

PROGRESS REPORT ON SEED PRODUCTION RESEARCH

prepared by

N.J. Ehlike and D. J. Vellekson
Department of Agronomy and Plant Genetics
University of Minnesota
St. Paul, Minnesota 55108

for

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Weather:

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Weather in 1991

The drought of 1990 created very dry soil conditions going into the spring of 1991. Rains in late April and May relieved the dry conditions. Above average rainfall during the summer and fall made 1991 the wettest year since we began keeping records in 1967. Wet fields and standing water in many cases made field operations difficult.

Winter injury was also worse than normal. Stand reductions and poor spring vigor occurred on many less hardy perennials.

Kentucky Bluegrass

Data from the 1987 Variety Trial and the 1988 irrigation x variety x fertility study are reported here. The dry fall and early spring reduced seed yields somewhat. The 1987 Trial had overall low seed yields but differences in some varieties seem noteworthy. MN #2405 (selected from MN #1920) significantly out-yielded Park over the 3 harvest years of the study. Several other new varieties also did well. Seed yields and other data are reported in Table 2. This study will not be continued in 1992. Variety trials were seeded in 1990 and 1991 and yields should be harvested in 1992 on the 1990 Trial.

The Kentucky Bluegrass irrigation x variety x fertility study also had lower seed yields in 1991. Because of the dry conditions in 1990, the irrigated plots produced significantly higher seed yields. Fertility rates did not affect seed yield (Table 3).

Timothy

Mediocre to poor seed yields were observed on Timothy in 1991. Late varieties such as Heidemij were able to utilize later rainfall and produced average yields. Early varieties suffered from dry conditions during seed head initiation and produced poor yields. Winter injury in 1991 and particularly 1990 reduced yields on the variety trials seeded in 1987 and 1988. Data from these trials and the 1990 seeding are reported in tables 4, 5 and 6.

The 1987 trial was discontinued but the 1988, 1990, and the newly seeded 1991 variety trials should be harvested in 1992.

Reed Canarygrass

Data on a residue x fertility study on Venture reed canarygrass is reported in Table 7. Fertilizer level of 160 #/Ac of nitrogen was applied to a portion of this study in an attempt to rejuvenate this 1985 seeding. The higher fertility level showed some benefit but still produced poor seed yields. The study was discontinued in 1991.

Birdsfoot Trefol

Seed yields and percent stands for the 1988 Birdsfoot Trefoil Variety Trial are presented in table 9. Stands were reduced in 1990 and 1991 because of winter injury. Norcen, WIT-II and Empire recovered to produce good yields in our plots. Weed competition in production fields may limit potential for this type of injured stand to recover and produced adequate seed yields.

Kura Clover

Kura clovers persistence, palatability, and forage quality has given it some notoriety as a pasture legume. Seed production of the species has been a serious problem and has limited its availability.

In 1990, 3 strains of kura clover were transplanted at Roseau for evaluation. Winter injury on the variety Manero limited its seed yield in 1991. Rhizo and an experimental strain, ARS 2678, yielded well although the earlier (8/8) harvest date yielded significantly better than the later (8/22) harvest date. This study will be continued in 1992.

Another study investigating the genetic variability of kura clover as it relates to seed production was initiated in 1991. Data from this will be collected in 1992.

Native Warm Season Grasses

Evaluation of 5 species of native prairie grasses seeded in 1987 and 1988 are presented in tables 11 and 12. Higher than optimum amounts of nitrogen seemed to be somewhat of a problem on some of the big bluestem and switchgrass plots. Large amounts of rain and fertilizer carryover from the dry 1990 season probably contributed to excessive nitrogen availability. Good yields were observed, however, and the side-oats grama and Indiangrass yielded exceptionally well.

Seed shattering of these species will be a problem. Our harvesting method prevents much of this loss that would be expected in production fields. Valid relative comparisons can be made, however. The 1988 Trial will be continued in 1992.

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	488
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	673
1971	.54	.13	.26	1.50	2.24	2.29	3.58	.69	3.33	2.97	.29	.50	19.02	-1.42	492
1972	.68	.76	.50	.70	1.66	5.03	1.92	1.53	4.22	1.4	.38	.32	19.10	-1.34	405
1973	.09	.17	1.18	.90	2.46	2.21	4.04	2.09	5.67	1.19	.67	.75	21.40	+0.96	422
1974	.88	.87	.16	2.72	4.12	1.56	2.56	10.97	.42	.66	.15	1.4	26.47	+6.03	642
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	504
1976	1.13	.50	1.05	.77	.54	5.82	1.52	3.72	.34	.07	T	.37	15.83	-4.61	146
1977	.14	.62	1.02	.27	2.43	3.71	2.28	1.74	3.83	.87	2.27	.26	19.44	-1.00	140
1978	.36	.26	.17	1.00	1.97	1.92	6.25	3.25	3.44	.23	.98	.79	20.62	+0.18	507
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	415
1980	.55	.82	.35	.00	.24	1.75	3.35	5.19	4.12	1.66	.94	.18	19.15	-1.29	62
1981	.27	.16	.66	.56	2.79	6.85	2.63	2.41	3.63	1.75	.90	.99	23.60	+3.16	625
1982	1.30	.45	.74	.24	1.38	2.00	5.53	2.71	1.92	2.91	.46	.57	20.21	-0.23	595
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	605
1984	T	.95	T	.72	.72	4.46	3.78	.99	.37	4.32	.10	1.02	17.18	-3.26	613
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	525
1986	.30	.90	.26	2.96	1.4	2.43	3.59	2.04	2.52	.65	1.97	.36	19.38	-1.06	488
1987	.47	.30	.10	.59	4.37	2.25	4.8	2.22	.82	.92	.73	.35	17.92	-2.52	288
1988	.60	.09	1.75	.00	1.74	1.34	5.53	1.70	2.24	.12	.77	1.05	16.81	-3.63	152
1989	3.27	.32	2.86	.10	2.82	5.46	1.60	2.56	1.24	.41	.62	.45	21.71	+1.27	320
1990	.55	.20	1.12	1.09	.47	3.19	2.48	.62	.91	.16	.18	.72	11.69	-8.75	160
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	210

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

Table 2. Mildew reading 1989, percent heading, plant height, lodging score, harvest data and seed yields for 36 Kentucky bluegrass strains seeded in 1987 in the Baumgartner (Weilin) farm, Roseau, MN. 1990 data.^a

VARIETY	MSP	Mildew ^b 6-14-89	Percent Heading 5-23	6-10	Plant Height at Harvest (in) 7-3	Lodging score ^c 1990	Harvest date 6-27-89	Seed Yield (lb/A)			
								1989	1990	1991	3 yr. ave.
2405	2405	0.0	48	96	25	2.0	6-26	327	609	205	380
Abbey	2422	0.0	1	26	14	1.0	7-6	360	321	268	316
BAR VP 264	2391	0.0	1	38	19	1.0	7-6	193	198	120	170
BAR VB 534	2392	0.0	0	24	12	1.0	7-6	333	335	225	298
BAR VB 577	2393	0.0	2	33	11	1.0	7-6	235	430	109	258
Baron	2178	0.0	0	25	13	1.0	7-6	372	285	274	310
Challenger	2289	0.0	--	--	--	1.3	---	250	235	NH ^d	
Cheri	2258	0.0	2	43	15	1.3	7-6	244	434	220	299
Classic	2314	0.0	2	44	17	1.0	7-6	226	254	98	193
Coventry	2423	0.0	0	29	13	1.0	7-6	401	265	183	283
Enmundi ^e	2512	0.0	13	61	21	1.7	6-26	250	288	71	203
Fortuna	2389	0.0	0	24	12	1.0	7-6	375	368	301	348
Glade	1574	0.0	0	5	12	1.0	7-6	235	65	25	108
K3-179	1816	0.7	1	33	21	1.3	7-6	122	129	62	104
Merit	1838	0.0	1	29	13	1.0	7-6	366	288	256	303
Midnight	2317	0.0	3	25	14	1.7	7-6	113	227	143	161
Monopoly	2515	0.0	3	39	21	1.0	7-3	262	198	105	188
NE 80-110 I	2522	0.0	11	68	24	1.3	6-26	241	163	123	176
NE 80-110 II	2523	0.0	10	58	25	1.0	6-26	211	185	103	166
NE 80-110 III	2524	0.0	15	75	24	1.0	6-26	220	234	125	193
NE 80-14 I	2519	2.3	2	36	20	1.7	7-6	205	178	83	155
NE 80-14 II	2520	1.0	1	30	21	1.3	7-6	247	129	65	147
NE 80-14 III	2521	0.0	12	60	21	3.3	6-26	312	337	116	255
NE 80-30	2516	0.0	12	48	11	1.3	7-6	167	263	263	255
NE 80-48 I	2517	0.0	--	--	--	1.0	---	184	184	236	187
NE 80-48 II	2518	0.0	--	--	--	1.0	---	187	235	NH ^d	
NE 80-48 III	2525	0.0	0	35	14	1.0	7-6	294	285	203	261
NE 80-50 I	2526	0.0	1	34	14	1.0	7-6	285	299	198	261
NE 80-50 II	2527	0.0	0	34	14	1.0	7-6	303	274	183	253
NE 80-50 III	2527	0.0	0	34	14	1.0	7-6	303	274	183	253
Newport	2372	0.0	19	68	19	1.0	6-26	449	404	377	410
Nugget	1589	0.0	3	17	9	1.0	7-6	167	116	76	120
Parade	1916	0.0	18	56	21	1.0	6-26	268	252	100	207
Park	2357	0.5	17	74	22	1.7	6-26	181	346	104	210
Park	895	0.1	20	71	24	1.3	6-26	241	363	105	236
Trenton	1810	0.0	4	41	17	1.0	7-6	181	192	111	161
VB-8302	2390	0.0	0	19	11	1.0	7-6	214	172	118	168

LSD at 5% level
1% level

0.5
0.6

1.0
1.0

107
127

72
86

53

^a Experimental design: RCBD with 4 reps. ^b 0 = no mildew, 5 = severe infection. ^c 1 = no lodging, 5 = severe lodging. ^d Not harvested because of poor stands. ^e this entry did not perform as Enmundi no lodging observed in 1991

Table 3. The effect of irrigation on disease ratings, percent heading, plant height, lodging, harvest date, dry matter production, harvest index and seed yield of five Kentucky bluegrass varieties averaged over four fertility treatments.

Variety	Irrigation ¹	Mildew Rating 6-8-91				Percent Heading				Plant Height (in) 6-5 harvest		Lodging score ² 7-2	Harvest date 1991	Dry Matter Production lb/A	Harvest Index %	Seed Yield ³ (lb/A)	
		5-28	6-5	6-14	6-24	6-5	6-14	6-24	6-24	6-5	6-14	6-24	6-24	6-5	6-14	6-24	1990
Park	Irrigated	2.2	85	98	100	100	100	100	26	29	8.2	6-25	3647	11.7	667	434	550
	Non-irrigated	2.1	64	88	100	100	100	100	25	26	2.7	6-26	2310	11.1	643	255	454
Midnight	Irrigated	0.0	1	12	32	84	84	84	9	20	1.1	7-6	2550	15.3	488	378	433
	Non-irrigated	0.0	1	10	26	68	68	68	7	14	1.0	7-6	1692	15.9	385	259	322
Aspen	Irrigated	T	18	37	57	88	88	88	19	22	2.0	7-4	2925	7.4	372	213	292
	Non-irrigated	0.0	16	25	43	72	72	72	15	15	1.0	7-3	1977	7.0	348	133	241
Rugby	Irrigated	0.0	30	52	71	91	91	91	22	25	3.1	7-1	2947	8.4	301	249	274
	Non-irrigated	T	30	40	59	84	84	84	18	19	1.1	7-3	2236	6.9	283	155	219
Abbey	Irrigated	0.0	18	36	59	91	91	91	13	20	1.1	7-4	2769	19.4	736	519	628
	Non-irrigated	0.0	17	27	43	77	77	77	11	14	1.0	7-4	1932	16.6	702	311	506
LSD (0.05)		0.1	5	5	4	4	4	4	1	1	1.4		262	1.7	81	45	
LSD (0.01)		0.2	7	6	6	6	6	6	1	2	2.0		367	2.4	97	63	

¹ Irrigated plots received 4 inches of water during September, 1989 and 4 inches of water during May, 1990.

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. Winter injury, percent heading, plant height, harvest date and seed yields for Timothy strains seeded in 1987 on Baumgartner (Welin) Farm, Roseau, MN^a.

Strain	MSP no.	Winter ^b Injury		Percent Heading		Plant Height (in) at Harvest	Harvest date	Seed Yield (lbs/A)				4 yr ave.
		5-25-90	5-23-91	6-7	6-24	7-11-89		1988	1989	1990	1991	
<u>Early maturity</u>												
Clair	1863	2.5	4.1	80	100	27	7-17	169	352	196	58	194
Climax	1743	2.5	4.5	17	80	32	7-22	127	381	281	50	210
Kampe II	1699	1.9	4.0	37	90	28	7-19	156	332	375	157	255
Mohawk	2209	2.0	4.0	23	68	29	7-19	140	261	457	60	230
Tiller	2418	2.5	4.3	80	100	24	7-17	91	368	198	68	181
<u>Intermediate maturity</u>												
Erecta	1070	3.0	4.2	12	57	27	7-23	136	408	270	80	224
Goliath	2198	2.3	4.0	7	58	27	7-23	123	355	395	56	232
Motim	1702	2.1	4.1	0	18	28	8-8	98	323	357	98	219
<u>Late maturity</u>												
Heidemij	1744	2.4	4.3	0	4	32	8-13	158	221	404	234	254
Hokushu	1511	2.4	3.9	0	7	31	8-13	181	227	475	181	266
LSD at 5% =		0.8	NS					38	60	108	63	
1% =		1.0						51	72	130	86	

^a Experimental Design: RDB with 4 reps.

^b 1 = no injury, 5 = severe injury.

Table 5. Winter injury, percent heading, plant height, lodging, harvest date and seed yield for ten timothy varieties seeded in 1988 on Baumgartner (Welin) farm, Roseau, Mn.^a

Strain	MSP No.	Winter Injury		Percent Heading			Harvest Height	Lodging ^b 6-27-89	Harvest Date	Seed Yield (lb/A)			2 yr avg.
		5-25-90	5-24-91	6-7	6-24	7-10				1989	1990	1991	
Alpha	2564	3.0	3.8	15	60	100	29	2.0	7-23	346	348	105	266
Climax	1743	2.8	3.1	19	80	100	32	1.8	7-25	250	357	114	240
C PhP 15	2590	3.1	3.4	9	78	100	32	1.5	7-25	299	384	152	278
C PhP 16	2591	3.1	2.0	8	74	75	24	1.8	7-18	343	390	219	317
C PhP 17	2592	2.6	2.8	11	71	100	30	1.8	7-24	294	434	201	310
Goliath	2198	2.6	2.8	9	60	100	28	1.0	7-26	332	368	143	281
Heidemij	1744	2.6	3.5	0	5	38	34	1.0	8-12	283	392	219	298
Motim	1702	3.3	3.9	0	14	93	33	1.0	8-12	335	341	140	272
Mom phl 83	2565	3.3	3.6	73	96	100	25	1.0	7-16	290	127	127	181
Senpoku	1703	3.3	3.3	33	80	100	30	1.3	7-17	350	297	201	283
LSD at 5% =		N.S.	1.0					0.9		N.S.	142	85	60
1% =		N.S.								N.S.	171		

^a Experimental design: RCB with 4 reps

^b 0 = no lodging, 5 = severe lodging

Table 6. Winter injury % heading, height, harvest date, and seed yield for 9 Timothy varieties seeded on the Baumgartner (Welin) farm. Roseau, 1990.^a

Variety	MSP no.	Winter injury	Percent Heading		Plant Height (in.)		Harvest date	Seed Yield (#/Ac)
			6-7	6-24	6-24	harvest		
Climax	1743	1.8	18	75	27	36	7-24	192
Comtal	2674	1.6	15	73	25	34	7-25	254
Goliath	2758	1.4	15	66	26	34	7-25	227
Heidemij	1744	1.9	0	10	13	37	8-13	406
Sigma (Mom phl 65)	2658	1.8	75	95	27	32	7-19	181
Chazy (NY83-1)	2656	1.6	50	96	29	37	7-19	198
Tupper (NY83-2)	2657	2.3	43	89	28	36	7-19	225
TM 8501	2634	1.4	60	99	29	35	7-19	198
TM 8601	2649	1.4	48	90	30	35	7-19	219
LSD at 5% level		.4	13	13	2	2	.8	92

^a Experimental design: RCB with 4 reps.

Table 7. Residue management on Venture reed canarygrass seeded in 1985 on the Baumgartner (Welin) farm, Roseau, Mn.

Treatment	* Fert. level	Percent Heading 6-14-90	Plant Height (in) at Harvest	Harvest Date 1990	Seed Yields (lbs/A)				Treat. Avg.	
					1988	1989		1990		1991
						7-9	7-11			
Fall Burn	A	83	43	6-26	18	251	326	90	41	68
	B	77	48	6-26					95	
Spring Burn	A	77	46	6-26	136	338	309	89	80	100
	B	68	49	6-26					119	
Fall Clip/Rake	A	80	43	6-26	32	210	245	66	80	88
	B	76	45	6-26					95	
Fall Rake Off	A	83	46	6-26	31	204	230	115	46	77
	B	58	49	6-26					107	
LSD (0.05)					12	62	87	NS		17

¹ Experimental Design: CRD with 3 reps

* A = 100 + 50 + 50

B = 160 + 80 + 80

Table 8. Percent stand, percent heading, plant height, lodging and seed yield for nine smooth bromegrass varieties seeded in 1988 on the Baumgartner (Welin) farm, Roseau, MN.^a

Strain	MSP No.	Percent Stand 7-20-88	Percent Heading 6-7-90	Plant Height (in) at Harvest	Lodging 7-11-90	Harvest Date	Seed Yield (lb/A)			
							1989	1990	1991	3 yr avg.
Alpha	2559	0	---	---	---	---	NH ^b	NH	---	---
B 19 E	2561	87	75	44	1.5	7-13	740	265	523	509
B 20 E	2562	85	77	45	1.3	7-13	622	263	538	474
Badger	2560	0	---	---	---	---	NH	NH	---	---
Barton	1746	80	70	47	1.3	7-13	575	370	494	480
Jubilee	1999	80	60	43	2.5	7-13	553	239	416	403
Lofar	2596	87	40	41	2.4	7-13	749	464	568	594
Matua	2563	80	---	---	---	---	NH	NH	---	---
Sac	2577	80	85	46	1.3	7-13	629	410	551	530
LSD 5% level					1.0		NS	130	126	

^a Experimental Design: RCB with 4 reps

^b NH = not harvested; poor field establishment of Alpha and Badger; severe winter injury recorded for Matua.

Table 9. Winter injury percent stand and seed yield for six birdsfoot trefoil varieties seeded in 1988 on Baumgartner (Welin) farm, Roseau, MN.^a

Variety	MSP No.	Winter injury ^b 6-14-90	Percent Stand 5-24-91	Seed yield (lb/A)			
				1989	1990	1991	3 yr Avg.
Au-Dewey	2567	5.0	0	577	---	---	---
Empire	1626	3.7	48	638	616	457	570
Mu-81	2414	4.5	18	579	---	---	---
Norcen	2412	2.8	72	470	679	689	613
Viking	1564	4.8	3	587	173	---	---
WIT-2	2604	3.4	40	736	601	793	710
LSD at 5% level				251	217	126	
1% level				N.S.	271	191	

^a Experimental design: RCB with 4 reps

^b 1 = no injury, 5 = severe injury

Table 10. Stand, vigor and seed yield for Kura Clover transplanted on Baumgartner (Welin) farm - Roseau, MN. 1991 data.

Variety	MSP No.	% Stand 5-22	Vigor* 5-22	Seed Yield (#/Ac)	
				8-8	8-22
ARS 2678	2723	90	1.8	419	235
Monaro	2712	37	4.3	190	113
Rhizo	2724	77	3.5	478	267
LSD at 5% level		7.6	.6	94	118

* 1 = most vigor, 5 = least vigor.

Table 11. Percent heading, plant height, harvest date and seed yield of thirteen native warm-season prairie grass varieties seeded in 1987 on the Cenex Farm, Roseau, MN.^a

Species	Strain	MSP No.	Percent Heading		Plant Height (in)		Lodging ^c 8-22-91	Harvest Date 1991	Seed Yield (lbs/A)	
			7-10	8-20	1991 8-20	1990 ^b			1991	2 yr. avg.
Big bluestem	Bison (NDG-4)	2435	3	90	63	2.0	9-9	---	254	---
	Bonilla	2534	0	70	60	2.8	9-9	---	419	---
	Kaw	2433	0	4	62	2.0	---	---	---	---
Little bluestem	Camper	2436	0	1	41	1	---	---	---	---
	Holt	2437	0	10	59	1	---	---	---	---
Indiangrass	Oto	2426	---	---	---	---	---	---	---	---
	Tomahawk (ND-444)	2438	0	100	63	1.5	8-22	544	816	680
Side-oats grama	Killdeer	2427	56	100	45	3.3	8-22	553	883	718
	Pierre	2428	61	100	45	1.5	8-22	---	806	---
	Trailway	2429	---	---	---	---	---	---	---	---
Switchgrass	Blackwell	2430	1	85	60	3.3	---	227	---	---
	Dacotah (NDG-965-98)	2431	55	100	51	4.3	8-22	708	553	631
	Forestburg (SD-149)	2432	11	95	61	3.6	9-9	568	834	701

^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

^c 1 = no lodging, 5 = severe lodging

Table 12. Percent heading, plant height, harvest date and seed yield of thirteen native warm-season prairie grass varieties seeded in 1988 on the Baumgartner (Welin) Farm, Roseau, MN.^a

Species	Strain	MSP No.	Percent Heading		Plant Height (in)	Harvest ^b date	Lodging	Seed Yield (lbs/A)			
			7-10	8-20				1990	1989	1990 ^b	1991
Big bluestem	Bison (NDG-4)	2435	3	62	56	8-22	2.4	152	292	485	310
	Bonilla	2434	0	58	61	9-11	3.4	87	134	352	191
	Kaw	2433	0	3	58		2.8				
Little bluestem	Camper	2436	0	1	44		1.3				
	Holt	2437	0	7	54		1.0				
Indiangrass	Oto	2426	--	--	--	--	--	--	--	--	--
	Tomahawk (ND-444)	2438	0	96	60	8-22	2.3	582	562	872	672
Side-oats grama	Killdeer	2427	59	100	37	8-22	2.3	265	397	754	472
	Pierre	2428	46	100	37	8-22	1.3	439	513	809	587
	Trailway	2429	0	100	41	9-11	1.0			455	
Switchgrass	Blackwell	2430	0	73	58	9-17	3.3		133	254	
	Dacotah (NDG-965-98)	2431	61	100	45	8-22	3.3	136	538	560	411
	Forestburg (SD-149)	2432	6	93	58	9-11	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.