

Progress Report of Seed Production Research

prepared by

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## Precipitation Records

In Tables 1 and 2 we have presented the monthly precipitation records for Roseau and Warroad for 1966-1977. These were taken from the U.S. Weather Reporting Service. We have our records for the growing season which we have recorded since 1971, but they are not as complete as these.

Also, in Table 1 we have included at the bottom of the table average seed yields of Park Kentucky Bluegrass for years 1968 thru 1977. One must recognize that these yields have been taken from different fields for different years. They have, however, come from similar treatments, and we believe they give a fair indication of the relative yields for those years. The 1968-1975 data were from July-burn, 100 lb/ac Nitrogen fertilized plots at Gus Kveen or Y. B. Magnusson farms. The 1976-1977 data were from plots on the Welin farm.

Interpretation of these types of data is risky, but we suggest that if you study the fall and spring precipitation preceeding a given crop, you will recognize that the yield is dependent upon the precipitation. Naturally, this does not hold 100%, but it seems worthwhile to look at these types of data and note how the seed yield depends on the precipitation.

Table 1. Monthly precipitation at Roseau, MN 1966-1977, with some average Kentucky Bluegrass Seed Yields from 1968-1977.

Month	Years												Average
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	
January	.56	1.13E	.62	3.07	.71	.54	.68	.09	.88	1.10E	1.13E	.65E	0.88
February	.31	.39	T	.11	.41	.13	.76	.17	.87	.29E	.50	.90E	0.40
March	1.70	.59	1.25	.05	1.38	.26E	.50E	1.18	.16	.64E	1.05	1.02	0.82
April	1.63	2.89	.63	1.27	2.56	1.50	.70	.90	2.72	1.40	.77	.27	1.44
May	2.04	.89	1.46	3.31	5.93	2.24	1.66	2.46	4.12	1.52	.54	2.43	2.38
June	3.81	2.23	6.47	2.29	4.07	2.99	5.03	2.21	1.56	4.96	5.82	3.71	3.76
July	3.71	4.95	6.18	3.70	3.55	3.58	1.92	4.04	2.56E	2.26	1.52	2.28	3.35
August	3.30	1.69	8.49	4.28	.83	.69	1.53	2.09	10.97	1.75	3.72	1.74	3.42
September	.99	.83	2.35	3.29	2.77	3.33	4.22	5.67	.42	1.79	.34	3.83	2.48
October	1.17	1.11	1.26	1.91	1.49	2.97	1.40	1.19	.66	1.49	.07	.87	1.30
November	.62E	.70	1.06	.30	1.21	.29	.38	.65	.15	.20	T	.51E	0.51
December	1.70E	1.76E	.21	.73	.37	.50E	.32	.75	1.40	.65E	.37	.85E	0.80
Total	21.54	19.16	29.98	24.31	25.28	19.02	19.10	21.40	26.47	18.05	15.83	19.06	
Departure from Normal -	+1.82	-.56	+10.26	+4.59	+5.56	-.70	-.62	+1.68	+5.48	-2.94	-5.16	-1.93	

E = Estimated rainfall

Kentucky Bluegrass Seed Yields\*

650 448 673 492 405 422 642 504 146 140

\*All from Park Variety, July burn treatment, with 80 to 100 lbs of nitrogen per acre.

Table 2. Monthly precipitation at Warroad, MN 1966-1977

Month	Years												Average
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	
January	.15	.98	.73	1.68	.61	.38	.52	.23	.79	1.49	0.61	.68	0.74
February	.40	.42	.33	.42	.28	.13	.46	.21	.21	.38	.46	.90	.38
March	1.95	.87	1.43	T	1.11	.71	.39	.59	.14	.49	.76	1.32	0.81
April	.92	3.59	1.32	1.09	2.23	.84	.76	1.08	3.79	1.11	.96	.25	1.50
May	1.72	.76	1.78	2.46	3.76	1.74	1.82	1.71	3.71	1.71	.79	3.77	2.14
June	3.54	3.09	6.17	2.18	3.53	4.12	3.62	2.62	.76	6.22	4.71	3.34	3.66
July	3.70	3.41	3.85	3.14	2.78	2.60	.69	4.94	1.16	1.92	1.28	2.98	2.70
August	3.95	1.09	5.94	3.97	1.41	.51	1.50	2.74	5.22	1.26	3.08	1.95	2.72
September	1.24	.28	1.89	1.72	3.74	2.50	4.33	6.17	.63	1.73	.76	3.68	2.39
October	.82	.87	2.89	1.96	2.13	4.18	1.05	2.03	.80	1.47	.26	1.08	1.63
November	.81E	.30	.37	.11	.46	.43	.38	.54	.17	.57	.03	.38E	0.38
December	.82	.89	.14	.55	.88	.35	.40	.61	.67	.57E	.48	.58E	0.58
Total	20.02	16.55	26.84	19.28	22.92	18.49	15.92	23.47	18.05	18.92	14.18	20.91	
Departure from Normal	-.97	-4.44	+5.85	-1.71	+1.93	-2.50	-5.07	+2.48	-3.09	-2.22	-6.96	-.23	

E = Estimated rainfall

## Kentucky Bluegrass Studies

We are reporting data from the 1975 seeding of 47 varieties and the 1975 seeding of four varieties which received two cultural management treatments and three different fertilizer treatments.

The very dry fall (1976) and the dry spring (1977) caused the lowest seed yields of Kentucky Bluegrass we have observed in any of our plots. While the winter was severe and with little snow cover, we did not observe winter kill, per se, in the bluegrass plots. We believe, however, that the very low yields were caused by the very dry conditions of August, September, October and November of 1976 and the continued dry weather in April, May and early June in 1977. Commercial production fields seemed to respond in the same way, very little seed produced.

In Table 4 we present data from the four varieties under three fertilizer and two cultural management regimes. It is apparent that the fertilizer level did not greatly affect the resulting seed yields. In most cases the higher the fertilizer application, the lower the seed yield. While none of the yields are encouraging, the July-burn cultural treatment was superior to the July-clip. This has been observed before. In general, the July-burn treatment is our best possibility for total seed yield for most of the varieties. For some desiccation may be required.

We did not harvest seed yields in the 1976 seedings. The only observation we will make is that in June we sprayed these seedings with an experimental herbicide and observed no deleterious effects, while "pigeongrass" control was excellent. This will not normally be important in our seed fields, but it is of interest to some of us.

Table 3. Vigor, harvest dates and seed yields for 47 Kentucky bluegrass varieties seeded in 1975 on the Welin Farm, Roseau, MN.

Variety	MSP No.	Vigor 5-9-77	1977 Harvest Date	Seed Yields (#'s/ac)		
				1976	1977 2-year average	
Arista	628	3.2	7-7	261	59	160
Adelphi	902	2.4	7-7	74	51	63
Aquilla K8-145	719	3.3	7-7	151	24	88
Baron	804	2.7	7-7	92	95	94
Birka	907	4.1	---	74	---	37
Bonnie blue	908	3.1	---	18	---	9
Cheri	861	2.7	7-7	196	101	149
Cougar	805	2.7	---	149	---	75
Delft	904	3.4	6-28	163	30	97
Emundi	825	3.2	7-7	131	9	70
Enoble	826	3.5	7-7	62	15	39
Enprima	827	3.5	7-1	324	86	205
Fanfare K2-100	720	1.9	6-30	160	89	125
Fylking	862	3.4	6-25	53	9	31
Galaxy	913	3.2	7-7	71	15	43
Glade K2-80	721	2.9	6-28	65	---	33
Golf	882	2.6	7-7	149	83	116
K-412	427	3.8	---	48	---	24
Majestic	909	3.3	7-7	77	15	46
Merion	806	3.7	---	101	---	51
Monopoly	863	3.9	---	273	---	137
Newport	722	2.7	7-7	273	172	223
Nugget	868	2.6	7-7	140	56	98
Olympriasp K2-113	723	3.0	7-7	181	175	178
Onar K3-31	724	4.0	---	199	---	100
Parade K1-192	725	3.1	7-7	137	92	115
Park	895	2.1	6-24	146	190	168
Pennstar	529	3.2	---	36	---	18
Prato	905	3.0	---	45	---	23
Primo	906	3.3	6-25	258	48	153
P-66 K8-176	808	3.5	---	59	---	30

Table 3. (cont.) Vigor, harvest dates and seed yields for 47 Kentucky bluegrass varieties seeded in 1975 on the Weilin Farm, Roseau, MN.

Variety	MSP No.	Vigor 5-9-77	1977 Harvest Date	Seed Yields (#'s/ac)	
				1976	1977 2-year average
Ram I	914	2.8	---	---	43
Ram II	872	3.7	---	---	37
RU-128	828	3.4	---	---	76
RU-178	829	2.7	---	---	24
Sodco	423	3.0	---	---	43
Sydsport	912	2.5	7-7	113	173
Touchdown	873	4.1	---	---	46
Trampas K3-32	726	3.6	6-28	36	67
WW AG 436	627	3.4	---	---	17
WW AG 463	626	3.0	7-7	33	60
Vantage	727	2.5	7-3	21	33
Victa	728	2.6	7-7	104	95
Park	895	1.5	6-23	258	235
K9-49-P124 (Funks)	145	3.1	7-7	80	98
K9-53-P129 (Funks)	146	3.2	7-7	---	39
K9-181-P76 (Funks)	147	3.2	---	---	55
LSD 5% level				49	
1% level				66	

Vigor 1 = most  
5 = least

Table 4. Harvest height (cm) and seed yields for four Kentucky bluegrass varieties with three fertilizer rates and two cultural treatments. Seeded in 1975 on the Welin Farm, Roseau, MN. 1977 data.

Variety	Fertilizer rate	July-burn		July-clip straw raked off	
		Plant height (cm)	Seed yield (#'s/ac)	Plant height (cm)	Seed yield (#'s /ac)
Nugget	75 + 38 + 38	47	43	47	45
	125 + 63 + 63	48	42	50	43
	175 + 88 + 88	47	27	48	34
Park	75 + 38 + 38	70	141	72	107
	125 + 63 + 63	72	126	73	73
	175 + 88 + 88	75	117	72	86
Sodco	75 + 38 + 38	52	25	58	21
	125 + 63 + 63	48	18	55	16
	175 + 88 + 88	53	12	53	19
Sydsport	75 + 38 + 38	57	113	57	91
	125 + 63 + 63	57	65	53	37
	175 + 88 + 88	60	48	55	31

2.5 cm = 1 inch



## Timothy Studies

We are including information from three different Timothy studies. Table 5 reports data from the 1975 variety seeding. The yields are lower than normal, but seem to give relative yield comparisons. A few varieties show more than normal winter injury, although this does not seem to be well correlated with seed yield. The later maturing varieties show higher yields than the earlier ones. We can only speculate as to the cause, but it appears that the later varieties were able to utilize the moisture which came in May and June, to better advantage than the early varieties. Climax, for example, is more than 100 lbs below Heidemij for both 1976 and 1977. There was a moisture deficiency both years, and in both cases there was rainfall in May and early June.

Information from varieties seeded in 1976 is reported in Table 6. Due to several circumstances, seed yields were not obtained from these plantings. There was some winter injury to some varieties but in most cases this did not seem severe. A heavy infestation of pigeongrass dictated that we spray the seeding with an experimental herbicide (HOE 23408) to control this pest. Control was excellent, but there was damage to some strains. There appears to be a significant difference between strains for tolerance to this chemical. This should not be assumed a final conclusion, but it is of interest.

Data from the Variety-Fertilizer-Seeding Rate-Cultural Management study is presented in Table 7. The thick seeding rate and the fall burn treatment were superior. There was no significant difference between varieties, but Heidemij produced as much seed as Climax, and S-48 was not much lower. As indicated for varieties seeded in 1975, it appears that the Heidemij and S-48 varieties were able to better utilize the June precipitation, to produce essentially the same seed yields as the early varieties. Fertilizer rates did not significantly affect the seed yields.

Table 5. Winter injury, % heading, plant height, harvest date and seed yields for 24 Timothy varieties seeded in 1975 on the Welin farm, Roseau, MN.

Variety	Winter injury		Percent heading		Plant height (cm)		Harvest dates		Seed yield (#'s/ac)	
	1976	1977	6/2	6/11	5/13	6/23	1976	1977	1976	1977
Castello	2	4	0	0	25	55	8-9	8-13	571	208
Champ	2	2	2	83	47	95	7-22	7-19	375	175
Climax	2	2	T	75	43	102	7-28	7-23	315	247
Flemar	2	3	0	63	40	87	7-27	7-24	303	250
Gusto	2	2	0	0	37	65	8-21	8-26	285	172
Heidemij	1	2	0	0	30	62	8-9	8-9	511	407
Heilbrink	2	2	10	100	45	88	7-21	7-18	229	178
HJA-1160	2	2	0	40	43	93	7-30	8-1	473	303
Lischower	2	3	4	87	43	92	7-24	7-24	470	193
Megas	2	3	0	4	37	83	8-1	7-29	282	250
Meson	2	3	0	0	32	60	8-11	8-13	476	226
Mom Tim H7	2	2	0	13	40	88	7-29	8-4	574	353
Murra	2	3	T	73	42	97	7-22	7-21	282	160
NK.-Exp. K2-105	2	4	0	10	25	53	8-11	8-15	175	62
NK.-Exp. K2-106	1	4	0	23	23	58	8-9	8-17	184	48
NK.-Exp. K2-107	2	4	0	T	35	65	8-10	8-9	357	300
Pedion	1	3	0	0	28	58	8-10	8-16	416	241
Pet	2	2	T	60	38	93	7-22	7-23	479	205
Piccolo	2	4	0	0	22	60	8-3	8-16	265	18
Resant	2	2	8	87	40	87	7-21	7-18	309	104
Toro	2	2	8	100	47	98	7-21	7-18	279	137
Winda	2	3	0	0	30	55	8-11	8-22	223	149
Mino M4-9329	2	3	0	5	33	70	7-31	8-9	339	190
Verdant NK N7-25-2	2	3	2	67	47	100	7-29	7-25	178	122

LSD at 5% level 156 79  
 1% level 208 106

2.5 cm = 1 inch

Table 6. Winter injury, percent stand, percent heading, height, and tolerance to herbicide HOE 23408 of 24 Timothy varieties seeded on Welin farm, Roseau, MN in 1976. 1977 data being reported.

Variety	Company number	Winter injury	Percent stand	Percent heading		Plant height	Tolerance to HOE-23408	
		5-6	5-6	6-1	6-29	(cm)5-31	7-1	7-12
Climax		1.0	70	T	100	40	3.3	4.3
Evergreen	WW	1.0	53	4	67	32	3.2	3.7
Goliath		1.0	70	0	100	30	2.1	2.7
Goliath		1.0	70	0	83	28	3.2	4.0
Gusto		1.3	57	0	10	20	2.7	1.0
Heidemij		1.0	57	0	50	20	2.4	1.7
Marcia	K4-181	1.3	18	0	75	20	3.0	2.3
Mortel		2.0	12	4	80	17	4.0	2.3
Motim		1.0	60	0	77	28	3.1	2.3
Mom Tim	T-6	1.0	60	0	93	25	2.8	3.3
Mom Tim	W-2	1.0	43	0	22	20	3.2	1.7
Nodora		1.7	7	4	70	12	3.2	1.3
NK-Exp.	K2-105	1.3	32	2	63	25	2.8	1.7
NK-Exp.	K2-106	2.7	8	4	100	15	3.2	2.0
NK-Exp.	K2-107	1.0	60	0	77	25	3.4	3.0
NK-Exp.	K4-216	1.0	60	0	100	35	2.9	4.0
NK-Exp.	N7-126	1.0	60	0	73	38	3.5	4.7
Palermo		3.4	13	27	---	12	4.3	3.3
Phleum boehmeri		2.0	1	0	---	--	---	---
Ramona		2.0	23	33	95	18	3.8	2.7
Rali		1.7	22	23	75	18	3.4	2.7
S-50	N-98	2.0	15	0	83	10	3.2	1.7
Teith		1.0	60	0	100	37	3.3	4.3
Timfor		1.0	63	5	80	38	3.5	5.0

Winter Injury - 1.0 = least  
5.0 = worst

Tolerance - 1 = least  
5 = worst

2.5 cm = 1 in.

Table 7. Percent heading, plant height, lodging, harvest date and seed yields for four Timothy varieties, under three fertilizer rates, two seeding rates and two cultural management regimes. Seeded on Welin farm, Roseau, MN in 1975.

Variety	Fertilizer rate	Seeding rate	% heading		Fall Burn*		Seed yield (#/av)	% heading	Rake off Straw**		Lodging at harvest	Harvest date	Harvest yield (#/ac)
			6-14	7-26	Plant height (cm)	Lodging at harvest			Plant ht. (cm)	Lodging at harvest			
			5-31	7-26	5-31	7-26			5-31	7-26			
Climax	100 + 50 + 50 <sup>+</sup>	Thin	70	115	42	115	348	50	41	111	1	8-1	247
	100 + 50 + 50	Thick	60	115	38	115	405	47	39	115	1	7-29	324
	100 + 50 + 50	Thin	70	118	42	118	265	50	41	113	1	8-3	192
	100 + 50 + 50	Thick	60	115	38	115	400	47	39	114	1	7-31	290
	150 + 75 + 75	Thin	70	117	42	117	253	50	41	112	1	8-3	239
150 + 75 + 75	Thick	60	113	38	113	503	47	39	113	1	8-3	326	
Timfor	100 + 50 + 150 <sup>+</sup>	Thin	80	108	40	108	292	67	43	108	1	7-22	286
	100 + 50 + 150	Thick	75	107	40	107	348	63	44	110	1	7-21	354
	100 + 50 + 50	Thin	80	115	40	115	314	67	43	111	1	7-22	264
	100 + 50 + 50	Thick	75	112	40	112	360	63	44	109	1	7-22	289
	150 + 75 + 75	Thin	80	113	40	113	405	67	43	113	1	7-22	231
150 + 75 + 75	Thick	75	112	40	112	436	63	44	112	1	7-22	332	
Heidemij	100 + 50 + 50 <sup>+</sup>	Thin	0	107	30	107	298	0	31	104	1	8-12	201
	100 + 50 + 50	Thick	0	107	30	107	428	0	33	105	2	8-10	357
	100 + 50 + 50	Thin	0	103	30	103	304	0	31	104	1	8-12	222
	100 + 50 + 50	Thick	0	110	30	110	458	0	33	107	2	8-10	403
	150 + 75 + 75	Thin	0	112	30	112	382	0	31	105	1	8-12	216
150 + 75 + 75	Thick	0	110	30	110	471	0	33	106	1	8-10	406	
S-48	100 + 50 + 50 <sup>+</sup>	Thin	0	107	25	107	308	0	24	102	1	8-19	198
	100 + 50 + 150	Thick	0	105	23	105	397	0	25	104	2	8-19	324
	100 + 50 + 50	Thin	0	105	25	105	232	0	24	103	1	8-19	162
	100 + 50 + 50	Thick	0	103	23	103	384	0	25	103	2	8-19	363
	150 + 75 + 75	Thin	0	105	25	105	326	0	24	101	1	8-19	210
150 + 75 + 75	Thick	0	102	23	102	430	0	25	100	2	8-19	407	

\*Straw and stubble burned after harvest.

\*\*Cut 6"-8" high and straw raked off.

+This treatment applied as split application, one-half in October and second half in April.

2.5 cm = 1 in.

## Timothy Spaced Plants

We have been looking at date of bloom and date of maturity on Timothy Varieties for several years. In 1976 we transplanted approximately 200 plants of each of 12 Timothy Varieties in five replications of 40 plants per replication.

During 1977 we recorded detailed data on this material, including vigor, winter injury, date of heading, date of bloom, date of maturity, average number of heads per plant, average length of heads, grams of seed per plant and seed yield on an acre basis. Here we are presenting only the average date of harvest, date of harvest of earliest and latest plants for a given variety, average heads per plant, average length of head, grams of seed per plant and calculated seed yield per acre.

It is apparent that some varieties contain plants with a wider range of maturity than other varieties. Toro shows 21 days from harvest of first plant to harvest of last plant, Bariton shows 37 days from first to last plant. If we remove a few plants (less than 5%) which are either the earliest or the very latest, we find the range even more striking. Toro would span just nine days and Bariton about 23 days. We believe that all we should show here is that there is a range of maturity in the varieties. We plan to calculate a rather complete analysis of this material, and we will present this type of information later. If this information is valid, it shows the urgency delaying swathing of the later maturing varieties until a higher percentage of the plants (heads) are mature. Too early swathing will cause difficulty in threshing and lower germination.

Table 8. Average, earliest and latest harvest dates; heads per plant, length of heads, grams of seed per plant and seed yields in pounds per acre for spaced plants of 12 Timothy varieties transplanted in 1976 on the Welin Farm, Roseau, MN.

Variety	Harvest dates			Average heads/ plant	Average length of heads (mm)	Seed grams per plant	Seed yield (#'s/ac)
	Average	Earliest	Latest				
Bariton	8-8	7-20	8-26	38	92	8.0	476
Comet	8-17	8-4	8-27	23	94	5.5	327
Evergreen	8-12	8-4	8-27	51	54	1.7	101
Heidemij	8-11	7-26	8-27	37	101	7.3	434
King	8-10	8-3	8-26	43	101	8.2	488
Olympia	8-17	8-4	8-27	24	112	6.4	381
Pastremo	8-17	8-4	8-27	40	113	8.1	482
S-48	8-18	8-6	8-27	26	95	6.4	381
Timo	8-11	8-4	8-27	27	88	5.3	315
Climax	7-28	7-20	8-11	27	70	3.8	226
Clair	7-18	7-14	8-4	16	50	2.2	131
Toro	7-20	7-14	8-4	20	57	2.9	172

### Orchardgrass Strain Trials

We are reporting information from Orchardgrass seeding made in 1975 and 1976. The major information in both of these trials is the winter injury suffered by orchardgrass. The winter was open with little snow cover, and the usual severe winter temperatures. All entries in both trials suffered severe winter injury. A few plots in the 1975 seeding were harvested in spite of the very low seed yields. Yields of strains harvested range from 36 to 60 lbs/ac. This clearly shows the effect of the winter injury.

The varieties seeded in 1976 suffered sufficient injury that none of the entries were harvested.

### Perennial Ryegrass Trials

Several perennial ryegrass trials were seeded in 1976. All material in these trials suffered complete loss through winter kill and no information, other than winter kill note, is available. We made two more seedings in 1977 as this appeared to be an unusual winter and one which should not be considered as normal. Perennial ryegrass has survived previous years and seed yields have been somewhat encouraging.

Table 9. Winter injury and seed yields for 52 Orchardgrass varieties seeded on Welin Farm, Roseau, MN in 1975. 1977 data.

Variety	Company no.	Winter injury (5/9)	Seed yields (#'s/ac)
Avon		4.1	NH
Brace		4.8	NH
Chinook		4.1	NH
Dart		5.0	NH
Dayton		4.3	NH
Fala		4.5	NH
Ferdia		4.8	NH
Felco-LO'L	Dart	4.7	NH
Felco-LO'L	DS-3	4.4	NH
Felco-LO'L	DS-4	4.8	NH
Frode		5.0	NH
Frontier		4.8	NH
Hayking		4.8	NH
Ina	K-88	4.6	NH
Sumas		4.7	NH
Iowa Exp.	I-G	4.8	NH
Iowa Exp.	2-P	4.5	NH
Iowa Exp.	2-P	4.7	NH
Iowa Exp.	2-PR	4.4	NH
Iowa Exp.	2-PR	4.7	NH
Kay		3.9	36
Latar		4.6	NH
Majestic		4.8	NH
Napier		4.6	NH
Nordstern		3.8	36
NAPB Exp.	41.0060	4.8	NH
NAPB Exp.	41.0074	5.0	NH
NAPB Exp.	41.0080	4.7	NH
NAPB Exp.	41.0087	4.7	NH
NAPB Exp.	41.0088	5.0	NH
NAPB Exp.	41.0089	4.8	NH
NAPB Exp.	41.0090	4.8	NH
NAPB Exp.	41.0092	5.0	NH
NAPB Exp.	41.0104	5.0	NH
NAPB Exp.	41.0105	5.0	NH
NAPB Exp.	41.0106	5.0	NH
NAPB Exp.	41.0107	4.7	NH
NAPB Exp.	41.0108	4.7	NH
NK Exp.	K2-7	4.2	NH
NK Exp.	K2-8	3.7	65
NK Exp.	K2-101	4.1	48
NK Exp.	K2-9	4.0	59
NK Exp.	K8-117	3.9	42
NK Exp.	K8-118	3.9	50
NK Exp.	K8-119	4.2	NH
NK Exp.	K8-122	3.9	36
Orbit	K8-120	4.5	NH
Saborto		---	---
Sterling		4.8	NH
Tardus II		4.8	NH
Tarus		5.0	NH
Tenderbite		5.0	NH

Winter Injury - 1 = least  
5 = most

NH = Not sufficient seed to warrant harvesting.



Table 10. Percent stand (1976) and winter injury (1977) for 12 orchard-grass varieties seeded in 1976 on Welin Farm, Roseau, MN.

Variety	Company no.	Percent stand 1976	Winter injury* 5/29/77
Iowa Exp.	2-P-R	90	4.8
Iowa Exp.	Sterling	92	4.6
Land O'Lakes	DS-3	83	4.6
Land O'Lakes	DS-4	83	5.0
Northrup King	K2-7	80	4.7
Northrup King	K2-8	77	4.8
Northrup King	K2-101	83	5.0
Northrup King	K3-9	77	4.8
Northrup King	KC-4	77	4.2
Northrup King	K8-118	83	4.3
Northrup King	K8-120	87	4.5
Nordstern		77	4.4

\*1 = Least injury, 5 = most (100% dead).

## Reed Canarygrass Strains

We continued the 1975 Reed canarygrass strain seeding through 1977. The yields are very low. This appears to be due to the very dry fall (1976) and the dry spring (1977). We will probably continue this seeding through 1978 to determine whether the material can recover after very poor conditions during 1976 and 1977.

Table 11. Winter injury, plant height, harvest dates and seed yields for 10 Reed canarygrass varieties seeded in 1975 on the Welin farm, Roseau, MN.

Variety	Winter injury		1977 Plant height (cm)		Harvest dates		Seed yields (#'s/ac)		
	1976	1977	5/31	6/23	1976	1977	1976	1977	2-year ave.
Caster	2	1	68	152	7-3	6-29	179	54	117
Common	1	1	77	153	7-2	6-29	54	39	47
Frontier	1	1	77	153	7-3	6-29	62	56	59
Minnesota Mn-72	2	1	75	157	7-3	6-29	65	71	68
NRG 721	1	1	80	157	7-4	6-29	173	98	136
PSI	1	1	78	158	7-5	6-29	92	143	118
Phalaris Tuberosa Syn1	5	---	--	---	---	---	---	--	---
Rise	2	1	82	155	7-3	6-29	92	140	116
Iowa RC-1 (Vantage)	2	1	80	152	7-3	6-29	80	92	86
Iowa RC-2	1	1	75	157	7-3	6-29	161	92	127

LSD at 5% level N.S. 60  
1% level N.S. 87

Winter injury - 1 = least  
5 = most injury

## Smooth Bromegrass Variety Trial

We are reporting information from the Bromegrass seeding made in 1975. Smooth bromegrass possesses exceptional winter hardiness and this is clearly shown in this material. There appeared to be no winter injury in any of this material. The maturity of these strains is very similar as indicated by harvest dates of 1976 and 1977. The 1976 seed yields are probably inflated as we did not clean those samples as well as we did the 1977 samples. However, the yields are relative, one to another. Quackgrass essentially prohibits bromegrass production in northern Minnesota, but otherwise this crop appears to have considerable promise for seed production.

Table 12. Winter injury, % heading, plant height, harvest dates, seed yields for 10 Smooth bromegrass varieties seeded in 1975 on the Welin Farm, Roseau, MN.

Variety	Winter injury	Percent heading	Plant height (cm)		Harvest dates		Seed yields (#'s/ac)		
		5/31	5/31	Harvest	1976	1977	1976	1977	2-year ave.
Barton	1	70	87	130	7-19	7-15	725	418	572
Baylor	1	80	88	135	7-19	7-15	986	472	729
Beacon	1	70	92	130	7-19	7-15	855	499	677
Blair	1	73	80	133	7-19	7-15	731	558	645
Brigand	1	60	78	125	7-19	7-15	772	472	622
BSI	1	67	90	143	7-19	7-15	947	472	710
Fox	1	63	87	133	7-19	7-15	817	422	620
NK-Exp. KI-105	1	67	82	138	7-19	7-15	725	270	498
Lincoln	1	90	83	132	7-19	7-15	493	793	643
Sac	1	80	90	135	7-19	7-15	618	413	516
LSD at 5% level							280	129	
1% level							384	185	

## Fescue Trials

Fine Fescues. Winter injury data for two trials seeded in 1975 or 1976 indicate wide differences for winterhardiness in the fine fescues. Winter injury in the 1975 seeding apparently reduced seed production in some strains. Several strains selected by Dr. Don White, Department of Horticulture, showed less winter injury and substantially better seed yield than the other strains. None of the named varieties produced sufficient seed to warrant harvesting in 1977.

Seed yields were not obtained in the 1976 seeding. Apparently the poor establishment and dry weather caused seed production failure. These 17 strains were sprayed with an experimental herbicide (HOE 23408) to control pigeon grass. The control of pigeon grass was excellent and there appeared to be no damage to the fine fescues from the chemical.

Meadow Fescues. The meadow fescues appeared to suffer severe winter injury, resulting in very little, if any seed production. The highest seed yield was 175#'s per acre compared to 967 in 1976. Three varieties were not harvested because of low seed production.

Tall Fescues. Like the meadow fescues, the tall fescues suffered severe winter injury and seed yields were very low, even for strains which produced some seed. All strains suffered injury and some were essentially killed out by the winter conditions.

Six strains seeded in 1976 produced no seed. Again, we assume the dry weather was the primary cause. These strains were sprayed with HOE 2340 and appeared to suffer considerable damage. Unlike the timothy varieties, none of these appear to have escaped at least moderate damage.



Table 14. Winter injury, % stand, % heading and plant height for 18 Fine fescue strains seeded in 1976 on the Welin Farm, Roseau, MN.

Variety	Company number	Winter injury 5-6	% stand 6-6	% heading 6-1	Height (cm) 5-31
Atlanta		3.0	57	0	10
Banner		2.3	67	T	13
Boreal		1.2	80	7	28
Checker		2.4	50	0	12
Durlawn		1.0	77	8	27
Koket		3.4	83	0	12
Menuet		2.9	83	0	13
Dawson		3.1	53	2	18
Festuca rubra commutata		3.1	85	0	13
Festuca rubra		1.6	43	5	20
NAPB	12.004	3.8	70	T	8
NAPB	16.0004	2.9	25	0	8
Festuca ovina duriuscula	67135	1.7	15	33	35
Festuca ovina	66432	2.0	20	40	18
Festuca rubra	6673	1.4	63	13	27
Festuca rubra	66111	1.9	40	17	27
Festuca rubra	66223	1.0	67	10	32
Festuca rubra	67123	1.1	87	10	28

No damage from HOE 23408 (7/1 LJE)

Seed was not harvested from these plots.

Winter Injury 1 = least

5 = most

2.5 cm - 1 inch

Table 15. Winter injury, % heading, plant height, harvest date and seed yields for 1977 and seed yields for 1976 for six meadow fescue varieties seeded in 1975 on the Welin Farm, Roseau, MN.

Varieties	MSP no.	Winter injury 5-99	% heading 5-31	Plant height (cm)		Harvest date	Seed yields (#'s/ac)		
				5-31	6-11		1977	1976	two-year ave.
Bergamo	149	4.1	3	30	58	---	---	366	183
Bundy	148	4.2	0	30	57	7-14	77	485	231
Canada common	152	4.5	2	27	57	---	---	967	484
S-215	151	4.2	0	28	57	7-14	46	604	325
S-53	150	4.4	0	33	50	---	---	268	134
Trader	64	4.0	T	40	67	7-14	175	437	306

Winter Injury - 1 = least  
5 = most

LSD 5% NS 214  
1% NS 305

2.5 cm - 1 inch

Table 16. Winter injury, % heading, plant height, harvest dates and seed yields for 1977, and seed yields for 1976, on 14 Tall Fescue varieties seeded in 1975 on the Welin Farm, Roseau, MN.

Variety	Co. number	MSP no.	Winter injury		Height (cm)		Harvest dates	Seed yields (#'s/ac)		
			5-9	% heading 5-31	5-31	6-11		1977	1976	2-year ave.
Alta		383	4.4	4	25	53	7-14	42	584	313
Festa1		503	4.4	0	33	50	7-14	65	548	307
HG-8013		385	4.3	0	27	35	---	---	317	158
NK	K8-108	386	4.6	0	32	48	---	---	865	432
Kentucky 31		397	4.3	2	32	53	7-14	98	1177	638
Kenwell		537	4.1	4	28	50	7-14	48	758	403
NAPB-Exp.	43.0043	833	4.2	0	28	33	---	---	241	121
	43.0064	834	4.5	0	23	25	---	---	339	169
	43.0070	835	4.6	0	22	25	---	---	335	167
	43.0071	836	4.8	2	30	---	---	---	237	118
	43.0073	837	3.9	17	33	55	7-8	175	731	453
Roze11e		502	4.5	8	35	63	7-14	36	451	244
S-170		505	4.5	3	28	65	---	---	326	153
Kentucky 31		683	4.3	3	33	60	7-14	154	972	564
						LSD	5% level	121	430	
							1% level	169	600	

Winter Injury 1 = least  
5 = most  
2.5 cm = 1 inch



Table 17. Winter injury, percent stand, percent heading, plant height, and tolerance to HOE-23408 for six Tall Fescue varieties seeded on Welin Farm, Roseau, MN in 1976.

Variety	Company number	Winter injury (5-6)	Percent stand (5-6)	Percent heading (6-1)	Height (cm) (5-31)	Tolerance to HOE-23408	
						(7-1)	(7-12)
Kenhy		2.4	83	12	32	4.1	3.3
Alta		2.7	83	30	45	4.1	4.0
NK-Exp.	K2-28	1.0	80	33	43	4.1	4.3
NK-Exp.	K5-27	2.9	70	23	33	4.3	4.7
NAPB-Exp.	43.0043	3.8	70	13	32	4.7	5.0
NAPB-Exp.	43.0064	3.0	80	13	40	3.8	2.3

Winter Injury - 1 = least  
5 = most

2.5 cm = 1 inch

Tolerance - 1 = most tolerant  
5 = least tolerant