1989 Research Report

SMBSC

1/1/1989
Southern Minnesota Beet Sugar Company
SMBSC

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Introduction

The drought conditions of 1988 continued to show its effect on crop production in 1989. The crop started in May with fairly good soil moisture which contributed to early emergence and good stands. Mid-season moisture again was much below normal but timely rains prevented the sugarbeet plant from severe wilt and loss of foliage.

Late rains initiated rapid growth and a flush of available nitrogen. The growing season was shortened by an early killing frost on October 2-3 when temperatures of 19 degrees were recorded over a wide area. Sugar and tonnage accumulation were stopped prematurely. Average tonnage for the Cooperative was 20.3 tons per acre with an average sugar content of 15.91% and 1.485% loss to molasses (LTM).

The growers of SMSC adopted a quality incentive program beginning with the 1990 crop. The program has incentives for growers who produce above average sugar content and lower than average loss to molasses.

The main factors for low quality (i.e., low sugar content and high LTM) include:

1) Short growing season.
2) Thin stands.
3) Lack of disease control.
4) Stress caused by drought, insects etc.
5) Excessive nitrogen late in the growing season.

The quality incentive program places more emphasis on control of nitrogen late in the growing season. The research program at SMSC will include comparisons to determine the

proper rates, placement, timing, availability and interactions of nitrogen with other production practices.

This report and other research findings are provided for your information to assist in the refinement of useful production practices. The results from a single trial or one year may provide only limited information for a narrow set of environmental conditions; however, certain trends and general conclusions may provide a basis for further evaluation.

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Research Summary

1. Variety Evaluations. Four new varieties have been added to the approved list. Two varieties were voluntarily withdrawn by the seed companies. Two varieties were approved for limited sale. Three varieties were approved for test market and one variety was approved for special use as Aphanomyces resistant.

2. Date of Harvest. A summary of data from 1987 - 1989 indicate that there are differences among the 9 varieties tested in ability to accumulate relatively high levels of sugar early in the growing season. Several factors, including variety must be considered in making comparisons between fields for early harvest.

3. Cotyledon Smartweed Control. Thirteen commonly used herbicides were evaluated on cotyledon Smartweed and sugarbeets. Weed control and crop injury was highest with the high rates of H-273. The sugarbeet seedlings were surprisingly tolerant to the higher herbicide rates of application.

4. Smartweed Control. Twelve herbicide combinations using Stinger, H-273 and Betamix were evaluated for Smartweed control. Stinger along was not effective for Smartweed control. H-273 and Stinger tankmixes gave the highest control in the trial.

5. Common Cocklebur Control. Eighteen commonly used herbicides and tankmixes were evaluated for Common Cocklebur control. Cocklebur control was best with tankmixes of Stinger and Betanex applied at an early growth stage. Betanex gave surprisingly good Cocklebur control when used alone early. Stinger expressed little or no crop injury on the sugarbeet.

6. Black Nightshade. Eighteen commonly used herbicides and tankmixes were evaluated for Black Nightshade control. Black Nightshade control was best with early tankmixes of Betanex and Stinger. Stinger's activity was slow during the first evaluation, but increased by the second evaluation 1 week later.

7. Simulated Drift on Sugarbeets. Sixteen low level herbicide treatments consisting of Harmony-Extra, Pinnacle, Pursuit, 2,4-D and Banvel were evaluated for phytotoxicity on sugarbeets. All treatments gave some crop injury with Harmony-Extra and Pursuit showing the highest degree of crop injury.

8. Disease Index Summary of 1989. A Cercospora model was again used to determine relative activity of the leaf spot spores at three locations throughout the SMSC growing area. Hourly temperature and relative humidity readings were used to calculate infection potential. Accurate measurement of conditions favorable for leaf spot spore germination and infection will enable growers to apply fungicides when the spores are most active.

9. Harvester Performance Summary 1989. Harvester performance data was collected for all growers that use the same type of harvester in their farming operation. The harvester data is split up into machines with 4 and 6 rows. Averages are shown 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.

10. Weather Data for 1989. The growing season for 1898 was again relatively dry and did not contribute to soil moisture reserve. Most measurable precipitation fell in July and August. Temperatures were average to above average with humidities that contributed to the development of late season Cercospora leaf spot.

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Chemical compounds were furnished by Griffin, DOW, BASF, and Nor-Am.

Planned Research for 1990

The 1989 growing season again experienced a significant drought pattern. A dry spring and early summer, posed a threat for a short crop in 1989. Precipitation which fell in July and August contributed to a Cooperative average of just over 20 tons per acre. Unfortunately, a hard freeze during the first week of October significantly reduced the sugar accumulation potential over the prepile and full harvest period.

Many perennial problems, as well as, some new production challenges confronted the sugarbeet growers in 1989. Wind and dry soil conditions forced over 11,000 acres to be replanted. Significant grasshopper populations affected most all acres of sugarbeets, as well as many other crop species. Favorable conditions for the development of Cercospora leaf spot were recorded on all of the remote weather stations. Late season infestations of the sugarbeet root aphid substantially reduced the yield potential of many fields. Root rots and weed control continued to persist as a production factor despite the dry weather.

Research efforts for 1990 will continue with many of the past projects and expand efforts dealing with root aphids, soil fertility, fungicide/insecticide tankmixes and herbicide drift and persistence.

Sugarbeet quality is always a main focus, fertility management will be evaluated to minimize loss to molasses (LTM)

and maximize the Technological Value of the sugarbeet. Sustained drought conditions have significantly affected the soil profile, not only in terms of moisture availability, but nutrient amount and availability. Proper nitrogen management will be paramount in 1990 to achieve not only a realistic tonnage goal, but a sugar goal as well.

Herbicide consistency and persistency will again be evaluated in 1990. New sugarbeet herbicides such as Stinger, will again be evaluated in tankmix combinations to better substantiate the weed species at which it is most effective. New small grain and soybean herbicides are registered which are very injurious to sugarbeets. The new class of compounds are usually applied at very low rates and subsequent drift or soil carry over can significantly reduce or eliminate sugarbeet yield. Continued testing will occur to better evaluate these new compounds.

Isolation of a early root aphid infection will be attempted. The root aphid will be evaluated for species, hosts and possible control measures in 1990. The sustained dry weather has caused an increase in root aphid population and related problems.

Cercospora leaf spot was evaluated for Tin fungicide tolerance in 1989 and testing will continue in 1990. Three remote weather stations will again monitor temperature and relative humidity for the leaf spot model. Root rot evaluations by variety and seed treatments will also continue.

The large acreage always presents the possibility of record yields and subsequent storage. To facilitate the potential tonnage, the factory would have to start slicing as early as

possible. The prepile could last over a longer period and achieving the highest quality crop would continue to be very important. The date of harvest trials were expanded to 3 harvest dates to better represent the prepile time period.

Storage studies dealing with pile ventilation and its feasibility will continue in 1990

Some of these research projects will be conducted solely by SMSC; other projects including fertility, disease and root aphid trials will be conducted in cooperation with university scientists. Specific treatments and additional projects may be included in response to the growing season and environmental conditions.

Variety Evaluation

A total of 19 varieties were approved for planting during 1989. In addition three varieties were approved on a test market basis.

A complete listing of approved varieties for SMSC since 1980 is given in table 1. Only one variety, Ultramono remained on the approved list for the past seven years. The other varieties have been on the approved list for a short period of time, which is indicative of the relative improvement in variety performance. A comparison of the average performance of all approved varieties is shown in table 2. These data show a slow but steady improvement in sugar content without dropping in yield ability or giving up leaf spot resistance.

Tables 3 and 4 show the relative performance of the 21 varieties approved for 1990, and data for the test market varieties is shown in tables 5 and 6.

The board granted limited approval to Maribo 865 and KW 1745. These two varieties did not meet the minimum requirements in recoverable sugar per ton; however, both varieties show potential for the cooperative in relatively high performance in recoverable sugar per acre. Further testing is necessary for these two varieties to fully evaluate their actual value for SMSC growers.

Test results for all varieties evaluated for the past three years are shown in tables 4 - 13.

The most popular varieties planted in 1989 were:

KW 3265
Hilleshog 5135
KW 1014
KW 3145
Beta 6625
Maribo Ultramono

The original seed issued to SMSC growers totaled 153,451 lbs. Replant seed amounted to 19,576 lbs.

A greater quantity of pelleted seeds were used in this area which amounted to 12,540 lbs.

Southern Minnesota Sugar Cooperative

List of Approved Varieties Since 1980

Table 1.

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

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

Southern Minnesota Sugar Cooperative

List of Approved Varieties Since 1980

Table 1. Continued

1988	1988 Cont.	1989	1989 Cont.
ACH 164	Hilleshog 5135	ACH 164	KW 3265
ACH 178	Hilleshog 8277	ACH 180	KW 3394
ACH 180	KW 1014	ACH 181	Maribo 403
ACH 181	KW 1132	ACH 198	Maribo 411
Beta 1230	KW 3145	Beta 3614	Maribo Ultramono
Beta 3614	KW 6264	Beta 6269	Mitsui Monohikari
Beta 3265	KW 3394	Beta 6625	Mono-Hy R-103
Beta 6625	Maribo 403	Hilleshog 4046	
BJ 1310	Maribo 411	Hilleshog 5090	
BJ Monofort	Maribo Ultramono	Hilleshog 5135	
Hilleshog 4046	Mitsui Monohikari	KW 1014	
Hilleshog 5090	Mono-Hy R-103	KW 3145	

1990	1990 Cont.
ACH 180	KW 1014
ACH 181	KW 3145
ACH 196	KW 3265
ACH 198	KW 3394
ACH 194	Maribo 403
Beta 3614	Maribo 411
Beta 6269	Maribo 875
Beta 6625	Maribo Ultramono
Hilleshog 4046	Mitsui Monohikari
Hilleshog 5090	
Hilleshog 5135	
HM 2401	

Comparison of Approved Varieties for SMSC over a Ten-Year Period

Table 2

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

SOUTHERN MINNESOTA SUGAR COOPERATIVE
List of Approved Varieties for 1990

Table 3. Three year performance summary from coded trials conducted at SMSC, 1987-89

Variety	Rec. S/A	Rec. S/T	Leaf Spot*	Tons/ Acre	% Sug	LTM	Seed Vig*
ACH 180	8907	311.0	4.58	28.5	17.2	1.66	1.6
ACH 181	9357	299.0	4.53	31.1	16.7	1.73	1.8
ACH 194	9044	315.1	4.94	28.6	17.4	1.65	1.4
ACH 196	8998	312.1	5.12	28.6	17.3	1.68	1.7
ACH 198	9238	307.4	4.51	29.9	17.1	1.69	1.6
Beta 3614	8743	312.1	4.91	27.9	17.2	1.62	1.6
Beta 6269	8947	309.9	4.71	28.8	17.2	1.65	1.7
Beta 6625	8980	318.9	4.91	28.0	17.5	1.58	1.9
Hilleshog 4046	8924	309.3	4.92	28.7	17.2	1.68	1.6
Hilleshog 5090	9157	302.0	5.26	30.2	16.7	1.64	1.5
Hilleshog 5135	9249	312.8	5.13	29.4	17.3	1.63	1.4
HM 2401	8986	310.8	5.02	28.7	17.2	1.66	1.7
KW 1014	9187	305.6	4.54	29.8	16.9	1.62	1.4
KW 3145	9361	299.9	5.02	31.0	16.7	1.65	1.7
KW 3265	9246	301.1	4.93	30.6	16.7	1.65	1.7
KW 3394	9046	304.9	4.86	29.5	16.9	1.67	1.8
Maribo 403	9025	302.4	4.96	29.7	16.8	1.72	1.4
Maribo 411	8847	308.8	4.88	28.6	17.1	1.65	1.4
Maribo 875	9173	307.5	4.77	29.7	17.1	1.71	1.3
Maribo Ultramono	8974	305.3	5.06	29.3	17.0	1.69	1.3
Mitsui Monohikari	9250	308.5	4.62	29.8	16.9	1.48	2.6
Mean of Approved	9078	307.8	4.87	29.4	17.1	1.65	1.6
KW 1745**	9453	304.9	4.90	30.8	16.9	1.65	2.0
Maribo 865**	9356	303.4	4.83	30.6	16.9	1.68	1.4

* Lower numbers indicate better resistance and seedling vigor.
** Limited Approval

SOUTHERN MINNESOTA SUGAR COOPERATIVE
List of Approved Varieties for 1990

Table 4. Three year performance summary (% of Approved) from coded trials conducted at SMSC, 1987-89

Variety	Rec. S/A	Rec. S/T	Leaf Spot*	Tons/ Acre	% Sug	LTM	Seed Vig*	Est. Grower $/Ton	Est. (LTM) Grower $/Ton
ACH 180	98.1	101.0	94.1	97.1	100.9	100.4	98.5	101.2	101.3
ACH 181	103.1	97.1	93.1	106.0	97.9	104.7	110.9	97.1	96.1
ACH 194	99.6	102.4	101.5	97.4	102.0	99.8	86.2	102.8	103.2
ACH 196	99.1	101.4	105.2	97.4	101.5	101.6	104.7	102.0	102.0
ACH 198	101.8	99.9	92.7	101.9	100.3	102.2	98.5	100.4	100.1
Beta 3614	96.3	101.4	100.9	95.1	100.9	98.0	98.5	101.2	101.6
Beta 6269	98.6	100.7	96.8	98.1	100.9	99.8	104.7	101.2	101.4
Beta 6625	98.9	103.6	100.9	95.4	102.6	95.6	117.0	103.6	104.7
Hilleshog 4046	98.3	100.5	101.1	97.8	100.9	101.6	98.5	101.2	101.1
Hilleshog 5090	100.9	98.1	108.1	102.9	97.9	99.2	92.4	97.1	96.9
Hilleshog 5135	101.9	101.6	105.4	100.2	101.5	98.6	86.2	102.0	102.4
HM 2401	99.0	101.0	103.2	97.8	100.9	100.4	104.7	101.2	101.3
KW 1014	101.2	99.3	93.3	101.5	99.1	98.0	86.2	98.8	98.9
KW 3145	103.1	97.4	103.2	105.6	97.9	99.8	104.7	97.1	96.8
KW 3265	101.9	97.8	101.3	104.3	97.9	99.8	104.7	97.1	96.8
KW 3394	99.6	99.0	99.9	100.5	99.1	101.0	110.9	98.8	98.5
Maribo 403	99.4	98.2	101.9	101.2	98.5	104.1	86.2	97.9	97.1
Maribo 411	97.5	100.3	100.3	97.4	100.3	99.8	86.2	100.4	100.5
Maribo 875	101.0	99.9	98.0	101.2	100.3	103.5	80.1	100.4	99.9
Maribo Ultramono	98.9	99.2	104.0	99.8	99.7	102.2	80.1	99.6	99.2
Mitsui Monohikari	101.9	100.2	95.0	101.5	99.1	89.5	160.1	98.8	100.2
Mean of Approved	9078	307.8	4.87	29.4	17.1	1.65	1.6		
KW 1745**	104.1	99.0	100.7	104.9	99.1	99.8	123.2	98.8	98.7
Maribo 865**	103.1	98.6	99.3	104.3	99.1	101.6	86.2	98.8	98.4

* Lower numbers indicate better resistance and seedling vigor.
** Limited Approval

SOUTHERN MINNESOTA SUGAR COOPERATIVE
Test Market Varieties for 1990

Table 5. Two year performance summary from coded trials conducted at SMSC, 1988-89

Variety	Rec. S/A	Rec. S/T	Leaf Spot*	Tons/ Acre	% Sug	LTM	Seed Vig*
ACH 180	7710	303.0	4.27	25.42	16.79	1.65	1.61
ACH 181	8098	288.6	4.16	28.03	16.19	1.75	1.93
ACH 194	7928	304.8	4.54	26.06	16.88	1.65	1.55
ACH 196	7857	303.6	4.77	25.77	16.84	1.66	1.72
ACH 198	8150	299.1	4.14	27.29	16.63	1.67	1.57
Beta 3614	7811	304.8	4.47	25.68	16.86	1.62	1.76
Beta 6269	7838	300.1	4.50	26.18	16.65	1.65	1.80
Beta 6625	7818	307.2	4.57	25.53	16.92	1.56	1.96
Hilleshog 4046	7813	299.6	4.62	26.12	16.68	1.69	1.66
Hilleshog 5090	8035	292.2	4.75	27.55	16.23	1.62	1.63
Hilleshog 5135	8120	305.1	4.81	26.62	16.87	1.62	1.53
HM 2401	7873	299.5	4.65	26.25	16.63	1.66	1.53
KW 1014	8017	296.8	4.06	27.07	16.47	1.63	1.46
KW 3145	8098	290.5	4.59	27.93	16.17	1.64	1.87
KW 3265	8089	292.2	4.63	27.80	16.23	1.63	1.64
KW 3394	7892	297.0	4.44	26.58	16.51	1.66	1.76
Maribo 403	7807	293.0	4.64	26.68	16.37	1.72	1.49
Maribo 411	7850	299.6	4.48	26.27	16.62	1.64	1.48
Maribo 875	8012	298.2	4.46	26.99	16.61	1.70	1.43
Maribo Ultramono	7829	298.9	4.71	26.19	16.63	1.68	1.40
Mitsui Monohikari	8154	302.0	4.13	26.91	16.53	1.44	2.84
Mean of Approved	7943	298.8	4.49	26.61	16.58	1.64	1.69
ACH 192**	7940	299.0	4.56	26.63	16.56	1.62	1.52
BJ 1320**	7770	299.1	4.63	26.01	16.57	1.62	2.12
KW 2398**	8374	304.8	4.59	27.64	16.82	1.58	1.45

* Lower numbers indicate better resistance and seedling vigor.
** Test Market

SOUTHERN MINNESOTA SUGAR COOPERATIVE
Test Market Varieties for 1990

Table 6. Two year performance summary (% of Approved) from coded trials conducted at SMSC, 1988-89

Variety	Rec. S/A	Rec. S/T	Leaf Spot*	Tons/ Acre	% Sug	LTM	Seed Vig*	Est. Grower $/Ton	Est. (LTM) Grower $/Ton
ACH 180	97.1	101.4	95.0	95.5	101.2	100.2	94.8	101.7	101.9
ACH 181	102.0	96.6	92.6	105.3	97.6	106.6	113.6	96.6	95.2
ACH 194	99.8	102.0	101.0	97.9	101.8	100.2	91.2	102.5	102.7
ACH 196	98.9	101.6	106.1	96.8	101.5	100.8	101.5	102.1	102.2
ACH 198	102.6	100.1	92.1	102.5	100.3	101.7	92.4	100.4	100.1
Beta 3614	98.3	102.0	99.4	96.5	101.6	98.4	103.6	102.3	102.8
Beta 6269	98.7	100.4	100.1	98.4	100.4	100.2	106.3	100.6	100.6
Beta 6625	98.4	102.8	101.7	95.9	102.0	95.0	115.7	102.8	103.9
Hilleshog 4046	98.4	100.3	102.8	98.1	100.6	102.9	98.0	100.8	100.4
Hilleshog 5090	101.2	97.8	105.7	103.5	97.8	98.7	95.9	97.0	96.8
Hilleshog 5135	102.2	102.1	107.0	100.0	101.7	98.4	90.3	102.4	102.9
HM 2401	99.1	100.2	103.5	98.6	100.3	100.8	90.0	100.4	100.3
KW 1014	100.9	99.3	90.3	101.7	99.3	99.0	86.2	99.0	99.0
KW 3145	102.0	97.2	102.1	104.9	97.5	99.9	110.1	96.5	96.1
KW 3265	101.8	97.8	103.0	104.4	97.9	99.0	96.5	97.0	96.8
KW 3394	99.4	99.4	98.8	99.9	99.6	101.1	103.9	99.4	99.1
Maribo 403	98.3	98.0	103.2	100.3	98.7	104.5	88.0	98.2	97.3
Maribo 411	98.8	100.3	99.7	98.7	100.2	99.6	87.1	100.3	100.4
Maribo 875	100.9	99.8	99.2	101.4	100.2	103.2	84.4	100.2	99.8
Maribo Ultramono	98.6	100.0	104.8	98.4	100.3	102.3	82.7	100.4	100.0
Mitsui Monohikari	102.7	101.1	91.9	101.1	99.7	87.4	167.7	99.6	101.4
Mean of Approved	7943	298.8	4.49	26.61	16.58	1.64	1.69		
ACH 192**	99.9	100.3	97.3	99.8	100.1	99.0	87.8	100.1	100.3
BJ 1320**	97.8	100.3	98.8	97.4	100.1	99.0	122.8	100.2	100.3
KW 2398**	105.4	102.2	97.9	103.5	101.6	96.2	83.7	102.3	103.1

* Lower numbers indicate better resistance and seedling vigor.
** Test Market

TABLE 7

Three Year Performance Summary of 1989 SMSC Commercial Coded Entries*
Three Locations

Description	Rec. Sugar / Ton (pounds)			Rec. Sugar / Acre (pounds)			Loss to Molasses (%)		
	1989	3 Yr Mean	3 Yr % Mean	1989	3 Yr Mean	3 Yr % Mean	1989	3 Yr Mean	3 Yr % Mean
ACH 180	276.7	311.0	101.2	7084	8907	97.9	1.64	1.66	100.1
ACH 181	256.7	299.0	97.3	7195	9357	102.9	1.79	1.73	104.8
ACH 194	277.9	315.1	102.5	7371	9044	99.4	1.65	1.65	99.5
ACH 196	276.0	312.1	101.5	7355	8998	98.9	1.63	1.68	101.7
ACH 198	273.6	307.4	100.0	7601	9238	101.6	1.73	1.69	101.9
Beta 2007	265.8	303.5	98.7	7429	8851	97.3	1.67	1.67	101.1
Beta 3614	277.4	312.1	101.6	7192	8743	96.1	1.64	1.62	97.7
Beta 4689 (Rhiz Spec)	251.4			6935			1.73		
Beta 6269	275.2	309.9	100.8	7411	8947	98.4	1.64	1.65	99.9
Beta 6625	279.9	318.9	103.8	7317	8980	98.7	1.62	1.58	95.5
Hilleshog 4046	271.9	309.3	100.6	7363	8924	98.1	1.68	1.68	101.7
Hilleshog 5090	260.7	302.0	98.2	7372	9157	100.7	1.71	1.64	99.1
Hilleshog 5135	278.0	312.8	101.8	7585	9249	101.7	1.62	1.63	98.3
HM 2401	272.2	310.8	101.1	7447	8986	98.8	1.63	1.66	100.1
KW 1014	268.7	305.6	99.4	7273	9187	101.0	1.69	1.62	97.9
KW 1745	267.2	304.9	99.2	7579	9453	103.9	1.65	1.65	99.9
KW 3145	265.5	299.9	97.6	7621	9361	102.9	1.65	1.65	99.9
KW 3265	265.5	301.1	98.0	7589	9246	101.7	1.64	1.65	99.5
KW 3394	265.0	304.9	99.2	7159	9046	99.4	1.70	1.67	100.7
Maribo 403	265.2	302.4	98.4	7128	9025	99.2	1.74	1.72	104.0
Maribo 411	273.1	308.8	100.5	7332	8848	97.3	1.68	1.65	99.7
Maribo 865	265.4	303.4	98.7	7396	9356	102.9	1.69	1.68	101.5
Maribo 875	272.4	307.5	100.1	7501	9173	100.8	1.70	1.71	103.4
Maribo Ultramono	268.5	305.3	99.3	7268	8974	98.7	1.71	1.69	102.1
Mitsui Monohikari	277.9	308.5	100.4	7704	9250	101.7	1.44	1.48	89.5
Mean	269.9	307.3	100.0	7368	9096	100.0	1.67	1.65	100.0

*1989 data from Renville, Maynard and Clara City
1988 data from Bird Island, Renville and Clara City
1987 data from Bird Island, DeGraff and Maynard

TABLE 8

Three Year Performance Summary of 1989 SMSC Commercial Coded Entries *
Three Locations

Description	Sugar Content (%)			Root Yield (Tons / Acre)			Seedling Vigor Rating + (1=Ex,5=Poor)			Field Emergence (%)		
	1989	3 Yr Mean	3 Yr % Mean	1989	3 Yr Mean	3 Yr % Mean	1989	3 Yr Mean	3 Yr % Mean	1989	3 Yr Mean	3 Yr % Mean
ACH 180	15.5	17.2	101.1	25.3	28.5	96.7	1.4	1.6	95.4	73.2	71.5	103.2
ACH 181	14.6	16.7	98.0	27.9	31.1	105.6	1.8	1.8	108.3	67.4	69.2	99.7
ACH 194	15.6	17.4	102.2	26.3	28.6	96.9	1.7	1.4	86.9	66.6	66.8	96.4
ACH 196	15.4	17.3	101.6	26.4	28.6	97.0	1.3	1.7	100.4	71.7		
ACH 198	15.4	17.1	100.2	27.6	29.9	101.7	1.2	1.6	95.6	72.6		
Beta 2007	15.0	16.9	99.0	27.8	29.1	98.7	1.6	1.8	111.0	71.1		
Beta 3614	15.5	17.2	101.2	25.8	27.9	94.7	1.8	1.6	97.6	70.1	68.5	98.8
Beta 4689 (Rhiz Spec)	14.3			27.5			1.1			76.9		
Beta 6269	15.4	17.2	100.8	26.8	28.8	97.6	1.6	1.7	105.1	72.1		
Beta 6625	15.6	17.5	102.9	26.0	28.0	95.2	1.6	1.9	116.0	73.9	67.6	97.5
Hilleshog 4046	15.3	17.2	100.7	26.9	28.7	97.5	1.4	1.6	98.8	71.8	69.8	100.6
Hilleshog 5090	14.7	16.7	98.3	28.1	30.2	102.6	1.4	1.5	93.7	70.1	70.8	102.1
Hilleshog 5135	15.5	17.3	101.4	27.1	29.4	99.9	1.6	1.4	84.8	68.2	67.9	97.9
HM 2401	15.2	17.2	101.0	27.1	28.7	97.4	1.4	1.7	103.9	69.0		
KW 1014	15.1	16.9	99.3	26.9	29.8	101.3	1.5	1.4	84.4	68.3	69.4	100.1
KW 1745	15.0	16.9	99.3	28.1	30.8	104.6	1.4	2.0	122.9	73.2		
KW 3145	14.9	16.7	97.8	28.6	31.0	105.2	1.4	1.7	105.9	70.1	66.9	96.4
KW 3265	14.9	16.7	98.1	28.4	30.6	104.0	1.3	1.7	104.3	70.1	64.9	93.6
KW 3394	14.9	16.9	99.3	26.8	29.5	100.3	1.6	1.8	107.9	68.5	65.7	94.7
Maribo 403	15.0	16.8	98.9	26.7	29.7	100.8	1.6	1.4	85.6	73.3	70.4	101.5
Maribo 411	15.3	17.1	100.4	26.6	28.6	96.9	1.3	1.4	86.3	73.7	71.9	103.6
Maribo 865	15.0	16.9	99.0	27.6	30.6	104.0	1.3	1.4	84.4	72.8	69.7	100.5
Maribo 875	15.3	17.1	100.4	27.4	29.7	100.9	1.1	1.3	80.6	74.9		
Maribo Ultramono	15.1	17.0	99.6	26.9	29.3	99.4	1.3	1.3	79.6	75.5	74.7	107.7
Mitsui Monohikari	15.3	16.9	99.3	27.4	29.8	101.1	2.9	2.6	160.6	73.2	73.2	105.6
Mean	15.2	17.0	100.0	27.1	29.5	100.0	1.5	1.6	100.0	71.5	69.3	100.0

* 1989 emergence and vigor from 2 locations. 1988 emergence and vigor from 2 locations.
1987 emergence and vigor from 2 locations.
+ Lower numbers indicate better vigor.

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
SM SEMI COMMERCIAL COMBINED 1989
TABLE 9 AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

28 varieties 24 repsxlocs 3 tests combined

VARIETY	CODE	Rec/T lbs	Rec/A lbs	Loss to Mol.	Sugar %	Yield T/A
ACH 192	150	271.0 (99.1)	7116 (96.8)	1.59 (99.8)	15.13 (99.2)	26.06 (97.7)
ACH 87-0745	164	281.0 (102.7)	7059 (96.0)	1.58 (99.5)	15.63 (102.4)	24.87 (93.3)
ACH 87-0839	171	280.7 (102.6)	7126 (96.9)	1.67 (105.4)	15.71 (102.9)	25.17 (94.4)
ACH 87-1720	158	274.7 (100.4)	7243 (98.5)	1.56 (97.9)	15.29 (100.2)	26.17 (98.1)
ACH 87-1721	169	273.6 (100.0)	7228 (98.3)	1.66 (104.3)	15.34 (100.5)	26.23 (98.3)
Beta 1238	162	272.0 (99.4)	7596 (103.3)	1.51 (95.0)	15.11 (99.0)	27.76 (104.1)
Beta 2885	163	272.9 (99.8)	7548 (102.7)	1.59 (100.2)	15.24 (99.8)	27.50 (103.1)
Beta 2988	166	277.2 (101.3)	7493 (101.9)	1.51 (95.2)	15.37 (100.7)	26.84 (100.6)
Beta 5657	167	269.2 (98.4)	7220 (98.2)	1.57 (98.8)	15.03 (98.5)	26.58 (99.6)
Beta 6719	144	271.9 (99.4)	7435 (101.1)	1.59 (100.1)	15.19 (99.5)	27.07 (101.5)
Bush Johnson 1320	151	274.4 (100.3)	7242 (98.5)	1.59 (99.9)	15.31 (100.3)	26.23 (98.3)
Bush Johnson 1330	161	277.7 (101.5)	7044 (95.8)	1.60 (100.9)	15.49 (101.5)	25.09 (94.1)
Hilleshog 5135 (Check #1)	156	280.6 (102.6)	7613 (103.6)	1.64 (103.2)	15.67 (102.7)	26.84 (100.6)
Hilleshog 8351	147	272.8 (99.8)	7708 (104.8)	1.63 (102.6)	15.27 (100.1)	28.14 (105.5)
HM 2408	165	278.4 (101.8)	7051 (95.9)	1.55 (97.3)	15.47 (101.3)	25.17 (94.4)
HM LSR88	168	257.8 (94.3)	7419 (100.9)	1.58 (99.3)	14.47 (94.8)	28.45 (106.7)
KW 1119	149	289.7 (105.9)	7569 (103.0)	1.57 (98.8)	16.06 (105.2)	25.93 (97.2)
KW 2249	146	279.5 (102.2)	7451 (101.3)	1.54 (96.9)	15.51 (101.6)	26.44 (99.1)
KW 2398	152	279.6 (102.2)	7806 (106.2)	1.54 (96.7)	15.52 (101.7)	27.66 (103.7)
KW 3009	157	272.0 (99.5)	7217 (98.2)	1.65 (103.6)	15.25 (99.9)	26.33 (98.7)
KW 3265 (Check #2)	153	270.2 (98.8)	7419 (100.9)	1.56 (98.3)	15.07 (98.7)	27.21 (102.0)
KW 3459	155	273.5 (100.0)	7227 (98.3)	1.61 (101.3)	15.29 (100.1)	26.18 (98.1)
Maribo 883	170	274.4 (100.3)	7206 (98.0)	1.61 (101.4)	15.33 (100.4)	25.96 (97.3)
Maribo 890	154	265.6 (97.1)	7495 (101.9)	1.68 (105.8)	14.96 (98.0)	28.03 (105.1)
Maribo 894	159	272.9 (99.8)	7482 (101.8)	1.45 (91.3)	15.10 (98.9)	27.16 (101.8)
Maribo 898	160	250.5 (91.6)	7137 (97.1)	1.66 (104.2)	14.18 (92.9)	28.20 (105.7)
Maribo 899	148	271.7 (99.3)	7543 (102.6)	1.59 (100.0)	15.17 (99.4)	27.52 (103.2)
Maribo Ultramono (Check #3)	145	272.4 (99.6)	7154 (97.3)	1.63 (102.4)	15.25 (99.9)	26.08 (97.8)

General Mean Across Varieties	273.50	7351.58	1.59	15.26	26.67
Coeff. of Var. (%)	3.40	6.60	6.95	2.78	5.90
Variety Mean Square	1279.80	1102531.88	0.07	3.06	23.90
Error Mean Square (Error B)	86.41	235773.30	0.01	0.18	2.48
F Value	14.81**	4.68**	5.56**	17.02**	9.63**
L.S.D. (.05)	5.19	271.27	0.06	0.24	0.88
L.S.D. (.01)	6.54	341.76	0.08	0.30	1.11

* significant at 5% ** significant at 1% ns not significant

Value in parenthesis represents percent of check.
General Mean used as check.

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
SM SEMI COMMERCIAL COMBINED 1989
TABLE 10 AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

VARIETY	CODE	Na ppm	K ppm	Am.N ppm	Gr.Sugar lbs/A	Vigor
ACH 192	150	460 (104.9)	2007 (101.2)	527 (97.0)	7939 (96.9)	1.38 (86.5)
ACH 87-0745	164	382 (87.1)	2029 (102.3)	545 (100.4)	7839 (95.7)	1.44 (90.4)
ACH 87-0839	171	357 (81.3)	2048 (103.2)	622 (114.6)	7963 (97.2)	1.75 (110.1)
ACH 87-1720	158	420 (95.6)	1890 (95.3)	549 (101.1)	8055 (98.3)	2.13 (133.7)
ACH 87-1721	169	412 (93.8)	1965 (99.1)	610 (112.4)	8094 (98.8)	2.00 (125.8)
Beta 1238	162	472 (107.6)	1914 (96.5)	488 (89.9)	8430 (102.9)	1.56 (98.3)
Beta 2885	163	409 (93.1)	2052 (103.4)	539 (99.2)	8421 (102.8)	1.94 (121.9)
Beta 2988	166	432 (98.3)	1920 (96.8)	503 (92.7)	8301 (101.3)	1.44 (90.4)
Beta 5657	167	444 (101.1)	1961 (98.8)	533 (98.2)	8050 (98.2)	1.19 (74.7)
Beta 6719	144	417 (95.0)	1926 (97.1)	568 (104.5)	8292 (101.2)	2.13 (133.7)
Bush Johnson 1320	151	494 (112.6)	1983 (99.9)	522 (96.1)	8070 (98.5)	1.88 (118.0)
Bush Johnson 1330	161	460 (104.9)	1911 (96.3)	566 (104.2)	7844 (95.7)	1.44 (90.4)
Hilleshog 5135 (Check #1)	156	456 (103.9)	2025 (102.1)	565 (104.1)	8485 (103.5)	1.44 (90.4)
Hilleshog 8351	147	399 (90.8)	2038 (102.7)	576 (106.1)	8624 (105.2)	2.25 (141.6)
HM 2408	165	387 (88.0)	1993 (100.5)	526 (96.9)	7826 (95.5)	2.13 (133.7)
HM LSR88	168	479 (109.2)	1987 (100.2)	519 (95.6)	8311 (101.4)	1.63 (102.2)
KW 1119	149	366 (83.2)	2059 (103.8)	535 (98.6)	8379 (102.2)	1.50 (94.4)
KW 2249	146	386 (87.9)	1950 (98.3)	533 (98.2)	8259 (100.8)	1.44 (90.4)
KW 2398	152	530 (120.7)	1880 (94.8)	497 (91.5)	8650 (105.6)	1.19 (74.7)
KW 3009	157	378 (86.1)	1940 (97.8)	621 (114.4)	8079 (98.6)	1.25 (78.7)
KW 3265 (Check #2)	153	440 (100.2)	1966 (99.1)	526 (96.9)	8263 (100.8)	1.31 (82.6)
KW 3459	155	448 (102.0)	1967 (99.1)	561 (103.3)	8067 (98.4)	1.81 (114.0)
Maribo 883	170	457 (104.1)	2025 (102.1)	542 (99.9)	8038 (98.1)	1.31 (82.6)
Maribo 890	154	497 (113.2)	2051 (103.4)	575 (105.9)	8436 (102.9)	1.31 (82.6)
Maribo 894	159	462 (105.1)	1837 (92.6)	466 (85.9)	8267 (100.9)	1.38 (86.5)
Maribo 898	160	464 (105.7)	2177 (109.7)	534 (98.4)	8066 (98.4)	1.69 (106.2)
Maribo 899	148	484 (110.3)	2001 (100.9)	521 (96.0)	8411 (102.6)	1.13 (70.8)
Maribo Ultramono (Check #3)	145	502 (114.3)	2048 (103.2)	533 (98.1)	7997 (97.6)	1.50 (94.4)

General Mean Across Varieties	439.09	1983.99	542.90	8194.87	1.59
Coeff. of Var. (%)	17.09	4.97	13.65	6.35	33.77
Variety Mean Square	48943.50	118332.05	32353.38	1288925.13	1.70
Error Mean Square (Error B)	5631.87	9737.74	5488.91	270867.41	0.29
F Value	8.69**	12.15**	5.89**	4.76**	5.89**
L.S.D. (.05)	41.93	55.13	41.39	290.76	0.37
L.S.D. (.01)	52.82	69.46	52.15	366.32	0.48

* significant at 5% ** significant at 1% ns not significant

Value in parenthesis represents percent of check.
General Mean used as check.

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
SM SEMI COMMERCIAL COMBINED 1989
TABLE 11 AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

VARIETY	CODE	Bolters %	Emergence %
ACH 192	150	0.000 (0.0)	0.0 (0.0)
ACH 87-0745	164	0.000 (0.0)	0.0 (0.0)
ACH 87-0839	171	0.074 (400.0)	0.0 (0.0)
ACH 87-1720	158	0.000 (0.0)	0.0 (0.0)
ACH 87-1721	169	0.000 (0.0)	0.0 (0.0)
Beta 1238	162	0.000 (0.0)	0.0 (0.0)
Beta 2885	163	0.149 (800.0)	0.0 (0.0)
Beta 2988	166	0.000 (0.0)	0.0 (0.0)
Beta 5657	167	0.000 (0.0)	0.0 (0.0)
Beta 6719	144	0.000 (0.0)	0.0 (0.0)
Bush Johnson 1320	151	0.000 (0.0)	0.0 (0.0)
Bush Johnson 1330	161	0.000 (0.0)	0.0 (0.0)
Hillesheg 5135 (Check #1)	156	0.074 (400.0)	0.0 (0.0)
Hillesheg 8351	147	0.000 (0.0)	0.0 (0.0)
HM 2408	165	0.000 (0.0)	0.0 (0.0)
HM LSR88	168	0.074 (400.0)	0.0 (0.0)
KW 1119	149	0.000 (0.0)	0.0 (0.0)
KW 2249	146	0.074 (400.0)	0.0 (0.0)
KW 2398	152	0.000 (0.0)	0.0 (0.0)
KW 3009	157	0.000 (0.0)	0.0 (0.0)
KW 3265 (Check #2)	153	0.000 (0.0)	0.0 (0.0)
KW 3459	155	0.000 (0.0)	0.0 (0.0)
Maribo 883	170	0.000 (0.0)	0.0 (0.0)
Maribo 890	154	0.000 (0.0)	0.0 (0.0)
Maribo 894	159	0.074 (400.0)	0.0 (0.0)
Maribo 898	160	0.000 (0.0)	0.0 (0.0)
Maribo 899	148	0.000 (0.0)	0.0 (0.0)
Maribo Ultramono (Check #3)	145	0.000 (0.0)	0.0 (0.0)

General Mean Across Varieties	0.02	0.00
Coeff. of Var. (%)	948.94	0.00
Variety Mean Square	0.04	0.00
Error Mean Square (Error B)	0.03	0.00
F Value	1.15	0.00
L.S.D. (.05)	ns	ns
L.S.D. (.01)	ns	ns

* significant at 5% ** significant at 1% ns not significant

Value in parenthesis represents percent of check.
General Mean used as check.

1989 Cercospora Leaf Spot Ratings for SMSC Commercial Coded Test Entries

TABLE 12 Betaseed Nursery - Shakopee, MN

Code	Description	Average Rating at Each Date *						Mean All Ratings*			
		7/28	8/1	8/4	8/8	8/11	8/14	1989	2 Yr Mean	3 Yr Mean	3 Yr % Mean
74	ACH 180	3.25	3.25	3.75	4.75	6.00	6.50	4.59	4.27	4.58	93.8
57	ACH 181	3.00	3.25	3.75	4.75	5.50	6.50	4.46	4.16	4.53	92.8
75	ACH 194	3.00	3.25	4.00	5.00	5.75	6.50	4.58	4.54	4.94	101.2
77	ACH 196	2.75	3.50	4.25	5.00	5.75	6.50	4.63	4.77	5.12	104.8
71	ACH 198	2.75	3.50	4.00	4.50	5.75	6.75	4.54	4.14		
70	Beta 2007	3.00	3.00	3.75	4.50	5.50	6.00	4.29	4.52	4.94	101.2
63	Beta 3614	3.00	3.50	4.50	5.25	5.75	6.75	4.79	4.47	4.91	100.5
68	Beta 4689 (Rhiz Spec)	2.75	3.00	3.50	4.25	5.00	6.00	4.09			
69	Beta 6269	2.75	3.25	4.00	5.50	6.25	6.75	4.75	4.50	4.71	96.4
61	Beta 6625	3.00	3.50	4.00	5.25	6.25	6.75	4.79	4.57	4.91	100.5
65	Hilleshog 4046	3.00	3.50	4.50	5.00	6.00	7.00	4.83	4.62	4.92	100.8
60	Hilleshog 5090	3.25	3.75	4.75	5.25	6.25	6.75	5.00	4.75	5.26	107.8
79	Hilleshog 5135	3.00	3.75	4.50	5.00	6.00	7.00	4.88	4.81	5.13	105.0
72	HM 2401	3.00	3.50	4.75	5.25	6.25	7.00	4.96	4.65	5.02	102.8
67	KW 1014	2.50	3.00	4.00	4.75	5.75	6.50	4.42	4.06	4.54	92.9
56	KW 1745	3.25	3.50	4.00	5.00	5.75	6.75	4.71	4.48	4.90	100.4
62	KW 3145	3.00	3.00	4.50	5.00	5.75	6.50	4.63	4.59	5.02	102.7
73	KW 3265	3.00	3.25	4.25	5.00	6.25	6.75	4.75	4.63	4.93	100.9
58	KW 3394	3.00	3.50	4.00	4.75	5.75	6.75	4.63	4.44	4.86	99.5
76	Maribo 403	3.50	3.75	4.50	5.50	6.25	7.25	5.13	4.64	4.96	101.5
55	Maribo 411	2.75	3.00	3.75	4.75	5.75	6.50	4.42	4.48	4.88	99.9
78	Maribo 865	3.00	3.50	4.25	5.00	6.00	7.00	4.79	4.60	4.83	98.8
64	Maribo 875	3.00	3.25	4.00	5.25	5.50	6.50	4.58	4.46	4.77	97.7
66	Maribo Ultramono	3.00	3.50	4.50	5.25	6.25	6.75	4.88	4.71	5.06	103.6
59	Mitsui Monohikari	3.00	3.00	3.50	4.50	5.25	6.00	4.21	4.13	4.62	94.5

* Lower numbers indicate better leaf spot resistance (1=Ex, 9=Poor).
Ratings are means of 4 replications.

1989 Cercospora Leaf Spot Ratings for SMSC Semi Commercial Coded Test Entries

TABLE 13 Betaseed Nursery - Shakopee, MN

Code	Description	Average Rating at Each Date * 7/28	8/1	8/4	8/8	8/11	8/14	1989	2 Yr Mean
150	ACH 192	2.75	3.00	3.75	4.75	5.75	6.25	4.38	4.56
164	ACH 87-0745	2.00	3.00	3.00	4.00	4.75	5.25	3.67	
171	ACH 87-0839	2.75	3.00	4.25	4.75	5.75	6.00	4.42	
158	ACH 87-1720	3.00	3.50	4.75	5.25	6.75	7.00	5.05	
169	ACH 87-1721	3.00	3.25	4.00	5.00	5.75	6.75	4.63	
162	Beta 1238	3.00	3.25	4.75	5.75	6.25	7.25	5.04	4.82
163	Beta 2885	3.00	3.25	4.50	5.00	5.75	6.75	4.71	
166	Beta 2988	3.00	3.75	4.50	5.25	6.00	7.25	4.96	4.88
167	Beta 5657	3.00	3.00	3.75	4.75	6.00	6.25	4.46	4.13
144	Beta 6719	2.75	3.50	4.25	5.00	5.75	6.50	4.63	
151	Bush Johnson 1320	3.00	3.50	4.25	5.50	6.25	7.00	4.92	4.63
161	Bush Johnson 1330	3.00	3.00	4.00	5.00	6.00	6.25	4.54	4.45
147	Hilleshog 8351	3.00	3.25	4.25	5.25	6.25	7.25	4.88	4.87
165	HM 2408	3.00	3.00	3.50	4.75	5.00	6.00	4.21	
168	HM LSR88	3.00	3.50	3.75	4.75	5.75	6.25	4.50	
149	KW 1119	3.00	3.25	4.25	5.00	6.00	7.00	4.75	
146	KW 2249	2.75	3.50	4.25	5.25	6.50	7.25	4.92	
152	KW 2398	3.00	3.25	4.25	5.00	5.75	6.50	4.63	4.59
157	KW 3009	2.50	3.25	4.25	4.75	5.50	6.75	4.50	
155	KW 3459	2.75	3.25	4.00	5.00	6.25	7.00	4.71	
170	Maribo 883	3.00	3.25	3.75	4.75	5.75	6.50	4.50	4.53
154	Maribo 890	3.00	3.50	4.25	5.25	6.25	7.50	4.96	
159	Maribo 894	3.00	3.25	4.25	5.25	6.25	7.00	4.83	
160	Maribo 898	2.50	3.25	3.50	4.50	5.25	5.75	4.13	
148	Maribo 899	3.25	3.50	4.25	5.00	5.75	6.50	4.71	

* Lower numbers indicate better leaf spot resistance (1=Ex, 9=Poor).
Ratings are means of 4 replications.

Date of Harvest Summary

Objectives

Evaluate 9 sugarbeet varieties for relative root yields and quality characteristics harvested early and late.

Experimental Procedures

Trials were planted at three locations in 1987 and 1988. Eight locations were planted in 1989. Two locations were harvested in 1987, two in 1988, and six in 1989.

The varieties included in these eight 1989 trials were:

Beta 3614	Ultramono
Beta 6625	Maribo 403
Monohikari	ACH 198
Hilleshog 2401	KW 3265
Hilleshog 5135	

The variety Beta 6625 has only 1988 and 1989 data. Varieties Hilleshog 2401 and ACH 198 have only 1989 data.

All varieties were planted in 4 row plots 30 ft in length and six replications in 1987 and 1988. The variety plots in 1989 consisted of 2 row strip trials planted and maintained with the cooperator's equipment. In 1987 harvest dates were scheduled to begin about September 20 for the early date and October 25 for the late harvest. Harvest dates were split into three intervals in 1988 and 1989 to represent the longer duration in prepile period associated with the increase in cooperative acreage. The harvest dates were September 22,

October 6 and October 25 for the early, mid-harvest and late harvest dates, respectively in
1988. In 1989, harvest dates were September 18, October 3 and October 16 for the early, mid-harvest and late harvest dates, respectively. Six replications per variety per date were hand harvested for quality analysis. Planting dates were April 20-23, April 25-27, and April 24-27 for 1987,1988 and 1989, respectively. All trials were thinned to a final population of 120-130 plants per 100 feet. Standard production practices were utilized for weed and disease control.

Results and Discussion

Variety Performance data for the early, mid harvest and late harvest dates are shown in tables 1, 2, 3 and 4. The average increase in percent sugar for 1989 over the harvest period was 1.67% (Table 1). The sugar increase in 1989 was not as large as has been experienced in recent years. Significant frost during the first week in October reduced the rate of sugar accumulation relative to past years. Average root yield increased 3.08 tons per acre for early to late harvest dates (Table 2).

Generally, adequate precipitation was received through out the growing area, however; some areas received less than normal rainfall. Precipitation was timely, but very little soil moisture reserve occurred. Adequate moisture resulted in an above average root yield and frost slowed sugar accumulation in early October. Data combined for

three years (1987-1989) indicated an increase on average of 2.57% sugar and 3.01 tons per acre.

Average deviations from percent of the mean for sugar content, tons per acre, recoverable sugar per ton (RST) and recoverable sugar per acre (RSA) for 1989 are presented in figures 1, 2, 3 and 4. Data combined for 1987-1989 are contained in figures 5,6,7 and 8. Varieties selected for this study do appear to respond differently for quality and yield at early, mid-harvest and late harvest intervals. The data previously mentioned indicates an increase in quality along harvest intervals on average among varieties. Within the varieties tested some varieties may show a greater potential to accumulate a relatively higher level of sugar and root yield earlier in the growing season. If data for just 1989 is considered, these data would indicate that Maribo 403, Hilleshog 2410, KW 3265, Beta 3614 and Beta 6625 would be likely candidates for early sugar. Varieties particularly strong for early tons per acre would be Monohikari, KW 3265, Hilleshog 5135 and Beta 6625. Recoverable sugar per acre, is used to evaluate sugar, yield and Loss to Molasses (LTM). Figure 4 shows the performance based on RSA. Varieties that did particularly well for RSA early in 1989 are Monohikari, Hilleshog 2401, KW 3265, Hilleshog 5135 and Beta 6625. Some varieties did achieve high quality; however, they required a full season to do so.

Varieties evaluated for 3 years show that Monohikari, Beta 3614 and Hilleshog 5135 have higher sugar early

compared with other varieties used in this study. Monohikari, Ultramono and KW 3265 were particularly strong for tons per acre early. Other varieties not included in this study may also be well suited for early harvest.

A grower must consider several factors including variety when making a determination of which field to harvest early or late.

The decision making process can be multifaceted and residual Nitrogen can further complicate the issue. High levels of nitrogen could seriously impact the quality of the sugarbeet crop, so attention to fertility may be more important than ever before. A variety such as Monohikari, which is significantly lower in LTM, may be used in a field high in Nitrogen. Some considerations other than sugarbeet varieties are as follows:

1) Plant population.
2) General plant growth and development throughout the growing season.
3) Plant stress caused by excess/deficient water, hail, insects, temperature, disease, weeds, etc.
4) Relative soil fertility.
5) Relative planting dates, emergence dates, speed of plant growth, etc.
6) Relative ability for plants to respond to the environment and continue rapid growth.

Any single factor or combination of the above list could overwhelm a "high sugar variety" planted specially for early harvest, and actually have lower quality than a "tonnage" variety.

Table 1. Three year performance of 1989 varieties harvested early, mid-harvest and late for sugar content.***

	Sugar Content (%)									
Variety	Early 1989	Mid 1989	Late 1989	Change E -> L	Early 2 Yr Mean 88-89	Late 2 Yr Mean 88-89	Early 3 Yr Mean 87-89	Late 3 Yr Mean 87-89	Early 3 Yr % Mean 87-89	Late 3 Yr % Mean 87-89
Monohikari	15.75	16.79	17.31	1.56	15.34	18.10	15.50	18.07	100.06	100.55
Ultramono	15.72	16.56	17.29	1.57	15.09	18.08	15.41	18.04	99.50	100.42
ACH 198	15.69	16.75	17.75	2.06						
Maribo 403	16.00	17.00	17.65	1.65	14.95	18.12	15.35	18.10	99.09	100.73
Hilleshog 2401	16.03	17.03	18.02	1.99						
KW 3265	15.98	16.34	16.99	1.01	15.22	17.78	15.45	17.81	99.76	99.12
Beta 3614	15.95	17.04	17.64	1.69	15.57	18.03	15.73	17.93	101.57	99.77
Hilleshog 5135	15.83	16.73	17.35	1.52	15.28	17.96	15.49	17.86	100.02	99.42
Beta 6625	15.90	17.17	17.88	1.98	15.61	18.20				
Mean	15.87	16.82	17.54	1.67	15.29	18.04	15.49	17.97	100.00	100.00
LSD(.05)	NS	0.83 *	1.03 *							

* is 0.05 significance level

***1987 Data from Renville and Clara City.
1988 Data from Renville and Bird Island.
1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard.

Table 2. Three year performance of 1989 varieties harvested early, mid-harvest and late for root yield.***

	Root Yield Tons/Acre									
Variety	Early 1989	Mid 1989	Late 1989	Change E -> L	Early 2 Yr Mean 88-89	Late 2 Yr Mean 88-89	Early 3 Yr Mean 87-89	Late 3 Yr Mean 87-89	Early 3 Yr % Mean 87-89	Late 3 Yr % Mean 87-89
Monohikari	25.54	27.31	27.20	1.66	21.92	24.82	22.31	25.68	103.97	99.88
Ultramono	22.01	25.29	25.49	3.48	20.39	25.56	21.69	26.20	101.08	101.91
ACH 198	22.20	25.41	25.06	2.86						
Maribo 403	22.51	25.39	24.51	2.00	19.53	23.21	20.53	24.73	95.71	96.19
Hilleshog 2401	22.79	24.74	26.82	4.03						
KW 3265	24.25	27.88	28.58	4.33	21.62	25.12	22.17	25.90	103.32	100.73
Beta 3614	21.56	25.30	25.76	4.20	19.69	24.70	20.97	25.25	97.74	98.20
Hilleshog 5135	23.32	25.80	26.95	3.63	20.21	25.59	21.06	26.51	98.18	103.10
Beta 6625	23.53	25.52	25.08	1.55	21.61	23.56				
Mean	23.08	25.85	26.16	3.08	20.71	24.65	21.45	25.71	100.00	100.00
LSD(.05)	3.98									
	*	NS	NS							

* is 0.05 significance level.

***1987 Data from Renville and Clara City.
1988 Data from Renville and Bird Island.
1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard.

Table 3. Three year performance of 1989 varieties harvested early, mid-harvest and late for recoverable sugar/ton.***

	Recoverable Sugar/Ton Lbs									
Variety	Early 1989	Mid 1989	Late 1989	Change E -> L	Early 2 Yr Mean 88-89	Late 2 Yr Mean 88-89	Early 3 Yr Mean 87-89	Late 3 Yr Mean 87-89	Early 3 Yr % Mean 87-89	Late 3 Yr % Mean 87-89
Monohikari	294	306	321	27	284	338	286	337	100.90	101.05
Ultramono	289	298	316	27	275	334	282	334	99.49	100.25
ACH 198	289	303	329	40						
Maribo 403	296	308	326	30	273	335	281	336	99.02	100.85
Hilleshog 2401	296	310	333	37						
KW 3265	295	293	309	14	279	328	283	330	99.73	98.85
Beta 3614	294	310	326	32	285	335	289	333	101.72	99.85
Hilleshog 5135	291	301	318	27	276	332	281	331	99.14	99.15
Beta 6625	293	313	330	37	286	339				
Mean	293	305	323	30	280	334	284	334	100.00	100.00
LSD(.05)	NS	20 *	24 **							

** and * are 0.01 and 0.05 significance levels, respectively.
***1987 Data from Renville and Clara City.
1988 Data from Renville and Bird Island.
1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard.

Table 4. Three year performance of 1989 varieties harvested early, mid-harvest and late for recoverable sugar/acre.*

	Recoverable Sugar/Acre Lbs									
Variety	Early 1989	Mid 1989	Late 1989	Change E -> L	Early 2 Yr Mean 88-89	Late 2 Yr Mean 88-89	Early 3 Yr Mean 87-89	Late 3 Yr Mean 87-89	Early 3 Yr % Mean 87-89	Late 3 Yr % Mean 87-89
Monohikari	7471	8351	8840	1369	6210	8924	6381	9017	103.66	104.50
Ultramono	6363	7515	8021	1658	5667	8527	6180	8753	100.40	101.44
ACH 198	6397	7698	8212	1815						
Maribo 403	6677	7763	7979	1302	5544	7767	5932	8306	96.37	96.27
Hilleshog 2401	6770	7679	8968	2198						
KW 3265	7080	8115	8831	1751	6045	8186	6288	8548	102.16	99.07
Beta 3614	6335	7767	8358	2023	5666	8239	6062	8390	98.48	97.24
Hilleshog 5135	6787	7742	8556	1769	5807	8476	6090	8757	98.94	101.49
Beta 6625	6910	7916	8243	1333	6180	7954				
Mean	6754 NS	7838 NS	8445 NS	1691	5874	8296	6156	8629	100.00	100.00

*1987 Data from Renville and Clara City.
1988 Data from Renville and Bird Island.
1989 Data from Hector, Bird Island, Danube, Renville, Clara City, and Maynard.

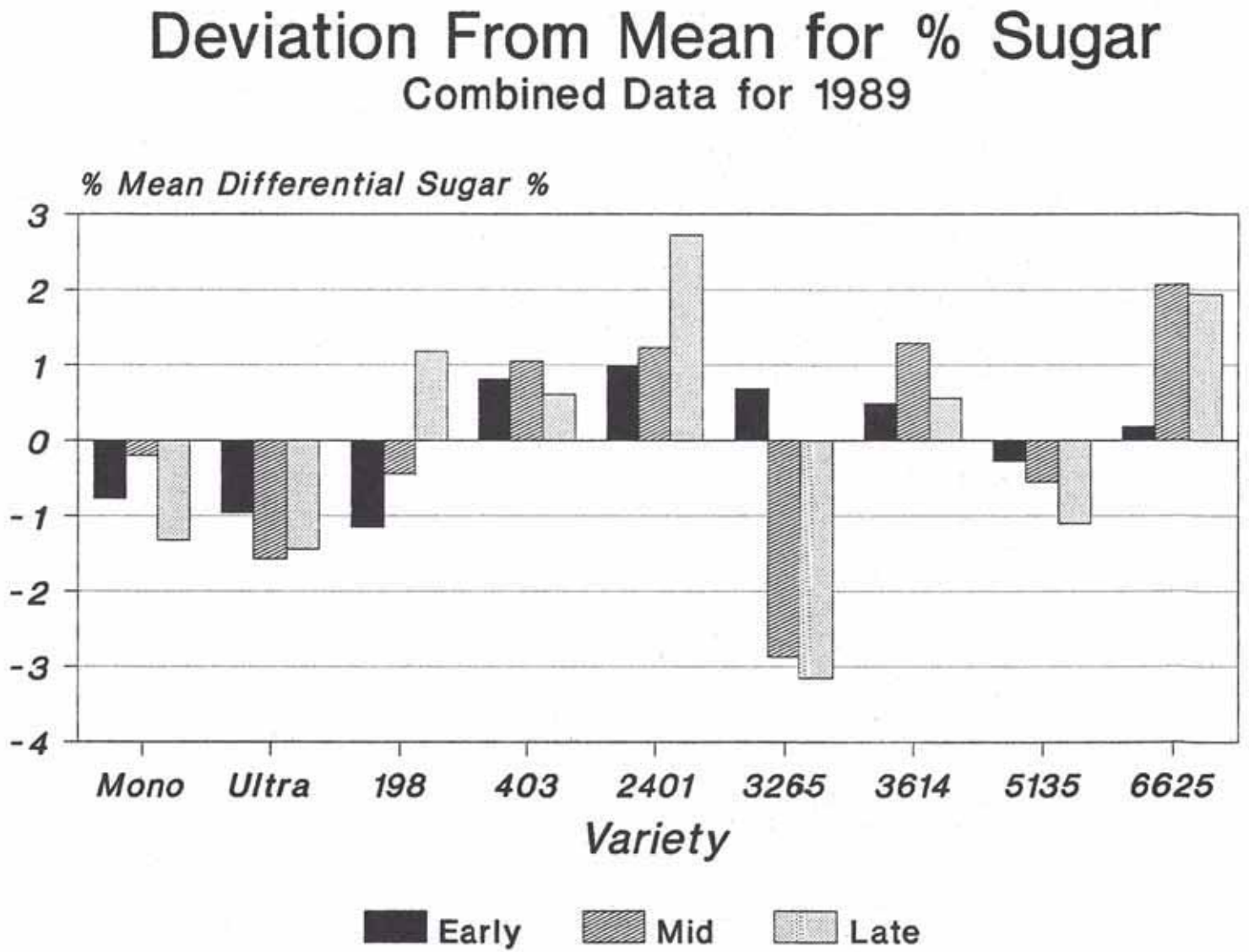

Figure 1. The average deviation from the mean for % sugar in 1989.

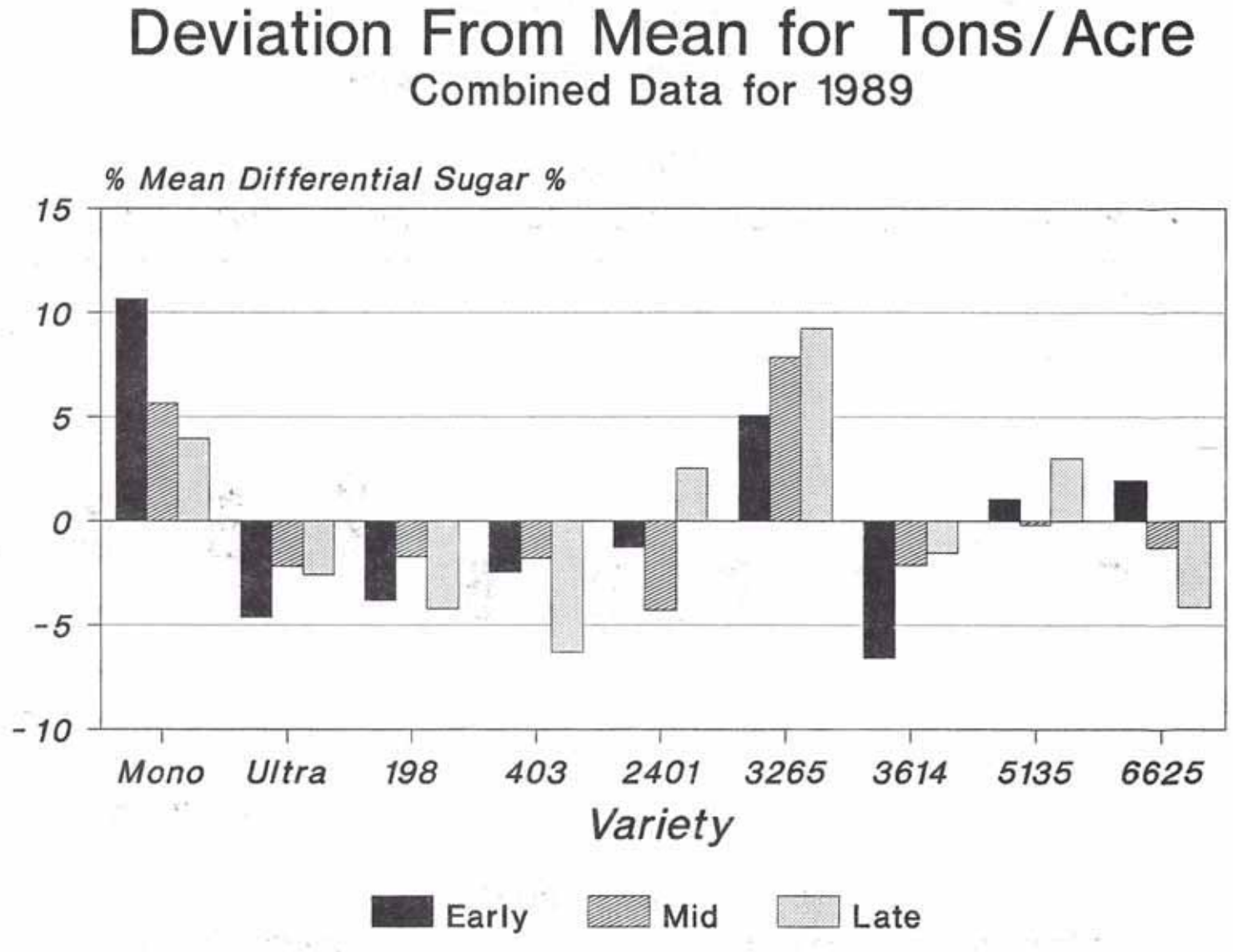

Figure 2. The average deviation from the mean for tons/acre in 1989.

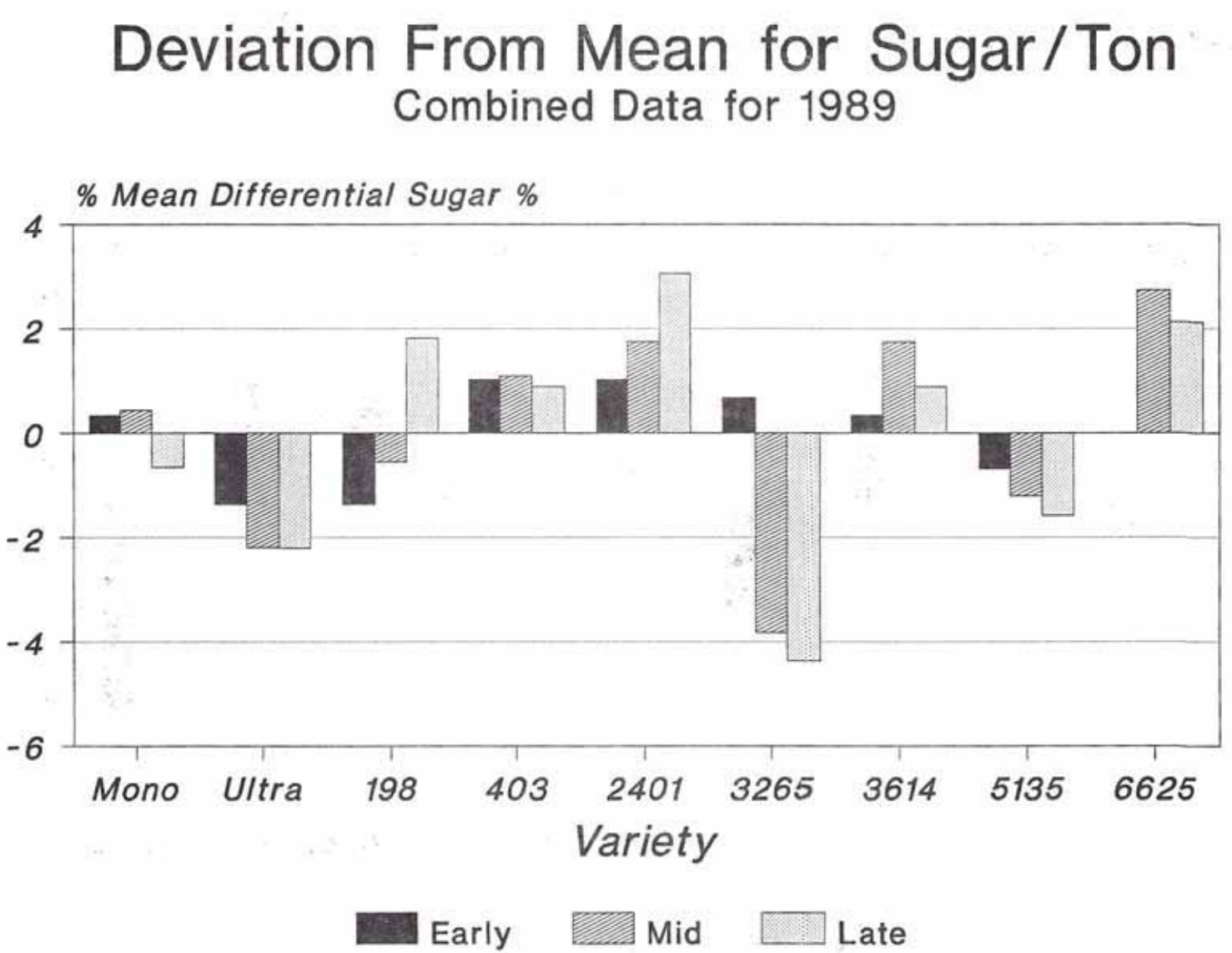

Figure 3. The average deviation from the mean for recoverable sugar per ton in 1989.

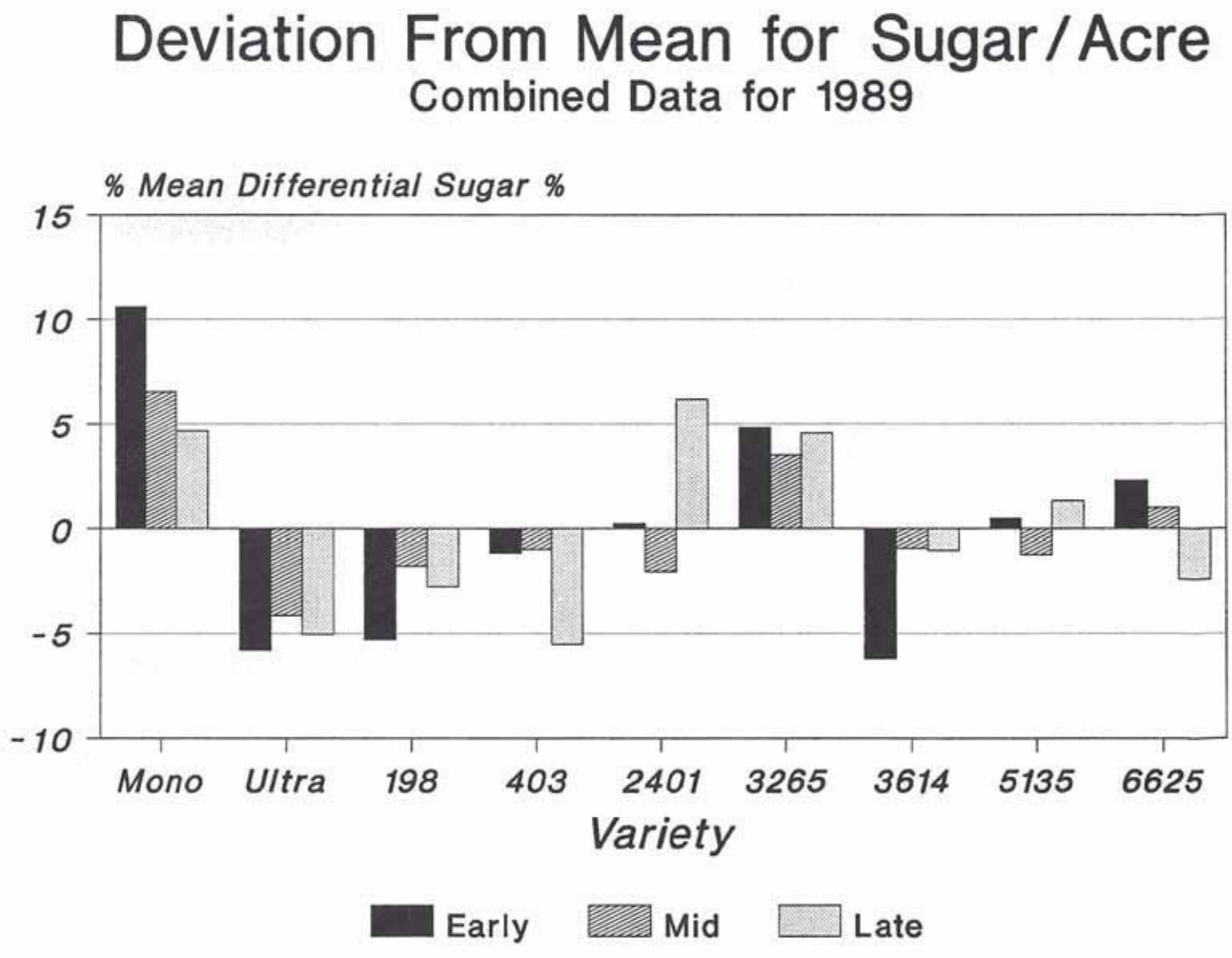

Figure 4. The average deviation from the mean for recoverable sugar per acre in 1989.

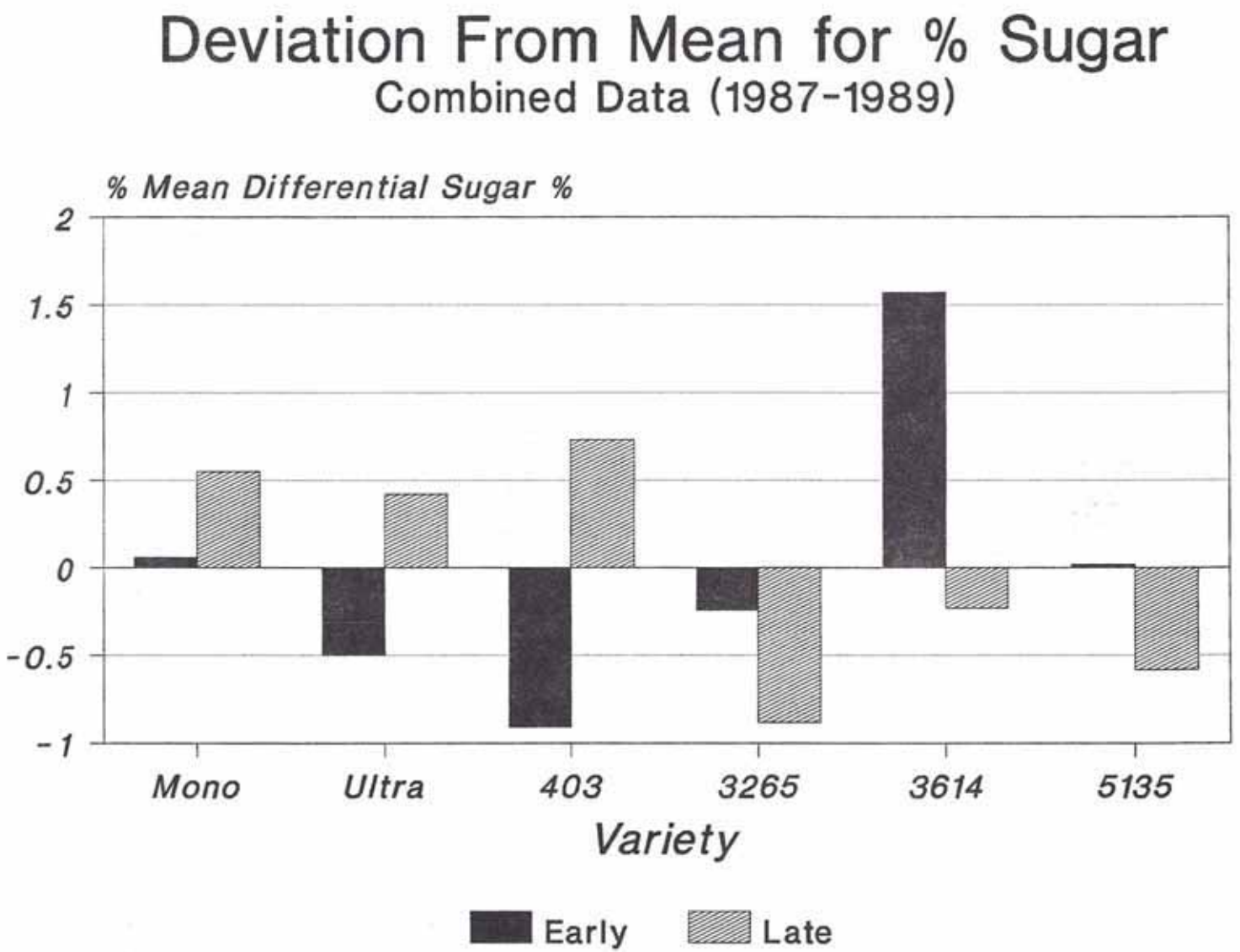

Figure 5. The average deviation of the % of the mean for % sugar combined data 1987 - 1989.

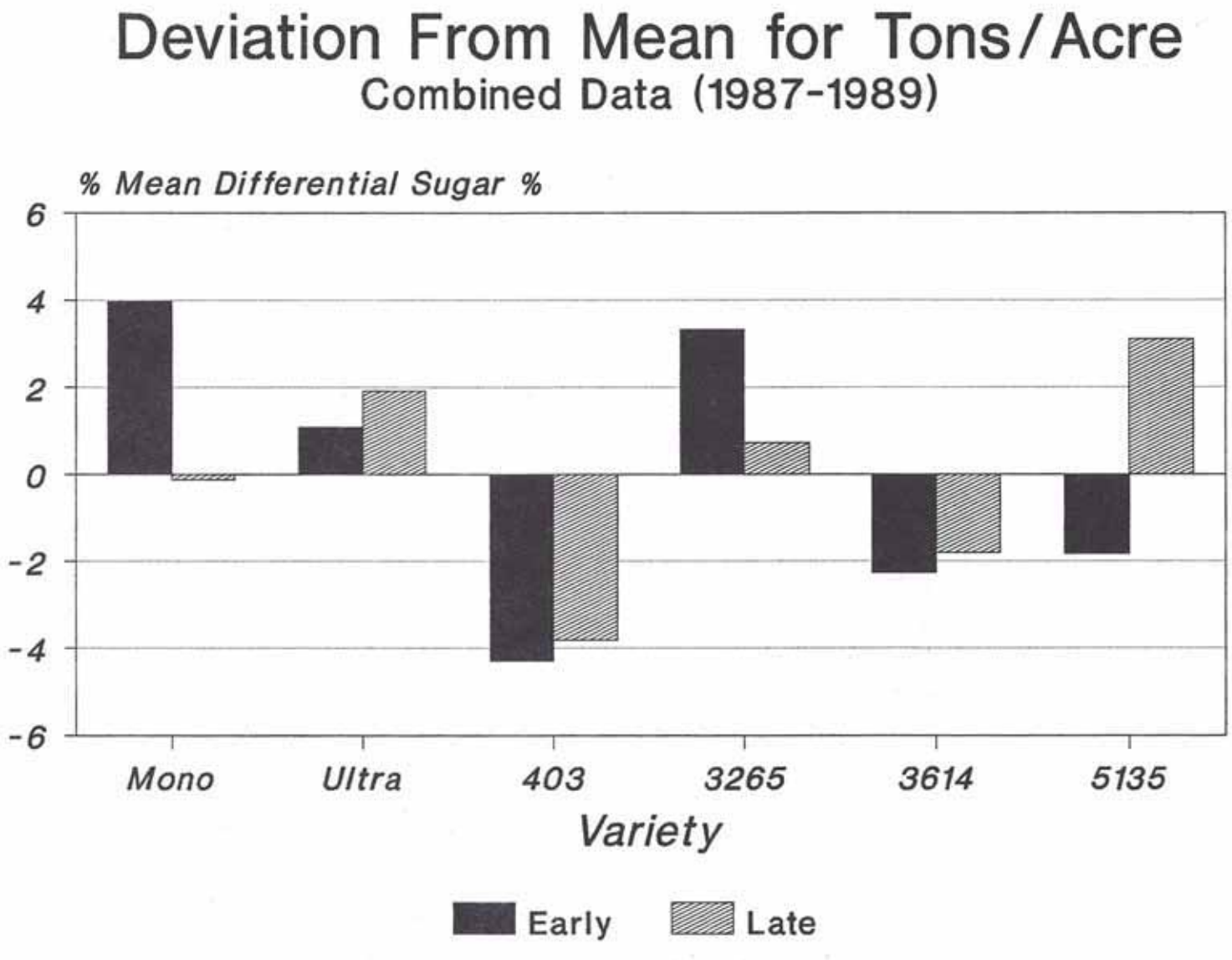

Figure 6. The average deviation of the % of the mean for tons/acre combined data 1987 - 1989.

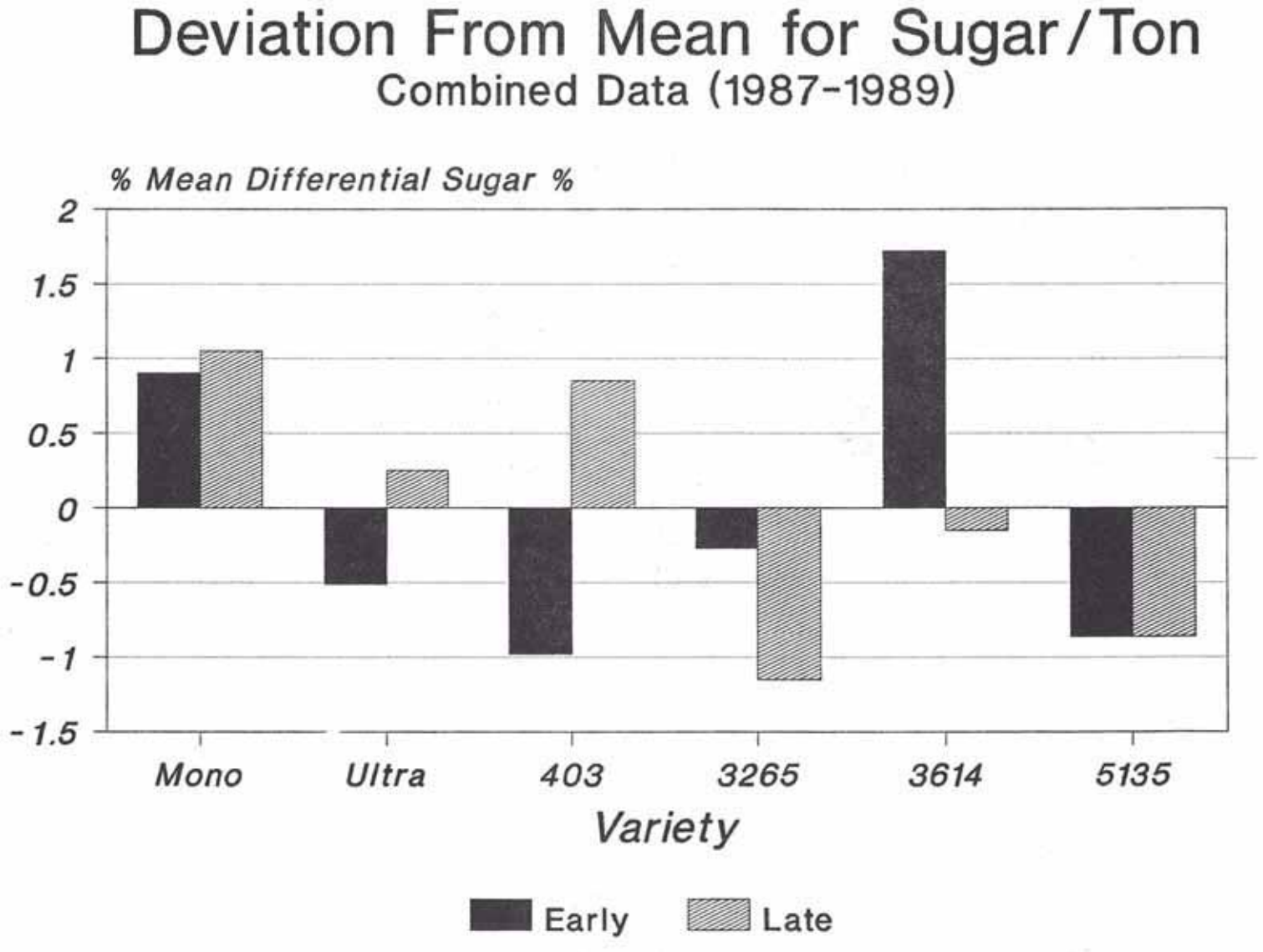

Figure 7. The average deviation of the % of the mean for recoverable sugar/ton combined data 1987 - 1989.

Deviation From Mean for Sugar/Acre
Combined Data (1987-1989)

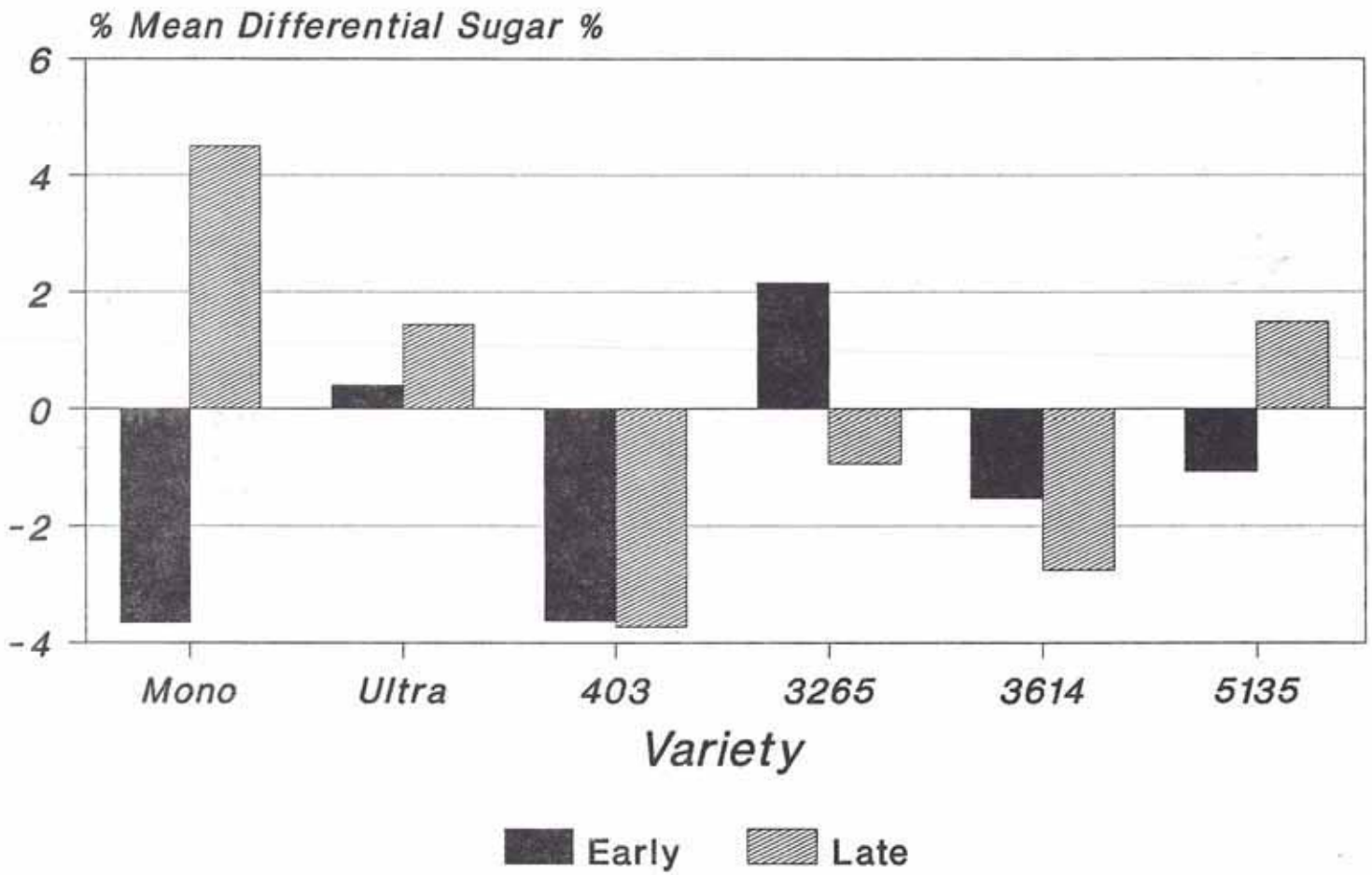

Figure 8. The average deviation of the % of the mean for recoverable sugar/acre combined data 1987 - 1989.

- Notice -

There is an error on the figure 8 bar graph on page 40. The early harvest date for Monohikari should be +3.66% of the mean and not -3.66%. I apologize for any inconvenience or misunderstanding. Please refer to the new chart enclosed.

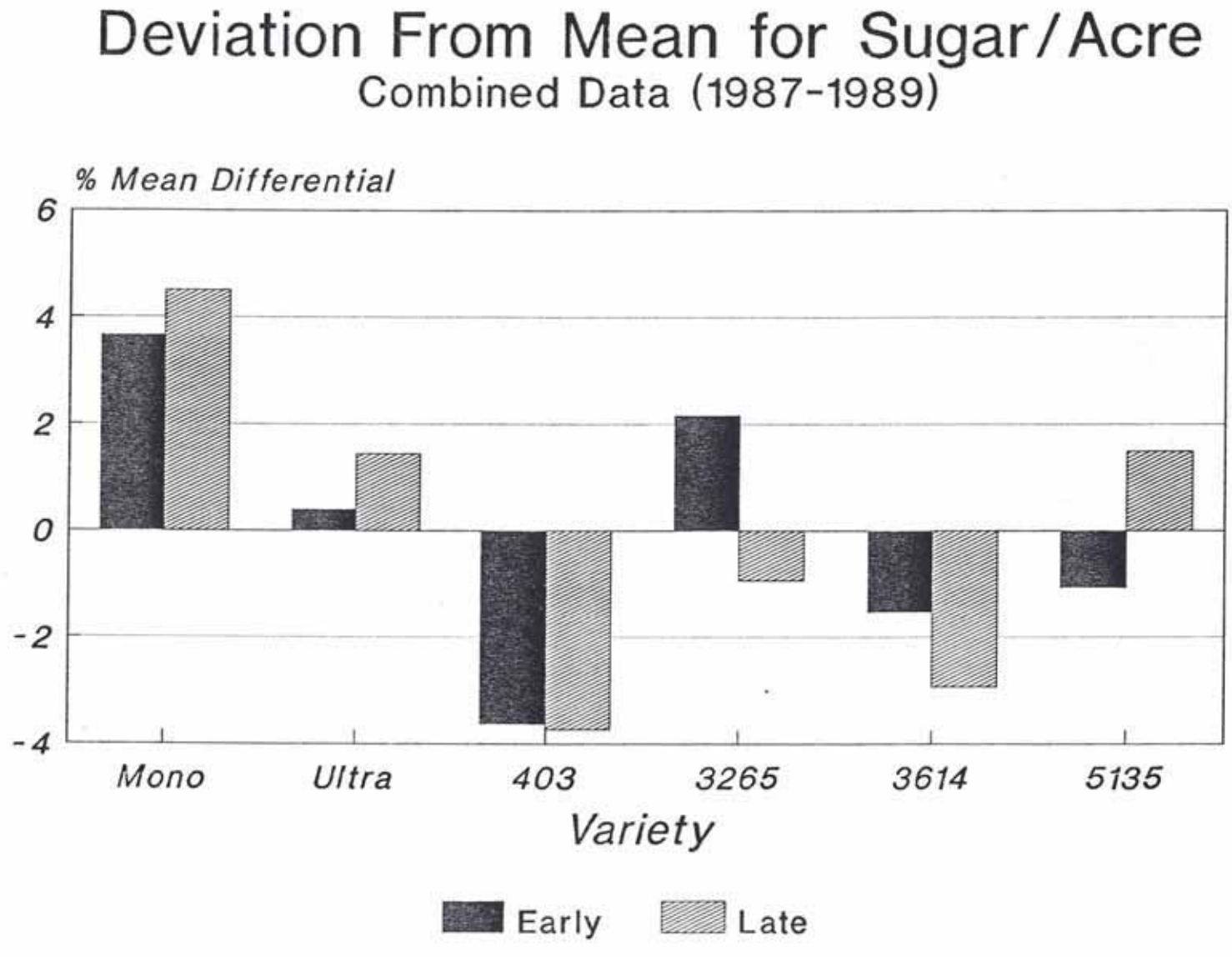

Figure 8. The average deviation of the % of the mean for recoverable sugar/acre combined data 1987 - 1989.

Cotyledon Smartweed Control

Objective

Evaluate the effect of Stinger, H-273, Betamix and combinations of the above Smartweed control and Sugarbeet injury at the cotyledon stage.

Experimental Procedures

Smartweed can be controlled relatively easy, but is usually accompanied by increased sugarbeet injury. The objective of this trial was to attempt to control Smartweed at a very early growth stage and still minimize sugarbeet injury. H-273, Stinger and Betamix were combined into 13 different treatments to evaluate control.

The trial was planted near Hector MN on April 15 with Hilleshog 5135. The trial was a randomized complete block design with 4 replications. The center 4 rows of the 6 row plots was sprayed and the border rows within each plot was used for treatment comparison. Smartweed control and crop injury was evaluated. The herbicide treatments are listed on table 1. The following is a table of application data.

	1st Application
Date	5/9/89
Time	10:30am
Air Temp	61°F
RH	55%
Wind Sp	5-7 MPH
Wind Dir.	NW
Soil	Moist
SugarBeet	Cotyledon
Smartweed	Cotyledon

All treatments were sprayed with 8.5 gallons per acre broadcast and at 40psi. The first evaluation was on 5/16/89 and the second was made on 5/31/89.

Results and Discussion

Sugarbeet injury increased as the rate of H-273 was increased (Table 1.). The tankmix of H-273 and Stinger at 0.75 and 0.19 lb ai/A, respectively gave the best Smartweed control, but also showed the highest sugarbeet injury on the first evaluation. The second evaluation showed that the sugarbeets did recover from the higher treatments of H-273 and Stinger. The best Smartweed control with H-273 used alone was at the 1 lb ai/A rate, which showed some crop injury on the second evaluation. Crop injury was much less than anticipated from H-273 on cotyledon sugarbeets. Environmental conditions may have played a role in reducing the level of crop injury from what was expected. More data over different environmental conditions is needed to better evaluate phytotoxicity. Stinger or Betamix used alone did not give adequate control of Smartweed. Despite the H-273 evaluations conducted on cotyledon sugarbeets, label restrictions on H-273 restrict application to the first 2 true leaves on sugarbeets. Rates of 0.75 - 1.0 lb ai/A would be considered normal application rates on early sugarbeets. More research is needed to determine tankmix combinations for Stinger and H-273.

Table 1. List of treatments, crop injury and Smartweed control ratings from postemergence herbicide applications on cotyledon sugarbeets at Hector, MN.*

Treatment	Rate	5/16/89		5/31/89	
		Sugarbeet Injury	Smartweed Control	Sugarbeet Injury	Smartweed Control
	(lb ai/A)	(%)	(%)	(%)	(%)
H-273	0.25	1	16	4	42
H-273	0.50	1	34	4	31
H-273	0.75	1	46	7	46
H-273	1.00	1	74	10	60
Stinger	0.09	0	1	0	27
Stinger	0.19	0	49	4	60
Weedy Check		0	0	0	0
H-273+Stinger	0.25+0.09	1	27	5	55
H-273+Stinger	0.25+0.19	0	57	6	69
H-273+Stinger	0.75+0.09	7	74	4	75
H-273+Stinger	0.75+0.19	10	86	6	81
Betamix	0.16	0	50	2	45
Betamix	0.24	0	56	0	45
LSD 5%		6	31	8	34

* + = Tankmixed

Smartweed Control

Objective

Evaluate the effect of Stinger, H-273, and Betamix for Smartweed control and sugarbeet injury.

Experimental Procedures

Smartweed is a weed that typically grows in wet, low lying areas. Usually H-273 is used for Smartweed control, however; crop injury can result if the sugarbeets are sprayed too early. The objective of this trial was to determine if alternate herbicides could be used to minimize phytotoxicity.

The trial was planted near Maynard, Minnesota on April 23 with KW 3265. The trial was a randomized complete block design with 4 replications. The center 4 rows of the 6 row plot were sprayed and the border rows within each plot were used for comparison. Twelve herbicide treatments were used to evaluate the herbicidal effect on Smartweed. The treatments consisted of combinations of Stinger, H-273, Betamix and adjuvents. Sugarbeet crop injury was evaluated twice folllowing the last application. The herbicide treatments are listed on table 1. The following is a table of application data.

	1st Application
Date	5/22/89
Time	10:00am
Air Temp	70°F
RH	51%
Wind Sp	5 MPH
Wind Dir.	NW
Soil	Sl. Dry
SugarBeet	2-4 Lf
Smartweed	2-4 Lf

All treatments were sprayed with 8.5 gallons per acre broadcast and at 40psi. The first evaluation was made on 5/31/89 and the second was made on 6/9/89.

Results and Discussion

Stinger used alone appeared to suppress the Smartweed slightly, but reasonable control was not achieved. H-273 did not give acceptable control alone, however; when tankmixed with Stinger at the high rate, the combination gave the highest level of control in the experiment at 87% control. Three adjuvents were used to increase the level of activity of Stinger. None of the adjuvents increased the smartweed control to an acceptable level, but Sun-it did show a visual difference when compared to the other treatments. Betamix + Stinger combinations were also complementary for smartweed control, however; not to a satisfactory degree.

Smartweed can be a very persistent weed problem. Weed control can vary greatly depending on the smartweed species. Annual smartweed can usually be controlled more easily than the perennial species. To date, it appears H-273 with a possible Stinger tankmix could give effective annual smartweed control.

Table 1. List of treatments, crop injury and Smartweed control ratings from postemergence herbicide applications at Maynard, MN.*

Treatment	Rate	5/31/89		6/9/89	
		Sugarbeet Injury	Smartweed Control	Sugarbeet Injury	Smartweed Control
	(oz ai/A)	(%)	(%)	(%)	(%)
Stinger	2	0	12	0	20
Stinger	3	0	18	0	33
Stinger	4	1	30	0	35
H-273	8	0	43	0	35
Stinger+H-273	2+8	8	53	0	65
Stinger+H-273	4+8	12	76	0	87
Betamix	8	5	42	0	47
Stinger+Betamix	2+8	5	56	0	60
Stinger+Betamix	4+8	13	73	0	71
Stinger+Crop Oil	3+1 qt	1	26	0	36
Stinger+Dash	3+1 qt	2	34	0	40
Stinger+Sun-It	3+1 qt	4	45	0	50
Weedy Check		0	0	0	0
LSD 5%		6	15	0	30

* + = Tankmixed

Common Cocklebur Control

Objective

Evaluate the effect of commonly used herbicides for Common Cocklebur control and sugarbeet injury.

Experimental Procedures

Common Cocklebur is a weed problem that affects many sugarbeet fields throughout the Southern Minnesota Sugar growing area. Prior to the registration of Stinger herbicide, few option other than hand labor were available. The objective of this trial was to evaluate Stinger and other commonly used herbicides for Common Cocklebur control. The trial was planted near Bird Island, Minnesota on May 5th with Hilleshog 5135. The trial was a randomized complete block design with 4 replications. The center 4 rows of the 6 row plots were sprayed and the border rows within each plot were used for treatment comparison. Eighteen commonly used herbicide treatments were used to evaluate the herbicidal effect on Cocklebur. Sugarbeet crop injury was evaluated twice following the last application. The herbicide treatments are listed on table 1. The following is a table of application data.

	1st Application	2nd Application	3rd Application
Date	6/1/89	6/6/89	5/15/89
Time	11:00am	4:00pm	3:30pm
Air Temp	72°F	89°F	72°F
RH	40%	29%	28%
Wind Sp	5-10 MPH	5-8 MPH	5-7 MPH
Wind Dir.	NW	NE	SE
Soil	Moist	Dry	Dry
SugarBeet	2-4 Lf	4 Lf	6 Lf
Cocklebur	2-4 Lf	4 Lf	6-8 Lf

All treatments were sprayed with 8.5 gallons per acre broadcast and at 40psi. The first evaluation was made on 6/22/89 and the second was made on 7/6/89.

Results and Discussion

Little or no crop injury occurred during the first evaluation. The third sequential application using higher rates of H-273, Nortron and Betanex did show some slight injury, however; the sugarbeets fully recovered within 10-14 days (Table 1). Cocklebur control was best when tankmixes of Stinger and Betanex were used early. Betanex alone gave surprisingly good control of cocklebur, if applied when the cocklebur was in the 2-4 leaf stage. Usually Betanex is not considered effective for cocklebur control, however; under the hot dry environmental conditions in 1989, Betanex tankmixed with Stinger gave excellent control of common cocklebur.

The second evaluation showed no sugarbeet injury and followed a similar trend as the first evaluation for cocklebur control. As the cocklebur grew larger Stinger would give good control with minimizing crop injury

Conclusions

Betanex applied sequentially at an early growth stage, gave surprisingly good common cocklebur control. The tankmixes of Betanex and Stinger gave the best control with sight sugarbeet injury. Stinger alone at higher rates is probably the method of choice if the cocklebur are past the 6 leaf stage.

Table 1. List of treatments, and crop injury and Common Cocklebur control ratings from postemergence herbicide applications at Bird Island, MN.*

Treatment	Rate	6/22/89		7/6/89	
		Sugarbeet Injury	Cocklebur Control	Sugarbeet Injury	Cocklebur Control
	(lb ai/A)	(%)	(%)	(%)	(%)
Betanex/Betanex	0.25/0.33	4	86	0	88
Betanex/Betanex+Stinger	0.25/0.33+0.09	6	91	0	95
Betanex/Betanex+Stinger	0.25/0.33+0.19	6	96	0	94
Betanex+Stinger/Betanex+Stinger	0.25+0.09/0.33+0.19	6	99	0	97
Betanex+Stinger/Betanex	0.25+0.09/0.33	3	95	0	94
Betanex+Stinger/Betanex	0.25+0.19/0.33	3	85	0	91
N/N/Stinger	0.19	1	76	0	83
N/Stinger	0.09	1	51	0	81
N/Stinger	0.19	0	71	0	85
N/Stinger+Dash	0.09+1 qt	0	55	0	78
N/Stinger+Dash	0.19+1 qt	0	68	0	80
N/Stinger+H-273	0.09+0.5	0	81	0	88
N/Stinger+H-273	0.19+0.5	0	80	0	93
N/Pyramin+Safener	2+1 qt	8	41	0	14
Betanex/Betanex/Betanex	0.25/0.33/0.5	13	85	0	97
Betanex/Betanex/Betanex+Stinger	0.25/0.33/0.5+0.19	8	83	0	90
Betanex/Betanex/Betanex+H-273	0.25/0.33/0.5+0.5	11	90	0	90
Betanex/Betanex/Betanex+Nortron	0.25/0.33/0.5+0.5	14	94	0	96
LSD 5%		10	24		11

* N = Nothing applied at that time interval
/ = Sequential treatments
+ = Tankmixed

Black Nightshade Control

Objective

Evaluate the effect of commonly used herbicides for Black Nightshade control and sugarbeet injury.

Experimental Procedures

Black Nightshade is continually becoming a major weed problem. The distribution of Black Nightshade covers a major portion of the SMSC growing area. The trial was planted near Renville, Minnesota on April 26 with Hilleshog 5135. The trial was a randomized complete block design with 4 replications. The center 4 rows of the 6 row plot were sprayed and the border rows within each plot were used for comparison. Eighteen commonly used herbicide treatments were used to evaluate the herbicidal effect on Black Nightshade. Sugarbeet crop injury was evaluated twice following the last application. The herbicide treatments are listed on table 1. The following is a table of application data.

	1st Application	2nd Application	3rd Application
Date	5/31/89	6/5/89	6/15/89
Time	9:00am	9:00pm	12:30pm
Air Temp	62°F	69°F	72°F
RH	61%	40%	35%
Wind Sp	5-10 MPH	2-4 MPH	5-7 MPH
Wind Dir.	NW	NE	NW
Soil	Moist	Dry	Dry
SugarBeet	6 Lf	6-8 Lf	8-10 Lf
Nightshade	4 Lf	6-8 LF	8-10 Lf

All treatments were sprayed with 8.5 gallons per acre and at 40psi. The first evaluation was made on 6/22/89 and the second

was made on 7/6/89.

Results and Discussion

The sugarbeet stage of growth in this trial was considerably larger than what would be considered ideal. Despite the sugarbeet and nightshade advanced stage, good weed control was achieved with some selected herbicide treatments (Table 1.).

Early sequential treatments of Betanex gave acceptable control, however; with the addition of Stinger in a tankmix, control was increased. Stinger used alone appeared to give poor control for the first evaluation. Stinger's activity increased by the second evaluation to a much higher level.

The best weed control was from early sequential treatments of Betanex and tankmixes later with either Stinger, H-273 or Nortron. As with most weed control problems, early detection and spraying would be the method of choice for Black Nightshade. Early sequential rates of tankmixed Betanex and Stinger would minimize competition and yield loss.

Table 1. List of treatments, and crop injury and Black Nightshade control ratings from postemergence herbicide applications at Renville, MN.*

Treatment	Rate	6/22/89		7/6/89	
		Sugarbeet Injury	Black Nightshade Control	Sugarbeet Injury	Black Nightshade Control
	(lb ai/A)	(%)	(%)	(%)	(%)
Betanex/Betanex	0.25/0.33	0	81	0	86
Betanex/Betanex+Stinger	0.25/0.33+0.09	1	93	0	92
Betanex/Betanex+Stinger	0.25/0.33+0.19	1	90	0	97
Betanex+Stinger/Betanex+Stinger	0.25+0.09/0.33+0.19	0	97	0	98
Betanex+Stinger/Betanex	0.25+0.09/0.33	0	94	0	97
Betanex+Stinger/Betanex	0.25+0.19/0.33	0	92	0	99
N/N/Stinger	0.19	0	29	0	74
N/Stinger	0.09	0	0	0	68
N/Stinger	0.19	0	6	0	84
N/Stinger+Dash	0.09+1 qt	0	21	0	80
N/Stinger+Dash	0.19+1 qt	1	84	0	88
N/Stinger+H-273	0.09+0.5	0	15	0	80
N/Stinger+H-273	0.19+0.5	0	25	0	80
N/Pyramin+Safener	2+1 qt	4	44	0	66
Betanex/Betanex/Betanex	0.25/0.33/0.5	5	99	0	97
Betanex/Betanex/Betanex+Stinger	0.25/0.33/0.5+0.19	6	98	0	98
Betanex/Betanex/Betanex+H-273	0.25/0.33/0.5+0.5	13	99	0	98
Betanex/Betanex/Betanex+Nortron	0.25/0.33/0.5+0.5	13	99	0	95
LSD 5%		8	22		8

* N = Nothing applied at that time interval
/ = Sequential treatments
+ = Tankmixed

Simulated Drift on Sugarbeets

Objective

To evaluate the potential crop injury associated with herbicide drift.

Experimental Procedures

Many new herbicides have been registered over the past few years. Many of the new compounds have similar characteristics in common, most of which is their activity at low rates of application. The associated problems with the new generation of herbicides is mainly drift and persistence. Sugarbeets can often be very susceptible to non-crop herbicides, therefore; the objective of this study was to determine the effect of varying levels of simulated drift from Harmony-Extra, Pinnacle, Pursuit, 2,4-D and Banvel.

The trial was planted near Renville, MN on May 20 with Maribo Ultramono. The trial was a randomized complete block design with 4 replications. The center 4 rows of the 6 row plots were sprayed and the border rows within each plot was used for treatment comparison. Sugarbeet injury was evaluated twice following the application. The herbicide treatments are listed on table 1. The following is a table of application data.

	1st Application
Date	6/19/89
Time	10:00am
Air Temp	70°F
RH	65%
Wind Sp	6-8 MPH
Wind Dir.	South
Soil	Dry
SugarBeet	6 Leaf

Results and Discussion

Sugarbeet injury occurred with all the treatments used. Significant crop injury occurred with rates as low as 0.0005 lb ai/A for Harmony-Extra. Harmony-Extra is an excellent small grain herbicide, however; sugarbeet susceptibility would indicate a significant distance should separate the target field and a sugarbeet field. Pinnacle is a soybean herbicide that would be more common in the Southern Minnesota Sugar growing area. The degree of crop injury was less with Pinnacle compared to Harmony Extra, but significant crop injury occurred with rates as low as 0.002 lb ai/A. Another popular soybean herbicide is Pursuit. Significant crop injury can occur from Pursuit. Rates at 0.02 lb ai/A caused 90% crop injury. Pursuit can also carry over from soybeans to sugarbeets the following year. The Pursuit label has an 18 month planting restriction between soybeans and sugarbeets.

In general, the crop recovered slightly by the second evaluation, however; significant damage continued. The rates used in this trial represent a very small percentage of the actual labeled rates used in a commercial field. As more of the new herbicides are used, an increased potential for crop damage from drift will become a reality. Specific procedures will have to be followed to minimize the risk of crop injury. Research will continue to evaluate new herbicides for drift potential.

Table 1. List of treatments and crop injury ratings from low levels of herbicide applications simulating drift in Renville MN.

Treatment	Rate	6/26/89 Sugarbeet Injury	7/10/89 Sugarbeet Injury
	(lb ai/A)	(%)	(%)
Harmony Extra+X77	0.002+0.25%	85	83
Harmony Extra+X77	0.001+0.25%	65	61
Harmony Extra+X77	0.0005+0.25%	45	30
Harmony Extra+X77	0.00025+0.25%	3	0
Pinnacle+X77	0.002+0.25%	70	60
Pinnacle+X77	0.001+0.25%	10	5
Pinnacle+X77	0.0005+0.25%	11	8
Pinnacle+X77	0.00025+0.25%	21	18
Pursuit+X77	0.02+0.25%	90	89
Pursuit+X77	0.01+0.25%	74	58
Pursuit+X77	0.005+0.25%	29	21
Pursuit+X77	0.001+0.25%	3	0
2,4-D	0.125	21	4
2,4-D	0.06	8	0
Banvel	0.125	55	33
Banvel	0.06	20	20
LSD 5%		17	22

* + = Tankmixed
X-77 is a Surfactant

Disease Index Summary of 1989

Introduction

Three remote weather stations were used to monitor leaf spot. Installations were 2 miles South of Sacred Heart, 9 miles North of Clara City, and 1 mile East or the Hector piling station. The stations monitored air temperature, soil temperature at 4 and 8 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. The purpose of the program is to give the sugarbeet grower an indication of the high probability of leaf spot infection. The predictive nature of leaf spot lead to the development of a model that uses temperature, relative humidity and time. It is important to note, canopy sensor placement is paramount to adequately model the Cercospora disease. Sugarbeet fields are highly variable in spore number, consequently; the model should be used in conjunction with field disease monitoring. The table for calculating the disease index values is on Table 1. The data for 1989 for Renville, Clara City, and Bird Island are presented in figures 1 - 12.

During harvest, temperature probes were placed in the crown of the sugarbeet and the resulting temperatures were used to aid in the decision for piler shutdown during freezing conditions.