

PROGRESS REPORT ON SEED PRODUCTION RESEARCH

prepared by

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for

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Kentucky Bluegrass

Adequate soil moisture and good seed prices provided optimism in the spring of 1993 for Kentucky bluegrass seed production. Severe powdery mildew in early May made it necessary to treat most acreage with a fungicide. Good control was obtained in most instances. As was the case last year, frost occurred several days and reduced yields in certain areas, especially on the peat soils. Wet conditions during harvest was also a major problem. Fields that did not get burned in the fall will need to be watched carefully in 1994 when heads begin to emerge from the boot. Silvertop, caused by capsus bugs, may need to be treated if damage is excessive.

There are 3 variety trials that have data reported here. Table 2 is a continuation of the 1990 trial. Seed yields are relative to last year but much lower. The 1991 variety trial was harvested for the first time in 1993 and data is in table 3. A variety trial seeded in August, 1992, which would normally not have been harvested for one more year, established well and data was taken and reported in table 4. There are some interesting results here. The common types of bluegrass i.e. Park, Minnifine and Newport, yielded substantially better than some of the elite types such as Midnight and Abbey which often times outyield them in the latter years. With this in mind, a grower may expect a reasonable yield sooner with some of these common types. The Park off-types (OT-433 & OT-422) that were originally taken out of Park as contaminants are included in this trial. They look good here with no mildew and quite reasonable seed yields but have failed to provide good seed production in the 90 & 91 trials. It is possible they get sod-bound more readily than Park. A space plant nursery was established in 1992 to further evaluate these off types.

Table 5 has 5 Kentucky bluegrass varieties under 4 nitrogen rate regimes. The 150#-200# nitrogen rates normally are excessive for optimum seed yield but cool, wet weather may have leached or made it unavailable for uptake. It seems safe to say, however, that the shorter elite types can better utilize nitrogen rates over 100#/AC range. All 4 of these trials will be continued in 1994.

Other Grasses

Two timothy variety trials have data reported on table 5 & 6. Yields are generally good but lodging and wet weather during pollination and filling may have reduced yields. Wet weather during harvest was a major limiting factor in production fields. Two fine fescue variety trials have data to report for the first time. There is some acreage of several of these varieties being commercially produced in northern Minnesota. Herbicides to control quackgrass are now available making this crop feasible to grow. The warm season grasses have done poorly for the second year in a row after three years of good seed production. Unusually cool weather is again to blame. Data collected is reported in table 10.

Kura Clover

Most legume seed production including kura clover, birdsfoot trefoil and alfalfa was very poor in 1993. Cool, wet weather caused lack of insect pollination and good, uniform flowering. A kura clover variety trial was established in 1990 and three years of data are reported in table 12. One problem with kura clover is establishment. It does not seem to compete well with either weeds or a companion crop. A trial to study this problem was initiated in 1992 and the striking difference in seed yield in 1993 is reported in table 11. This study will be repeated in 1994. Other problems with kura clover include weed control, seedling vigor and seed production stands becoming sod-bound, are also currently being worked on.

Table 1. Monthly precipitation and average Park Kentucky bluegrass seed yields at Roseau, MN from 1967 to 1993.

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	-1.71	650
1968	.62	T	1.25	.63	1.46	6.47	6.13	8.49	2.35	1.26	1.06	.21	29.98	+9.11	488
1969	3.07	.11	.05	1.27	3.31	2.29	3.70	4.28	3.29	1.91	.30	.73	24.31	+3.44	488
1970	.71	.41	1.38	2.56	5.93	4.07	3.55	.83	2.77	1.49	1.21	.37	25.28	+4.41	673
1971	.54	.13	.26	1.50	2.24	2.29	3.58	.69	3.33	2.97	.29	.50	19.02	-1.85	492
1972	.68	.76	.50	.70	1.66	5.03	1.92	1.53	4.22	1.4	.38	.32	19.10	-1.77	405
1973	.09	.17	1.18	.90	2.46	2.21	4.04	2.09	5.67	1.19	.67	.75	21.40	+0.53	422
1974	.88	.87	.16	2.72	4.12	1.56	2.56	10.97	.42	.66	.15	1.4	26.47	+5.60	642
1975	1.10	.29	.64	1.40	1.52	4.96	2.26	1.75	1.79	1.49	.20	.65	18.05	-2.82	504
1976	1.13	.50	1.05	.77	.54	5.82	1.52	3.72	.34	.07	T	.37	15.83	-5.04	146
1977	.14	.62	1.02	.27	2.43	3.71	2.28	1.74	3.83	.87	2.27	.26	19.44	-1.43	140
1978	.36	.26	.17	1.00	1.97	1.92	6.25	3.25	3.44	.23	.98	.79	20.62	-0.25	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	-3.41	415
1980	.55	.82	.35	.00	.24	1.75	3.35	5.19	4.12	1.66	.94	.18	19.15	-1.72	62
1981	.27	.16	.66	.56	2.79	6.85	2.63	2.41	3.63	1.75	.90	.99	23.60	+2.73	625
1982	1.30	.45	.74	.24	1.38	2.00	5.53	2.71	1.92	2.91	.46	.57	20.21	-0.66	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	+0.98	605
1984	T	.95	T	.72	.72	4.46	3.78	.99	.37	4.32	.10	1.02	17.18	-3.69	613
1985	.12	.33	.06	1.07	4.35	4.62	1.08	8.72	1.6	1.04	1.68	.38	25.05	+4.18	525
1986	.30	.90	.26	2.96	1.4	2.43	3.59	2.04	2.52	.65	1.97	.36	19.38	-1.49	488
1987	.47	.30	.10	.59	4.37	2.25	4.8	2.22	.82	.92	.73	.35	17.92	-2.95	288
1988	.60	.09	1.75	.00	1.74	1.34	5.53	1.70	2.24	.12	.77	1.05	16.81	-4.06	152
1989	3.27	.32	2.86	.10	2.82	5.46	1.60	2.56	1.24	.41	.62	.45	21.71	+0.84	320
1990	.55	.20	1.12	1.09	.47	3.19	2.48	.62	.91	.16	.18	.72	11.69	-9.18	160
1991	.56	.64	.58	2.87	3.19	5.94	3.40	1.99	7.42	1.64	1.36	.70	30.29	+9.42	210
1992	.61	.68	.45	2.27	1.99	2.36	2.72	4.51	2.76	.12	1.27	.88	20.62	-0.25	630
1993	.68	.05	.27	1.01	1.63	5.06	5.87	4.69	.72	.71	.45	.65	21.79	+0.92	490

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	6-10	6-18	6-18	at harvest			1992	1993	2 yr ave.
Abbey	2606	1	24	100	23	26	7-12	1.0	1204	686	945
Argyle	2694	54	80	100	33	33	7-9	4.3	781	463	622
Aspen	2608	1	29	100	24	26	7-17	1.0	707	278	493
Baron	2514	1	19	98	19	21	7-12	1.0	1050	597	824
Classic	2695	1	35	100	21	24	7-12	1.0	818	537	678
Columbia	2696	4	29	100	26	26	7-14	1.5	560	350	455
Compact	2652	2	25	100	22	26	7-16	2.8	781	470	626
Coventry	2423	0	21	99	21	25	7-17	1.0	814	347	581
Cynthia	2642	1	25	100	17	20	7-12	1.0	939	439	689
Rutgers (H86-526)	2641	30	53	100	26	27	7-9	1.5	582	383	483
Haga	2653	9	41	100	25	29	7-14	1.5	644	383	514
Hessen	2697	20	45	100	23	24	7-12	1.0	583	474	529
Julia	2698	15	45	100	25	27	7-12	3.3	702	359	531
Light	2611	1	10	95	18	23	7-16	1.0	1032	412	722
Minstrel	2643	1	7	95	17	21	7-17	2.0	488	160	324
Virginia	2659	5	34	100	23	26	7-12	2.0	473	203	338
Opal	2654	2	21	100	21	24	7-14	2.5	874	372	623
Park	2556	40	100	100	30	31	7-6	1.0	636	379	508
Park OT-1	2601	55	100	100	31	32	7-5	4.5	528	163	346
Park OT-2	2602	55	100	100	31	31	7-5	5.5	522	180	351
R-740	2665	2	19	100	20	23	7-12	1.0	999	666	833
R-751A	2666	3	24	100	19	22	7-12	1.0	1065	628	847
Rugby	2609	10	35	100	25	25	7-12	1.3	651	334	493
NK60 PRI	2760	11	54	100	25	26	7-12	1.5	410	134	272
Sophia	2644	26	40	100	23	26	7-14	1.3	662	459	561
Sydsport	2655	7	31	100	20	25	7-14	1.0	705	419	562
YO-88	2667	10	43	100	26	26	7-14	2.3	593	312	453
2405	2692	83	100	100	31	33	7-6	1.5	676	588	632
LSD at 5% level		13	12	3	2	3	3	1.9	144	105	

¹1 = no lodging; 9 = severe lodging.

Table 3. Powdery mildew, percent heading, height, harvest date, lodging and seed yield for 24 Kentucky bluegrass varieties seeded on the Baumgartner farm, Roseau 1991.

Variety	MSP#	Mildew 6/17	% heading			Height (In.)		Harvest Date	Lodging ^b at harvest	Seed yield (#/A)
			5-31	6-10	6-18	6-18	at harvest			
Abbey	2606	0	1	19	100	19	27	7-14	1.0	989
Aspen	2608	0	2	25	100	18	22	7-17	1.5	470
BA-13	2822	0.3	2	13	98	15	19	7-14	1.3	644
Baron	2514	0	2	14	95	15	20	7-14	1.3	708 ^c
Blacksburg	2568	0	3	10	93	14	21	7-17	1.0	390
Challenger	2569	0.3	0	23	100	18	23	7-19	1.3	789
Cheri	2607	0	1	14	95	16	21	7-17	1.0	662
Columbia	2570	0.7	1	21	100	21	29	7-17	1.3	555
Compact	2652	0	0	14	98	18	25	7-14	1.0	677
CPP86-14-5	2825	0	0	18	100	18	26	7-18	1.0	548
CPP86-36-6	2826	0	0	18	100	16	20	7-14	1.0	194
Donna (Lucia)	2566	0	5	23	100	16	21	7-14	1.0	608
Four Aces (RE-88)	2823	0	5	29	100	17	25	7-14	1.0	503
Midnight	2571	0	1	9	80	13	19	7-17	1.5	686 ^c
Minifine (2405)	2692	0	85	100	100	29	33	7-8	1.8	508 ^c
Miracle (CPP141)	2594	0	8	31	100	15	20	7-15	1.0	717
Newport	2372	0	12	50	100	21	24	7-14	1.3	570 ^d
Opal	2654	0	2	18	98	17	21	7-14	1.0	519
Park	2556	1.3	28	86	100	29	33	7-9	3.0	548 ^c
Park OT 442	2602	0	80	100	100	31	33	7-8	1.5	254
Park OT 433	2601	0	73	100	100	27	31	7-8	1.5	265
Rugby	2609	0.3	1	24	100	20	25	7-14	1.0	579
Silvia (CPP139)	2593	0	6	43	100	23	28	7-17	2.0	604
Unique (C-76)	2824	0	4	9	88	12	20	7-18	1.0	486
LSD at 5% level		0.4	11	8	5	3	5		1	242

^a 0 = no powdery mildew, 5 = severe powdery mildew.

^b 1 = no lodging, 10 = severe lodging.

^c 2 of 4 plots suffered from standing water. Adding 100# - 150 #/A to the harvested seed yields shown may give a better indication of relative yield.

^d 3 of 4 plots had standing water damage. Adding 200 #/A to the harvested seed yields shown may give a better indication of relative yield.

Experimented Design: RCB with 4 reps.

Table 5. The effect of nitrogen treatments on percent heading, plant height, lodging, harvest date, and seed yield for five Kentucky bluegrass varieties seeded in 1988. 1993 data.

Variety	Nitrogen ¹ Treatment	Percent Heading		Plant Height (in.)		Lodging ² at harvest	Harvest date	Seed Yield (lb/A)
		6-3	6-10	6-18	at harvest			
Abbey	50#	6	26	16	20	1.0	7-14	553
	100#	5	30	18	20	1.0	7-14	663
	150#	1	18	18	25	1.0	7-14	755
	200#	1	20	21	28	1.0	7-14	858
Aspen	50#	6	24	16	20	1.0	7-14	148
	100#	7	30	20	22	1.0	7-14	285
	150#	1	30	23	25	1.0	7-17	230
	200#	5	30	26	28	8.0	7-19	297
Midnight	50#	0	8	13	18	1.0	7-17	375
	100#	0	9	13	18	1.0	7-17	341
	150#	0	3	12	20	1.0	7-19	259
	200#	0	6	14	23	1.5	7-17	451
Park	50#	78	95	28	30	1.3	7-8	248
	100#	70	94	30	32	4.0	7-8	436
	150#	65	95	27	30	8.5	7-14	614
	200#	65	90	29	29	8.0	7-11	530
Rugby	50#	8	31	19	22	1.0	7-14	190
	100#	11	46	22	28	1.0	7-14	382
	150#	6	35	23	29	1.5	7-17	380
	200#	6	35	23	25	5.0	7-19	188
LSD at 5% level								193

¹ Ammonium nitrate applied in October 50# and 100# rates had 4 reps. 150# and 200# rates had 2 reps.

² Lodging score: 1 = no lodging; 10 = severe lodging.

Table 6. Percent heading, height, lodging, 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.) 6-15 harvest	Harvest date	Lodging ^b at harvest	Seed Yield (lb/A)			3 year Avg.
		6-18	6-24	7-1				1991	1992	1993	
Climax	1743	4	45	84	31	8-15	3.0	192	830	401	474
Comtal	2674	9	58	90	30	8-13	6.5	254	763	419	479
Goliath	2758	6	48	78	29	8-12	7.0	227	816	276	440
Heidemilj	1744	0	2	10	23	8-22	8.0	406	553	325	428
Sigma (Mom phl 65)	2658	28	96	100	30	8-11	3.8	181	749	365	432
Chazy (NY83-1)	2656	9	68	100	31	8-13	2.3	198	846	463	502
Tupper (NY83-2)	2657	9	74	98	29	8-14	1.3	225	740	423	463
TM 8601 ^c	2634	21	90	100	31	8-11	1.5	198	760	463	474
TM 8501 ^c	2649	26	88	100	33	8-11	3.5	219	818	347	461
LSD at 5% level		10	11	9	3	3	2	1.7	92	130	92

^a Experimental design: RCB with 4 reps.

^b 1 = no lodging, 10 = severe lodging (Pollination and filling may have been reduced on some varieties with high lodging scores).

^c Data on TM8601 and TM 8501 reported in the 1993 Proceedings was reversed. Data shown here is correct.

Table 7. Percent heading, plant height, lodging, 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.)		Lodging ^b at Harvest	Harvest Date	Seed Yield (lb/A)		
		6-18	6-23	7-2	6-15	at Harvest			1992	1993	2 yr. ave.
Climax	2713	23	75	99	33	52	1.0	8-16	691	642	667
FFR-TM 8601	2767	45	95	100	35	49	1.0	8-5	520	546	533
FFR-TM 8501	2766	38	88	100	37	47	1.8	8-9	700	463	582
Goliath	2758	29	75	100	30	46	1.5	8-9	778	497	638
Midemij	2715	0	7	21	24	47	3.8	8-23	714	361	538
Notim	1595	13	58	84	28	46	2.5	8-19	687	568	628
SV 8406	2746	38	83	100	33	45	2.0	8-9	698	468	583
SV 8407	2747	40	85	100	33	44	1.8	8-9	823	646	735
SV 8414	2748	40	83	100	34	44	2.5	8-9	767	526	647
SV 8423	2749	40	78	100	33	44	2.8	8-9	841	477	659
SV 8505	2750	39	83	100	33	44	1.8	8-9	725	546	636
LSD at 5% level		11	16	5	1	3	1.1	2	121	144	

^a Experimental design: RCB with 4 reps.

^b 1 = lodging, 10 = severe lodging.

Table 8. Percent heading, plant height, harvest date, lodging and seed yield for 13 fine fescue varieties seeded on the Baumgartner farm 1992. 1993 data.

Variety	Species	MSP No.	% heading			Height (in.)		Harvest Date	Lodging ² at harvest	Seed yield (#/A)
			6-3	6-10	6-18	6-18	at harvest			
Aurora	hard	2780	73	100	100	24	31	7-13	1.3	606
Big Horn	sheep	2779	88	100	100	26	29	7-13	4.0	719
Dawson	slender creeping red	2762	26	60	100	27	31	7-21	9.3	478
Dustin	creeping red	2753	3	33	98	27	31	7-20	8.8	1013
Fortress	creeping red	2781	20	50	100	28	31	7-20	7.8	730
Mary	chewings	2853	11	43	100	27	34	7-20	5.3	679
Pascal	creeping red	2754	8	26	93	26	29	7-22	9.5	519 ¹
Pennlawn	creeping red	2768	9	41	100	28	29	7-22	9.0	512 ¹
Shade master	creeping red	2782	30	55	100	29	33	7-21	5.3	868
Shadow	chewings	2783	35	66	100	27	35	7-20	5.0	677 ¹
Sylvester	creeping red	2854	15	39	100	27	32	7-20	9.5	936
Victor	creeping red	2855	10	44	98	27	33	7-20	6.8	717
67135	sheep	2765	95	100	100	29	33	7-20	6.3	673
LSD at 5% level			11	10.4	3.3	2.5	2.6	2	3.1	264

¹ Yields reduced in 2 reps because of excess soil moisture. Adding 150#-200#/A may give a better indication of relative yield.

² Lodging - 1 = no lodging, 10 = severe lodging.

Experimental design: RCP with 4 reps.

Table 9. Percent heading, plant height, lodging and seed yield for 9 fine fescue varieties seeded in 1991 on Baumgartner farm. 1993 data.

Variety	MSP	Species	% heading			Height (in.)		Lodging ¹ at harvest	Seed yield (#/A)
			6-3	6-10	6-18	6-18	at harvest		
67135	2765	sheep	85	100	100	27	33	4.0	437
Aurora	2780	hard	100	100	100	24	30	1.7	841
Big Horn	2779	sheep	100	100	100	24	29	3.3	701
Dawson	2762	slender creeping red	5	22	93	24	30	6.3	214
Justin	2753	creeping red	1	7	70	23	31	6.3	398
Pascal	2754	creeping red	0	2	73	21	27	9.0	80
Pennlawn	2768	creeping red	1	7	80	23	29	6.0	50
Rapid	1988	creeping red	7	25	93	25	30	6.0	588
Ruby	1364	creeping red	7	35	90	23	29	7.0	546
LSD at 5% level			13	12	15	3	4	3.9	239

¹ 1 = no lodging, 5 = severe lodging.
Experimental design RCB 3 reps.

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 (Wein) Farm, Roseau, MN.^a

Species	Strain	MSP No.	Percent Heading		Plant Height (in.)		Harvest date	Lodging	Seed Yield (lbs/A)									
			1993 8-16	1993 2.4	1993 8-16	1993 8-22-91			1989	1990	1991	1992	1993					
Big bluestem	Bison (NDG-4)	2435	75	58	2.4	152	292	485										
	Bonilla	2434	4				51		3.4	87	134	352						
	Kaw	2433	0				44		2.8									
Indiangrass	Holt	2437	0				39		1.0									
	Oto	2426	---				---		---	---	---	---	---					
	Tomahawk (ND-444)	2438	10				44		2.3	582	562	872						
Little bluestem	Camper	2436	0				26		1.3									
Side-oats grama	Killdeer	2427	100				34		2.3	265	397	754	207	94				
	Pierre	2428	93				31		1.3	439	513	809	187	91				
	Trailway	2429	0				25		1.0			455						
Switchgrass	Blackwell	2430	0				46		3.3		133	254						
	Dacotah (NDG-965-98)	2431	100				49		3.3	136	438	560	390	283				
	Forestburg (SD-149)	2432	68				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. Dry weights of kura and weed herbage and seed yield of 'Rhizo' kura clover seeded under 3 base treatments and 2 seeding rate regimes on the Baumgartner farm, May 29, 1992.

Base Treatment	Seeding ^a rate	Herbage dry wt. (gm/ft ²) at harvest		Seed Yield (#/A)
		kura	weeds	
Flax	1	6	14	6
Flax	2	12	14	22
None	1	28	13	45
None	2	40	9	92
Treflan	1	92	8	289
Treflan	2	92	7	309
Wheat	1	4	9	1
Wheat	2	8	17	7
LSD at 5% level		19	10	130

^a 1 = 12" rows @ 1.25 #/A.

2 = 12" rows @ 1.25 #/A + cross seeded at .75 #/A.

Table 12. Percent stand, vigor and seed yield for 3 kura clover strains transplanted on Baumgartner farm - Roseau, MN in 1990.

Entry	1991				1992				1993 8/25	3 yr. Ave. (early harvest)
	5/22/91		Seed yield		5/14/92		Seed yield			
	stand	vigor	8/8	8/22	stand	vigor	8/21	9/3		
	%	score ²	-----#/A-----	%	score ¹	-----#/A-----	#/A			
ARS-2678	90	1.8	419	235	100	2.2	238	231	70	242
KZ-1	37	4.3	190	113	68	4.8	277	221	110	192
Rhizo	77	3.5	479	268	83	3.3	184	197	126	263
LSD (0.05)	8	0.6	95	118	8	1.0	NS	NS	NS	NS

¹ Experimental design: RCB with 3 replicates.
² 1 = most vigorous to 5 = least vigorous.