1991 Research Report

SMBSC

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Southern Minnesota Beet Sugar Company
SMBSC

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RESEARCH SUMMARY

1. Variety Evaluation. Twenty-one varieties were approved for planting during the 1991 growing season including six test market varieties and two special use varieties. Eight of the twenty-one varieties have been on the list for two years or less. There were seven new varieties approved for planting in 1991 including the test market varieties.

2. Date of Harvest Summary. A summary of data from 1989 to 1991 indicates that there is a difference among varieties in ability to accumulate relatively high levels of sugar at different time intervals throughout the harvest season.

3. Sugarbeet Plant Population Study. Plant populations of 100, 125, 150, 175, and 200 were evaluated for relative root and quality data. Gross return was highest when populations were between 100 and 150 plants per 100 ft. Plant populations of 175 or greater were signficantly lower in yield, quality and expected returns.

4. Side Dress Nitrogen Influence on Relative Quantity and Quality. Nitrogen was side dressed at 0, 40, and 80 pounds per acre in late July. The data indicated that there was no advantage to addition of nitrogen at this time in the season. However, an earlier application may have been more advantageous. The nitrogen that was added may have been leached out of the root zone due to the high amounts of precipiation received.

5. Fertilization According to Soil Test Recommendations. Fertilizer was applied with commercial applicators at six rates based on a percent of the soil test recommendations. The experimental results deviated from the normal trends; however, the highest recoverable sugar per acre and return per acre was generally produced by a fertilizer rate within plus or minus 25 percent of 100 percent of the recommended rate.

6. Tachigaren for Control of Root Rot in Sugarbeets. Sugarbeet stand count significantly decreased over time regardless of treatment. However, stand count was signficantly increased for each 15 g/kg increase of tachigaren at 4-5 weeks after planting.

7. Delayed Control of Cover Crop Effect on Sugarbeet Quality and Quantity. All treatments applied within the first three weeks were not signficantly different except when Poast plus oil or Poast plus oil plus 28% N were applied on oats at the three week treatment. The data indicates that control of cover crop regardless of treatment should be conducted within three weeks after sugarbeet emergence.

8. Multispecies Evaluation of Postemergence Broadleaf Herbicides. Velvetleaf, and wild mustard control was good when DPX-66 was applied with Betanex or Betamix. Redroot pigweed tended to best be controlled by Betanex and Stinger applied at the second application of a Betanex split application or by Betanex at .25 and

.33 (split application) and DPX-66 at .031 twice. Kochia control was not adequate regardless of treatment. Further research with DPX-66 for kochia control will be conducted since good kochia control was obtained in the RRV.

9. Common Cocklebur Control with Postemergence Herbicides. Common cocklebur control was highest when clopyralid was applied alone or in mixture with other herbicides. In absence of clopyralid common cocklebur control did not exceed 35 percent.

10. Wild Buck Wheat Control with Postemergence Herbicides. The highest wild buck wheat control was obtained when endothal and clopyralid were applied alone or together and wild buck wheat was 1.5 to 3 inches tall. All other treatments did not give adquate control of wild buck wheat.

11. Buffalobur and Green and Yellow Foxtail Control with Postemergence Herbicides. Desmedipham applied with DPX-66 at .0156 gave 96 percent control of Buffalobur. This treatment was significantly better than all treatments except when DPX-66 was applied with desmedipham. DPX-66 plus desmedipham gave the highest control of green and yellow foxtail at 86 percent.

12. Common Lambsquarter and Redroot Pigweed. The highest degree of control was obtained with a desmedipham and DPX-66 combination in a split application. This combination tended to give the best control regardless of the weed in question.

13. Cercospora Leaf Spot Efficacy Trial. Supertin treatments were among the best treatments, regardless of the rate. Topsin looked the best, but would **not be recommended** as a primary treatment. Mancozeb treatments gave good control as well as the Rohm and Haas experimental (Rh7592).

14. Disease Index Summary. A cercospora model was again used to determine relative activity of the leaf spot spores at three locations throughout the Southern Minnesota Sugar Coop growing area. Hourly temperature and relative humidity readings were used to calcuate infection potential. Accurate measurements of conditions favorable for leaf spot spore germination and infection will enable growers to apply fungicide when spores are most active.

15. 1991 Harvester Comparison. Harvester performance data was collected for all growers in the Southern Minnesota Sugar growing area. The harvester data is presented combined over four and six row harvesters. Averages are presented for % first dirt, % tare and total dirt. Ranges for % tare and total dirt are also included. The harvester data is also separated by receiving station for comparison.

16. Weather Data for 1991. The growing season for 1991 was relatively wet throughout the growing area with approximately 30 to 40 inches of rain received from April 1 to October 31. The large amount of moisture received contributed to root rot, late planting dates, cercospora leaf spot and ultimately lower yields.

SOUTHERN MINNESOTA SUGAR COOP PRODUCTION RECORDS

A recap of the production records since 1975 is summarized in Table 1. The estimated planted acres for 1992 and 1993 assumes a + 2% planting tolerance from stock acres.

Planted acres have almost doubled since 1975. This increase is directly attributable to increase in tons sliced per day and other efficiencies gained by improvement in the factory. Also, growers have made the necessary adjustments in production practices to achieve a relatively high level of sugar content by mid-September.

Estimated production for 1992 is projected at 1,700,000 net tons and average slice/day at 9,000 tons, which equates to 175-178 day slice campaign. Pre-pile would begin the first week of September and continue for approximately 30-32 days.

For 1993, production is estimated at 1,905,000 net tons and daily slice at 10,000 tons, which gives a slice campaign of 179-180 days. Harvest will be scheduled near the first of September so that slice can be completed by March 1.

The beet quality for Southern Minnesota Sugar Coop since 1985 is shown in Table 2. Average sugar content is 16.2 for this time period. The relatively low sugar contents for 1990 and 1991 are directly related to significant replants (1990) and general plant stress due to excess soil moisture (1991). Also, as harvest season begins in early September, a larger percentage of the crop is harvested at relatively lower sugar contents.

Percent loss to molasses (LTM) is driven primarily by crop maturity and availability of nitrogen. The relatively high percent LTM in 1988, 1989 & 1990 was a result of significant replanting and ultimately, shorter growing season (1988 and 1990), and late rains in September 1989 following an extended dry period. This made excessive nitrogen available late in the growing season, and had a depressing effect on beet quality.

The speed of harvest is shown in Table 3. The data shows percent of the crop that was harvested during prepile and then weekly until the end of harvest. On average the Coop has harvested 15.5% of the crop by October 6. The growers harvested an average of 53.6% of the crop by October 13, and 83% by October 20.

Weekly average sugar content is shown in Table 4. On average, the Coop had an average sugar content of 16.22%.

A summary of the prepile harvest records is shown in Table 5. On average, prepile began on September 15 and continued for 21 days in which growers delivered over 14% of the crop. Average sugar content at the end of prepile was 14.78%. Percent sugar on the first day of full harvest was 16.2%, which is also the average final percent sugar at the completion of harvest.

TABLE 1. HISTORIC DATA FOR SOUTHERN MINNESOTA SUGAR COOP, 1975–1991

YEAR	PLANTED ACRES	REPLANT ACRES	HARVEST ACRES	NET TONS	AVG. T/A	AVG. SUGAR	AVG. LTM	DAYS OF SLICE	TONS SLICED/ DAY
1975	49273		48536	766743	15.79	14.41		145	3196
1976	54784		50209	537361	10.71	15.21		106	4966
1977	51614		49345	986056	19.98	14.11		193	4810
1978	51913		50311	916625	18.22	14.48		157	5492
1979	52061	948	48425	727124	15.02	15.88		134	5162
1980	58105	510	57711	948767	16.44	15.53		154	5753
1981	59051	5456	57484	848808	14.77	13.04		157	5088
1982	54095	262	53422	1153158	21.59	15.36		185	5776
1983	57308	1100	56084	1083689	19.32	14.61		150	6697
1984	57240	6500	54085	948553	17.54	15.49		135	6151
1985	59703	7082	58897	1279935	21.73	16.21	1.204	167	6985
1986	66635	4150	65412	986846	15.09	16.22	1.201	121	7745
1987	66860	1450	66488	1498024	22.53	16.98	1.301	197	7158
1988	70646	42000	69500	1229526	17.69	17.15	1.468	159	7154
1989	74943	11000	74040	1507224	20.36	15.91	1.484	172	8013
1990	80783	40350	78781	1411200	17.91	15.63	1.348	161	8283
1991	82285	7600	79672	1304039	16.37	15.42	1.221	146	
1992	(87563)								
1993	(102000)								

TABLE 2. BEET QUALITY ANALYSIS, SMSC, 1985–1991					
YEAR	AVERAGE % SUGAR	AVERAGE PPM POT.	AVERAGE PPM SODIUM	AVERAGE AM N	AVERAGE % LTM
1985	16.21	2313	304	209	1.204
1986	16.22	2363	324	185	1.201
1987	16.98	2400	339	344	1.301
1988	17.15	2433	268	394	1.468
1989	15.91	2234	422	402	1.484
1990	15.61	2052	557	296	1.348
1991	15.42	1908	460	270	1.221

TABLE 3. COMPARATIVE HARVEST SUMMARY, 1985–1991

TONS* HARVESTED BY WEEK

HARVEST	1985		1986		1987		1988		1989		1990		1991		AVERAGE	
PERIOD	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%
START – 10/06	176680	13.7	147860	14.9	289128	19.3	80992	6.6	318594	21.1	252550	17.8	167690	12.8	204785	15.5
10/07 – 10/13	182244	14.1	349263	35.2	534053	35.6	545308	44.3	728313	48.2	554348	39.1	632102	48.4	503662	38.1
10/14 – 10/20	269976	20.9	383746	38.6	453468	30.2	520558	42.3	344987	22.8	374776	26.4	365074	27.9	387512	29.3
10/21 – 10/27	511174	39.6	105784	10.6	214117	14.3	85076	6.9	117130	7.8	230266	16.2	142193	10.9	200820	15.2
10/28 – END	152254	11.8	6887	0.7	11195	0.7	0	0.0	1890	0.1	5758	0.4	0	0.0	25426	1.9
TOTALS	1292328	100	993540	100	1501961	100	1231934	100	1510914	100	1417698	100	1307059	100	1322205	100

* TONS HARVESTED ARE NOT ADJUSTED FOR FINAL DIRT PERCENTAGE

TABLE 4. COMPARATIVE HARVEST SUMMARY, 1985–1991

% SUGAR BY WEEK

	1985		1986		1987		1988		1989		1990		1991		AVERAGE	
HARVEST PERIOD	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU
START – 10/06	14.66	14.55	15.25	15.36	16.58	15.89	16.12	16.18	14.08	14.47	13.60	13.79	13.78	13.66	14.87	14.84
10/07 – 10/13	16.19	15.36	16.21	15.91	17.36	16.88	17.05	16.97	16.24	15.71	15.86	15.21	15.47	15.09	16.34	15.88
10/14 – 10/20	16.21	15.74	16.46	16.15	17.16	16.98	17.33	17.13	16.45	15.89	16.18	15.50	15.77	15.33	16.51	16.10
10/21 – 10/27	16.57	16.11	16.55	16.21	16.95	16.98	17.52	17.16	16.52	15.93	16.33	15.62	15.65	15.41	16.58	16.20
10/28 – END	16.72	16.20	16.79	16.21	16.85	16.98	—	17.16	16.45	15.93	16.14	15.63	15.83	15.42	16.46	16.22
TOTALS		16.20		16.21		16.98		17.16		15.93		15.63		15.42		16.22

TABLE 5. HARVEST SUMMARY, 1985–1991

PRE–PILE HARVEST

VARIABLE	1985	1986	1987	1988	1989	1990	1991	AVERAG
BEGINNING DATE	09/14	09/27	09/01	10/03	09/06	09/10	09/19	09/15
LENGTH (DAYS)	23	9	37	5	30	28	18	21
TOTAL NET TONS *	176680	92586	289726	80976	278579	252550	167690	191255
% OF TOTAL TONS	13.8	9.4	19.3	6.6	18.5	17.9	12.9	14.1
AVERAGE % SUGAR	14.55	15.10	15.89	16.28	14.21	13.79	13.66	14.78
% SUGAR ON FIRST DAY OF FULL HARVEST	16.07	15.8	17.46	16.71	16.3	15.95	15.3	16.22
% FINAL SUGAR	16.21	16.22	16.98	17.15	15.91	15.63	15.42	16.22

** BEFORE FINAL DIRT ADJUSTMENT*

FUTURE CONSIDERATIONS

The planting tolerance is projected to be 87,560 acres in 1992 and 102,000 acres in 1993. Based on the past seven years, and expected slice rates for the next two years, growers should plan on a 30-35 day prepile. Approximately 18-20% of the crop could be harvested during this period.

Growers should make plans in the spring to deliver high quality beets during prepile. Fields for prepile should be fertilized for 17-18 tons/acre, plant varieties that tend to accumulate high sugar early in the season, and confirm these plans by taking samples during August to check the relative maturity.

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PLANNED RESEARCH 1992

The growing season of 1991 was complicated by many sugarbeet production problems. Probably the largest of these problems was the infection of root rots brought to the extreme in some cases by the large amounts of precipitation received in the spring of 1991 in portions of the growing area. Research pertaining to the control or suppression of root rot will be the main emphasis in 1992. Seven sites for root rot research were implemented in the fall of 1991. This research will include a wide range of treatments and will be very labor intensive. Since root rots in general are the main perennial production problem in Southern Minnesota Sugar Cooperative's growing area an increased emphasis will be put into this area for 1992 and beyond.

However, there are many other areas that cannot and will not be forgotten. Research pertaining to control of sugarbeet root aphid needs to be set high on our list of priorities. The application of insecticides in commercial field trials needs to be pursued further. Resistant or tolerant varieties need not be forgotten. Continued research on the host and life cycle will be conducted.

With the increase in acres being on the horizon, research considering the concept of harvesting annually in late August or early September need to be conducted. This will entail research considering super high sugar varieties as well as varieties that reach maximum production early. Fertility programs will have to be researched more in depth considering rates of fertilizer dependent on planting dates and projected harvest dates.

Research regarding weed control and herbicide persistence will be continued. Evaluation of some new herbicide compounds as well as old compounds will be conducted. The persistence of herbicide compounds detrimental to sugarbeets will be continued and expanded to include more factors than have been considered in the past. Factors such as climatic conditions, soil types, and tillage types will be attempted.

Cercospora leaf spot research will be conducted in the Southern Minnesota Sugar Cooperative's growing area in 1992. This research will entail efficacy trials, and operation of remote weather station for the leaf spot model. Portable (hand held) cercospora leaf spot monitoring devices will also be evaluated.

Specific treatments and additional projects may be included in response to the growing season and environmental conditions. The success and completion of this research will depend on the available time and equipment and cooperation among growers, industry representatives, and Southern Minnesota Sugar Cooperative's Agricultural staff.

VARIETY EVALUATION

Twenty-one varieties were approved for planting in the 1992 growing season. Six test market varieties, ACH 890126, Hilleshog 7003, KW 1800, KW 3580, KW 6770 and VDH H66140 and two special use varieties ACH 176 and 205 were also approved. The introduction of VDH H66140 is a introduction of two types, one of a new variety and another of a new seed company (Van Der Have) to Southern Minnesota Sugar Cooperative growers.

The approved varieties for Southern Minnesota Sugar Cooperative since 1980 are listed in Table 1. Maribo Ultramono is making an appearance on the list for the tenth consecutive year. KW 3265 has been on the list for the last six years. These two varieties (Maribo Ultramono and KW 3265) are making the last appearance on the list since they did not meet the requirements for approval this year. A policy put into effect this year states that "A variety can be sold one year past the testing year in which the elimination decision was made".

Eight of the twenty-one varieties have been on the list for two years or less. This indicates a fairly rapid turn over of the varieties. However, four varieties have been on the list for five to six years and six for greater than five years. Some of these varieties are varieties that are considered standards.

A comparison of the average sugar/acre, sugar/ton, tons/acre, percent sugar and leaf spot rating for past 12 years for all approved varieties are listed in Table 2. These indicate an increase in production of sugar/acre as well as the factors influencing sugar/acre.

The original seed issued to Southern Minnesota Sugar Cooperative growers in 1991 was 156,440 lbs. and replant seed amounted to almost 14,660 lbs. The majority of the replant seed was issued to the eastern area growers as was the case in 1990. The pounds of seed issued in previous years is listed in Table 3. Tables 4 and 5 list the three year performance of the 21 approved varieties plus the test market varieties. Coded trial results for all varieties evaluated for the past three years are listed in Tables 8 through 13.

The most popular varieties planted in 1991 were:

- Hilleshog 5135
- KW 2398
- KW 3265
- ACH 198
- KW 3145

Southern Minnesota Sugar Cooperative

List of Approved Varieties Since 1980

Table 1.

1980	1981	1982	1983
Beta 1443	Beta 1443	Beta 1237	Beta 1237
Beta 1345	Beta 1345	Beta 1230	Beta 1230
Beta 1237	Beta 1237	Mono-Hy R1	Mono-Hy R1
Mono-Hy R1	Beta 1230	Mono-Hy M8	Mono-Hy M8
Mono-Hy E4	Mono-Hy R1	Mono-Hy M7	Mono-Hy M7
BJ Monofort	Mono-Hy M8	Mono-Hy E4	BJ Monofort
Holly HH33	Mono-Hy M7	BJ Monofort	ACH 14
ACH 14	Mono-Hy X73	Holly HH33	ACH 30
ACH 12	ACH 14	ACH 14	Maribo Ultramono
ACH 17	ACH 151	ACH 17	
ACH 30	ACH 30	ACH 145	
	Maribo Unica		
	Maribo Ultramono		
	BJ Monofort		

1984	1985	1986	1987
Beta 1230	Beta 1230	Beta 1230	Beta 1230
KW 3394	KW 3394	Beta 6264	Beta 6264
BJ Monofort	KW 1132	KW 3394	Beta 5494
Mono-Hy R1	BJ Monofort	KW 1132	KW 3394
Mono-Hy M7	Mono-Hy R1	KW 3265	KW 1132
ACH 30	Mono-Hy M7	BJ Monofort	KW 3265
ACH 145	ACH 30	BJ 1310	BJ Monofort
ACH 154	ACH 145	Mono-Hy M7	BJ 1310
Maribo Ultramono	ACH 154	ACH 30	Mono-Hy M7
	Maribo Ultramono.	ACH 146	Mono-Hy R103
	Maribo 401	ACH 164	Mono-Hy R117
		Maribo Ultramono	ACH 164
		Maribo 401	Maribo Ultramono
		Maribo 403	Maribo 403
			Hilleshog 4046
			Hilleshog 5090
			Hilleshog 5135
			Mitsui Monohikari

Southern Minnesota Sugar Cooperative

List of Approved Varieties Since 1980

Table 1. (cont.)

1988	1989	1990	1991
Beta 1230	Beta 6625	Beta 6625	Beta 6625
Beta 6625	Beta 6269	Beta 6269	Beta 6269
Beta 3614	Beta 3614	Beta 3614	Beta 1238
KW 3265	KW 3265	KW 3265	Beta 2988
KW 1014	KW 1014	KW 1014	Beta 5657
KW 1132	KW 3145	KW 3145	KW 3265
KW 3145	KW 3394	KW 3394	KW 2398
KW 6264	Mono-Hy R103	Maribo Ultramono	KW 3145
KW 3394	Maribo Ultramono	Maribo 403	Maribo Ultramono
BJ Monofort	Maribo 403	Maribo 411	Maribo 403
BJ 1310	Maribo 411	Maribo 875	Maribo 875
Mono-Hy R103	Hilleshog 4046	Hilleshog 4046	Hilleshog 2401
Maribo Ultramono	Hilleshog 5090	Hilleshog 5090	Hilleshog 5090
Maribo 403	Hilleshog 5135	Hilleshog 5135	Hilleshog 5135
Maribo 411	Mitsui Monohikari	HM 2410	Mitsui Monohikari
Hilleshog 4046	ACH 164	Mitsui Monohikari	ACH 194
Hilleshog 5090	ACH 198	ACH 194	ACH 198
Hilleshog 5135	ACH 180	ACH 198	ACH 196
Hilleshog 8277	ACH 181	ACH 180	
Mitsui Monohikari		ACH 181	
ACH 164		ACH 196	
ACH 178			
ACH 180			
ACH 181			

1992	1992 (cont.)
Beta 2010	KW 1119
Beta 6625	Maribo Ultramono
Beta 6269	Maribo 875
Beta 1238	HM 2401
Beta 2988	Hilleshog 5090
Beta 5657	Hilleshog 5135
BJ 1330	Mitsui Monohikari
KW 3265	ACH 194
KW 2398	ACH 198
KW 3145	ACH 196

Table 2. Comparison of Approved Varieties for Southern Minnesota over a Eleven year period.

Year	No. of Approved	Recoverable Sugar/Acre Mean of Approved	Sugar/Ton Mean of Approved	Tons/Acre Mean of Approved	% Sugar Mean of Approved	Leaf Spot Rating Mean of Approved	LTM Mean of Approved
1981 (78-79-80)	15	6724	264.5	25.7	15.40	4.43	2.18
1982 (79-80-81)	12	6282	262.6	23.9	15.50	4.31	2.17
1983 (80-81-82)	9	7053	261.9	26.9	15.60	4.84	2.37
1984 (81-82-83)	9	6823	253.1	26.9	15.30	4.80	2.5
1985 (82-83-84)	11	7682	269.7	28.6	15.90	4.87	2.64
1986 (83-84-85)	14	7837	280.9	27.9	16.10	4.80	2.41
1987 (84-85-86)	18	7764	300.4	25.9	16.70	4.68	1.68
1988 (85-86-87)	24	8884	308.7	28.7	16.95	4.93	1.51
1989 (86-87-88)	19	8689	318.6	27.2	17.40	4.70	1.47
1990 (87-88-89)	21	9078	307.8	29.4	17.10	4.87	1.71
1991 (88-89-90)	19	7554	294.1	25.7	16.39	4.56	1.59
1991 (89-90-91)	21	6831	276.6	24.8	15.50	4.60	1.60

Table 3. Seed usage for SMSC, 1987-1991.

Year	Original Issue (LBs.)	Replant (LBs.) (LBs.)	Total (LBs.) (LBs.)
1987	117,000	2,540	119,540
1988	123,630	73,500	187,130
1989	131,150	19,250	150,400
1990	141,370	70,680	212,050
1991	156,440	14,660	171,100

SOUTHERN MINNESOTA SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1992

Table 4. *Three year performance summary from coded trials conducted at SMSC, 1989–1991.*

Variety	Rec. S/A	Rec. S/T	Leaf Spot**	Percent Sugar	Tons/ Acre	Percent LTM	Seed Vig**	% Field Emerg.
ACH 194	6821	281.4	4.57	15.73	24.26	1.66	1.56	65.43
ACH 196	6760	280.5	4.61	15.67	24.10	1.65	1.35	69.43
ACH 198	6869	276.4	4.10	15.56	24.98	1.74	1.36	70.77
Beta 1238	6977	277.9	4.83	15.47	25.21	1.58	1.87	
Beta 2010	7124	280.1	4.51	15.65	25.43	1.57	1.68	
Beta 2988	6795	278.3	4.58	15.49	24.52	1.58	1.70	
Beta 5657	6831	276.6	4.29	15.43	24.78	1.60	1.87	
Beta 6269	6744	277.8	4.55	15.54	24.32	1.65	1.96	67.40
Beta 6625	6676	282.9	4.88	15.72	23.67	1.58	1.79	68.87
B J 1330	6571	272.7	4.69	15.35	24.16	1.71	1.35	
Hilleshog 5090	6816	267.4	4.79	15.07	25.63	1.71	1.59	67.10
Hilleshog 5135	6879	275.0	4.74	15.44	25.02	1.69	1.79	66.73
HM 2401	6738	275.1	4.74	15.41	24.52	1.65	1.65	71.70
KW 1119	6891	290.5	4.71	16.11	23.76	1.59	1.70	
KW 2249 Blend	7061	279.3	4.86	15.55	25.31	1.59	1.63	
KW 2398	6963	278.4	4.64	15.51	25.07	1.59	1.62	
KW 3145	7145	270.8	4.66	15.19	26.46	1.64	1.84	66.90
KW 3265 *	6778	266.7	4.68	14.98	25.51	1.65	1.60	69.30
Maribo 875	6792	273.9	4.78	15.38	24.82	1.69	1.25	71.13
Maribo Ultramono *	6544	269.7	4.76	15.22	24.32	1.73	1.40	71.87
Mitsui Monohikari	6672	277.2	4.11	15.35	24.06	1.49	2.61	69.57
Mean of App.	6830.8	276.6	4.6	15.5	24.8	1.6	1.7	68.9

* Last year of sale
** Lower numbers indicate better resistance and vigor

SOUTHERN MINNESOTA SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1992
PERCENT OF MEAN OF APPROVED

Table 5. Three year performance summary from coded trials conducted at SMSC, 1989–1991.

Variety	Rec. S/A	Rec. S/T	Leaf Spot**	Percent Sugar	Tons/ Acre	Percent LTM	Seed Vig**	% Field Emerg.	Est. Grower Return/Ton
ACH 194	99.9	101.7	98.9	101.7	98.0	101.5	93.1	94.9	103.0
ACH 196	99.0	101.4	99.7	101.3	97.3	100.9	80.6	100.7	102.4
ACH 198	100.6	99.9	88.7	100.6	100.9	106.4	81.2	102.7	99.9
Beta 1238	102.1	100.5	104.5	100.0	101.8	96.6	111.7		100.8
Beta 2010	104.3	101.3	97.6	101.2	102.7	96.0	100.3		103.2
Beta 2988	99.5	100.6	99.1	100.1	99.0	96.6	101.5		101.1
Beta 5657	100.0	100.0	92.8	99.8	100.1	97.8	111.7		100.1
Beta 6269	98.7	100.4	98.4	100.5	98.2	100.9	117.0	97.8	100.8
Beta 6625	97.7	102.3	105.6	101.6	95.6	96.6	106.9	99.9	103.9
B J 1330	96.2	98.6	101.5	99.2	97.6	104.6	80.6		97.7
Hilleshog 5090	99.8	96.7	103.6	97.4	103.5	104.6	94.9	97.3	94.3
Hilleshog 5135	100.7	99.4	102.5	99.8	101.1	103.3	106.9	96.8	99.1
HM 2401	98.6	99.5	102.5	99.6	99.0	100.9	98.5	104.0	99.2
KW 1119	100.9	105.0	101.9	104.2	96.0	97.2	101.5		108.6
KW 2249 Blend	103.4	101.0	105.1	100.5	102.2	97.2	97.3		101.7
KW 2398	101.9	100.7	100.4	100.3	101.3	97.2	96.7		101.2
KW 3145	104.6	97.9	100.8	98.2	106.9	100.3	109.9	97.0	96.6
KW 3265 *	99.2	96.4	101.2	96.8	103.0	100.9	95.5	100.5	93.9
Maribo 875	99.4	99.0	103.4	99.4	100.3	103.3	74.6	103.2	98.3
Maribo Ultramono *	95.8	97.5	103.0	98.4	98.2	105.8	83.6	104.3	95.9
Mitsui Monohikari	97.7	100.2	88.9	99.2	97.2	91.1	155.8	100.9	100.4
Mean of App. (Actual)	6830.8	276.6	4.6	15.5	24.8	1.6	1.7	68.9	

** Last year of sale*
*** Lower numbers indicate better resistance and vigor*

SOUTHERN MINNESOTA SUGAR COOPERATIVE
*LIST OF TEST MARKET VARIETIES **

Table 6. Two year performance summary from coded trials conducted at SMSC, 1990–1991.

Variety	Rec. S/A	Rec. S/T	Leaf Spot**	Percent Sugar	Tons/ Acre	Percent LTM	Seed Vig**	% Field Emerg.
ACH 194	6546	283.2	4.6	15.8	23.2	1.7	1.5	64.9
ACH 196	6462	282.8	4.6	15.8	23.0	1.7	1.4	68.3
ACH 198	6504	277.8	3.9	15.6	23.7	1.8	1.4	69.9
Beta 1238	6624	282.8	4.7	15.7	23.6	1.6	2.0	61.4
Beta 2010	6896	285.6	4.4	15.9	24.3	1.6	1.6	64.9
Beta 2988	6404	280.8	4.4	15.6	23.0	1.6	1.8	71.7
Beta 5657	6595	282.2	4.2	15.7	23.5	1.6	2.2	56.0
Beta 6269	6411	279.2	4.5	15.6	23.1	1.7	2.2	65.1
Beta 6625	6355	284.4	4.9	15.8	22.5	1.6	1.9	66.4
B J 1330	6294	272.1	4.8	15.4	23.3	1.7	1.3	67.8
Hilleshog 5090	6538	270.7	4.7	15.2	24.4	1.7	1.7	65.6
Hilleshog 5135	6527	273.5	4.7	15.4	24.0	1.7	1.9	66.0
HM 2401	6383	276.6	4.6	15.5	23.2	1.7	1.8	73.1
KW 1119	6509	292.8	4.7	16.2	22.3	1.6	1.8	62.7
KW 2249 Blend	6823	281.1	4.8	15.6	24.4	1.6	1.7	62.3
KW 2398	6497	279.7	4.6	15.6	23.4	1.6	1.8	68.3
KW 3145	6907	273.5	4.7	15.3	25.4	1.6	2.1	65.3
Maribo 875	6438	274.6	4.9	15.4	23.6	1.7	1.3	69.3
Mitsui Monohikari	6156	276.9	4.1	15.4	22.4	1.5	2.5	67.8
Mean of App.	6519	279.5	4.6	15.6	23.5	1.6	1.8	66.1

TEST MARKET

Variety	Rec. S/A	Rec. S/T	Leaf Spot**	Percent Sugar	Tons/ Acre	Percent LTM	Seed Vig**	% Field Emerg.
ACH 205 (895205) Special	6501	273.0	3.6	15.2	24.0	1.6	1.5	71.7
ACH 890126 *	6751	288.0	4.6	16.1	23.3	1.7	1.5	
Hilleshog 7003 *	6432	280.9	4.0	15.7	23.4	1.6	2.6	
KW 3580 *	6799	280.7	4.6	15.6	24.1	1.6	2.1	
KW 1800*	7008	282.1	4.6	15.8	24.8	1.7	1.7	
KW 6770 *	6908	291.2	4.5	16.1	23.6	1.5	1.6	
Van Der Have H66140 *	6636	281.0	4.7	15.6	23.6	1.6	2.1	

* *Depending on seed availability*

** *Lower numbers indicate better resistance and vigor*

SOUTHERN MINNESOT SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1992
PERCENT OF MEAN APPROVED

Table 7. Two year performance summary from coded trials conducted at SMSC, 1990–1991.

Variety	Rec. S/A	Rec. S/T	Leaf Spot**	Percent Sugar	Tons/ Acre	Percent LTM	Seed Vig**	% Field Emerg.	Est. Grower Return/Ton
ACH 194	99.6	101.0	101.9	101.0	98.4	103.8	83.0	97.7	101.7
ACH 196	98.3	100.9	101.9	101.0	97.5	103.8	77.4	102.8	101.7
ACH 198	98.9	99.1	86.4	99.8	100.5	109.9	77.4	105.2	98.1
Beta 1238	100.8	100.9	104.1	100.4	100.1	97.7	110.6	92.4	101.7
Beta 2010	104.9	101.9	97.4	101.7	103.1	97.7	88.5	97.7	104.2
Beta 2988	97.4	100.2	97.4	99.8	97.5	97.7	99.6	107.9	100.5
Beta 5657	100.3	100.7	93.0	100.4	99.7	97.7	121.7	84.3	101.7
Beta 6269	97.5	99.6	99.7	99.8	98.0	103.8	121.7	98.0	99.3
Beta 6625	96.7	101.5	108.5	101.0	95.4	97.7	105.1	100.0	102.9
B J 1330	95.8	97.1	106.3	98.5	98.8	103.8	71.9	102.1	96.9
Hilleshog 5090	99.5	96.6	104.1	97.2	103.5	103.8	94.0	98.8	94.4
Hilleshog 5135	99.3	97.6	104.1	98.5	101.8	103.8	105.1	99.4	96.9
HM 2401	97.1	98.7	101.9	99.1	98.4	103.8	99.6	110.0	98.1
KW 1119	99.0	104.5	104.1	103.6	94.6	97.7	99.6	94.4	107.8
KW 2249 Blend	103.8	100.3	106.3	99.8	103.5	97.7	94.0	93.8	100.5
KW 2398	98.8	99.8	101.9	99.8	99.2	97.7	99.6	102.8	100.5
KW 3145	105.1	97.6	104.1	97.8	107.7	97.7	116.2	98.3	96.9
Maribo 875	97.9	98.0	108.5	98.5	100.1	103.8	71.9	104.3	96.9
Mitsui Monohikari	93.6	98.8	90.8	98.5	95.0	91.5	138.3	102.1	99.3
Mean of App.	6531.7	279.4	4.5	15.6	23.5	1.6	1.8	66.4	
ACH 205 (895205) Special	98.9	97.4	79.7	97.2	101.8	97.7	83.0	107.9	95.6
ACH 890126 *	102.7	102.8	101.9	103.0	98.8	103.8	83.0		105.4
Hilleshog 7003 *	97.8	100.2	88.6	100.4	99.2	97.7	143.8		101.7
KW 3580 *	103.4	100.2	101.9	99.8	102.2	97.7	116.2		100.5
KW 1800 *	106.6	100.7	101.9	101.0	105.2	103.8	94.0		101.7
KW 6770 *	105.1	103.9	99.7	103.0	100.1	91.5	88.5		107.8
Van Der Have H66140 *	101.0	100.3	104.1	99.8	100.1	97.7	116.2		100.5

* Depending on seed availability

** Lower numbers indicate better resistance and vigor

Table 8. Three Year Performance Summary of 1991 SMSC Commercial Coded Entries (Three Locations)- APPROVAL CALC.

Description	------Rec. / Ton------						------Rec. / Acre-----							--Loss to Molasses--				
	1989	1990	1991	3 Yr Mean	3 Yr Mean	3 Yr % Mean	1989	1990	1991	2 Yr Mean	3 Yr Mean	3 Yr % Mean	R/T+ R/A	1989	1990	1991	3 Yr Mean	3 Yr % Mean
ACH 194	277.9	291.7	274.7	283.2	281.4	102.2	7371	6890	6201	6546	6821	100.3	202.5	1.65	1.52	1.81	1.66	101.0
ACH 196	276.0	289.5	276.0	282.8	280.5	101.8	7355	6529	6395	6462	6760	99.4	201.3	1.63	1.57	1.74	1.65	100.2
ACH 198	273.6	278.0	277.6	277.8	276.4	100.3	7601	6626	6381	6504	6869	101.0	201.4	1.73	1.68	1.82	1.74	106.1
Beta 1238	268.3	288.5	277.0	282.8	277.9	100.9	7684	7022	6225	6624	6977	102.6	203.5	1.55	1.48	1.70	1.58	95.9
Beta 2988	273.4	285.3	276.3	280.8	278.3	101.0	7579	6826	5981	6404	6795	100.0	201.0	1.55	1.46	1.72	1.58	95.9
Beta 5657	265.5	286.7	277.6	282.2	276.6	100.4	7303	6635	6555	6595	6831	100.5	200.9	1.62	1.47	1.71	1.60	97.3
Beta 6269	275.2	281.1	277.2	279.2	277.8	100.9	7411	6678	6143	6411	6744	99.2	200.1	1.64	1.54	1.77	1.65	100.4
Beta 6625	279.9	287.2	281.5	284.4	282.9	102.7	7317	6590	6120	6355	6676	98.2	200.9	1.62	1.45	1.67	1.58	96.1
Bush Johnson 1330	273.9	280.6	263.6	272.1	272.7	99.0	7125	6588	6000	6294	6571	96.7	195.6	1.65	1.61	1.88	1.71	104.2
Hilleshog 5090	260.7	278.5	262.9	270.7	267.4	97.1	7372	6678	6397	6538	6816	100.3	197.3	1.71	1.57	1.84	1.71	103.8
Hilleshog 5135	278.0	279.9	267.1	273.5	275.0	99.8	7585	6721	6332	6527	6879	101.2	201.0	1.62	1.60	1.86	1.69	103.0
HM 2401	272.2	280.9	272.3	276.6	275.1	99.9	7447	6603	6163	6383	6738	99.1	199.0	1.63	1.56	1.76	1.65	100.4
KW 2398	275.8	285.6	273.8	279.7	278.4	101.1	7896	6741	6252	6497	6963	102.4	203.5	1.58	1.46	1.72	1.59	96.5
KW 3145	265.5	281.9	265.1	273.5	270.8	98.3	7621	7264	6550	6907	7145	105.1	203.4	1.65	1.50	1.78	1.64	100.0
KW 3265	265.5	274.1	260.4	267.3	266.7	96.8	7589	6592	6153	6373	6778	99.7	196.5	1.64	1.53	1.77	1.65	100.2
Maribo 875	272.4	283.7	265.5	274.6	273.9	99.4	7501	6724	6151	6438	6792	99.9	199.3	1.70	1.56	1.81	1.69	102.8
Maribo Ultramono	268.5	276.3	264.4	270.4	269.7	97.9	7268	6360	6004	6182	6544	96.3	194.2	1.71	1.60	1.89	1.73	105.5
Mitsui Monohikari	277.9	285.7	268.0	276.9	277.2	100.6	7704	6027	6284	6156	6672	98.1	198.8	1.44	1.38	1.65	1.49	90.6
ACH 192	267.3	278.7	268.4	273.6	271.5	98.5	7198	6790	6357	6574	6782	99.8	198.3	1.64	1.64	1.81	1.70	103.2
Beta 2010	269.2	285.2	285.9	285.6	280.1	101.7	7579	7058	6734	6896	7124	104.8	206.5	1.55	1.48	1.68	1.57	95.5
Bush Johnson 1320	270.7	278.8	262.7	270.8	270.7	98.3	7326	6739	6076	6408	6714	98.8	197.0	1.64	1.57	1.84	1.68	102.4
KW 1119	285.8	301.0	284.6	292.8	290.5	105.4	7656	6889	6129	6509	6891	101.4	206.8	1.62	1.47	1.67	1.59	96.5
KW 2249	275.7	284.9	277.2	281.1	279.3	101.4	7537	7141	6504	6823	7061	103.9	205.2	1.58	1.48	1.70	1.59	96.5
Maribo 865	265.4	274.8	268.2	271.5	269.5	97.8	7396	6639	6307	6473	6781	99.7	197.6	1.69	1.60	1.79	1.69	103.0
Maribo 894	269.2	282.3	257.1	269.7	269.5	97.8	7568	6850	6216	6533	6878	101.2	199.0	1.49	1.42	1.75	1.55	94.5
ACH 205 (895205)		275.7	270.3	273.0				6737	6264	6501					1.49	1.67		
ACH 895121 (Rhiz)			247.7						5404							1.81		
Mean of APPROVED	272.2	283.1	271.2	277.1	275.5	100.0	7485	6672	6238	6455	6798	100.0	200.0	1.63	1.53	1.77	1.64	100.0

Table 9. Three Year Performance Summary of 1991 SMSC Commercial Coded Entries (Three Locations)

	--Sugar Content (%)--					---Root Yield (T/A)---					---Seedling Vigor---					---Field Emerg (%)---				
Descriptio	1989	1990	1991	3 Yr Mean	3 Yr % Mean	1989	1990	1991	3 Yr Mean	3 Yr % Mean	1989	1990	1991	3 Yr Mean	3 Yr % Mean	1989	1990	1991	3 Yr Mean	3 Yr % Mean
ACH 194	15.55	16.10	15.54	15.73	102.0	26.32	23.49	22.97	24.26	97.7	1.69	1.75	1.25	1.56	95.4	66.6	70.7	59.0	65.43	94.9
ACH 196	15.43	16.04	15.54	15.67	101.6	26.38	22.44	23.47	24.10	97.1	1.31	1.75	1.00	1.35	82.5	71.7	71.3	65.3	69.43	100.7
ACH 198	15.41	15.58	15.70	15.56	100.9	27.61	23.74	23.60	24.98	100.6	1.19	1.75	1.13	1.36	82.8	72.6	74.5	65.2	70.77	102.6
Beta 1238	14.97	15.90	15.55	15.47	100.3	28.53	24.33	22.77	25.21	101.5	1.53	2.38	1.69	1.87	113.9		61.3	61.5		
Beta 2988	15.23	15.72	15.53	15.49	100.5	27.59	23.83	22.15	24.52	98.8	1.42	1.75	1.94	1.70	103.9		75.6	66.6		
Beta 5657	14.89	15.80	15.59	15.43	100.0	27.32	23.07	23.95	24.78	99.8	1.17	3.13	1.31	1.87	114.1		43.7	68.3		
Beta 6269	15.40	15.60	15.62	15.54	100.8	26.81	23.61	22.53	24.32	97.9	1.56	2.31	2.00	1.96	119.3	72.1	69.9	60.2	67.40	97.7
Beta 6625	15.61	15.81	15.75	15.72	102.0	26.04	22.83	22.15	23.67	95.4	1.63	1.94	1.81	1.79	109.4	73.9	69.6	63.1	68.87	99.9
BJ 1330	15.35	15.64	15.07	15.35	99.6	25.79	23.43	23.25	24.16	97.3	1.42	1.44	1.19	1.35	82.3		73.9	61.6		
Hill. 5090	14.74	15.49	14.98	15.07	97.7	28.15	23.88	24.86	25.63	103.2	1.44	1.94	1.38	1.59	96.8	70.1	71.6	59.6	67.10	97.3
Hill. 5135	15.52	15.59	15.21	15.44	100.1	27.07	23.87	24.12	25.02	100.8	1.56	2.19	1.63	1.79	109.4	68.2	70.7	61.3	66.73	96.8
HM 2401	15.24	15.60	15.38	15.41	99.9	27.11	23.41	23.04	24.52	98.8	1.44	2.13	1.38	1.65	100.6	69.0	76.9	69.2	71.70	104.0
KW 2398	15.38	15.74	15.41	15.51	100.6	28.43	23.52	23.25	25.07	101.0	1.17	2.44	1.25	1.62	98.8		70.0	66.6		
KW 3145	14.93	15.60	15.04	15.19	98.5	28.55	25.71	25.11	26.46	106.6	1.38	2.63	1.50	1.84	112.0	70.1	66.2	64.4	66.90	97.0
KW 3265	14.91	15.23	14.79	14.98	97.1	28.39	24.00	24.13	25.51	102.7	1.31	2.00	1.50	1.60	97.8	70.1	74.1	63.7	69.30	100.5
Maribo 87	15.32	15.75	15.08	15.38	99.8	27.37	23.58	23.52	24.82	100.0	1.06	1.56	1.13	1.25	76.2	74.9	75.2	63.3	71.13	103.1
Ultramono	15.14	15.41	15.11	15.22	98.7	26.90	22.89	23.17	24.32	98.0	1.31	1.75	1.13	1.40	85.2	75.5	76.2	63.9	71.87	104.2
Monohikari	15.33	15.67	15.05	15.35	99.5	27.36	20.97	23.86	24.06	96.9	2.88	2.56	2.38	2.61	159.0	73.2	71.9	63.6	69.57	100.9
ACH 192	14.99	15.57	15.23	15.26	99.0	26.79	24.33	24.12	25.08	101.0	1.36	1.44	1.00	1.27	77.3		70.1	63.4		
Beta 2010	15.23	15.74	15.98	15.65	101.5	27.59	24.66	24.03	25.43	102.4	1.91	1.58	1.56	1.68	102.7			64.9		
BJ 1320	15.17	15.51	14.97	15.22	98.7	26.96	24.09	23.64	24.90	100.3	1.85	2.25	1.25	1.78	108.8		62.5	58.1		
KW 1119	15.91	16.52	15.90	16.11	104.5	26.65	22.81	21.83	23.76	95.7	1.48	2.38	1.25	1.70	103.9		57.9	67.4		
KW 2249	15.37	15.72	15.56	15.55	100.8	27.18	24.98	23.76	25.31	101.9	1.42	1.71	1.75	1.63	99.2			62.3		
Maribo 86	14.96	15.34	15.20	15.17	98.4	27.64	24.11	23.88	25.21	101.5	1.31	1.81	1.06	1.39	85.0	72.8	70.6	64.7	69.37	100.6
Maribo 89	14.96	15.54	14.61	15.04	97.5	27.92	24.17	24.65	25.58	103.0	1.36	1.63	1.13	1.37	83.8		67.8	64.0		
ACH 205 (895205)		15.27	15.18				24.29	23.74				1.90	1.06					71.7		
ACH 895121 (Rhiz)			14.20					22.40					1.06					66.2		
Mean	15.24	15.67	15.29	15.42	100.0	27.30	23.69	23.48	24.83	100.0	1.49	2.00	1.40	1.64	100.0	71.5	69.2	64.0	68.97	100.0

TABLE 10

ENTRY	CODE	REC/T	LBS	REC/A	LBS	LOSS TO MOL.		SUGAR	%	YIELD	T/A
ACH 192	77	268.4	99	6357	102	1.81	102	15.23	100	24.12	103
ACH 194	84	274.7	102	6201	99	1.81	102	15.54	102	22.97	98
ACH 196	67	276.0	102	6395	103	1.74	99	15.54	102	23.47	100
ACH 198	79	277.6	103	6381	102	1.82	103	15.7	103	23.60	100
ACH 205	71	270.3	100	6264	101	1.67	95	15.18	99	23.74	101
ACH 895121 (Rhiz)	70	247.7	92	5404	87	1.81	103	14.2	93	22.40	95
Beta 1238	69	277.0	102	6225	100	1.70	96	15.55	102	22.77	97
Beta 2010	85	285.9	106	6734	108	1.68	96	15.98	105	24.03	102
Beta 2988	62	276.3	102	5981	96	1.72	97	15.53	102	22.15	94
Beta 5657	86	277.6	103	6555	105	1.71	97	15.59	102	23.95	102
Beta 6269	82	277.2	102	6143	99	1.77	100	15.62	102	22.53	96
Beta 6625	75	281.5	104	6120	98	1.67	95	15.75	103	22.15	94
Bush Johnson 1320	74	262.7	97	6076	97	1.84	104	14.97	98	23.64	101
Bush Johnson 1330	68	263.6	97	6000	96	1.88	107	15.07	99	23.25	99
Hilleshog 5090	83	262.9	97	6397	103	1.84	104	14.98	98	24.86	106
Hilleshog 5135	61	267.1	99	6332	102	1.86	105	15.21	99	24.12	103
HM 2401	66	272.3	101	6163	99	1.76	100	15.38	101	23.04	98
KW 1119	78	284.6	105	6129	98	1.67	95	15.9	104	21.83	93
KW 2249	63	277.2	102	6504	104	1.70	97	15.56	102	23.76	101
KW 2398	87	273.8	101	6252	100	1.72	98	15.41	101	23.25	99
KW 3145	81	265.1	98	6550	105	1.78	101	15.04	98	25.11	107
KW 3265	80	260.4	96	6153	99	1.77	101	14.79	97	24.13	103
Maribo 865	73	268.2	99	6307	101	1.79	101	15.2	99	23.88	102
Maribo 875	64	265.5	98	6151	99	1.81	102	15.08	99	23.52	100
Maribo 894	72	257.1	95	6216	100	1.75	99	14.61	96	24.65	105
Maribo Ultramono	65	264.4	98	6004	96	1.89	107	15.11	99	23.17	99
Mitsui Monohikari	76	268.0	99	6284	101	1.65	93	15.05	98	23.86	102
General Mean		270.49		6232.50		1.76		15.29		23.48	
Coeff. of Var. (%)		2.96		6.34		4.83		2.17		6.15	
Variety Mean Square		1212.69		966695.38		0.08		2.66		10.93	
Error Mean Square B		64.11		156294.73		0.01		0.11		2.09	
F Value		18.92 **		6.19 **		11.23 **		24.15 **		5.24 **	
L.S.D. (.05)		5.54		273.34		0.06		0.23		1.00	
L.S.D. (.01)		7.13		352.15		0.08		0.30		1.29	

** Significant at 5%*
*** Significant at 1%*
NS - Not sigificant

Second column for each trait is percent of check.
General mean used as check.

TABLE 11

ENTRY	CODE	NA	PPM	K	PPM	AM.N	PPM	GROSS/A	LBS	EMER	%
ACH 192	77	493	109	2534	103	546	99	7259	102	63.4	99
ACH 194	84	474	105	2535	103	553	101	7060	100	59.0	92
ACH 196	67	461	102	2434	99	532	97	7235	102	65.3	102
ACH 198	79	405	89	2443	100	614	112	7278	103	65.2	102
ACH 205	71	401	89	2320	95	531	97	7091	100	71.7	112
ACH 895121 (Rhiz)	70	526	116	2547	104	532	97	6247	88	66.2	103
Beta 1238	69	368	81	2375	97	551	100	7023	99	61.5	96
Beta 2010	85	350	77	2430	99	532	97	7576	107	64.9	101
Beta 2988	62	404	89	2436	99	534	97	6776	96	66.6	104
Beta 5657	86	410	91	2410	98	537	98	7399	104	68.3	107
Beta 6269	82	397	88	2435	99	576	105	6966	98	60.2	94
Beta 6625	75	392	87	2347	96	528	96	6891	97	63.1	99
Bush Johnson 1320	74	526	116	2533	103	561	102	6981	98	58.1	91
Bush Johnson 1330	68	514	114	2497	102	608	111	6907	97	61.6	96
Hilleshog 5090	83	492	109	2526	103	572	104	7344	104	59.6	93
Hilleshog 5135	61	512	113	2618	107	555	101	7254	102	61.3	96
HM 2401	66	462	102	2524	103	527	96	7003	99	69.2	108
KW 1119	78	339	75	2361	96	546	99	6883	97	67.4	105
KW 2249	63	394	87	2409	98	535	97	7336	103	62.3	97
KW 2398	87	514	114	2344	96	524	95	7086	100	66.6	104
KW 3145	81	456	101	2439	99	566	103	7476	105	64.4	101
KW 3265	80	472	104	2446	100	553	101	7046	99	63.7	99
Maribo 865	73	507	112	2481	101	540	98	7187	101	64.7	101
Maribo 875	64	489	108	2536	103	547	100	7026	99	63.3	99
Maribo 894	72	533	118	2361	96	534	97	7110	100	64.0	100
Maribo Ultramono	65	511	113	2636	107	574	105	6911	97	63.9	100
Mitsui Monohikari	76	410	91	2254	92	529	96	7102	100	63.6	99
General Mean		452.25		2452.31		549.51		7090.88		64.04	
Coeff. of Var. (%)		12.69		4.32		8.02		6.20		8.07	
Variety Mean Square		56684.92		134301.54		8640.31		1064408.62		156.61	
Error Mean Square B		3291.86		11220.89		1944.18		193239.25		26.69	
F Value		17.22	**	11.97	**	4.44	**	5.51	**	5.87	**
L.S.D. (.05)		39.67		73.24		30.49		303.94		3.57	
L.S.D. (.01)		51.11		94.36		39.29		391.56		4.60	

* Significant at 5%
** Significant at 1%
NS - Not sigificant

Second column for each trait is percent of check.
General mean used as check.

TABLE 12

ENTRY	CODE	BOLTERS %	VIGOR	
ACH 192	77	0.00	1.00	72
ACH 194	84	0.32	1.25	90
ACH 196	67	0.00	1.00	72
ACH 198	79	0.00	1.13	81
ACH 205	71	0.00	1.06	76
ACH 895121 (Rhiz)	70	0.00	1.06	76
Beta 1238	69	0.00	1.69	121
Beta 2010	85	0.00	1.56	112
Beta 2988	62	0.00	1.94	139
Beta 5657	86	0.00	1.31	94
Beta 6269	82	0.00	2.00	143
Beta 6625	75	0.00	1.81	130
Bush Johnson 1320	74	0.00	1.25	90
Bush Johnson 1330	68	0.00	1.19	85
Hilleshog 5090	83	0.11	1.38	98
Hilleshog 5135	61	0.00	1.63	116
HM 2401	66	0.00	1.38	98
KW 1119	78	0.00	1.25	90
KW 2249	63	0.00	1.75	125
KW 2398	87	0.00	1.25	90
KW 3145	81	0.00	1.50	107
KW 3265	80	0.00	1.50	107
Maribo 865	73	0.00	1.06	76
Maribo 875	64	0.00	1.13	81
Maribo 894	72	0.32	1.13	81
Maribo Ultramono	65	0.00	1.13	81
Mitsui Monohikari	76	0.00	2.38	170
General Mean	0.03	1.40		
Coeff. of Var. (%)	880.72	30.18		
Variety Mean Square	0.12	1.96		
Error Mean Square B	0.06	0.18		
F Value	2.04 **	11.03 **		
L.S.D. (.05)	0.17	0.29		
L.S.D. (.01)	0.21	0.38		

* Significant at 5%

** Significant at 1%

NS - Not sigificant

Second column for each trait is percent of check.

General mean used as check.

TABLE 13

1991 CERCOSPORA LEAF SPOT RATINGS FOR CODED TEST ENTRIES
READINGS FROM BETASEED - SHAKOPEE, MN

ENT	SMITH	DESCRIPTION	8/1	8/5	8/9	8/13	8/16	8/21	8/26	MEAN
9	9	ACH 180	3.0	3.0	3.4	4.2	4.8	5.4	7.6	4.48
32	32	ACH 181	2.2	3.0	3.4	4.2	4.6	5.0	7.6	4.29
20	20	ACH 192	3.0	3.2	3.8	4.4	5.0	5.8	7.8	4.71
10	10	ACH 194	2.4	3.2	3.2	4.4	5.4	5.6	8.0	4.60
16	16	ACH 196	2.6	3.6	3.6	5.0	5.4	5.4	8.0	4.80
17	17	ACH 198 (Aph)	2.0	3.0	3.0	3.8	4.4	4.8	6.6	3.94
62	104	ACH 204	3.0	3.6	4.0	5.0	5.4	6.4	8.2	5.08
6	6	ACH 205 (Aph)	2.0	2.6	3.0	3.4	3.6	4.6	6.2	3.63
63	105	ACH 301	2.8	3.6	3.8	5.0	6.0	6.0	8.2	5.06
46	88	ACH 860035	2.4	3.0	3.4	4.4	5.0	5.8	8.0	4.57
96	162	ACH 870332	2.6	3.4	3.4	4.4	5.2	5.4	8.0	4.63
101	175	ACH 890126	2.2	2.4	3.2	3.6	4.4	4.4	7.2	3.91
55	97	ACH 890286	2.8	3.8	4.0	5.0	5.8	6.2	8.0	5.08
108	199	ACH 890321	2.4	2.6	3.2	3.4	4.4	4.6	6.8	3.91
58	100	ACH 890323	2.4	3.0	3.4	4.6	5.2	5.4	7.8	4.54
74	119	ACH 890374	2.2	3.0	3.0	3.6	4.0	4.8	7.2	3.97
102	177	ACH 890416	2.2	2.6	3.4	4.0	4.4	4.8	6.6	4.00
98	167	ACH 890421	2.2	2.4	3.0	3.4	4.0	4.2	6.4	3.66
41	70	ACH 895121 (Rhiz)	2.4	3.0	3.0	3.6	4.2	4.8	7.2	4.03
103	180	ACH 895204	2.4	2.8	3.4	4.0	4.4	4.8	6.6	4.06
92	151	ACH 9000841	2.0	2.0	3.0	3.0	3.6	3.8	6.4	3.40
22	22	Beta 1238	2.6	3.2	3.6	4.6	5.4	5.6	7.8	4.69
72	115	Beta 1441	2.8	3.2	3.6	4.8	5.2	5.6	8.0	4.74
87	135	Beta 1471	2.6	3.4	3.8	4.8	5.6	5.6	8.0	4.83
44	85	Beta 2010	2.4	3.0	3.4	4.2	4.8	5.6	8.0	4.49
66	108	Beta 2251	2.6	3.2	3.6	4.2	5.2	5.4	8.0	4.60
21	21	Beta 2988	2.4	3.0	3.2	4.4	4.8	4.8	7.6	4.31
45	86	Beta 5657	2.0	3.0	3.0	4.2	4.6	5.0	7.6	4.20
100	174	Beta 5931	2.2	2.4	3.0	3.6	4.2	4.2	6.0	3.66
15	15	Beta 6269	2.6	3.0	3.6	4.2	5.0	5.4	7.8	4.52
11	11	Beta 6625	3.0	3.4	3.8	4.8	5.6	5.6	8.0	4.88
75	120	Beta 6981	3.0	3.0	3.2	4.4	5.0	5.6	8.0	4.60
13	13	Bush Johnson 1320	2.2	3.2	3.4	4.4	5.2	5.8	8.0	4.60
1	1	Bush Johnson 1330	2.8	3.0	3.8	4.6	5.2	5.4	8.0	4.68
14	14	Bush Johnson 1337	2.6	3.4	3.6	4.6	5.2	6.0	8.0	4.77
34	34	Bush Johnson 1340	3.0	3.4	3.6	4.8	5.4	6.4	8.2	4.97
79	124	Bush Johnson 1357	2.8	3.0	3.2	4.8	5.0	5.2	7.8	4.54
52	94	Bush Johnson 1358	3.0	3.6	4.0	4.6	5.6	5.8	8.0	4.94
3	3	Hilleshog 5090	2.4	3.4	3.4	4.2	5.0	5.4	8.0	4.54
25	25	Hilleshog 5135	3.0	3.0	3.8	4.4	5.2	5.6	8.0	4.71
47	89	Hilleshog 7001	2.8	3.0	3.8	4.8	5.2	5.4	7.6	4.66
61	103	Hilleshog 7002	3.0	3.4	4.0	4.8	5.4	6.4	8.2	5.03
94	153	Hilleshog 7003	2.4	2.6	3.0	3.6	4.2	4.6	7.4	3.97
107	188	Hilleshog 7005	2.8	3.2	4.0	5.0	6.0	6.6	8.4	5.14

TABLE 13 1991 CERCOSPORA LEAF SPOT RATINGS FOR CODED TEST ENTRIES
READINGS FROM BETASEED - SHAKOPEE, MN

ENT	SMITH	DESCRIPTION	8/1	8/5	8/9	8/13	8/16	8/21	8/26	MEAN
99	170	Hilleshog 7008	2.0	2.4	3.0	3.4	4.2	4.4	7.4	3.83
97	166	Hilleshog 7013	3.0	3.8	4.2	5.2	6.2	6.6	8.6	5.37
109	207	Hilleshog 7015	2.8	3.4	3.6	4.4	5.2	5.2	8.2	4.69
77	122	Hilleshog 7017	3.0	3.6	4.0	5.2	5.8	6.4	8.4	5.20
81	126	Hilleshog 7018	2.8	3.2	3.6	5.2	6.0	6.8	8.4	5.14
89	143	Hilleshog 7019	3.0	3.2	3.8	5.2	6.4	6.8	8.2	5.23
71	114	Hilleshog 7504	2.6	3.2	3.2	4.2	5.2	5.4	8.2	4.57
80	125	Hilleshog 7505	2.2	2.8	3.0	4.0	4.6	4.8	7.4	4.11
27	27	Hilleshog 8277	2.8	3.6	3.4	5.0	5.6	6.2	8.4	5.00
38	48	Hilleshog 8351	3.0	3.2	3.4	4.4	5.0	5.8	8.0	4.68
19	19	HM 2401	2.6	3.4	3.8	4.6	5.0	5.4	7.8	4.66
36	36	HM 2402	2.4	2.8	3.2	4.0	4.4	4.8	7.2	4.12
93	152	HM 2409	2.8	3.0	3.4	4.6	5.2	5.8	7.8	4.66
86	134	HM 2412	2.0	2.4	3.0	3.4	4.4	4.4	7.6	3.88
65	107	HM 2416	2.8	2.8	3.6	4.2	5.0	5.6	8.0	4.57
105	183	HM RH1 (Rhiz)	2.2	2.6	3.0	3.4	4.4	4.6	7.2	3.91
60	102	Holly 89N147-04	2.4	3.2	3.6	4.4	5.4	5.8	8.0	4.69
48	90	Holly 89N156-026	2.8	3.4	3.6	4.8	5.4	6.2	8.2	4.91
57	99	Holly 89N158-030	3.0	3.4	3.8	5.0	5.6	6.4	8.2	5.06
73	116	Holly 89N158-031	2.8	3.6	4.0	5.0	6.2	6.4	8.0	5.14
68	110	Holly 89T162-018 (Rhiz)	2.6	3.2	3.4	4.2	5.2	5.8	8.0	4.63
70	113	Holly 89T162-04 (Rhiz)	2.6	2.8	3.0	4.0	4.8	5.0	7.6	4.26
31	31	KW 1119	2.8	3.0	3.2	4.0	4.6	5.2	7.6	4.34
35	35	KW 1745	2.8	3.4	3.8	4.6	5.4	5.6	8.0	4.80
59	101	KW 1800	2.8	3.0	3.2	4.2	5.0	5.4	7.8	4.49
33	33	KW 2249	2.8	3.4	3.6	4.4	5.0	5.8	7.8	4.69
8	8	KW 2398	2.8	3.0	3.4	4.2	5.0	5.8	8.0	4.60
43	81	KW 3145	2.6	3.4	3.4	4.4	5.0	5.6	8.0	4.63
29	29	KW 3265	2.8	3.4	3.4	4.2	5.0	5.4	8.0	4.60
76	121	KW 3291	2.6	2.8	3.2	4.0	4.6	5.2	7.6	4.28
64	106	KW 3580	3.0	3.2	3.4	4.6	5.6	5.8	8.0	4.80
50	92	KW 6001	2.6	3.4	3.6	4.0	5.0	5.2	8.0	4.54
67	109	KW 6770	2.8	3.0	3.4	4.0	4.8	5.2	8.0	4.46
28	28	Maribo 403	3.0	3.4	3.4	4.8	5.2	5.8	8.0	4.80
4	4	Maribo 410	2.4	3.0	3.2	4.2	4.8	5.6	7.6	4.40
26	26	Maribo 862	2.6	3.6	3.6	4.6	5.2	5.8	8.0	4.77
18	18	Maribo 865	3.0	3.4	3.6	4.4	5.0	5.4	8.0	4.69
2	2	Maribo 875	2.8	3.4	4.2	4.8	5.8	5.6	8.0	4.94
42	72	Maribo 894	2.6	3.4	3.4	4.2	4.8	5.2	8.0	4.51
40	58	Maribo 897	2.8	3.4	3.6	4.6	5.4	6.2	7.8	4.83
51	93	Maribo 899	2.6	3.4	3.6	4.6	5.4	5.6	7.8	4.71
83	129	Maribo 902	3.0	3.4	3.8	4.8	5.6	6.0	8.0	4.94
37	41	Maribo 905	2.8	3.2	3.4	4.6	5.2	5.8	7.8	4.69
39	51	Maribo 906	3.0	3.4	4.0	5.0	5.6	6.0	8.0	5.00

TABLE 13 — 1991 CERCOSPORA LEAF SPOT RATINGS FOR CODED TEST ENTRIES
READINGS FROM BETASEED - SHAKOPEE, MN

ENT	SMITH	DESCRIPTION	8/1	8/5	8/9	8/13	8/16	8/21	8/26	MEAN
85	133	Maribo 911	2.8	3.2	3.4	4.2	5.2	5.4	7.8	4.57
69	111	Maribo 912	2.8	3.6	3.6	4.8	5.6	5.8	8.0	4.88
84	130	Maribo 913	3.0	3.4	3.8	4.8	5.4	6.2	8.0	4.94
91	146	Maribo 914	2.8	3.4	4.0	5.0	5.4	5.8	8.0	4.91
95	158	Maribo 915	2.4	3.2	3.4	4.4	4.8	5.2	8.0	4.48
105	182	Maribo 916	2.8	3.2	3.4	4.8	5.2	5.8	8.0	4.74
23	23	Maribo Ultramono	3.0	3.6	4.2	4.6	5.4	5.8	8.2	4.97
5	5	mitsui Monohikari	2.6	2.8	3.0	3.4	4.4	4.8	7.4	4.06
56	98	Seedex SX0804	3.0	3.0	3.4	4.0	4.6	5.2	7.6	4.40
90	145	Seedex SX0902	2.2	3.0	3.2	4.2	4.8	5.4	7.8	4.37
12	12	Seedex SX1	2.6	3.0	3.0	3.8	4.8	4.6	7.2	4.15
106	187	Seedex SX1003	2.6	3.0	3.2	3.6	4.6	5.4	7.8	4.31
110	213	Seedex SX1004	2.2	2.6	3.0	3.6	4.2	4.4	6.8	3.83
30	30	Seedex SX2 (SX0802)	2.0	2.0	2.8	3.4	3.6	3.8	5.8	3.34
24	24	Van der Have H66110	3.0	3.0	3.4	4.4	5.4	5.8	8.0	4.71
7	7	Van der Have H66140	3.0	3.0	3.4	4.6	5.0	5.8	7.8	4.66
54	96	Van der Have H66156	3.0	3.6	3.8	5.0	5.6	6.4	8.0	5.06
78	123	Van der Have H66168	3.0	3.4	3.8	5.0	5.4	5.8	8.0	4.91
49	91	Van der Have H66169	2.4	3.0	3.4	4.4	5.2	5.6	8.0	4.57
53	95	Van der Have H66170	3.0	3.0	3.4	4.6	5.2	5.6	8.0	4.68
82	127	Van der Have H66171	3.0	3.4	3.6	4.8	5.2	6.2	8.0	4.88
88	137	Van der Have Suprafort C	3.0	3.0	3.4	4.4	4.8	5.2	7.2	4.43
		High Mean	3.0	3.8	4.2	5.2	6.4	6.8	8.6	5.37
		Low Mean	2.0	2.0	2.8	3.0	3.6	3.8	5.8	3.34
		Exp Mean	2.7	3.1	3.5	4.4	5.0	5.5	7.8	4.56
		C.V. %	15.5	14.4	14.9	14.6	11.1	11.2	6.6	8.14
		LSD 5%	0.5	0.6	0.6	0.8	0.7	0.8	0.6	0.46
		LSD 1%	0.7	0.7	0.8	1.0	0.9	1.0	0.8	0.60

TABLE 14

	COMMERCIAL STATUS		REC/T		REC/A		LOSS TO MOL.		SUGAR		YIELD		VIGOR *	
CH	DESCRIPTION	CODE	LBS/T	% MEA	LBS/A	% MEA	%	% MEA	%	% MEA	T/A	% MEA	1-5	% MEAN
	ACH 301	204	269.2	100	6451	99	1.84	103	15.29	100	23.88	99	1.09	76
	ACH 890126	175	286.1	106	6816	105	1.82	101	16.12	105	23.78	99	0.95	66
	ACH 890321	199	282.1	104	7008	108	1.75	97	15.85	104	24.85	103	1.18	81
	ACH 890416	177	286.6	106	6817	105	1.82	101	16.14	106	23.72	98	1.03	71
	ACH 895204	180	266.9	99	6596	101	1.79	100	15.13	99	24.80	103	1.03	71
	Beta 1441	193	271.4	101	6808	105	1.74	97	15.3	100	24.99	104	1.32	91
	Beta 1471	195	272.6	101	6357	98	1.81	101	15.43	101	23.26	96	1.48	102
	Beta 2251	206	263.1	97	6519	100	1.74	97	14.89	97	24.71	103	1.55	107
	Beta 5931	174	285.7	106	6755	104	1.74	97	16.02	105	23.57	98	1.24	86
	Beta 6981	179	267.0	99	6466	99	1.79	99	15.13	99	24.08	100	1.02	70
	Bush Johnson 1337	178	265.6	98	5987	92	1.91	106	15.18	99	22.65	94	1.02	70
	Bush Johnson 1340	203	265.4	98	6102	94	1.92	107	15.18	99	22.98	95	0.95	66
	Hilleshog 7001	190	265.5	98	6709	103	1.77	99	15.05	98	25.42	405	1.67	116
	Hilleshog 7002	176	273.7	101	6286	97	1.81	100	15.48	101	22.92	95	1.74	120
	Hilleshog 7003	185	278.1	103	6194	95	1.74	97	15.64	102	22.31	93	2.19	151
	Hilleshog 7005	188	266.0	99	6499	100	1.86	103	15.15	99	24.48	102	1.67	116
	Hilleshog 7015	207	267.5	99	6857	105	1.79	100	15.15	99	25.66	106	2.27	157
	Hilleshog 7505	196	277.9	103	6626	102	1.80	100	15.69	103	23.89	99	1.62	112
	HM 2412	192	273.8	101	6747	104	1.72	95	15.4	101	24.59	102	1.81	125
	HM RH1 (Rhiz)	183	245.0	91	5475	84	1.94	108	14.19	93	22.65	94	1.18	81
	Holly 89N147-04	184	267.3	99	6588	101	1.93	107	15.28	100	24.69	102	2.72	187
	Holly 89N158-031	208	254.3	94	6125	94	2.05	114	14.76	96	24.24	101	1.32	91
	KW 1800	181	277.7	103	9855	105	1.78	99	15.67	102	24.69	102	1.25	87
	KW 3291	212	289.2	107	6714	103	1.72	96	16.18	106	23.18	96	1.03	71
	KW 3580	209	280.8	104	6533	100	1.69	94	15.72	103	23.14	96	1.25	87
	KW 6001	205	260.7	97	6500	100	1.77	99	14.81	97	24.95	104	1.67	116
	KW 6770	189	286.1	106	6876	106	1.67	93	15.97	104	23.93	99	1.48	102
	Maribo 902	2001	253.9	94	6446	99	1.7	94	14.39	94	25.39	105	1.62	112
	Maribo 912	210	255.2	95	6060	93	1.94	108	14.7	96	23.83	99	1.24	86
	Maribo 914	186	273.6	101	6281	97	1.83	102	15.5	101	22.95	95	1.09	76
	Maribo 916	182	252.30	93	6418	99	1.75	97	14.36	94	25.41	105	1.24	85
	Seedex SX1003	187	264.70	98	6688	103	1.68	94	14.92	98	25.27	105	2.14	148
	Seedex SX1004	213	279.90	104	6748	104	1.74	97	15.73	103	24.12	100	1.46	101
	Van der Have H66140	198	270.60	100	6252	96	1.75	98	15.27	100	23.17	96	1.55	107
	Van der Have H66156	197	269.70	100	6640	102	1.76	98	15.23	100	24.64	102	1.49	103
	Van der Have Suprafort C	194	267.20	99	7152	110	1.74	97	15.10	99	26.84	111	1.84	127
C	ACH 194 (Check)	200	270.40	100	6382	98	1.84	102	15.35	100	23.65	98	1.18	81
C	Hilleshog 5135 (Check)	191	268.6	99	6471	100	1.85	103	15.28	100	24.07	100	1.54	106
C	KW 3265 (Check)	211	260.1	96	6165	95	1.79	100	14.8	97	23.67	98	1.68	116
C	Maribo Ultramono (Check)	202	267.6	99	6134	94	1.84	102	15.21	99	23	95	1.11	77
	Mean	40	269.97	100	6502.5	100	1.8	100.1	15.29	100	24.1	99.9	1.45	100

TABLE 15 *1991 CERCOSPORA LEAF SPOT RATINGS FOR CODED TEST ENTRIES*
BETASEED NURSERY - SHAKOPEE, MN

CODE	DESCRIPTION	8/1	8/5	8/9	8/13	8/16	8/21	8/26	1991 MEAN	2 YR MEAN
200	ACH 194 (Check)	2.4	3.2	3.2	4.4	5.4	5.6	8.0	4.60	4.57
204	ACH 301	2.8	3.6	3.8	5.0	6.0	6.0	8.2	5.06	5.01
175	ACH 890126	2.2	2.4	3.2	3.6	4.4	4.4	7.2	3.91	3.98
199	ACH 890321	2.4	2.6	3.2	3.4	4.4	4.6	6.8	3.91	
177	ACH 890416	2.2	2.6	3.4	4.0	4.4	4.8	6.6	4.00	
180	ACH 895204	2.4	2.8	3.4	4.0	4.4	4.8	6.6	4.06	
193	Beta 1441	2.8	3.2	3.6	4.8	5.2	5.6	8.0	4.74	
195	Beta 1471	2.6	3.4	3.8	4.8	5.6	5.6	8.0	4.83	
206	Beta 2251	2.6	3.2	3.6	4.2	5.2	5.4	8.0	4.60	
174	Beta 5931	2.2	2.4	3.0	3.6	4.2	4.2	6.0	3.66	
179	Beta 6981	3.0	3.0	3.2	4.4	5.0	5.6	8.0	4.60	
178	Bush Johnson 1337	2.6	3.4	3.6	4.6	5.2	6.0	8.0	4.77	
203	Bush Johnson 1340	3.0	3.4	3.6	4.8	5.4	6.4	8.2	4.97	
191	Hilleshog 5135 (Check)	3.0	3.0	3.8	4.4	5.2	5.6	8.0	4.71	4.68
190	Hilleshog 7001	2.8	3.0	3.8	4.8	5.2	5.4	7.6	4.66	
176	Hilleshog 7002	3.0	3.4	4.0	4.8	5.4	6.4	8.2	5.03	
185	Hilleshog 7003	2.4	2.6	3.0	3.6	4.2	4.6	7.4	3.97	3.95
188	Hilleshog 7005	2.8	3.2	4.0	5.0	6.0	6.6	8.4	5.14	4.89
207	Hilleshog 7015	2.8	3.4	3.6	4.4	5.2	5.2	8.2	4.69	
196	Hilleshog 7505	2.2	2.8	3.0	4.0	4.6	4.8	7.4	4.11	
192	HM 2412	2.0	2.4	3.0	3.4	4.4	4.4	7.6	3.88	
183	HM RH1 (Rhiz)	2.2	2.6	3.0	3.4	4.4	4.6	7.2	3.91	3.83
184	Holly 89N147-04	2.4	3.2	3.6	4.4	5.4	5.8	8.0	4.69	
208	Holly 89N158-031	2.8	3.6	4.0	5.0	6.2	6.4	8.0	5.14	
181	KW 1800	2.8	3.0	3.2	4.2	5.0	5.4	7.8	4.49	4.55
211	KW 3265 (Check)	2.8	3.4	3.4	4.2	5.0	5.4	8.0	4.60	4.64
212	KW 3291	2.6	2.8	3.2	4.0	4.6	5.2	7.6	4.28	
209	KW 3580	3.0	3.2	3.4	4.6	5.6	5.8	8.0	4.80	4.6
205	KW 6001	2.6	3.4	3.6	4.0	5.0	5.2	8.0	4.54	
189	KW 6770	2.8	3.0	3.4	4.0	4.8	5.2	8.0	4.46	4.54
201	Maribo 902	3.0	3.4	3.8	4.8	5.6	6.0	8.0	4.94	
210	Maribo 912	2.8	3.6	3.6	4.8	5.6	5.8	8.0	4.88	
186	Maribo 914	2.8	3.4	4.0	5.0	5.4	5.8	8.0	4.91	
182	Maribo 916	2.8	3.2	3.4	4.8	5.2	5.8	8.0	4.74	
202	Maribo Ultramono (Check)	3.0	3.6	4.2	4.6	5.4	5.8	8.2	4.97	4.7
187	Seedex SX1003	2.6	3.0	3.2	3.6	4.6	5.4	7.8	4.31	4.32
213	Seedex SX1004	2.2	2.6	3.0	3.6	4.2	4.4	6.8	3.83	
198	Van der Have H66140	3.0	3.0	3.4	4.6	5.0	5.8	7.8	4.66	4.73
197	Van der Have H66156	3.0	3.6	3.8	5.0	5.6	6.4	8.0	5.06	
194	Van der Have Suprafort C	3.0	3.0	3.4	4.4	4.8	5.2	7.2	4.43	4.11

** Lower numbers indicate better leaf spot resistance (1=Ex, 9=Poor)*
Ratings are means of 5 replications.

TABLE 16 *1991 CERCOSPORA LEAF SPOT RATINGS FOR CODED TEST ENTRIES*
BETASEED NURSERY - SHAKOPEE, MN

*AVERAGE RATING AT EACH DATE **

CODE	DESCRIPTION	8/1	8/5	8/9	8/13	8/16	8/21	8/26	1991 MEAN	2 YR MEAN	3 YR MEAN	3 YR% MEAN
77	ACH 192	3.0	3.2	3.8	4.4	5.0	5.8	7.8	4.71	4.55	4.49	97.2
84	ACH 194	2.4	3.2	3.2	4.4	5.4	5.6	8.0	4.60	4.57	4.57	98.9
67	ACH 196	2.6	3.6	3.6	5.0	5.4	5.4	8.0	4.80	4.60	4.61	99.6
79	ACH 198	2.0	3.0	3.0	3.8	4.4	4.8	6.6	3.94	3.88	4.10	88.7
71	ACH 205 (895205)	2.0	2.6	3.0	3.4	3.6	4.6	6.2	3.63	3.64		
70	ACH 895121 (Rhi)	2.4	3.0	3.0	3.6	4.2	4.8	7.2	4.03			
69	Beta 1238	2.6	3.2	3.6	4.6	5.4	5.6	7.8	4.69	4.72	4.83	104.4
85	Beta 2010 (2885)	2.4	3.0	3.4	4.2	4.8	5.6	8.0	4.49	4.41	4.51	97.5
62	Beta 2988	2.4	3.0	3.2	4.4	4.8	4.8	7.6	4.31	4.39	4.58	99.0
86	Beta 5657	2.0	3.0	3.0	4.2	4.6	5.0	7.6	4.20	4.21	4.29	92.8
82	Beta 6269	2.6	3.0	3.6	4.2	5.0	5.4	7.8	4.52	4.46	4.55	98.5
75	Beta 6625	3.0	3.4	3.8	4.8	5.6	5.6	8.0	4.88	4.92	4.88	105.5
74	Bush Johnson 1320	2.2	3.2	3.4	4.4	5.2	5.8	8.0	4.60	4.64	4.73	102.4
68	Bush Johnson 1330	2.8	3.0	3.8	4.6	5.2	5.4	8.0	4.68	4.77	4.69	101.5
83	Hilleshog 5090	2.4	3.4	3.4	4.2	5.0	5.4	8.0	4.54	4.68	4.79	103.5
61	Hilleshog 5135	3.0	3.0	3.8	4.4	5.2	5.6	8.0	4.71	4.68	4.74	102.6
66	HN 2401	2.6	3.4	3.8	4.6	5.0	5.4	7.8	4.66	4.63	4.74	102.6
78	KW 1119	2.8	3.0	3.2	4.0	4.6	5.2	7.6	4.34	4.69	4.71	101.8
63	KW 2249	2.8	3.4	3.6	4.4	5.0	5.8	7.8	4.69	4.83	4.86	105.0
87	KW 2398	2.8	3.0	3.4	4.2	5.0	5.8	8.0	4.60	4.64	4.64	100.3
81	KW 3145	2.6	3.4	3.4	4.4	5.0	5.6	8.0	4.63	4.67	4.66	100.7
80	KW 3265	2.8	3.4	3.4	4.2	5.0	5.4	8.0	4.60	4.64	4.68	101.1
73	Maribo 865	3.0	3.4	3.6	4.4	5.0	5.4	8.0	4.69	4.47	4.58	99.0
64	Maribo 875	2.8	3.4	4.2	4.8	5.8	5.6	8.0	4.94	4.88	4.78	103.4
72	Maribo 894	2.6	3.4	3.4	4.2	4.8	5.2	8.0	4.51	4.67	4.72	102.1
65	Maribo Ultramono	3.0	3.6	4.2	4.6	5.4	5.8	8.2	4.97	4.70	4.76	102.9
76	Mitsui Monohikari	2.6	2.8	3.0	3.4	4.4	4.8	7.4	4.06	4.07	4.11	89.0

** Lower numbers indicate better leaf spot resistance (1=Ex, 9=Poor)*
Ratings are means of 5 replications.

DATE OF HARVEST SUMMARY

Objectives

Evaluate twelve varieties for relative root yields and quality characteristics harvested early (mid prepile), mid (beginning full harvest) and late (late full harvest).

Experimental Procedures

Trials were planted at eight locations in 1989, and seven locations in 1990 and 1991. Six locations were harvested in all three years.

The twelve varieties that were planted in 1991 were:

ACH 198	KW 2398
ACH 194	KW 1119
ACH 038	Beta 2988
Holly 205	Beta 2249
Hilleshog 5135	Beta 2249 Component A (Triploid)
Monohikari	Beta 2249 Component B (Diploid)

The varieties ACH 198, Hilleshog 5135, and Monohikari have been tested for three or more years and KW 2398 was tested in 1990 and 1991. Varieties KW 1119, Beta 2988, 2249, 2249 Component A, 2249 Component B, ACH 194 and 038, and Holly 205 have only 1991 data.

The experimental units consist of two row strip trials planted and maintained with the cooperators equipment. All trials we thinned to a final population of 125-160 plants per 100/ft. of row. Standard production practices were conducted for weed and disease control. The dates of harvest were split into three intervals; early, mid, and late harvest. The dates of harvest were September 18, 14, 17 for early harvest; October 3, 10, 5 for mid harvest; and October 16, 24, 18 for late harvest in 1989, 1990, and 1991, respectively.

Results and Discussion

In the production of sugarbeets the choice of seed is an integral part of managing that production. The choice of the sugarbeet variety has been made much simpler since Southern Minnesota Beet Sugar Cooperative's seed committee has set requirements for seed to be approved for sugarbeet production in the Southern Minnesota Beet Sugar Cooperative's growing area. The main requirements are that the varieties tested in the coded variety trials for Southern Minnesota Beet Sugar Coop need to have recoverable sugar per ton that is 100% or greater of the mean and recoverable sugar per ton plus recoverable sugar per acre needs to be 195% of the mean. If the varieties meet these two requirements they then need to meet further requirements for cercospora leaf spot, seedling vigor, etc. Then once the varieties are approved they need only to be 97% or greater of the recoverable sugar per ton mean and 195% of the recoverable sugar per ton plus recoverable sugar per acre mean. These requirements are used to determine which varieties will be tested in the date of harvest trials.

Since the approval of varieties is determined by the coded variety trials conducted by American Crystal Sugar Research, this trial is conducted to determine the best harvest interval for each variety for highest productivity. These data will determine whether an early (prepile), mid-harvest (October 3-10), or late October 16-24 is the best harvest interval. This is the first year that unapproved varieties were also tested. Seed companies were asked for unapproved varieties that they felt would provide a high sugar (super sugar variety) in which they were willing and/or able to provide seed. Five varieties were provided; Holly 205, ACH 038, KW 2249 (Triploid + Diploid mixture), KW 2249-D (Diploid component of KW 2249) and KW 2249-T (Triploid component of KW 2249).

Variety Performance

Data are presented in tables 1-5. Sugar percent (Table 1) increase from early to late harvest averaged 3.3 percent. This increase was .62 percent greater than 1990 and 1.63 percent greater than 1989. The larger increase could be due to a lower tons/acre in 1991 than in 1989 and 1990, giving smaller beets, which usually results in a higher sugar percent. The nights were cool and days were warm in 1991, much more consistently than in 1989 and 1990. These type of conditions aid in the increase in sugar percent. Early harvest data show that KW 2249-T gave the highest sugar percent and significantly greater than other varieties. KW 2249-T gave 1.1 percent higher sugar percent than Monohikari which was the lowest. The highest sugar percent obtained by early harvest by an approved variety was ACH 194 at 13.5 percent with KW 2398 a very close second at 13.4 percent.

Mid harvest for sugar percent shows that Beta 2988 gave the highest sugar percent at 15.3. However, ACH 194, KW 2249-M, and ACH 198 were close behind at 15.2 percent. The lowest sugar percent was obtained by KW 2249-D (Diploid component of KW 2249-M). Late harvest data did not show a significant difference among eight of the twelve varieties tested. These eight varieties ranged from 16.7 to 16.9 percent sugar. The lowest percent sugar was obtained with Monohikari at 16.0 percent.

Root yield (Table 2) increase from early to late averaged 1.6 tons per acre. This was typical for 1991 in that yield increase was not great. However, this is not typical for an average year. In 1989 a 3.08 ton increase was observed and 2.68 ton in 1990. The varieties that did not increase to a great degree were high at early harvest. KW 2249-T gave the highest tons/acre at early harvest of 22.9, but only increased 0.4 tons from early to late harvest. Holly 205 also had a high early tons/acre and increased only 1 ton. Although other varieties such as ACH 194 and Hilleshog 5135 were lower at early harvest and only increased 1.2 and .6 tons/acre, respectively. The lowest ton/acre varieties at early harvest KW 1119, Beta 2988, and ACH 198 gave the greatest increases of 3.3, 3.1 and 2.6, respectively.

Loss to molasses data (Table 3) shows an increase of 0.03 percent from early to late harvest. Loss to molasses was not significantly different regardless of variety at any harvest time interval. Mid-harvest tended to give a higher loss to molasses than at early or late harvest intervals. This could be due to the early September precipitation making deep nitrogen more accessible to the plant, resulting in higher loss to molasses.

Recoverable sugar per ton (RST) was highest with KW 2249-T at 253.6 pounds during early harvest (Table 4). KW 2249-T was significantly greater at early harvest than any other variety. All other varieties were similar in RST except Monohikari which was similar only to ACH 038. Beta 2988 gave the highest RST at mid-harvest but not significantly higher than ACH 194, 2249-M, KW 2398 and ACH 198. ACH 198 gave the highest RST at late harvest but not significantly higher KW 2398, 2249-M, - T or -D, Beta 2988, KW 1119 and ACH 194.

Recoverable sugar per acre (RSA) is or should be the primary factory in determining which variety to plant, and when considering the data in question, when to harvest a particular variety. All data were non-significant in the early and mid-harvest intervals. Late harvest data shows that seven of the twelve varieties (ACH 194, Holly 205, KW 1119, Beta 2249-M, D, T and KW 2398) had similar RSA. The varieties with the highest RSA at early harvest tended to have the highest at late harvest. ACH 038 gave the lowest RSA at late harvest with Monohikari being a close second.

Average deviation from the mean for each variety tested in 1991 is presented in figures 1-5 for sugar percent, tons/acre, loss to molasses, recoverable sugar per ton, and recoverable sugar per acre. Data combined for 1989-1991 are presented in tables 6-9.

Since recoverable sugar per acre is the factor that sugarbeet producers payment is based on, the remainder of this discussion will concentrate of RSA for each variety. Recoverable sugar per acre for ACH 194, Holly 205, KW 2398, KW 2249-D and KW 2249-T was above average regardless of harvest time interval (figure 5). ACH 194 and 2249-D mean differential increased above the mean over time. Thus, these two varieties in 1991 could have been harvested at any time interval for top sugar production with late harvest being optimum. Holly 205 and KW 2249-T gave the greatest differential above the mean at mid-harvest. The next best alternative would be to harvest Holly 205 late and KW 2249-T early. Early was the best time to harvest KW 2398, but mid-harvest was not much different when considered the differential from the mean. Hilleshog 5135 and Beta 2988 would be best harvested early as indicated by these data. Both Hilleshog 5135 and Beta 2988 were above the mean at early harvest but below the mean at mid and late harvest. Monohikari was above the mean only at mid harvest and KW 2249-M was above the mean only at late harvest, indicating these time intervals the respective varieties. KW 2249-M did not deviate far below the mean at early (-28.1 lbs.) and mid-harvest (-34.2 lbs.). ACH 038, ACH 198 and KW 1119 were below the mean regardless of the harvest interval. However, ACH 198 and KW 1119 are typically high sugar varieties and in this authors opinion would still be good choices for seed. ACH 198 and KW 1119 could have reacted more negatively to the wet conditions of the past season than the other varieties.

A sugarbeet grower should also consider other individual factors such as sugar percent, tons per acre, loss to molasses, recoverable sugar per ton. There are certain circumstances that would warrant varieties that produce higher tons/acre than sugar percent vs. higher sugar than tons/acre. These circumstances should be discussed with an Agriculturalist.

Only three varieties have data for three years or more. This indicates the improvement of varieties has been very successful. The rapid turn over of varieties is the reason that we need to test the varieties tested in the coded variety trials in this trial one to two years prior to their approval so then growers will know how to grow each variety in order to reach its greatest potential. In consideration of which varieties to plant and when to harvest each variety a grower should consider the data presented here, coded variety trial data, personal experience and the experience and knowledge of the Agricultural staff.

Table 1. Three year performance of 1991 varieties harvested early, mid-harvest, and late for sugar content.

							Sugar Content %					
Variety	Early 1991	Mid 1991	Late 1991	Change E->L	Early 1991	Late 1991	Early 2yr Mean 90-91	Late 2yr Mean 90-91	Early 3yr Mean 89-91	Late 3yr Mean 89-91	Early 3yr %Mean 89-91	Late 3yr %Mean 89-91
Ach 38	13.2	14.8	16.1	2.9	98.9	96.9						
ACH 194	13.5	15.2	16.8	3.4	100.7	101.1						
Holly 205	13.1	15.0	16.4	3.3	98.3	98.7						
KW 1119	13.3	14.9	16.8	3.5	99.9	101.1						
Beta 2988	13.3	15.3	16.7	3.4	99.6	100.3						
KW 2249-D	13.3	14.7	16.7	3.4	99.9	100.5						
KW 2249-M	13.3	15.2	16.8	3.5	99.4	100.8						
KW 2249-T	13.8	15.0	16.7	2.9	103.1	100.2						
KW 2398	13.4	15.1	16.7	3.4	100.0	100.8	13.3	16.3				
ACH 198	13.2	15.2	16.9	3.8	98.7	101.9	13.2	16.5	13.8	16.9	100.4	101.8
Hill. 5135	13.2	14.9	16.4	3.3	98.7	98.9	13.2	16.3	13.8	16.6	100.6	99.8
Monohikari	12.7	14.8	16.0	3.3	95.4	96.3	13.0	16.0	13.6	16.3	98.9	98.3
Mean	13.3	15.0	16.6	3.3	100.0	100.0	13.1	16.3	13.7	16.6	100.0	100.0
*LSD(0.05)	0.25	0.23	0.27									

* 0.05 significance level

1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard

1990 Data from Hector, Renville, Sacred Heart, Maynard, and Clara City.

1991 Data from Hector, Olivia, Renville, Maynard, Clara City, Gluek, and Degraff.

Table 2. Three year performance of 1991 varieties harvested early, mid-harvest, and late for root yield.

Root Yield Tons												
Variety	Early 1991	Mid 1991	Late 1991	Change E->L	Early %Mean	Late %Mean	Early 2yr Mean 90-91	Late 2yr Mean 90-91	Early 3yr Mean 89-91	Late 3yr Mean 89-91	Early 3yr %Mean 89-91	Late 3yr %Mean 89-91
ACH 38	21.2	21.5	23.5	2.4	97.6	100.2						
ACH 194	22.0	23.2	23.2	1.2	101.5	98.8						
Holly 205	22.8	23.0	23.8	1.0	104.9	101.1						
KW 1119	20.3	21.8	23.6	3.2	93.6	100.2						
Beta 2988	20.7	21.6	23.8	3.1	95.5	101.4						
KW 2249-D	22.6	23.2	23.4	0.9	104.0	99.7						
KW 2249-M	21.4	22.7	23.1	1.7	98.6	98.1						
KW 2249-T	22.9	22.0	23.3	0.4	105.4	98.9						
KW 2398	22.2	22.2	23.8	1.6	102.2	101.1	22.8	23.0				
ACH 198	20.4	20.6	23.0	2.6	94.0	97.9	21.3	21.0	22.0	21.9	98.4	96.3
Hill. 5135	21.4	22.1	22.0	0.6	98.5	93.4	21.2	23.0	21.9	23.7	106.4	104.2
Monohikari	22.6	21.7	23.5	0.9	104.0	100.0	21.6	20.9	23.1	22.7	101.6	99.5
Mean	21.7	22.4	23.5	1.7	100.0	99.2	21.7	22.0	22.3	22.8	100.0	100.0
*LSD (0.05)	NS	0.5	1.6									

* 0.05 significance level

1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard

1990 Data from Hector, Renville, Sacred Heart, Maynard, and Clara City.

1991 Data from Hector, Olivia, Renville, Maynard, Clara City, Gluek, and Degraff.

Table 3. Three year performance of 1991 varieties harvested early, mid-harvest, and late for loss to molasses (LTM).

Loss to Molasses
%

Variety	Early 1991	Mid 1991	Late 1991	Change E->L	Early %Mean	Mid %Mean	Early 2yr Mean 90-91	Late 2yr Mean 90-91
38	1.18	1.26	1.21	0.03	107	107		
194	1.15	1.18	1.14	-0.01	105	101		
205	1.02	1.19	1.08	0.06	93	96		
1119	1.10	1.16	1.12	0.02	100	99		
2988	1.09	1.15	1.12	0.03	99	99		
2249-D	1.12	1.13	1.11	-0.01	102	98		
2249-M	1.08	1.17	1.16	0.08	98	103		
2249-T	1.09	1.20	1.08	-0.01	99	96		
2398	1.06	1.13	1.11	0.05	96	98	1.18	1.21
198	1.09	1.18	1.15	0.06	99	102	1.24	1.25
5135	1.10	1.12	1.20	0.10	100	106	1.23	1.26
MONO	0.97	1.09	1.10	0.13	88	97	1.08	1.18
Mean	1.10	1.18	1.13	0.02				
*LSD(0.05)	NS	NS	NS					

* 0.05 significance level

1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard

1990 Data from Hector, Renville, Sacred Heart, Maynard, and Clara City.

1991 Data from Hector, Olivia, Renville, Maynard, Clara City, Gluek, and Degraff.

Table 4. Three year performance of 1991 varieties harvested early, mid-harvest, and late for Recoverable Sugar per Ton.

							Recoverable Sugar/Ton Lbs					
Variety	Early 1991	Mid 1991	Late 1991	Change E->L	Early %Mean	Late %Mean	Early 2yr Mean 90-91	Late 2yr Mean 90-91	Early 3yr Mean 89-91	Late 3yr Mean 89-91	Early 3yr %Mea 89-91	Late 3yr %Mean 89-91
ACH 38	240.3	271.1	297.6	57.3	98.7	96.4						
ACH 194	245.9	280.9	312.5	66.6	101.0	101.2						
Holly 205	242.1	276.9	306.3	64.2	99.4	99.2						
KW 1119	244.7	275.3	313.2	68.5	100.5	101.4						
Beta 2988	244.2	283.8	310.8	66.6	100.3	100.7						
Beta 2249-D	244.0	271.1	311.5	67.5	100.2	100.9						
Beta 2249-M	243.7	280.1	311.8	68.0	100.1	101.0						
Beta 2249-T	253.6	276.1	311.5	57.9	104.1	100.9						
KW 2398	245.9	279.2	312.7	66.8	100.9	101.3	242.0	302.4				
ACH 198	241.6	280.7	315.2	73.6	99.2	102.1	238.8	302.6	252.0	312.3	100.0	101.7
Hill. 5135	241.5	275.5	304.3	62.8	99.1	98.5	238.7	300.2	252.5	305.7	100.2	99.6
Monohikari	235.5	274.1	298.1	62.5	96.7	96.5	237.8	296.5	251.3	303.0	99.7	98.7
Mean	243.6	277.1	308.8	65.2	100.0	100.0	239.3	300.4	251.9	307.0	100.0	100.0
*LSD(0.05)	5.41	4.97	5.83									

* 0.05 significance level

1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard

1990 Data from Hector, Renville, Sacred Heart, Maynard, and Clara City.

1991 Data from Hector, Olivia, Renville, Maynard, Clara City, Gluek, and Degraff.

Table 5. Three year performance of 1991 varieties harvested early, mid-harvest, and late for sugar/acre.

							Sugar/Acre Lbs					
Variety	Early 1991	Mid 1991	Late 1991	Change E->L	Early %Mean	Late %Mean	Early 2yr Mean 90-91	Late 2yr Mean 90-91	Early 3yr Mean 89-91	Late 3yr Mean 89-91	Early 3yr %Mea 89-91	Late 3yr %Mean 89-91
ACH 38	5647.57	5737.10	6403.62	756.05	98.8	92.5						
ACH 194	5687.48	6177.16	7249.16	1561.68	99.5	104.7						
Holly 205	5742.05	6303.05	7055.86	1313.81	100.5	101.9						
KW 1119	5529.66	5596.86	6825.71	1296.05	96.7	98.6						
Beta 2988	5839.20	5865.94	6705.57	866.37	102.2	96.8						
Beta 2249-D	5731.36	6123.90	7223.16	1491.8	100.3	104.3						
Beta 2249-M	5639.88	5975.14	7095.07	1455.19	98.7	102.5						
Beta 2249-T	5904.59	6333.86	6841.47	936.88	103.3	98.8						
KW 2398	5859.95	6174.28	6905.69	1045.74	102.5	99.7	5519.0	6917.8				
ACH 198	5567.44	5731.83	6524.26	956.82	97.4	94.2	5085.2	6460.6	5533.7	6914.6	98.1	98.0
Hill. 5135	5313.86	5898.82	6715.31	1401.45	93.0	97.0	5062.4	6887.7	5556.4	7261.7	98.5	102.9
Monohikari	5552.70	6194.99	6472.47	919.77	97.2	93.5	5142.4	6320.2	5827.1	6988.2	103.3	99.1
Mean	5715.22	6014.13	6924.95	1209.73	100.0	100.0	5202.2	6646.6	5639.1	7054.9	100.0	100.0
*LSD(0.05)	NS	NS	487.80									

* 0.05 significance level

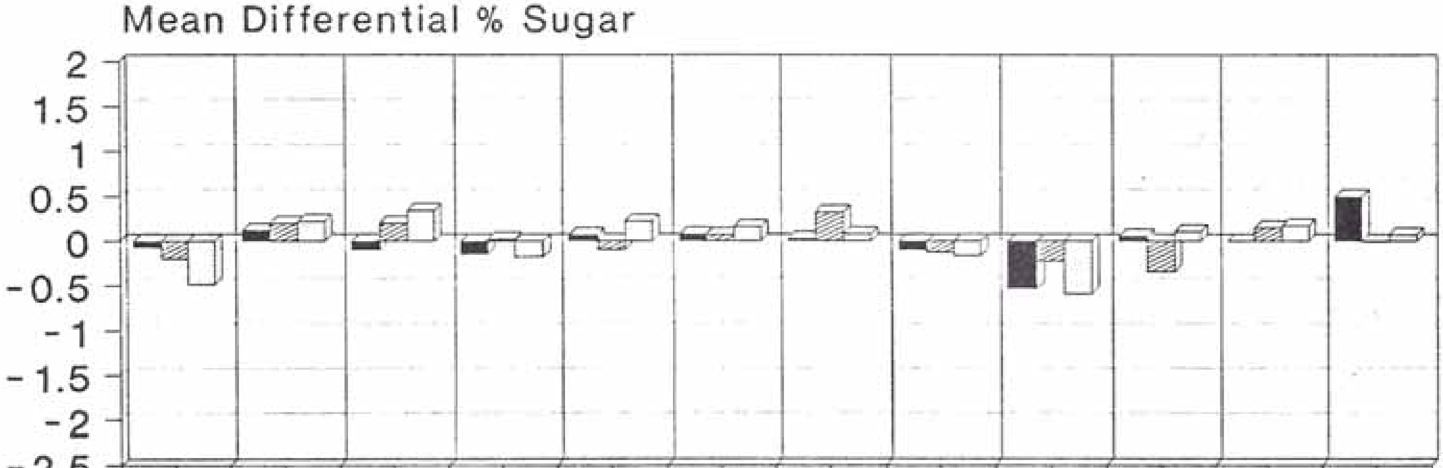
1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard

1990 Data from Hector, Renville, Sacred Heart, Maynard, and Clara City.

1991 Data from Hector, Olivia, Renville, Maynard, Clara City, Gluek, and Degraff.

Deviation From Mean for % Sugar

Combined Data for 1991



	038	194	198	205	1119	2398	2988	5135	Mono	2249D	2249M	2249T
Early	-0.07	0.12	-0.1	-0.15	0.07	0.08	0.03	-0.1	-0.53	0.06	0	0.5
Mid	-0.2	0.2	0.2	0.02	-0.1	0.07	0.32	-0.13	-0.23	-0.34	0.15	-0.01
Late	-0.48	0.22	0.34	-0.18	0.22	0.16	0.08	-0.16	-0.59	0.11	0.17	0.07

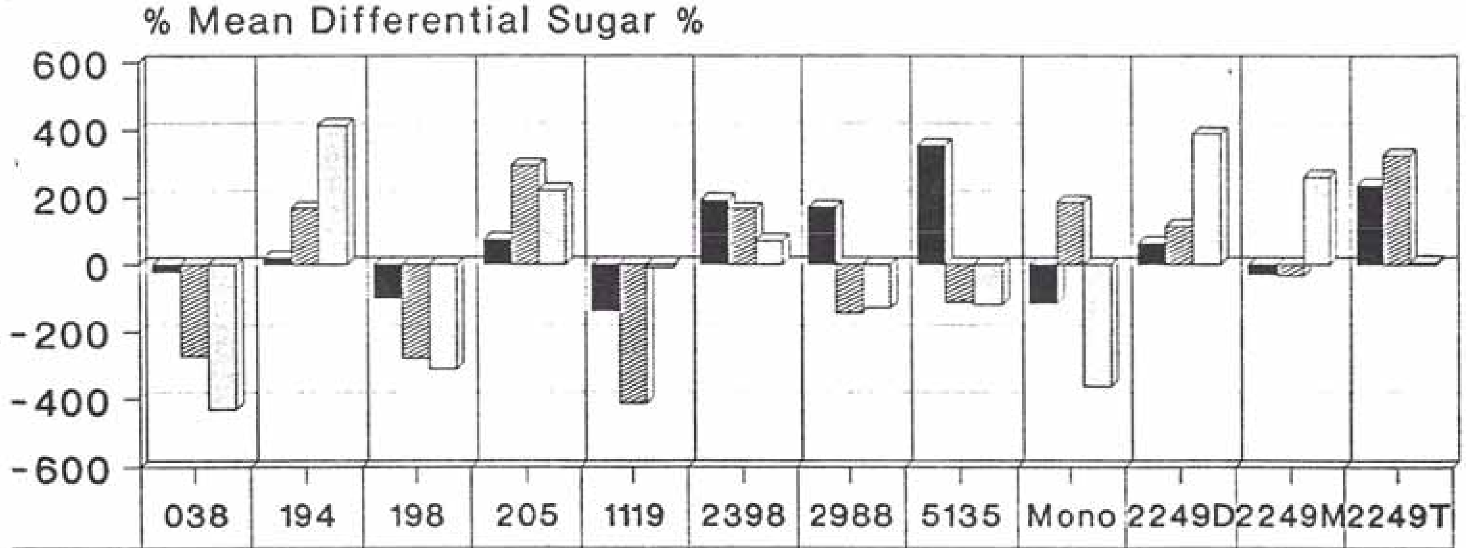
Variety

Early Mid Late

Figure 1

Deviation From Mean for RSA

Combined Data for 1991



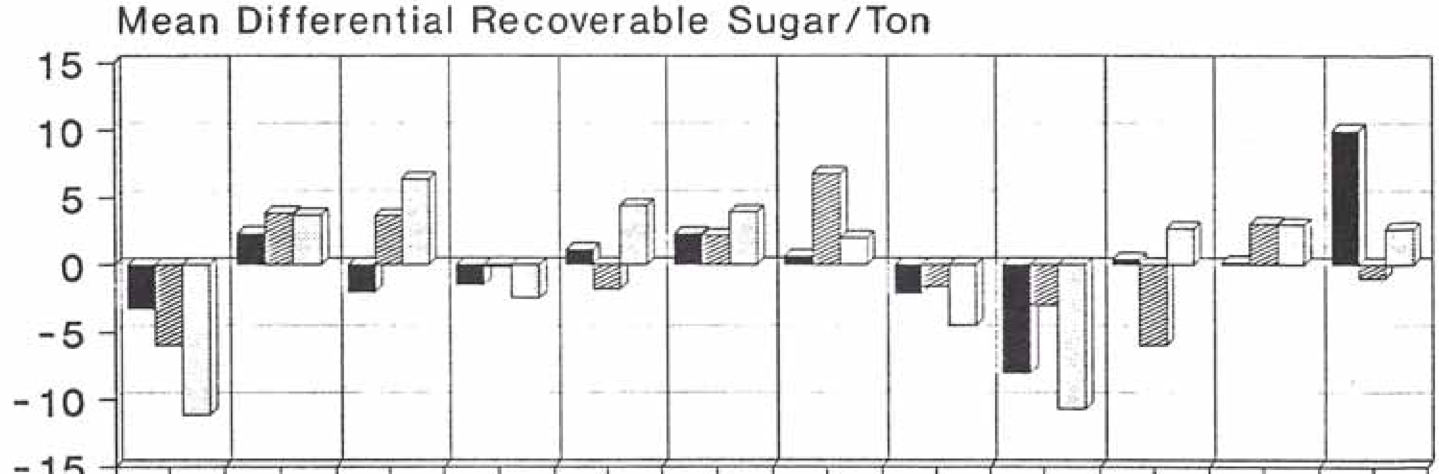
	038	194	198	205	1119	2398	2988	5135	Mono	2249D	2249M	2249T
Early	-20.4	19.5	-100.5	74	-138.3	191.9	171.2	354.1	-115.2	63.3	-28.1	236.6
Mid	-272.3	167.7	-277.5	293.6	-412.5	164.8	-143.4	-110.5	185.5	114.4	-34.2	324.4
Late	-431.1	414.3	-310.3	221	-9	70.9	-129.2	-119.4	-362.3	388.3	260.2	6.6

Variety

Early Mid Late

Figure 2

Deviation From Mean for RST
Combined Data for 1991



	038	194	198	205	1119	2398	2988	5135	Mono	2249D	2249M	2249T
Early	-3.27	2.35	-2.02	-1.48	1.14	2.31	0.63	-2.11	-8.06	0.42	0.151	9.967
Mid	-5.98	3.85	3.64	-0.12	-1.77	2.17	6.73	-1.6	-2.98	-5.96	3.04	-1.01
Late	-11.15	3.71	6.38	-2.45	4.4	3.93	2.01	-4.48	-10.71	2.73	2.98	2.66

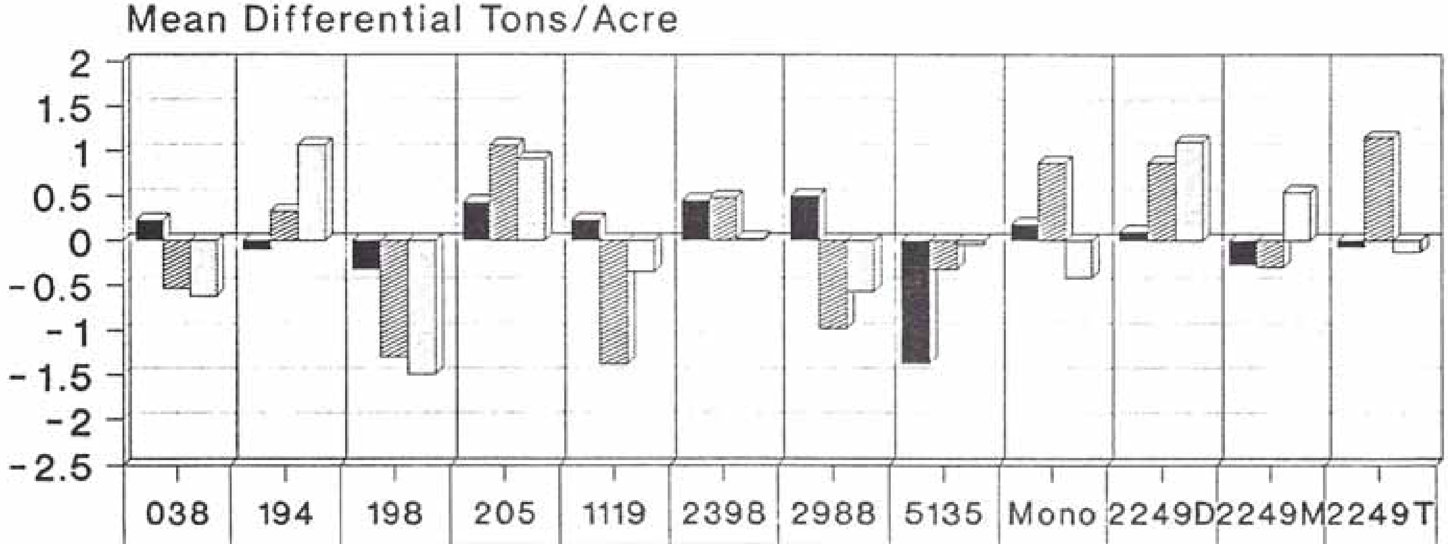
Variety

Early Mid Late

Figure 3

Deviation From Mean for Tons/Acre

Combined Data for 1991



	038	194	198	205	1119	2398	2988	5135	Mono	2249D	2249M	2249T
Early	0.227	-0.1	-0.32	0.43	0.23	0.45	0.5	-1.37	0.183	0.1	-0.27	-0.07
Mid	-0.53	0.33	-1.3	1.06	-1.38	0.48	-0.98	-0.32	0.87	0.87	-0.3	1.15
Late	-0.62	1.07	-1.49	0.91	-0.35	0.02	-0.57	-0.04	-0.41	1.1	0.54	-0.13

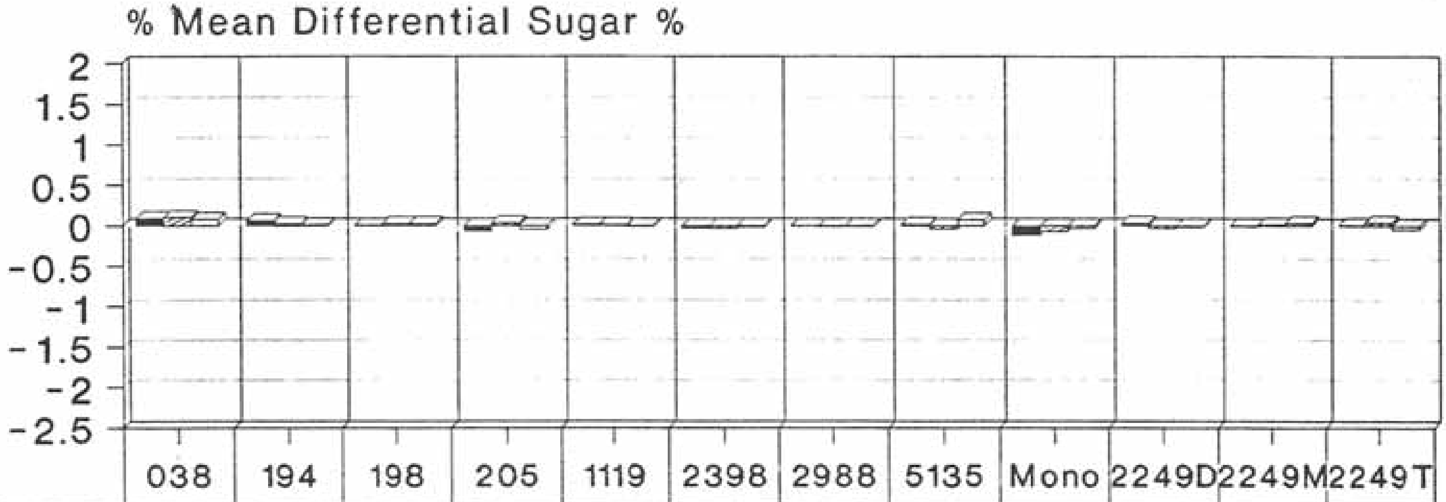
Variety

Early Mid Late

Figure 4

Deviation From Mean for LTM

Combined Data for 1991



	038	194	198	205	1119	2398	2988	5135	Mono	2249D	2249M	2249T
Early	0.09	0.06	0.002	-0.07	0.01	-0.03	0	0.017	-0.12	0.03	-0.01	0.007
Mid	0.1	0.02	0.02	0.03	0.008	-0.03	-0.01	-0.04	-0.07	-0.03	0.01	0.04
Late	0.08	0.01	0.02	-0.05	-0.01	-0.02	-0.01	0.07	-0.03	-0.02	0.03	-0.05

Variety

Early Mid Late

Figure 5

SUGARBEET PLANT POPULATION STUDY

Objective:

Evaluate sugarbeet plant stand of 100 to 200/100 ft. of row for relative root yields and quality characteristics.

Experimental Procedure:

Sugarbeets variety KW 3265 were planted April 3, 1991 at Gluek, MN spaced three inches apart in 22 inch rows. Sugarbeets were thinned in June to the desired spacing of 100, 125, 150, 175, and 200.

The experimental units consist of 12 row plots 40 ft. in length with four replications. The plots were harvested on September 22, 1991. Twenty 10 foot samples of sugarbeets per experimental in all four replications per plant stand, sugarbeets were hand harvested for yield and quality analysis.

Results and Discussion

There was a significant difference among treatment means for all characteristics (Table 1) at the 5% level of probability. The populations of 100, 125 and 150 plants per 100 feet of row showed significantly higher recoverable sugar per acre than the populations of 175 and 200 plants per 100 feet of row. Average yield and sugar content dropped significantly at 175 and 200 plants/100 feet compared to the lower plant population.

Recoverable sugar per ton, which is a function of sugar content and percent loss to molasses, dropped significantly at the two highest plant populations.

Sugarbeet yield and quality are production problems facing every grower during the growing season. Spacing of sugarbeets is a management practice that has a significant effect on both factors.

Based on estimated gross returns per ton and per acre, growers would receive the highest returns at population levels between 100 and 150 plants per 100 ft. (Table 2).

Plant population levels above 175 per 100 feet were significantly lower in yield, quality and expected returns. Normally, higher populations produce slightly smaller beets which are usually higher in sugar content. Harvest losses can also increase at the higher populations.

Previous tests have shown that uniformly spaced beets at population levels between 120-160 plants per 100 feet of row usually produce the highest recoverable sugar per acre and lowest harvest losses.

Table 1. Effects of yield and quality at various plant populations.

Treatment Plants/100 ft.	Root Yield (Tons)	Sugar Percent (%)	Loss to Molasses (%)	Recoverable Sugar/Ton (lbs.)	Recoverable Sugar/Acre (lbs.)
100	21.88	14.69	1.20	269.77	5,898.9
125	22.88	14.37	1.22	262.97	6,021.1
150	22.27	14.53	1.20	266.57	5,933.8
175	21.46	14.05	1.36	253.75	5,442.5
200	20.41	13.70	1.32	247.50	5,034.1
Mean	21.78	14.26	1.26	210.11	5,666.1
LSD (0.05)	1.57	0.19	0.40	4.22	413.5

Table 2

Treatment Plants/100 ft.	Estimated Gross Return Ton (% of mean)	Acre
100	106.7	107.2
125	102.1	107.2
150	104.5	106.9
175	95.7	94.3
200	91.5	85.7
Mean	100.0	

Table 3

Treatment Plant/100 ft.	Avg. Plant Spacing Inches	Plant per Acre
100	12.0	23,760
125	9.6	29,700
150	8.0	35,640
175	6.8	41,580
200	6.0	47,520

SIDE DRESS NITROGEN INFLUENCE ON RELATIVE QUANTITY AND QUALITY

OBJECTIVE

Evaluate the influence of late side dressed nitrogen on quantity and quality of sugarbeets.

EXPERIMENTAL PROCEDURE

Nitrogen was side dressed by a grower at three different rates on July 15-20, 1991. The rates of nitrogen side dressed were 0, 40 and 80 pounds nitrogen per acre. These treatments were applied at two locations in strips through the field. Sugarbeets were hand-harvested in these strips by treatment. Each treatment had 20 subsamples hand-harvested at two time intervals. The times of harvest were September 27 and October 21.

RESULTS AND DISCUSSION

Tons/acre was not increased by an increase in nitrogen at either harvest interval (Table 1 - 2). There actually was a significant decrease in tons/acre at the first harvest interval when comparing 0 to 80 lb. of N/acre and at the second harvest interval when comparing 0 and 40 lb. of N/acre to 80 lb. of N/acre.

Sugar percent was significantly reduced by the addition of nitrogen. When nitrogen was added, the increase in nitrogen had an indirect relationship to sugar percent. Loss to molasses was statistically similar regardless of treatment, but there was tendency for loss to molasses to increase as nitrogen increased.

Recoverable sugar per ton and per acre decreased as nitrogen increased. There was not a significant decrease in recoverable sugar per ton (RSI) for each 40 lb. nitrogen increase. However, 80 lb. nitrogen reduced RST significantly. This is largely due to the decrease in sugar percent and partially due to the increase in loss to molasses when nitrogen was increased. Recoverable sugar per acre (RSA) was statistically similar at 0 and 40 pounds nitrogen per acre, however, both treatments were statistically greater than 80 lb. nitrogen per acre. This result was mainly due to the decrease in tons/acre at the 80 lb. nitrogen/acre.

The loss in tons/acre as nitrogen rate was increased generally is not the typical response. These data may indicate that there is a threshold when considering the addition of nitrogen. Tons/acre or any other of the quantity and quality factors were not significantly reduced when comparing 0 to 40 lb. nitrogen/acre. The significant reduction was obtained at 80 lb. nitrogen/acre. Another factor to consider in these results is that due to wet weather the nitrogen was not side dressed until July 15-20. Generally speaking, June 1 is the latest a person should add nitrogen to sugarbeet field. At an earlier date side dressed nitrogen may had been advantageous.

The predominant reason for the application of side dressed nitrogen is to increase return per acre. The return per acre was highest at both harvest intervals when no side dress nitrogen was applied. For each increase in side dressed nitrogen there was a substantial decrease in return per acre. The decrease in return per acre probably is largely due to the late timing of the side dress application. A more timely side dress application of nitrogen may have better results for return per acre with added nitrogen considering that there is a need for added nitrogen.

Future research effort will take into consideration time of application and variability in sampling. Treatments will be randomized and replicated to reduce sampling error. Typically, sugarbeet yields increase with additional nitrogen until the basic plant requirements are satisfied.

Further applications above the normal plant requirements of nitrogen show no yield response; however, sugar content and relative purities decrease significantly which lowers total payment.

Growers must carefully consider the plant requirements for total nutrients, particularly nitrogen. Apparent deficiencies may be related to <u>temporary</u> conditions, and could be corrected over time without additional nitrogen.

The apparent need for side dress nitrogen in these trials was a function of excessive soil moisture which may have leached nitrogen out of the root zone, or the root system of the developing plant was severely stunted. Denitrification also may have reduced the total amount of nitrogen available to the plant.

There may be circumstances when side dress nitrogen is necessary, particularly if less than 100% of the recommended amount was applied broadcast in the spring. Plans should be made early in the growing season to supplement the nitrogen application, and then only if the plant/soil relationship requires the additional amount.

Table 2. Sugarbeet yield and quality as influenced by rate of side dress nitrogen at the first harvest interval (Sept. 27).

Nitrogen Lb/A	Tons/ Acre	Sugar Percent	Loss to Molasses	Recoverable Sugar/Ton	Recoverable Sugar/Acre	Return* per Acre
		(%)	(%)			(% of mean)
0	28.7	14.26	1.21	261	7505	111
40	28.0	13.89	1.24	253	7105	102
80	25.7	13.55	1.29	245	6255	88
HIGH MEAN	28.7	14.26	1.29	261	7205	100
LOW MEAN	25.6	13.55	1.21	245	6255	
EXP. MEAN	27.5	13.90	1.24	253	6955	
C.V. %	23.7	5.56	12.93	7	25	
LSD 5%	2.5	0.34	NS	8	532	

* Higher percent indicates greater return per acre.
** Return per acre is the calculation of payment per acre considering all quality and yield factors and the cost of nitrogen fertilizer.

Table 3. Sugarbeet yield and quality as influenced by rate of side dress nitrogen at the second harvest interval (Oct. 21).

Nitrogen Lb/A	Tons/ Acre	Sugar Percent	Loss to Molasses	Recoverable Sugar/Ton	Recoverable Sugar/Acre	Return* per Acre
		(%)	(%)			(% of mean)
0	28.7	14.13	1.28	257	7363	110
40	28.3	13.88	1.33	251	7130	103
80	25.1	13.58	1.27	246	6153	88
HIGH MEAN	28.7	14.13	1.33	257	7363	100
LOW MEAN	25.1	13.58	1.27	246	6153	
EXP. MEAN	27.4	13.87	1.29	251	6882	
C.V. %	23.1	5.33	12.93	7	17	
LSD 5%	2.3	0.33	NS	8	587	

* Higher percent indicates greater return per acre.
** Return per acre is the calculation of payment per acre considering all quality and yield factors and the cost of nitrogen fertilizer.

FERTILIZING ACCORDING TO SOIL TEST

OBJECTIVES:

Evaluate the effect of fertility rates based on soil test analysis and recommendation of nutrients on root yields and quality characteristics.

EXPERIMENTAL PROCEDURES:

Fertilizer was applied by a commercial applicator at three locations. The application rates were made in six strips 60 feet by 200 feet at 25, 50, 75, 100, 125, and 150% of recommended nutrient analysis. Fields were chosen due to their relatively low fertility as indicated by their fertility test.

Harvest of experimental units was conducted on October 15, 1991, and evaluated for quantity and quality characteristics. All ten replications per treatment were hand harvested. At harvest time all three locations averaged 125, 132, and 135 plants per 100 feet.

RESULT AND DISCUSSION:

Sugarbeet quality is an important factor in the production of sugarbeets, and there are many factors affecting the quality of sugarbeets. However, one of the factors a producer probably has the most control over is the fertility. The fertilizer applied is usually based on a fertility analysis and the recommendation from the soil test results. Fertility tests are not always trusted and sometimes a variation from the recommended nutrient rates is applied. Thus, fertility rates were tested in comparison to soil test recommendations.

Table 1 shows the fertilizer rates applied at each location. Due to variation of fertility at each location, the results will be discussed by location and treatments will be referred to as a percent of soil test recommendation.

The results of this experiment produced deviations from the normal that are difficult to explain within the parameters of this experiment. At locations one and two, tons/acre generally showed a slight increase as fertilizer rate increased; however, at location three, root yield showed a significant decrease with increasing levels of fertility.

Sugar percent and loss to molasses generally follow normal trend of lower sugar percent and higher loss to molasses as fertility rate increases. However, at location three the sugar percent and loss to molasses did not follow this normal trend.

Recoverable sugar per acre is a function of tons/acre, sugar percent and loss to molasses, but tons/acre probably has the most influence on recoverable sugar per acre. Low recoverable sugar per acre was observed at location one and three at 150% of the recommended rate. This treatment should have produced a higher recoverable sugar per acre due to tons/acre at the expense of sugar percent and loss to molasses as was the case at location two. At locations two and three, a low recoverable sugar per acre was observed at 100 percent of recommended fertilizer rate. This treatment should have an above average tons/acre, sugar percent, and below average loss to molasses calculating into a high recoverable sugar acre as was the case at location one.

The above stated deviation may be attributed to position effect of treatments within the field. Thus, further research will be conducted in 1992 to minimize this variability. This experiment will be conducted in smaller experimental units being randomized and replicated within each location. The fertilizer will be applied with smaller equipment. These criteria should reduce variability by applying fertilizer more accurately and increasing sampling accuracy.

The highest recoverable sugar per acre and return per acre were generally produced by a fertilizer rate within 25 percent plus or minus of 100 percent. This indicates the fertilizer recommendation from fertility tests were relatively correct.

TABLE 1. FERTILIZER RATES APPLIED AT EACH LOCATION FOR EACH TREATMENT.

Fertilizer Rate	Nitrogen	Phosphate	Potassium
(% of Recommended)	- - - - - - - - - -	(lb/A)	- - - - - - - - - -
Location 1			
25	12.50	17.50	7.50
50	25.00	35.00	15.00
75	35.00	52.00	22.00
100	50.00	70.00	30.00
125	62.00	87.00	37.00
150	75.00	105.00	45.00
Location 2			
25	30.00	16.00	16.00
50	60.00	32.00	32.00
75	80.00	48.00	48.00
100	118.00	65.00	65.00
125	147.00	81.00	81.00
150	171.00	97.00	97.00
Location 3			
25	25.00	22.50	25.00
50	50.00	45.00	50.00
75	75.00	67.50	75.00
100	100.00	90.00	100.00
125	125.00	112.30	125.00
150	150.00	135.00	150.00

Table 2. Quantity and quality data from location one as influenced by fertilizer rate.

% of Fertilizer Recomendation (%)	Tons/ Acre	Sugar Percent (%)	Loss to Molasses (%)	Recoverable Sugar/Ton	Recoverable Sugar/Acre	$ Return per Acre (% of mean)
25	21.9	16.25	0.82	308	6780	86
50	24.6	17.23	0.86	327	8088	106
75	25.8	17.08	0.88	324	8388	109
100	27.0	16.19	0.97	304	8248	103
125	28.4	15.66	0.99	293	8358	102
150	27.3	15.35	0.99	287	7847	94
High Mean	28.4	17.23	0.99	327	8388	100
Low Mean	21.9	15.35	0.82	287	6780	
Exp. Mean	25.9	16.29	0.92	307	7952	
C.V. %	14.0	3.30	12.78	4	19	
LSD 5%	2.7	0.34	0.07	5	NS	

* Lower number indicates a greater return per acre

Table 3. Quantity and quality data from location two as influenced by fertilizer rate.

% of Fertilizer Recomendation (%)	Tons/ Acre	Sugar Percent (%)	Loss to Molasses (%)	Recoverable Sugar/Ton	Recoverable Sugar/Acre	$ Return per Acre (% of mean)
25	25.3	16.21	1.06	303	7697	96
50	25.6	16.35	1.06	306	7841	97
75	29.0	16.03	1.14	298	8640	105
100	27.7	15.32	1.30	280	7776	90
125	31.9	15.50	1.19	286	9133	107
150	33.0	15.07	1.22	277	9163	105
High Mean	33.0	16.35	1.06	306	9163	100
Low Mean	25.3	15.07	1.30	277	7697	
Exp. Mean	28.8	15.75	1.16	292	8375	
C.V. %	19.4	3.65	10.48	4	19	
LSD 5%	2.7	0.36	0.08	8	758	

* Lower number indicates a greater return per acre

Table 4. Quantity and quality data from location three as influenced by fertilizer rate.

% of Fertilizer Recomendation (%)	Tons/ Acre	Sugar Percent (%)	Loss to Molasses (%)	Recoverable Sugar/Ton	Recoverable Sugar/Acre	$ Return per Acre (% of mean)
25	22.0	15.87	1.43	288	6352	97
50	27.1	15.35	1.29	281	7631	114
75	26.2	15.52	1.30	284	7456	111
100	21.0	15.52	1.36	283	5963	87
125	23.8	15.33	1.44	278	6632	95
150	22.7	15.78	1.34	289	6580	96
High Mean	27.1	15.87	1.44	284	7631	100
Low Mean	21.0	15.33	1.29	278	6352	
Exp. Mean	23.9	15.56	1.36	284	6769	
C.V. %	19.0	6.1	12.75	7	25	
LSD 5%	2.8	0.51	0.10	11	797	

* Lower number indicates a greater return per acre

TACHIGAREN FOR CONTROL OF ROOT ROT IN SUGARBEETS

EXPERIMENTAL PROCEDURE

This research was conducted in cooperation with Scott Pahl of Seed Systems (formerly Germains). Sugarbeet seeds pelleted with Tachigaren were planted in commercial fields where root rot had eliminated or decreased the sugarbeet stand. The sugarbeet seed was planted with a hand planter at approximately two inches apart on June 21. Sugarbeet stand counts were taken two and four to five weeks after planting. The treatments that were applied to the pelleted seeds were 0, 15, 30 and 45 gm of tachigaren per kg of seed. Apron and thiram at commercial rates will be considered the check since it is considered a standard treatment.

RESULTS AND DISCUSSION

Two weeks after planting tachigaren at 45 g/kg gave a significantly greater stand count than the 0 or 15 g/kg of tachigaren and the apron plus thiram treatment (Table 1). In the cases of 15, 30, and 45 g/kg of tachigaren a 15 g/kg increase of tachigaren did not produce a significant change in stand count. However, the addition of 15 g/kg verses 0 g/kg of tachigaren did produce a significant increase. It is important to notice that 0 g/kg of tachigaren and apron and thiram treatment were essentially the same indicating that apron and thiram gave no control of root rot.

Four to five weeks after planting 0 g/kg of tachigaren and apron and thiram were still similar. Stand count was significantly increased as tachigaren rate was increased each 15 g/kg.

Sugarbeet stand count significantly decreased over time regardless of treatment. However, tachigaren treated seed remained in what is considered an adequate level for sugarbeet production.

Yield data was not obtained from these research plots. Research in 1992 will be taking this factor into consideration.

COMBINED DATA FOR SUGARBEET STAND COUNTS AT 2 AND 4 TO 5 WEEKS AFTER PLANTING

TREATMENTS	SUGARBEET STAND COUNT	SUGARBEET STAND COUNT	% STAND LOSS
(g/kg)	2 Weeks after planting	4-5 Weeks after planting	2 Week -> 4-5 Weeks
APTH	170	98	42
TACHIGAREN TREATMENT (g/kg)			
0	168	97	42
15	208	141	32
30	221	165	25
45	241	197	18
HIGH MEAN	241		
LOW MEAN	97		
EXP MEAN	171		
C.V. %	16		
LSD 5%	24		

APTH = Apron Plus Thiram

DELAYED CONTROL OF COVER CROP EFFECT ON SUGARBEET QUANTITY AND QUALITY

Objective

Evaluate the effect of cover crop (wheat and oats) control over time on relative quantity and quality characteristics.

Experimental Procedure

Wheat and oats were seeded in 10 ft. strips within each of the three replications on April 18. Sugarbeets were planted on April 23 at 3 inches apart. Treatments were Poast at 1.5 pints/acre plus Sunit (methylated seed oil) at 1 quart/acre, Poast at 1.5 pints/acre plus Sunit at 1 pint/acre plus Lorsban 1 pint/acre, and Poast at 1.5 pints/acre plus Sunit 1 quart/acre plus 1 gallon/acre. The treatments were applied at 1, 2, 3, 4, and 5 weeks after sugarbeet emergence. Treatment efficacy was evaluated four weeks after the fifth and last treatment. In all three replications two subsamples were hand harvested from each experimental unit for quantity and quality analysis.

Result and Discussion

Wheat control regardless of treatment was similar at one and two weeks after planting (Table 1). At the third, fourth and fifth week after sugarbeet emergence applications, a significant decrease in wheat control was observed. Wheat control decreased 9, 20, and 39% per week when compared to the treatment made two weeks after sugarbeet emergence when considering the means. Only the first two weeks gave control of 98 percent or greater. The highest control at three weeks after planting was 92 percent with Poast at 1.5 pints plus Sunit at 2 quarts plus 1 gallon 28%.

Oat control was similar to the wheat control achieved. The best control was achieved at one and two weeks after sugarbeet emergence. Control of oats at one and two week after sugarbeet emergence were similar but were significantly better than at three weeks.

Thus, control of wheat and oats would be best conducted within the first two weeks after sugarbeet emergence or by the fourth leaf stage of the oat, and wheat (Table 2). At three weeks after sugarbeet emergence control of wheat and oats decreased significantly.

Yield and quality data are presented in Figures 1, 2, 3, 4, and 5. Tons per acre tended to be higher with wheat as a cover crop than with oats. There is no definite reason for this result. Literature review conducted did not indicate a difference among cover crops, except winter rye. Research conducted by James Stordahl, Alan Dexter and Alan Cattanach showed a significant decrease in tons/acre when winter rye was used as a cover crop compared to winter wheat, fall and spring barley, and spring rye. However, this research did not include an oat vs. wheat comparison.

Recoverable sugar per acre was not significantly decreased from one to two weeks after sugarbeet emergence treatments. All treatments within the first three weeks were not significantly different except when Poast Plus plus oil or Poast Plus Oil plus 28% N were applied on oats at the three week treatment. However, all treatment in the third, fourth and fifth week treatment were statistically similar. Thus, this data indicates that control of cover crop regardless of treatment should be conducted within three weeks after sugarbeet emergence or by the fifth leaf stage of the cover crop (oat or wheat).

Table 1. List of treatments and wheat and oats control from Poast applied treatments.

Treatments	Rate	Wheat Control					Oats Control				
		(%) Weeks after planting					(%) Weeks after planting				
		1	2	3	4	5	1	2	3	4	5
Poast + Sunit	1.5 pt + 1 qt	100	98	89	70	25	100	97	87	55	30
Poast + Sunit + Lorsban	1.5 pt + 1 pt + 1 pt	100	100	90	65	30	100	98	92	62	30
Poast + Sunit + 28% N	1.5 pt + 1 qt + 1 gal	100	100	92	75	32	100	97	92	68	35
Mean		100	99	90	70	29	100	97	90	62	32
C.V.%					75				79		
LSD 5%					5				6		
# of rep					3				3		

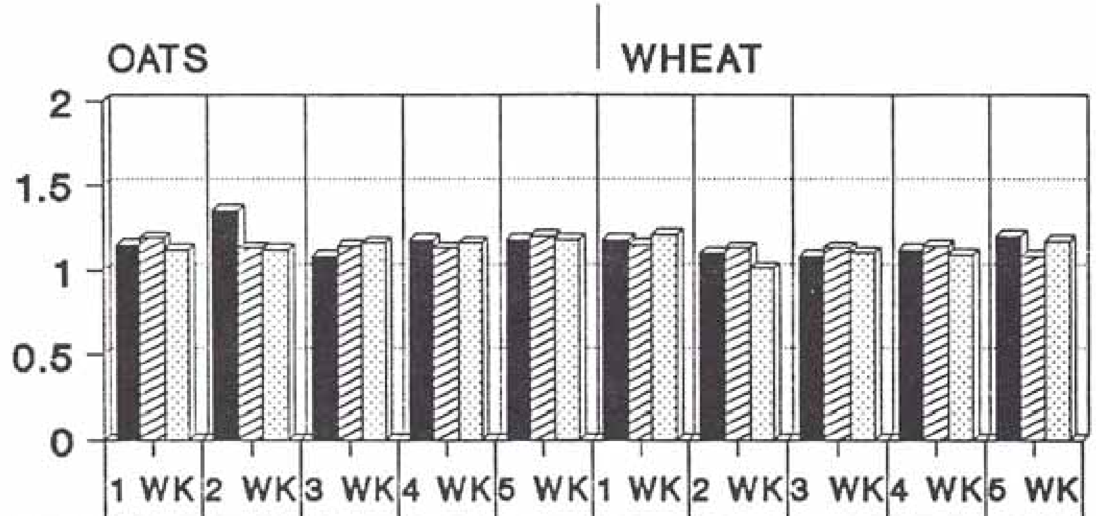
* Sunit = Methylate seed oil
\+ = Tank mix

Table 2. Stage of cover crop and sugarbeets

Week After Sugarbeet Emergence	Oat and Wheat Leaf Stage	Sugarbeet Leaf Stage
1	2	2
2	4	4
3	5-6	6
4	12	10
5	15 (Boot stage)	12

Delayed Control Effect

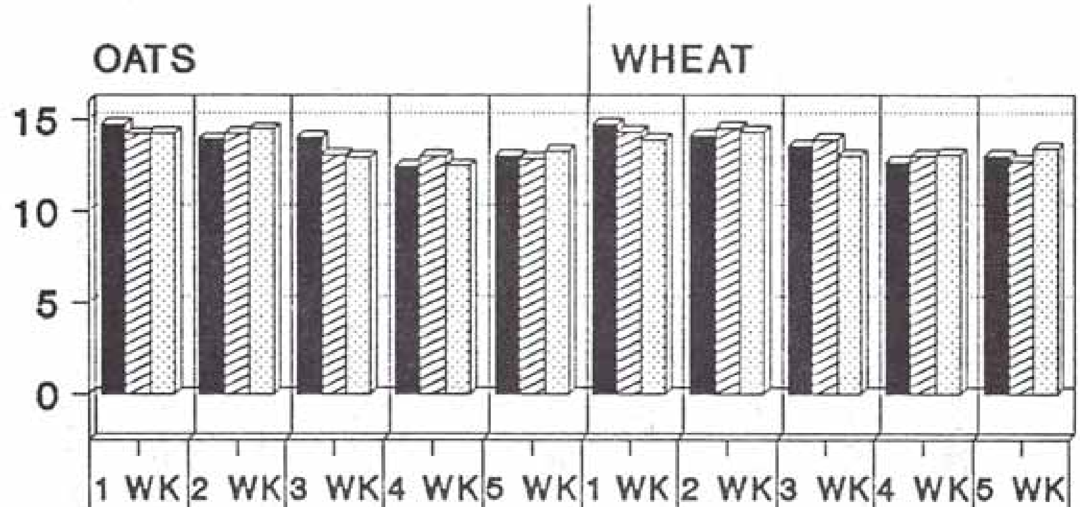
on Loss to Molasses



	OATS 1 WK	OATS 2 WK	OATS 3 WK	OATS 4 WK	OATS 5 WK	WHEAT 1 WK	WHEAT 2 WK	WHEAT 3 WK	WHEAT 4 WK	WHEAT 5 WK
POAST+OIL	1.15	1.35	1.08	1.18	1.18	1.18	1.1	1.08	1.12	1.2
POAST+OIL+LORSBAN	1.19	1.13	1.14	1.13	1.2	1.15	1.13	1.13	1.14	1.08
POAST+OIL+28%	1.12	1.12	1.16	1.16	1.18	1.21	1.01	1.1	1.09	1.17

POAST+OIL　POAST+OIL+LORSBAN　POAST+OIL+28%

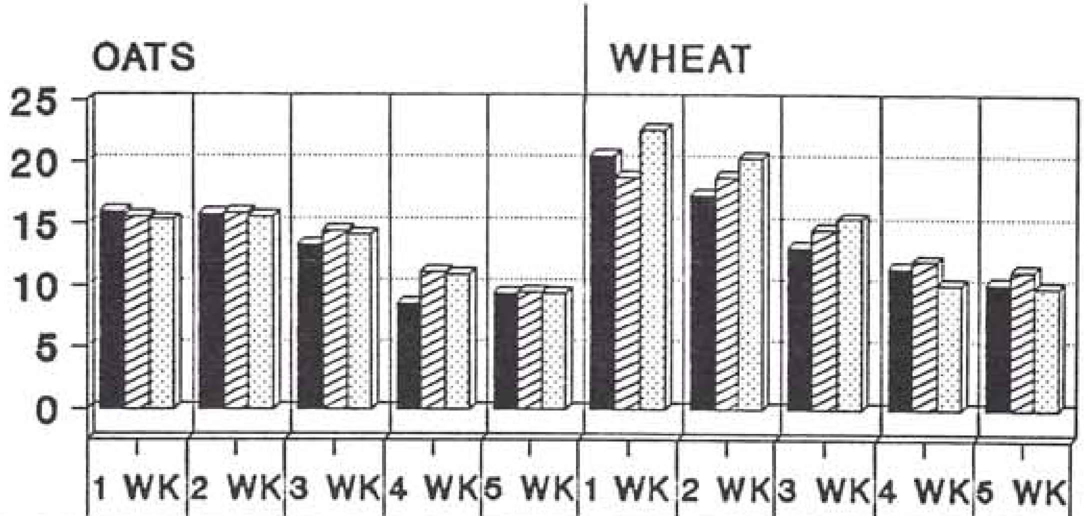
Delayed Control Effect
on Sugar Percent



	OATS 1 WK	OATS 2 WK	OATS 3 WK	OATS 4 WK	OATS 5 WK	WHEAT 1 WK	WHEAT 2 WK	WHEAT 3 WK	WHEAT 4 WK	WHEAT 5 WK
POAST+OIL	14.73	13.92	14.03	12.44	12.96	14.72	14.11	13.56	12.62	12.99
POAST+OIL+LORSBAN	14.2	14.23	13.04	13	12.84	14.31	14.49	13.91	12.96	12.72
POAST+OIL+28%	14.21	14.48	12.91	12.47	13.29	13.87	14.29	12.97	13.04	13.38

POAST+OIL   POAST+OIL+LORSBAN
POAST+OIL+28%

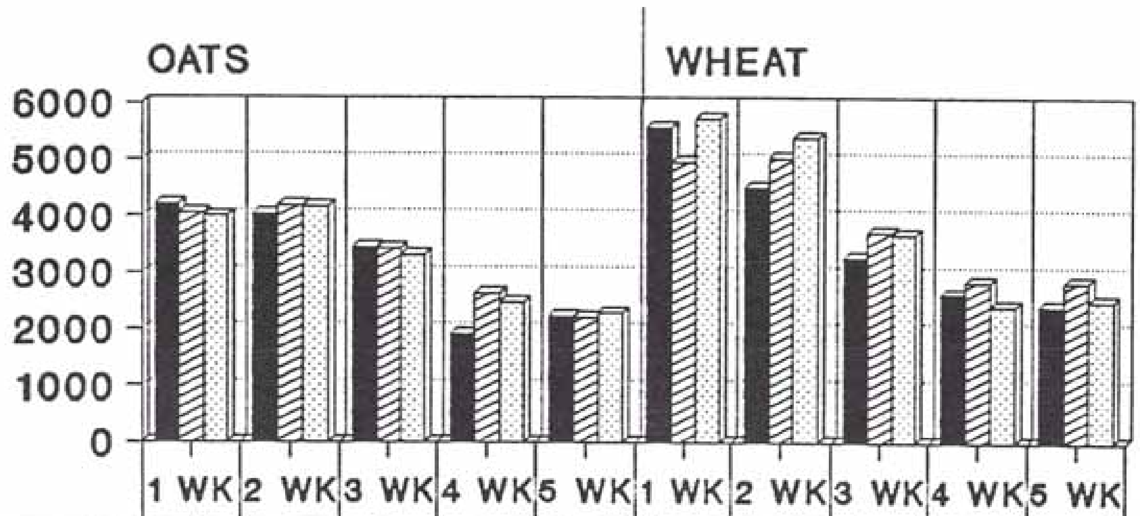
Delayed Control Effect
on Tons/Acre



	Oats 1 WK	Oats 2 WK	Oats 3 WK	Oats 4 WK	Oats 5 WK	Wheat 1 WK	Wheat 2 WK	Wheat 3 WK	Wheat 4 WK	Wheat 5 WK
POAST+OIL	16	15.8	13.3	8.5	9.4	20.5	17.3	13.1	11.4	10.2
POAST+OIL+LORSBAN	15.6	15.9	14.4	11.1	9.5	18.8	18.8	14.5	12	11.2
POAST+OIL+28%	15.3	15.6	14.1	10.9	9.4	22.6	20.3	15.4	10.1	9.9

POAST+OIL
POAST+OIL+LORSBAN
POAST+OIL+28%

Delayed Control Effect
on Sugar per Acre



	1 WK	2 WK	3 WK	4 WK	5 WK	1 WK	2 WK	3 WK	4 WK	5 WK
POAST+OIL	4212	4034	3445	1919	2222	5557	4501	3262	2622	2400
POAST+OIL+LORSBAN	4054	4185	3427	2630	2205	4956	5032	3719	2832	2839
POAST+OIL+28%	3998	4163	3313	2468	2284	5730	5388	3666	2408	2505

POAST+OIL
POAST+OIL+LORSBAN
POAST+OIL+28%

MULTISPECIES EVALUATION OF POSTEMERGENCE BROADLEAF HERBICIDES

Experimental procedure KW 3145 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. The first half of split applications was applied 5:00 pm May 31 when the air temperature was 70F, relative humidity was 70%, wind velocity was 5 to 10 mph, velvetleaf was 1 to 1.5 inches tall, kochia was emerging to 1 inch tall, redroot pigweed was in the cotyledon stage to 1 inch tall, and wild mustard was 1 to 2 inches tall. The second half of split applications and the single application treatments were applied 3:00 pm June 6 when the air temperature was 75F, relative humidity was 70%, wind velocity was 0 to 5 mph, velvetleaf was 1.5 to 2 inches tall, kochia was 1 to 1.5 inches tall, redroot pigweed was 0.5 to 1 inch tall, and wild mustard was 2 to 3 inches tall. All herbicides were applied in 8.5 gpa water at 38 psi through 8001 nozzles.

RESULTS AND DISCUSSION

Velvetleaf control was not acceptable except when DPX-66 was applied at .0156 lb/acre with Surfactant and Betamix or DPX-66 at .031 lb./acre with Surfactant plus Betamix or Betanex in a split application. All other treatments were significantly less effective than the above mentioned treatments.

The treatment that gave the highest degree of control of Kochia was DPX-66 plus Betanex at .031 lb./acre and Betamix. However, Kochia control did not exceed 53% DPX-66 control of Kochia was much better in experiments conducted in the Red River Valley. This variability is unknown at this time. Further research will be conducted to determine the cause of variability.

Redroot pigweed was most effectively controlled by six treatments that were statistically similar. However, two treatments gave 9 to 11% greater control of redroot pigweed than the other four. These two treatments were Stinger applied in the second application of a split application of Betanex (87%) and Betanex and DPX-66 applied in a split application at 0.25 + 0.31 lb./acre and .033 + 0.31 lb./acre respectively giving 88% control.

Wild mustard control was greatest with DPX-66. Betamix or Betanex was not needed to obtain 100% wild mustard control with DPX-66. However, Betanex applied alone gave excellent control (93%) of wild mustard.

This experiment indicated that DPX-66 has great potential for control of velvetleaf when applied with Betamix or Betanex and wild mustard control when applied alone or with Betamix or Betanex. Kochia control was not adequate regardless of treatment. Redroot pigweed tended to be best controlled by Betanex and Stinger applied at the second application of a Betanex split application or by Betanex at .25 and .33 (split application) and DPX-66 at .031 twice. This indicates that for broad spectrum control a good program will be a large selection of herbicides to choose from for best results.

Table 1

Treatment*	Rate	Vele	Kocz	Rrpw	Wimu
	(lb/A)	------------- (%) control ------------------			
Desmedipham/Desmedipham	0.25/0.33	8	5	72	83
Des&Phen/Des&Phen	0.25/0.33	20	12	45	93
Desm/Desm+Clopyralid	0.25/0.33+0.09	13	18	87	90
Des&Phen/Des&Phen+Clpy	0.25/0.33+0.09	3	8	57	85
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	0	12	77	90
Des&Phen+Clpy/Des&Phen+Clpy	0.25+0.09/0.33+0.09	0	3	3	90
--/Clopyralid	--/0.19	15	0	0	19
--/Clopyralid+Endothall	--/0.09+0.5	20	7	15	15
--/Clopyralid+Endothall	--/0.19+0.5	17	15	38	32
--/Endothall	--/0.5	5	10	43	7
DPX-66+X-77/DPX-66+X-77	0.0156+0.25%/0.0156+0.25%	25	7	15	100
DPX-66+X-77/DPX-66+X-77	0.031+0.25%/0.031+0.25%	48	27	77	100
Des+DPX-66/Des+DPX-66	0.25+0.0078/0.33+.0078	17	17	72	100
D&P+DPX-66/D&P+DPX-66	0.25+0.0078/0.33+.0078	23	12	62	100
Des+DPX-66/Des+DPX-66	0.25+0.156/0.33+.0156	53	18	78	100
D&P+DPX-66/D&P+DPX-66	0.25+0.156/0.33+.0156	88	12	68	100
Des+DPX-66/Des+DPX-66	0.25+0.031/0.33+0.031	100	38	88	100
D&P+DPX-66/D&P+DPX-66	0.25+0.031/0.33+0.031	100	53	77	100
HIGH MEAN		100	53	88	100
LOW MEAN		0	0	0	7
EXP MEAN		31	15	54	78
C.V. %		44	71	15	11
LSD 5%		23	18	13	14
# OF REPS		3	3	3	3

COMMON COCKLEBUR CONTROL WITH POSTEMERGENCE HERBICIDES

Experimental procedures with KW 2398 sugarbeet was seeded April 23. The first half of split applications was applied 3:00 pm May 22 when the air temperature was 80F, relative humidity was 75%, wind velocity was 10 to 15 mph, and common cocklebur was in the cotyledon stage. The second half of split applications and the single application treatments were applied 12:00 pm May 29 when the air temperature was 75F, relative humidity was 70%, wind velocity was 5 mph, and common cocklebur was 2 to 5 inches tall. All herbicides were applied in 8.5 gpa water at 38 psi through 8001 nozzles.

RESULTS AND DISCUSSION

Common cocklebur control was highest when clopyralid was applied alone or with desmipham or endothall. Clopyralid applied with desmedipham or endothall did tend to give better control than clopyralid applied alone. However, it is important to note that this difference was only four to seven percent. These data as well as data from other experiments including mixtures of other herbicides with clopyralid tends to give better control of broadleaf weeds. In the absence of clopyralid common cocklebur control did not exceed 35 percent.

Treatment*	Rate	Common Cocklebur
	(lb/A)	(%) control
Desmedipham/Desmedipham	0.25/0.33	30
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	100
Desm/Desm+Clopyralid	0.25/0.33+0.09	98
--/Clopyralid	--/0.19	93
--/Clopyralid+Endothall	--/0.09+0.5	100
--/Clopyralid+Endothall	--/0.19+0.5	97
--/Endothall	--/0.5	0
DPX-66+X-77/DPX-66+X-77	0.0156+0.25%/0.0156+0.25%	0
DPX-66+X-77/DPX-66+X-77	0.031+0.25%/0.031+0.25%	0
Des+DPX-66/Des+DPX-66	0.25+0.0078/0.33+0.0078	20
Des+DPX-66/Des+DPX-66	0.25+0.0156/0.33+0.0156	25
Des+DPX-66/Des+DPX-66	0.25+0.031/0.33+0.031	35
HIGH MEAN		100
LOW MEAN		0
EXP MEAN		50
C.V. %		15
LSD 5%		13
LSD 1%		17
# OF REPS		3

* - X-77 = non-ionic surfactant from Valent

WILD BUCK WHEAT CONTROL WITH POSTEMERGENCE HERBICIDES

Experimental procedure of KW 3145 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. The first half of split applications was applied 7:00 pm May 30 when the air temperature was 75F, relative humidity was 70%, wind velocity was 5 mph, and wild buckwheat was in the cotyledon stage to one inch tall. The second half of split applications and the single application treatments were applied 6:00 pm June 6 when the air temperature was 75F, relative humidity was 70%, wind velocity was 0 to 5 mph, and wild buckwheat was 1.5 to 3 inches tall. All herbicides were applied in 8.5 gpa water at 38 psi through 8001 nozzles to the center four rows of six row plots.

RESULT AND DISCUSSION

The highest wild buckwheat control was obtained when endothall and clopyralid were applied together and wild buckwheat was 1.5 to 3 inches tall. However, all treatments with clopyralid and/or endothall were not significantly different. With the above mentioned treatments the lowest control was 89 percent with desmedipham at the first application and desmedipham and clopyralid at the second application. An increase of six percent was obtained by including clopyralid in the first application also. The mixture of clopyralid and endothall gave an increase of three to four percent and four to five percent compared to clopyralid and endothall applied alone, respectively.

All other treatments did not give adequate control of wild buckwheat. The highest control was 69 percent with desmedipham and DPX-66 in a split application. Thus, the best control of wild buckwheat was achieved when endothall and/or clopyralid was added to the spray mixture.

Treatment*	Rate	Wild Buckwheat Control
	(lb/A)	----- (%) -----
Desmedipham/Desmedipham	0.25/0.33	33
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	95
Desm/Desm+Clopyralid	0.25/0.33+0.09	89
--/Clopyralid	--/0.19	94
--/Clopyralid+Endothall	--/0.09+0.5	97
--/Clopyralid+Endothall	--/0.19+0.5	98
--/Endothall	--/0.5	93
DPX-66+X-77/DPX-66+X-77	0.0156+0.25%/0.0156+0.25%	35
DPX-66+X-77/DPX-66+X-77	0.031+0.25%/0.031+0.25%	45
Des+DPX-66/Des+DPX-66	0.25+0.0078/0.33+0.0078	54
Des+DPX-66/Des+DPX-66	0.25+0.0156/0.33+0.0156	49
Des+DPX-66/Des+DPX-66	0.25+0.031/0.33+0.031	69
HIGH MEAN		98
LOW MEAN		33
EXP MEAN		71
C.V. %		12
LSD 5%		12
# OF REPS		4

* X-77 = non-ionic surfactant from Valent

BUFFALOBUR AND GREEN AND YELLOW FOXTAIL CONTROL WITH POSTEMERGENCE HERBICIDES

Experimental procedures with KW 2249 sugarbeet was seeded April 28. The first half of split applications was applied 2:00 pm May 24 when the air temperature was 80F, relative humidity was 75%, and wind velocity was 5 to 10 mph. The second half of split applications and the single application treatments were applied 6:00 pm May 30 when the air temperature was 75F, relative humidity was 70%, and wind velocity was 0 to 5 mph. All herbicides were applied in 8.5 gpa water at 38 psi through 8001 nozzles.

RESULTS AND DISCUSSION

Buffalobur control was significantly increased when clopyralid was added to desmedipham. Clopyralid plus desmedipham gave 81 percent control when clopyralid was included in the first and second application. Buffalobur control of 80 percent was obtained with clopyralid added only in the second application. Endothal gave 0 percent control indicating that endothal probably did not contribute to buffalobur control. However, the addition of endothal to 0.19 lb/acre of clopyralid significantly increased buffalobur control compared to clopyralid at 0.19 lb/acre applied alone.

DPX-66 at .0156 lb/acre applied alone gave significantly greater buffalobur control than desmedipham applied alone. DPX-66 added to desmedipham significantly increased buffalobur control when compared to desmedipham or DPX-66 alone.

Desmedipham applied with DPX-66 at .0156 gave 96 percent control of buffalobur which was significantly better than all treatments except when DPX-66 was applied with desmedipham. DPX-66 applied with desmedipham gave 93 to 96 percent control of buffalobur depending on the DPX-66 rate. Thus DPX-66 plus desmedipham was the best treatment for buffalobur control. DPX-66 seems to give good control of the solani family which includes buffalobur and nightshades. Data was not collected from multispecies experiment for black nightshade; however, DPX-66 was observed to give very good control of black nightshade.

Green and yellow foxtail control did not exceed 86 percent. DPX-66 plus desmedipham gave the highest control of green and yellow foxtail. DPX-66 at .031 lb/acre applied alone or DPX-66 applied at all rates with desmedipham gave significantly better control of green and yellow foxtail than all treatments without DPX-66. Green and yellow foxtail control of 86 percent at the time of late May to early July may provide enough foxtail control until late season foxtail flushes would appear.

Treatment*	Rate	Buffalo Bur	Green & Yellow Foxtail
	(lb/A)	-------- (%) control --------	
Desmedipham/Desmedipham	0.25/0.33	64	40
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	81	60
Desm/Desm+Clopyralid	0.25/0.33+0.09	80	50
--/Clopyralid	--/0.19	65	9
--/Clopyralid+Endothall	--/0.09+0.5	65	24
--/Clopyralid+Endothall	--/0.19+0.5	83	38
--/Endothall	--/0.5	0	59
DPX-66+X-77/DPX-66+X-77	0.0156+0.25%/0.0156+0.25%	76	69
DPX-66+X-77/DPX-66+X-77	0.031+0.25%/0.031+0.25%	74	76
Des+DPX-66/Des+DPX-66	0.25+0.0078/0.33+0.0078	94	86
Des+DPX-66/Des+DPX-66	0.25+0.0156/0.33+0.0156	96	78
Des+DPX-66/Des+DPX-66	0.25+0.031/0.33+0.031	93	86
HIGH MEAN		96	86
LOW MEAN		0	9
EXP MEAN		73	56
C.V. %		12	19
LSD 5%		12	15
# OF REPS		4	4

* X-77 = non-ionic surfactant from Valent

COMMON LAMBSQUARTER AND REDROOT PIGWEED

Experimental procedure for ACH 198 sugarbeet was seeded May 5. The first half of split applications was applied 10:00 am May 30 when the air temperature was 70F, relative humidity was 65%, wind velocity was 5 to 10 mph, and redroot pigweed and common lambsquarters were in the cotyledon stage. The second half of split applications and the single application treatments were applied 9:00 am June 11 when the air temperature was 70F, relative humidity was 60%, wind velocity was 0 to 5 mph, and redroot pigweed and common lambsquarters were 2 to 4 inches tall. All herbicides were applied in 8.5 gpa water at 38 psi through 8001 nozzles.

RESULT AND DISCUSSION

Desmedipham applied in split application of 0.25 and 0.33 lb/acre gave only 75 percent control of common lambsquarter. The addition of clopyralid increased lambsquarter control by 10 percent. Clopyralid alone at 0.19 lb/acre gave 88 percent control. However, clopyralid probably will not consistently give 88 percent control. Control of common lambsquarter by clopyralid and/or endothall was and tends to be highly variable and inconsistent, except when mixed with desmedipham. The highest degree of control of common lambsquarter was obtained with DPX-66 at .0156 or .031 plus desmedipham at 0.25 and 0.33 in a split application. DPX-66 at .0156 or .031 plus desmedipham at 0.25 and 0.31 in split applications gave significantly greater control than desmedipham alone in a split application but not significantly better than when clopyralid was included with desmedipham.

Redroot pigweed control tended to give similar trends as what was experienced with control of common lambsquarter. Clopyralid added to desmedipham significantly increased redroot pigweed control when compared to desmedipham alone. However, redroot pigweed control with clopyralid or endothall applied alone or together and DPX-66 applied alone did not exceed 31 percent. DPX-66 applied with desmedipham gave significantly better control of redroot pigweed than desmedipham alone. The highest redroot pigweed control with desmedipham and clopyralid was 86 percent. Redroot pigweed control was 88, 91 and 95 percent with DPX-66 at .0078, .0156 and .031, respectively added to desmedipham at 0.25 and 0.33 in a split application. Thus, in both situations DPX-66 with desmedipham tended to give better control of redroot pigweed and common lambsquarter than clopyralid with desmedipham.

CERCOSPORA LEAF SPOT EFFICACY TRIAL

EXPERIMENTAL PROCEDURE

Variety KW 3145 (disease rating 4.67) was planted on May 23 at four inches apart. Roneet and Eptam were applied and incorporated at 2 and 2 pounds active ingredient, respectively. Betamix was applied twice with Stinger applied with Betamix at the second application. Fungicides for cercospora leaf spot were applied with a three point hitch mounted tractor sprayer at 20 gpa and 200 psi on dates indicated in Table 2. Cercospora leaf spot ratings were taken on September 23 using KWS scales on a 1 to 9 basis (1 = no incidence of disease, 9 = completely defoliated by disease, rating of 3 - 4 equals economic loss levels). Treatments were harvested with a two row harvestor on September 25 for quantity and quality analysis.

RESULTS AND DISCUSSION

The cercospora leaf spot pressure was very heavy in 1991. This resulted in some very good data. All treatments except Pencozeb 75 DP (14 day PHI) and RH7592 and B1956 at 0.12 lb. an acre were statistically similar for cercospora leaf spot ratings. However, Topsin did tend to have the lowest rating at 4.1 with Supertin at 4 and 8 ounces being very close at 4.2 and 4.3, respectively. Sugar percent and tons/acre were non-significant. Recoverable sugar per acre was similar for all treatments except Pencozeb 75DF (21 day PHI), RH 7592 2F+B1956, Dithane 75% DF, and Kocide 40% DF+B1956(0.5%) which were significantly lower.

The treatment that looked the best was Topsin. Topsin is a systemic and thus would not be recommended as a primary fungicide for cercospora leaf spot treatment. The Supertin treatments were among the best treatments, regardless of rate. The mancozeb products (Dithane and Pencozeb) gave good control of cercospora leaf spot. These products were applied at 14 and 21 day pre-harvest intervals (PHI). The 14 day pre-harvest interval treatment was slightly better than the 21 day pre-harvest treatment. The experimental fungicide from Rohm and Haas gave good control but does need to be further evaluated. Kocide gave the poorest control of fungicides evaluated, but may be used as a substitute in the spray interval with Supertin or as a late season treatment. The check showed a large reduction in production of sugar. This indicated the importance of a good cercospora leaf spot treatment program.

When considering these data a person must realize that the effectiveness a fungicide for cercospora leaf spot suppression is largely due to spraying techniques, and disease pressure. A successful program would also include keeping up to date on cercospora index values, and consulting with your Agriculturist.

Treatment*	Rate	Common Lambsquarters	Redroot Pigweed
	(lb/A)	------------ (%) control	------------
Desmedipham/Desmedipham	0.25/0.33	75	64
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	85	84
Desm/Desm+Clopyralid	0.25/0.33+0.09	85	86
--/Clopyralid	--/0.19	88	16
--/Clopyralid+Endothall	--/0.09+0.5	85	5
--/Clopyralid+Endothall	--/0.19+0.5	24	25
--/Endothall	--/0.5	38	9
DPX-66+X-77/DPX-66+X-77	0.0156+0.25%/0.0156+0.25%	46	10
DPX-66+X-77/DPX-66+X-77	0.031+0.25%/0.031+0.25%	50	31
Des+DPX-66/Des+DPX-66	0.25+0.0078/0.33+0.0078	75	88
Des+DPX-66/Des+DPX-66	0.25+0.0156/0.33+0.0156	91	91
Des+DPX-66/Des+DPX-66	0.25+0.031/0.33+0.031	93	95
HIGH MEAN		93	95
LOW MEAN		24	5
EXP MEAN		70	50
C.V. %		12	14
LSD 5%		12	10
# OF REPS		4	4

* X-77 = non-ionic surfactant from Valent

Table 1

Cercospora Leaf Spot Trial, Southern Minnesota, 1991.

Treatment	Rate	Spray Inter.	* Cercospora Leafspot rating	Sugar Percent	Tons Per Acre	Recoverable Sugar/Acre
	(lb ai/A)	(days)	(1-9)	(%)	(ton/A)	(lb/A)
Untreated Check	0	--	7.7	13.7	12.2	2977
Penncozeb 75DF (14 day PHI)	1.50	10	5.7	15.2	15.3	4152
Topsin M	0.35	14	4.1	15.2	16.7	4604
Supertin 4L	0.12	14	4.2	15.2	16.5	4561
Supertin 4L	0.19	14	4.6	15.6	15.2	4299
Supertin 4L	0.25	14	4.3	15.2	15.9	4351
Penncozeb 75DF (21 day PHI)	1.50	10	4.6	14.5	14.4	3769
Penncozeb	1.50	10	5.3	14.6	15.4	4047
RH7592 2F+B1956(12oz/100gal)	0.09	14	4.8	14.1	15.2	3784
RH7592+B1956	0.12	14	4.9	15.2	15.2	4237
Supertin 4L+Thiolux 80%DF	0.19+5	14	4.5	14.7	15.5	4031
Dithane 75%DF	1.6	10	4.5	14.3	14.8	3768
Kocide 40%DF+B1956(0.5%)	1.2	14	4.8	14.5	14.0	3585
HIGH MEAN			7.7	15.6	16.7	4604
LOW MEAN			4.1	13.7	12.2	2977
EXP MEAN			4.9	14.8	15.1	4013
C.V. %			11.6	7.0	15.2	16
LSD 5%			0.7	NS	NS	740
LSD 1%			0.9	NS	NS	984
# OF REPS			6.0	6.0	6.0	6

* Lower number best

Table 2

Ten Day Treatments	Fourteen Day Treatments
July 25	July 25
August 5	August 8
August 4	August 19
August 23	September 5
September 5	

All treatments were applied at 20 gpa and 200 psi

Southern Minnesota Sugar Cooperative
Harveter Comparison

The followimg tables summarize the 1991 yield data and dirt removal from different harveters by district over the entire cooperative.

The 1991 growing season was relatively wet with none of the SMSC growing districts experiencing dry conditions. Many of the growing districts experienced reduction in sugar beet yields mostly due to the excessive precipitation recieved. However, the percent first dirt (dirt removed by piler) and percent tare (dirt that goes into the piles) were both higher in 1990 than in 1991 Which was a relatively dry year). These results probably were due to the larger amount of rain fall recieved in 1990 than in 1991 during the Harvest season.

Operational practices of the harvester still has predominant effect on the results. The high and low ranges in each category indicates the advantages of the combined performance of the operation and properly equiped harvester.

Table 1. Southern Minnesota Sugar Cooperative combined harvester results 1991.

Harvester	ACRES	AVG TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	42264.4	3.2	2.2	5.4	1.4	6.7	2.8	18.0
Heath	25347.1	3.1	2.1	5.2	1.2	7.0	2.8	8.8
Parma	1609.4	3.7	2.5	6.2	2.2	6.5	5.1	11.1
Hesston	1798.1	3.0	2.7	5.6	1.9	4.2	3.9	16.1
Red River Speacial	1360.3	3.1	2.3	5.4	1.4	4.9	3.1	8.4
Mix	913.4	3.2	1.9	5.1	2.1	4.1	3.8	10.2
Artsway	3582.6	3.3	2.3	5.7	2.3	6.6	4.6	9.0
John Deere	1261.3	3.3	3.0	6.4	1.9	4.3	4.3	6.6
Farmhand	1204.2	3.1	2.3	5.3	2.5	4.2	7.0	8.6
Lofftness	323.1	3.4	3.2	6.6	2.7	4.9		
TOTAL	79667.0	3.2	2.2	5.4	2.0	5.3	4.1	10.5

Table 2. Renville harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	16952.5	3.1	2.1	5.3	1.5	5.2	3.3	11.3
Heath	7476.4	2.9	2.1	5.0	1.2	5.5	2.8	7.8
Parma	102.2	2.5	2.6	5.1	2.5	2.5	5.1	5.1
Hesston	745.1	2.6	2.3	4.9	1.9	3.5	3.9	6.5
Red River Special	1007.1	2.9	2.2	5.1	1.9	4.9	3.7	8.4
Mix	494.1	3.2	2.0	5.2	2.7	4.1	4.9	5.9
Artsway	593.4	3.0	2.0	5.0	2.6	3.5	4.0	6.0
John Deere	250.4	3.4	2.8	6.2	2.4	4.3	5.3	7.1
Farmhand	456.8	2.8	2.1	4.9	2.5	3.4	4.3	5.7
TOTAL	27647.0	2.9	2.3	5.2	2.1	4.1	4.1	7.1

Table 3. Milan harvester results 1991.

Harvester	AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	3.2	2.0	5.2	1.4	4.8	2.8	7.7
Heath	3.6	2.1	5.7	2.4	5.2	4.1	7.5
Hesston	2.9	2.8	5.7	2.4	3.4	4.9	6.3
TOTAL	3.2	2.3	5.5	2.1	4.5	3.9	7.2

Table 4. Murdock harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	3570.0	3.1	2.2	5.3	2.2	3.9	4.8	7.7
Heath	2018.3	3.1	2.3	5.5	2.5	4.3	4.6	6.7
Parma	250.8	3.5	2.2	5.7	2.5	4.1	4.6	6.6
Artsway	75.4	3.8	3.9	7.7	3.7	3.8	6.9	8.0
TOTAL	5915.0	3.4	2.7	6.0	3.6	4.0	5.2	7.2

Table 5. Maynard harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	941.6	3.0	1.5	4.5	2.5	4.1	3.5	9.0
Heath	2495.3	3.2	1.8	5.0	1.9	5.0	3.2	7.0
Artsway	274.5	4.4	3.2	7.6	3.1	6.6	5.5	9.2
Farmhand	169.5	3.0	2.6	5.6	2.9	3.1	4.3	5.8
TOTAL	3881.0	3.4	2.3	5.7	2.6	4.7	4.1	7.7

Table 6. Clara City West harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	3862.2	2.9	1.8	4.7	2.2	4.1	3.5	5.7
Heath	2562.3	3.0	1.8	4.9	1.8	4.1	3.6	6.7
RedRiver Special	240.7	3.1	2.1	5.2	1.4	3.8	3.1	6.2
Mix	403.2	3.0	1.8	4.8	2.1	4.1	3.8	6.4
Artsway	747.0	3.0	2.1	5.1	2.3	4.3	3.8	6.5
Farmhand	371.5	3.3	2.1	5.4	2.9	4.2	4.5	6.0
TOTAL	8186.9	3.0	2.0	5.0	2.1	4.1	3.7	6.3

Table 7. Clara City East harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	HIGH	TOTAL % DIRT RANGE LOW	HIGH
WIC	1840.7	3.1	2.1	5.2	2.5	5.5	3.9	7.0
Heath	2442.2	3.1	2.2	5.3	2.2	4.3	4.2	6.9
Mix	26.2	4.1	3.9	8.0	4.1	4.1	8.0	8.0
Artsway	52.4	3.3	3.5	6.8	3.3	3.3	6.8	6.8
Farmhand	78.2	3.4	2.9	6.3	3.3	3.4	6.1	6.6
TOTAL	4439.7	3.4	2.9	6.3	3.1	4.1	5.8	7.1

Table 8. Redwood Falls harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	% TARE RANGE HIGH	TOTAL % DIRT RANGE LOW	TOTAL % DIRT RANGE HIGH
WIC	551.3	3.4	2.5	5.9	2.7	4.4	4.7	7.4
Heath	717.3	2.7	2.0	4.7	2.0	3.4	3.5	5.3
Hesston	96.4	3.2	3.3	6.5	2.6	3.7	4.9	9.1
TOTAL	1365.0	3.1	2.6	5.7	2.4	3.8	4.4	7.3

Table 9. Bird Island harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	% TARE RANGE HIGH	TOTAL % DIRT RANGE LOW	TOTAL % DIRT RANGE HIGH
WIC	5679.6	3.4	2.6	6.0	2.1	5.3	3.7	18.0
Heath	1757.2	3.4	2.0	5.3	1.5	7.0	3.2	8.8
Parma	1324.5	3.7	2.6	6.4	2.2	6.5	4.0	11.1
Hesston	529.3	3.4	2.8	6.1	2.1	4.2	4.5	16.1
RedRiver Special	33.5	3.7	2.4	6.1	3.7	3.7	6.1	6.1
Artsway	1651.8	3.2	2.4	5.5	1.8	4.5	4.1	10.1
John Deere	558.7	3.3	3.0	6.3	2.3	4.2	4.7	8.5
Farm Hand	101.4	6.4	2.5	8.9	3.0	3.4	5.5	6.1
Loftness	64.4	3.5	3.5	7.0	3.5	3.5	7.0	7.0
TOTAL	11700.3	3.8	2.6	6.4	2.5	4.7	4.7	10.2

Table 10. Hector harvester results 1991.

Harvester		AVG %TARE	AVG % 1st DIRT	TOTAL DIRT	% TARE RANGE LOW	% TARE RANGE HIGH	TOTAL % DIRT RANGE LOW	TOTAL % DIRT RANGE HIGH
WIC	6944.6	3.3	2.4	5.7	1.6	6.7	3.6	14.5
Heath	3243.2	3.4	2.3	5.6	2.0	5.0	4.0	8.6
Hesston	179.5	3.3	3.8	7.1	2.7	3.9	5.8	9.5
Red River Special	96.1	4.7	3.1	7.8	4.6	4.8	7.6	7.9
Artsway	264.2	3.8	2.5	6.2	3.0	4.5	5.2	9.2
John Deere	519.2	3.3	3.1	6.4	1.9	3.7	4.6	9.0
Loftness	281.1	3.4	3.1	6.5	2.7	4.9	5.5	8.6
TOTAL	11528.0	3.6	2.9	6.5	2.6	4.8	5.2	9.6

DISEASE INDEX SUMMARY OF 1991

INTRODUCTION

Three remote weather stations were used to monitor conditions favorable for development of leaf spot. Installations were two miles south of Sacred Heart, nine miles north of Clara City, and one mile east and one mile north of Hector piling station. The stations monitored air temperature, soil temperature at two and six inches, relative humidity, leaf wetness and precipitation. The Sacred Heart station also monitored wind speed and wind direction. The recorded data were used in a cercospora computer model developed by Shane and Teng of the University of Minnesota. This program gives the sugarbeet grower an indication of the probability of leaf infection. This model uses temperature, relative humidity and time to determine probability of leaf infection. The placement of the canopy sensor (leaf wetness) is important to adequately model the cercospora leaf spot disease. Sugarbeet fields are highly variable in spore number; thus, the model should be used in conjunction with field disease monitoring. The table for calculating the disease index values is in Table 1. The data for 1991 for Clara City are presented in Figures 1-4. Data for Renville and Hector are not presented since these weather stations were malfunctional periodically during 1991 due to harsh weather conditions, primarily direct lightning strikes to weather stations.

During harvest, temperature probes were placed in the crown of topped and untopped sugarbeets and the resulting temperatures were used to aid in the decision for piler station management during high and low temperature conditions.

RESULTS AND DISCUSSION

Large amounts of moisture during the growing season of 1991 resulted into very favorable disease index values for cercospora leaf spot, values greater or equal to six for a two day or three for a one day total are considered favorable for infection of cercospora leaf spot. Cercospora was sited in late June which was earlier than normal, and fields remained infected to various degrees throughout the growing season into late September. Temperatures as well as moisture were relatively high during 1991 and contributed considerably to the cercospora leaf spot index levels and persistence of cercospora leaf spot infection. The spores require high relative humidity (90% to free moisture) and high temperatures (65-80 F) for a sustained period, usually 8-9 hours for germination and penetration to occur.

Spraying for leaf spot was started early in July and continued to mid September. The number of applications was above average in 1991 with 97 percent of Southern Minnesota Sugar growers applying 3-6 applications.

The cercospora leaf spot modeling should be used as a management tool to reduce the influence of leaf spot on quality and quantity of sugarbeets. The cercospora leaf spot model along with scouting and advice from Southern Minnesota Sugar Agricultural staff should result in a successful control season.

Table 1. Daily infection condition values based on numbers of hours of high relative humidity and mean temperature.

Hours	Daily Infection Condition Values																																
24	1	2	4	5	5	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
23	1	2	3	4	5	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
22	1	1	3	5	5	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
21	0	1	2	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
20	0	1	2	3	4	5	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
19	0	0	1	3	4	5	5	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
18	0	0	1	2	3	4	4	4	4	4	4	5	5	5	5	5	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
17	0	0	1	2	3	4	4	4	4	4	4	4	5	5	5	5	5	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
16	0	0	0	2	3	4	4	4	4	4	4	4	4	4	4	4	5	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
15	0	0	0	1	3	4	4	4	4	4	4	4	4	4	4	4	4	5	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7
14	0	0	0	1	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7
13	0	0	0	0	3	3	3	3	3	3	3	3	4	4	4	4	4	4	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7
12	0	0	0	0	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7
11	0	0	0	0	2	2	3	3	3	3	3	3	3	3	3	3	3	3	4	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7
10	0	0	0	0	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	6	6	7	7	7	7	7	7	7	7	7	7	7	7
9	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6
8	0	0	0	0	1	0	2	2	2	2	2	2	2	2	2	2	2	2	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5
7	0	0	0	0	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4
5	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	89	90	91	92	93

Average Temperature (Fahrenheit)