.13	.50	1.05	.77	.54	5.82	1.52	3.72	.34	.07	T	.37	15.83	-4.61	140
1977	.14	.62	1.02	.27	2.43	3.71	2.28	1.74	3.83	.87	2.27	.26	19.44	-1.00	507
1978	.36	.26	.17	1.00	1.97	1.92	6.25	3.25	3.44	.23	.98	.79	20.62	+0.18	415
1979	.50	1.01	1.06	2.77	1.89	1.91	3.7	1.59	.45	1.40	1.02	.16	17.46	-2.98	62
1980	.55	.82	.35	.00	.24	1.75	3.35	5.19	4.12	1.66	.94	.18	19.15	-1.29	625
1981	.27	.16	.66	.56	2.79	6.85	2.63	2.41	3.63	1.75	.90	.99	23.60	+3.16	595
1982	1.30	.45	.74	.24	1.38	2.00	5.53	2.71	1.92	2.91	.46	.57	20.21	-0.23	605
1983	1.31	1.26	1.17	.53	2.76	4.03	1.62	3.34	2.81	2.26	.66	.10	21.85	+1.41	613
1984	T	.95	T	.72	.72	4.46	3.78	.99	.37	4.32	.10	1.02	17.18	-3.26	525
1985	.12	.33	.06	1.07	4.35	4.62	1.08	8.72	1.6	1.04	1.68	.38	25.05	+4.61	488
1986	.30	.90	.26	2.96	1.4	2.43	3.59	2.04	2.52	.65	1.97	.36	19.38	-1.06	288
1987	.47	.30	.10	.59	4.37	2.25	4.8	2.22	.82	.92	.73	.35	17.92	-2.52	152
1988	.60	.09	1.75	.00	1.74	1.34	5.53	1.70	2.24	.12	.77	1.05	16.81	-3.63	320
1989	3.27	.32	2.86	.10	2.82	5.46	1.60	2.56	1.24	.41	.62	.45	21.71	+1.27	160
1990	.55	.20	1.12	1.09	.47	3.19	2.48	.62	.91	.16	.18	.72	11.69	-8.75	210
1991	.56	.64	.58	2.87	3.19	5.94	3.40	1.99	7.42	1.64	1.36	.70	30.29	+9.85	630
1992	.61	.68	.45	2.27	1.99	2.36	2.72	4.51	2.76	.12	1.27	.88	20.62	+0.18	

¹ Seed yield estimates of Park Kentucky bluegrass on 2-4 year old stands at Roseau with 100 lbs/A of nitrogen.

Table 2. Percent heading, plant height, harvest date, lodging, and seed yield for 28 Kentucky bluegrass strains seeded in 1990 on Baumgartner farm - Roseau, MN.

Variety	MSP No.	Percent Heading				Plant height (in.)		Harvest date	Lodging ¹ at harvest	Seed Yield (lb/A)
		5-29	6-5	6-11	6-15	6-19	at harvest			
Abbey	2606	1	14	38	88	27	30	7-13	1.3	1204
Argyle	2694	35	66	99	100	34	35	7-7	3.3	781
Aspen	2608	2	18	43	95	30	30	7-13	1.8	707
Baron	2514	1	9	33	76	23	27	7-13	1.3	1050
Classic	2695	2	19	44	93	28	31	7-11	1.5	818
Columbia	2696	2	21	45	100	31	32	7-14	3.0	560
Compact	2652	0	14	45	93	26	29	7-13	2.8	781
Coventry	2423	0	13	41	95	27	30	7-14	1.0	814
Cynthia	2642	3	20	44	93	24	26	7-13	1.3	939
Rutgers (H86-526)	2641	24	46	64	100	33	33	7-8	4.8	582
Haga	2653	4	25	51	98	31	31	7-13	3.8	644
Hessen	2697	10	32	62	100	29	29	7-9	1.0	583
Julia	2698	10	34	61	100	35	33	7-12	7.8	702
Midnight	2611	0	6	21	58	20	27	7-14	1.8	1032
Minstrel	2643	0	9	25	70	23	24	7-14	2.3	488
Virginia	2659	2	26	53	100	32	32	7-13	4.3	473
Opal	2654	0	13	38	93	27	29	7-13	4.5	874
Park	2556	29	63	100	100	35	35	7-7	3.5	636
Park OT-1	2601	64	99	100	100	36	36	6-29	2.0	528
Park OT-2	2602	61	96	100	100	35	35	6-29	2.5	522
R-740	2665	0	9	33	80	25	29	7-13	1.0	999
R-751A	2666	1	14	38	80	24	27	7-13	1.0	1065
Rugby	2609	2	21	45	98	30	32	7-14	2.8	651
NK60 PRI	2760	16	43	81	100	30	30	7-8	1.3	410
Sophia	2644	8	33	56	98	23	24	7-13	1.5	662
Sydsport	2655	5	23	50	88	27	29	7-12	1.3	705
YO-88	2667	3	26	50	98	31	31	7-13	2.8	593
2405	2692	55	83	100	100	33	33	7-7	5.8	676
LSD at 5% level							3	2	1.7	144

¹1 = no lodging; 9 = severe lodging

Table 3. The effect of irrigation on percent heading, plant height, lodging, harvest date, dry matter production, harvest index and seed yield of five Kentucky bluegrass varieties seeded in 1988 averaged over four fertility treatments. 1992 data + 1990 and 1991 seed yield.

Variety	Irrigation ¹	Percent Heading			Plant Height (in)		Lodging score ² at harvest	Harvest date	Dry Matter Production lb/A	Harvest Index %	Seed Yield ³ (lb/A)			
		6-2	6-5	6-12	6-18	6-8					8-8	1990	1991	1992
Park	Irrigated	48	63	100	100	33	7.6	7-9	4638	16.9	667	434	782	628
	Non-irrigated	46	63	100	100	33	5.7	7-9	4140	21.3	643	255	882	593
Midnight	Irrigated	0	2	33	60	16	1.1	7-16	2623	31.5	488	378	827	564
	Non-irrigated	0	1	29	57	14	1.0	7-16	2266	33.8	385	259	766	470
Aspen	Irrigated	4	12	58	93	25	2.6	7-17	3175	17.3	372	213	550	378
	Non-irrigated	3	8	54	87	22	1.6	7-16	2828	21.1	348	133	597	359
Rugby	Irrigated	4	13	63	96	26	3.2	7-17	3344	18.2	301	249	607	386
	Non-irrigated	2	7	55	92	23	1.3	7-16	2873	21.1	283	155	606	348
Abbey	Irrigated	3	9	46	83	18	1.0	7-15	2883	28.9	736	519	833	696
	Non-irrigated	1	4	43	74	17	1.0	7-15	2873	30.0	702	311	863	625
LSD (0.05)												81	45	175
LSD (0.01)												97	63	246

¹ Irrigated plots received 4 inches of water during September and 6 inches of water during May and June.

² Lodging score: 1 = no lodging to 9 = severe lodging.

³ Seed yields are the mean of 64 samples and are averaged over the four fertility treatments.

Table 4. The effect of nitrogen treatments on percent heading, plant height, lodging, harvest date, dry matter production, harvest index and seed yield for five Kentucky bluegrass varieties seeded in 1988 averaged over two irrigation treatments. 1992 data.

Variety	Nitrogen ¹ Treatment	Percent Heading			Plant Height (in.) 6-8 at harvest	Lodging ² at harvest	Harvest date	Dry Matter Production	Harvest index	Seed Yield ³ (lb/A)		
		6-2	6-5	6-12							6-18	
Park	75# + 25#	46	63	100	100	33	33	6.5	7-8	4322	20.4	882
	100# + 50#	48	62	100	100	32	32	8.3	7-9	4734	17.3	821
	100# Fall	48	64	100	100	35	35	4.3	7-8	3989	20.9	834
	150# Fall	48	64	100	100	33	34	7.5	7-9	4511	17.5	790
Midnight	75# + 25#	0	1	29	58	14	23	1.0	7-17	2393	35.1	840
	100# + 50#	0	1	29	56	15	25	1.0	7-17	2792	29.4	821
	100# Fall	0	3	35	61	15	21	1.1	7-17	2042	35.7	728
	150# Fall	0	1	31	59	16	25	1.1	7-17	2550	31.3	797
Aspen	75# + 25#	4	10	57	93	23	27	1.0	7-17	2477	22.0	544
	100# + 50#	4	13	57	89	24	28	2.8	7-17	3470	17.6	610
	100# Fall	3	10	55	87	22	25	1.0	7-17	2406	23.1	556
	150# Fall	2	9	56	89	24	27	3.8	7-17	3652	15.9	582
Rugby	75# + 25#	3	10	60	94	24	29	1.3	7-17	2777	20.9	580
	100# + 50#	2	9	60	93	25	30	3.8	7-17	3529	17.4	613
	100# Fall	5	12	59	96	23	28	1.0	7-17	2657	21.9	583
	150# Fall	3	9	55	92	26	31	2.9	7-17	3470	18.7	650
Abbey	75# + 25#	4	9	41	77	17	23	1.0	7-15	2609	30.4	794
	100# + 50#	2	6	46	78	19	26	1.0	7-15	3365	27.2	915
	100# Fall	3	8	49	80	15	21	1.0	7-15	2047	33.7	689
	150# Fall	0	4	43	81	19	26	1.0	7-15	3490	28.5	995
LSD at 5% level						1.37	791	7.25	175			

¹ Ammonium nitrate applied in October with split applications made in October and April.

² Lodging score: 1 = no lodging; 9 = severe lodging.

³ Seed yields are the means of 32 samples averaged over irrigation treatments.

Table 5. Percent heading, height, harvest date, and seed yield for 9 Timothy varieties seeded on the Baumgartner farm. Roseau, May 1990.^a

Variety	MSP no.	Percent Heading		Plant Height (in.)		Harvest date	Seed Yield (lb/A)		
		6-11	6-23	6-19	harvest		1991	1992	2 year Avg.
Climax	1743	2	70	38	53	8-10	192	930	561
Comtal	2674	1	63	34	49	8-10	254	855	555
Goliath	2758	5	73	35	46	8-12	227	915	571
Heidemij	1744	0	5	27	48	8-29	406	620	513
Sigma (Mom phl 65)	2658	26	100	40	44	8-9	181	840	511
Chazy (NY83-1)	2656	8	85	42	53	8-8	198	948	573
Tupper (NY83-2)	2657	3	83	39	54	8-9	225	830	528
TM 8501	2634	16	94	41	50	8-8	198	853	526
TM 8601	2649	10	90	39	49	8-9	219	918	569
LSD at 5% level		6	2	2	2	1.7	92	146	

^a Experimental design: RCB with 4 reps.

Table 6. Percent heading, plant height, harvest date and seed yield for 11 timothy strains seeded in August 1990 on Baumgartner farm, Roseau, MN.^a

Variety	MSP No.	Percent heading				Plant Height (in.)		Harvest Date	Seed Yield (lb/A)
		6-11	6-16	6-23	7-6	6-23	at Harvest		
Motim	1595	3	14	45	95	32	49	8-29	687
Climax	2713	4	23	79	100	40	52	8-7	691
Heidemij	2715	0	1	4	50	22	49	8-29	714
SV 8406	2746	10	48	99	100	40	49	8-8	698
SV 8407	2747	16	55	99	100	43	47	8-6	823
SV 8414	2748	15	54	99	100	41	47	8-6	767
SV 8423	2749	17	53	98	100	42	46	8-8	841
SV 8505	2750	10	49	83	100	41	47	8-6	725
Goliath	2758	8	36	83	100	36	46	8-7	778
FFR-TM 8501	2766	14	50	99	100	45	49	8-6	700
FFR-TM 8601	2767	20	61	100	100	44	50	8-3	520
LSD at 5% level		7	10	12	4	2	3	2	121

^a Experimental design: RCB with 4 reps.

Table 7. 1990 National Perennial Ryegrass Test: Winter hardyness - Roseau, 1992

Name	Released ¹	Sponsor	WH Score ²	Turf Rating ³
Accolade	*	O.M. Scott & Son	2.2	5.8
Advent	*	Jacklin Seed Company	1.6	6.3
Affinity		Genesis Group	3.5	6.5
Allegro	*	DFL/Trifolium (USA)	4.3	5.4
APM	*	Jacklin Seed Company	1.8	6.4
Assure	*	LESCO Inc.	3.3	6.4
BAR Lp 086FL		Barenbrug Holland	3.3	5.5
BAR Lp 852		Barenbrug Holland	2.2	5.5
Barrage	*	Barenbrug Holland	4.2	5.4
Barrage ++	*	Barenbrug Holland	2.7	5.6
Brightstar	*	Pure-Seed Testing Inc.	2.8	6.5
C-21		Mid-Valley Ag. Products	2.3	5.5
Caliente	*	Willamette Seed Company	3.4	5.5
Calypso	*	Roberts Seed Company	5.7	5.6
Cartel	*	Cebeco Handelsraad	1.5	4.7
Charger	*	Turf-Seed Inc.	2.3	5.9
Citation II	*	Turf-Seed Inc.	1.8	5.6
CLP 144		Cebeco Handelsraad	1.9	5.2
CLP 39		Cebeco Handelsraad	5.0	5.3
Commander	*	LESCO Inc.	2.0	5.8
Competitor	*	E.F. Burlingham & Son	1.9	5.9
Cowboy II	*	Loft's Seed Inc.	1.0	5.9
Cutless	*	International Seeds Inc.	2.8	5.8
Danaro		Danish Plant Breeding	2.0	5.1
Dandy	*	Medalist America	3.2	6.1
Danilo		Danish Plant Breeding	2.4	5.2
Delray		Northrup King & Co.	1.1	-
Derby Supreme	*	International Seeds Inc.	3.2	5.7
Dimension	*	Advanta Seeds West	1.8	6.0
Duet	*	Cascade Inter. Seed Co.	1.3	5.2
Eagle		Forbes Seed & Grain	3.2	6.3
EEG 358		International Seeds Inc.	2.7	5.8
Elite		Forbes Seed & Grain	2.3	5.8
Envy	*	Zajac Performance Seeds	1.8	6.0
Equal	*	All-Western Seeds	2.5	6.0
Essence	*	International Seeds Inc.	2.7	6.0
Express	*	Pickseed West	2.4	5.9
Fiesta II	*	Pickseed West	3.5	5.8
Gator	*	International Seeds Inc.	3.8	5.7
Gettysburg	*	Cascade Inter./Jon. Green	2.7	6.0
Goalie	*	Medalist America	2.8	4.8
HE 311		Advanta Seeds West	4.3	5.9

Table 7. Cont.

Name	Released	Sponsor	WH Score	Turf Rating
Koos 90-1		John R. Koos & Son	2.3	6.0
Koos 90-2		John R. Koos & Son	2.3	5.9
Legacy	*	LESCO Inc.	2.8	6.2
Lindsay	*	International Seeds Inc.	3.2	5.7
Linn	*		1.0	3.4
Loretta	*	O.M. Scott & Son	4.7	5.2
Manhattan II (E)	*	Turf-Seed Inc.	2.8	5.9
Meteor	*	Cebeco Handelsraad	1.4	4.7
Mom Lp 3111		Advanta Seeds West	3.1	5.0
Mom Lp 3147		Advanta Seeds West	1.7	6.1
Mom Lp 3179		Advanta Seeds West	2.2	4.8
Mom Lp 3182		Advanta Seeds West	1.5	5.2
Mom Lp 3184		Advanta Seeds West	1.0	5.6
Mom Lp 3185		Advanta Seeds West	1.3	5.1
Mulligan		Medalist America	2.4	5.4
MVF 89-88		Mid Valley Farms	1.8	5.6
MVF 89-90		Mid Valley Farms	1.6	5.8
N-33		Normarc Seed Company	2.0	5.9
Navajo	*	Pure-Seed Testing Inc.	2.7	6.1
NK 200		Northrup King & Co.	5.5	-
Nomad	*	Turf Merchants	3.8	6.0
OFI-D4		Olsen-Fennel Seed Company	2.6	5.5
OFI-F7		Olsen-Fennel Seed Company	1.8	5.9
Ovation	*	O.M. Scott & Son	3.7	5.2
Palmer II	*	Loft's Seed Inc.	1.3	6.2
Patriot II	*	Turf Merchants	2.0	5.9
Pebble Beach	*	Finelawn Research	2.0	5.9
Pennant	*	E.F. Burlingham & Son	2.6	5.7
Pennfine	*		1.4	4.9
Pick DKM		Pickseed West	1.8	6.4
Pick EEC		Pickseed West	1.5	6.1
Pick 1800		Pickseed West	3.2	6.2
Pick 89-4		Pickseed West	1.8	6.4
Pick 89LLG		Pickseed West	2.3	6.1
Pick 9100		Pickseed West	2.1	6.2
Pinnacle	*	Normarc Seed Company	1.2	6.3
Pleasure	*	Ampac Seed Company	2.7	5.9
Poly-SH		Turf Merchants	1.5	5.9
PR 9108		International Seeds Inc.	2.5	5.5
PR 9109		International Seeds Inc.	1.8	5.7
PR 9118		International Seeds Inc.	2.3	5.7
PR 9119		International Seeds Inc.	1.0	5.8
PR 9121		International Seeds Inc.	4.2	6.0
Prelude II	*	Loft's Seed Inc.	2.0	6.4
Premier	*	Normarc Seed Company	1.3	5.6

Table 7. Cont.

Name	Released	Sponsor	WH Score	Turf Rating
PS-105		Pro-Seeds Marketing	3.8	6.3
PST-2B3		Pure-Seed Testing Inc.	1.3	6.1
PST-2FF		Pure-Seed Testing Inc.	1.3	6.2
PST-2R0R		Pure-Seed Testing Inc.	1.7	5.9
PST-20G		Pure-Seed Testing Inc.	2.6	5.9
PST-28M		Pure-Seed Testing Inc.	3.1	6.3
PST-290		Pure-Seed Testing Inc.	1.8	6.2
P11-RF3		University of Minnesota	1.2	-
P15-RFP1		University of Minnesota	1.0	-
P15-R3		University of Minnesota	1.0	-
Quickstart	*	Pure-Seed Testing Inc.	1.4	6.3
Regal	*	International Seeds Inc.	1.8	5.5
Repell	*	Loff's Seed Inc.	1.8	5.9
Repell II	*	Loff's Seed Inc.	2.8	6.2
Riviera	*	Roberts Seed Company	3.2	5.7
Rodeo II	*	Turf Merchants	1.1	5.8
Saturn	*	Zajac Performance Seeds	3.7	6.0
Seville	*	Willamette Seed Company	5.0	6.2
Sherwood	*	Jonathan Green & Son	2.1	6.0
SR 4200	*	Seed Research of Oregon Inc.	2.2	6.2
Stallion	*	Finelawn Research	2.3	5.4
Statesman	*	Smith Seed Service	2.3	5.8
Surprise	*	Cebeco Handelsraad	2.4	5.0
Syn-P		Jacklin Seed Company	2.0	6.2
Target	*	Medalist America	1.8	5.9
Taya	*	DFL/Trifolium (USA)	3.7	5.5
Topeka		Smith Seed Service	3.0	5.7
Toronto	*	Advanta Seeds West	2.0	5.2
Troubadour	*	International Seeds Inc.	2.7	5.0
WVPB-89-87A		Willamette Valley Plt. Br.	2.3	6.0
WVPN 89-92		Willamette Valley Plt. Br.	3.0	5.9
Yorktown III	*	Loff's Seed Inc.	2.1	6.4
ZPS-2EZ		Zajac Performance Seeds	1.5	5.7
ZPS-28D		Pure-Seed Testing Inc.	1.4	6.4
ZW 42-176		Green Genetics	3.1	5.7
4DD-Delaware Dwarf	*	Ampac Seed Company	1.8	6.3
89-666		Mid-Valley Ag. Products	3.2	6.3
856		Mid-Valley Ag. Products	2.5	5.4
LSD (0.05)			1.6	0.2

¹Commercially available in the United States in 1992.

²Winter injury score: 1 = dead to 9 = healthy, no injury

³Turf quality rating: 1 = poor turf to 9 = ideal turf, mean of 21 locations in the United States and Canada, 1991 data

Table 8. Percent heading, plant height, harvest date, lodging and seed yield for seven perennial ryegrass strains seeded in 1991 on the Baumgartner farm Roseau, MN. 1992 data (Test 1).¹

Variety	MSP No.	Percent heading			Plant Height (in.)		Harvest Date	Lodging at Harvest	Seed Yield (lb/A)
		6-11	6-18	6-26	6-2	at Harvest			
Brenda	2761	55	85	96	24	28	7-27	7.5	1140
Delray	1585	60	88	100	24	30	7-23	8.3	1276
Goalie	1819	30	58	94	22	29	7-30	8.8	1126
NK-200	2807	1	16	70	23	36	8-7	7.3	1325
Preference	2154	3	18	63	23	34	8-5	7.5	1086
WWE 19	2120	4	23	69	24	35	8-5	8.5	1360
83624	2751	55	78	96	25	29	7-28	8.0	1082
LSD at 5% level						2	5	0.9	199

¹ Experimental design: RCB with 4 reps. Seeded in May under Marshal wheat.

² 1 = no lodging; 9 = severe lodging.

Table 9. Percent heading, plant height, harvest date, lodging and seed yield for six perennial ryegrass strains seeded in 1991 on the Baumgartner farm, Roseau, MN. 1992 data (Test 2).¹

Variety	MSP No.	Percent heading			Plant Height (in.)		Harvest Date	Lodging at Harvest	Seed Yield (lb/A)
		6-11	6-18	6-26	6-2	at Harvest			
WLh4-P	2808	35	63	96	36	39	7-27	2.2	1133
WLP4-a1	2809	30	53	90	30	34	7-27	7.5	1169
WLP4-a4	2810	18	40	88	32	37	7-29	7.5	1434
WLP4-T1	2811	40	63	91	29	35	7-27	8.0	1552
Delray	1585	68	88	100	28	30	7-23	6.5	1041
NK-200	2807	3	26	78	26	35	8-5	7.0	1311
LSD at 5% level						4	2	2	300

¹ Experimental design: RCB with 4 reps. Seeded in May under Marshal wheat.

² 1 = no lodging; 9 = severe lodging.

Table 10. Percent heading, plant height, harvest date and seed yield of thirteen native warm-season prairie grass varieties seeded in 1988 on the Baumgartner (Weilin) Farm, Roseau, MN.^a

Species	Strain	MSP No.	Percent Heading 1992		Plant Height (in) 1992	Harvest ^b date 1992	Lodging 8-22-91	Seed Yield (lbs/A)			
			7-23	8-6				1989	1990 ^b	1991	1992
Big bluestem	Bison (NDG-4)	2435	T	15	55		2.4	152	292	485	
	Bonilla	2434	0	T	52		3.4	87	134	352	
	Kaw	2433	0	0	43		2.8				
Little bluestem	Camper	2436	0	0	36		1.3				
Indiangrass	Holt	2437	0	0	43		1.0				
	Oto	2426	--	--	--		--	--	--	--	
	Tomahawk (ND-444)	2438	0	0	52		2.3	582	562	872	
Side-oats grama	Killdeer	2427	40	100	34	9-23	2.3	265	397	754	
	Pierre	2428	35	100	34	9-23	1.3	439	513	809	
	Trailway	2429	0	0	32		1.0			455	
Switchgrass	Blackwell	2430	0	0	54		3.3		133	254	
	Dacotah (NDG-965-98)	2431	55	100	44	9-23	3.3	136	538	560	
	Forestburg (SD-149)	2432	0	8	51		4.0	--	495	834	

^a Experimental design: RCB with 4 reps

^b 10-9-90 harvest: Forestburg had 30-40% seed shattered and Blackwell had 20-30% seed shattered and seed was not fully mature.

Table 11. Percent stand, vigor and seed yield for 3 kura clover strains transplanted on Baumgartner farm - Roseau, MN in 1990.

Entry	1991			1992				2 year average		
	5/22/91		Seed yield	5/14/92		Seed yield	Spring		Seed yield	
	stand	vigor	8/8	stand	vigor	8/21	stand	vigor	early	late
	%	score ²	--- kg ha ⁻¹ ---	%	score ¹	--- kg ha ⁻¹ ---	%	score ¹	--- kg ha ⁻¹ ---	---
ARS-2678	90	1.8	470	100	2.2	267	95	2.0	368	261
Manero	37	4.3	213	68	4.8	311	53	4.6	262	187
Rhizo	77	3.5	537	83	3.3	206	80	3.4	371	261
LSD (0.05)	8	0.6	106	8	1.0	NS	4	0.5	98	NS

¹ Experimental design: RCB with 3 replicates.

² 1 = most vigorous to 5 = least vigorous.