1987 Research Report

SMBSC

1/1/1987
Southern Minnesota Beet Sugar Company
SMBSC

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INTRODUCTION

This report is a summary of the research programs conducted by the Southern Minnesota Sugar Cooperative (SMSC) Agricultural Department for growers in the SMSC sugarbeet growing area. Additional research projects are sponsored by the grower check-off (3 cents per ton) from the three Cooperatives in ND/MN. These funds are administered through the Research and Education Board. Results of these trials are reported in the annual Extension Report. The Coded Variety Trials were conducted by the American Crystal Sugar Research Center in cooperation with SMSC.

Research projects are carefully and meticulously planned and executed; however, the objectives may not be realized if the growing season or environmental conditions are not conducive for the development of the stress under evaluation. Several projects were initiated to evaluate the combined efforts on increasing speed of seedling development and decreasing seedling diseases. The early planting season and relatively drier than normal spring were not conducive for the development of seedling root rots. Therefore, the trials did not provide discriminating data to show the possible benefits of the treatments i.e., the standard treatments or untreated checks performed as well as the newer chemicals or procedures under evaluation. These projects will be repeated again in 1988 or until critical conditions exist to evaluate the various treatments.

The long growing season plus proper and timely executed agronomic practices combined to produce new records for total net tons harvested, highest tons/acre, and highest percent sucrose.

There are several advantages for the cooperative to have a processing campaign length of 170 - 180 days or 1,250,000 - 1,500,000 net tons. In order to achieve these objectives, harvest will have to begin in early September to complete the slice by early March.

Several production factors must be carefully considered in order to maintain proper tonnage and quality relationships. The pre-pile harvest period could continue for 35 - 40 days in which 300,000 tons would be harvested and processed.

In order to achieve maximum extraction and minimize losses during storage, several basic factors of production must be accomplished in the field:

1. Proper balance of plant nutrients.
2. Regulation of available nitrates late in the growing season.
3. Plant as early as possible in order to achieve rapid and uniform seedling emergence.
4. Maintain optimum levels of beet population.
5. Effective weed and disease control.
6. Select proper varieties.
7. Exercise care during harvest in order to deliver clean, unfrozen beets for storage.

8. Select fields with good drainage and low available nitrates at the 4' level.

The observations and conclusions reported herein are to supplement prior information discussed in the Sugarbeet Research and Extension Reports, Sugarbeet Production Guides and technical bulletins. The recommendations provide an average starting point and may need to be adjusted for individual situations. The authors do not make any guarantees or offer any warranties, either stated or implied, on data summarized in this report. Mention of chemicals or equipment are not endorsements to the exclusion of other similar products.

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Research Agronomist

Research Summary - 1987

1. Variety Evaluations. Nine new varieties have been added to the approved list. Two varieties, Beta 5494 and Mono-Hy M7, fell below the minimum standards set by the Cooperative and will not be available for 1988. Two varieties (3614 and 6625) were approved on a limited basis for 1988. These two varieties are characterized as higher sugar types and may be adapted to certain high fertility soils.

2. Date of Harvest. A summary of data from 1985 - 1987 indicate that there are differences among the 10 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. Root Rot Control with Seed Treatments. Seed treatments were evaluated to determine their effect on root rot disease. The experimental fungicide Tachagaren significantly reduced the visual symptoms associated with seedling root rot.

4. Root Rot - Herbicide Interaction Study. Many commonly used herbicide treatments were evaluated to determine if herbicide stress increased the level of visual infection from seedling root rot. The study was conducted only in 1987, however; no herbicide treatment significantly increased the root rot symptoms over the check plot.

5. Cocklebur Control with Lontrel. Cocklebur continues to be a major weed species in Southern Minnesota. The experimental herbicide Lontrel was evaluated for cocklebur control. Lontrel significantly reduced cocklebur competition over the other herbicide treatments.

6. Effects of Petiole Material on Tare Lab Sugar Analysis. Comparisons were made evaluating topped sugarbeets vs poorly topped sugarbeets. On average, poorly topped sugarbeets significantly reduced the tare lab sugar analysis over sugarbeets with most petiole material removed.

7. Disease Index Summary of 1987. A Cercospora model was again used to determine relative activity of the leaf spot spores. 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.

8. Harvester Performance Summary 1987. Evaluations were made at the Harvester demonstration held on August 28, 1987. Eight different harvesters were evaluated on depth, dirt, tare, harvest loss, root loss, speed and tons per acre. Harvester performance data was also 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.

9. Weather Data for 1987. Rainfall was much less in 1987 compared to 1986, however; much more timely. A high of 22 inches was recorded at Hutchinson between April and November. Extended high temperatures and relative humidity were present for much of July and the first part of August. The lowest temperature recorded during harvest occurred on October 10.

Acknowledgments

We wish to give thanks to the many growers of SMSC for their cooperation of this research effort. The 1987 cooperators are follows:

SMSC Research	University Research
Chuck Weis	Mike Schjenken
Robert Weis	Doug Sandgren
Dale Rudeen	Kurt Sandgren
Bill Rudeen	Robert Schwitters
Neil Rudeen	Eugene Schwitters
Rik Rudeen	
Mike Schjenken	
Chuck Hinderks	Coded Variety Trial
Don Hinderks	Chuck Weis
G.E. Blad	Robert Weis
Robert Schemel	Chuck Hinderks
Wayne Schemel	Don Hinderks
Jerrell Andresen	Robert Schemel
Kevin Loftness	Wayne Schemel
Alex Lamb	Tom Payne
Mike Lamb	Eugene Payne

In addition, the assistance of the Agricultural Staff of SMSC is greatly acknowledged:

Ken Dahl	Mike Schjenken
Mike Holien	Wally VanEps
LeRoy Sager	Greg Johnson

Agricultural Maintenance
Hilb Eitel
Larry Roos
Lenard DeGree

Technical assistance was provided by Alan Dexter, Allan Cattanach, Carol Windels, John Lamb, Mark Seeley and Greg Spoden from the University of Minnesota and NDSU.

Seed was furnished by American Crystal, Betaseed, Bush Johnson, Mitsui, Maribo, Mono-Hy Seed and Hilleshog.

Planned Research for 1988

The 1987 sugarbeet crop proved to be one of the most successful in the history of Southern Minnesota Sugar. Many agronomic factors converged to produce the high quality crop. Environmentally, 1987 was very different from 1986. The goal for research in 1988 is to continue to evaluate past trials under varying environmental conditions as well as expand research dealing with root rots, weeds and Cercospora leaf spot.

Root rot will continually be evaluated for better seed treatments and helpful production practices. Herbicides will again be evaluated for their effect on sugarbeet seedlings resistance to root rot diseases. New herbicides will be studied to determine their efficacy on Cocklebur, Canada Thistle and Sunflower. With the long growing season of 1987, the date of harvest information becomes very important and will continue in 1988. Two more weather stations will be added to the growing area for 1988. The information gathered daily from three weather stations will aid in Cercospora modeling and give valuable root temperature information during the harvest period.

Some of these research projects will be conducted solely by SMSC; other projects including timing and effective application of fertilizers and fungicide

evaluations 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 EVALUATIONS

A total of 55 varieties were evaluated in coded trials at three locations in the Southern Minnesota Sugar Cooperative (SMSC) growing area. The trials were conducted by American Crystal Sugar Research Center. Entries were contributed by nine seed companies.

The Board of Directors approved 22 varieties for unlimited sales in 1988. In addition, two varieties are available for special use (moderate root rot tolerance), and two other varieties were approved for limited use.

Table 1 shows all the approved varieties for SMSC since 1980. BJ Monofort is the only variety remaining in 1988 from the 1980 list.

The most popular varieties planted in 1987 were:

KW 3265 - 33%	Ultramono - 16%
Hilleshog 5135 - 9%	Beta 3394 - 8%
Maribo 403 - 6%	Beta 1230 - 6%

Table 2 shows the relative improvement of varieties since 1981. Recoverable sugar per acre and tons/acre have remained relatively stable; however, percent sugar and recoverable sugar per ton have made steady and significant improvement with the approval of the newer varieties.

The list of approved varieties for 1988 are shown in Tables 3 (actual data) and 4 (% of mean).

Test results of all varieties evaluated for the past three years are summarized in Tables 5 through 11.

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

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

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

Table 2

Year	No. of Approved	Recoverable Sugar/Acre		Recoverable Sugar/Ton		Tons/Acre		% Sugar		Leaf Spot Rating	
		Mean of Approved	% of Checks	Mean of Approved	% of Checks	Mean of Approved	% of Checks	Mean of Approved	% of Checks	Mean of Approved	% of Checks
1981 (78-79-80)	15	6724	97.5	264.5	98.5	25.7	99	15.40	98.5	4.43	97.3
1982 (79-80-81)	12	6282	99.3	262.6	99.5	23.9	100	15.50	99.4	4.31	88.0
1983 (80-81-82)	9	7053	98.3	261.9	100.5	26.9	98.0	15.60	100.0	4.84	94.2
1984 (81-82-83)	9	6823	99.4	253.1	100.6	26.9	98.7	15.30	100.5	4.80	96.4
1985 (82-83-84)	11	7682	98.1	269.7	100.9	28.6	97.2	15.90	100.3	4.87	98.4
1986 (83-84-85)	14	7837	99.3	280.9	102.0	27.9	97.1	16.10	101.4	4.80	98.5
1987 (84-85-86)	18	7764	100.3	300.4	102.1	25.9	98.0	16.70	101.5	4.68	96.6
1988 (85-86-87)	24	8884	99.9	308.7	102.7	28.7	97.0	16.95	102.2	4.93	97.0

Checks: Beta 1230, M7, Ultramono, Monofort

Southern Minnesota Sugar Cooperative

List of Approved Varieties for 1988

Table 3 Three year performance summary from coded trials conducted at SMSC 1985-1987.

Variety	Recov. Sugar/Acre	Recov. Sugar/Ton	Leaf Spot Rating *	Tons/Acre	% Sugar	Seedling Vigor *
ACH 164	8699	307.4	4.97	28.2	16.9	1.4
ACH 178	8709	313.4	4.41	27.8	17.2	1.3
ACH 180	8745	311.2	4.95	28.0	17.1	1.6
ACH 181	8974	307.1	4.67	29.1	16.9	1.8
Beta 1230	8987	300.0	5.00	29.9	16.5	2.0
Beta 3614	8645	318.8	5.11	27.0	17.4	1.3
Beta 6264	8800	307.3	4.86	28.6	16.9	1.7
Beta 6625	8660	328.1	5.10	26.3	17.9	1.8
BJ 1310	8797	303.6	4.16	28.8	16.7	1.8
BJ Monofort	9027	299.0	5.29	30.1	16.5	1.4
Hilleshog 4046	8935	307.8	5.07	29.0	16.9	1.7
Hilleshog 5090	8866	307.1	5.01	28.8	16.9	1.4
Hilleshog 5135	9137	315.9	5.07	28.9	17.3	1.5
Hilleshog 8277	9058	307.2	5.25	29.4	16.9	2.0
KW 1014	8936	309.4	4.71	28.8	17.0	1.6
KW 1132	8912	304.4	5.17	29.2	16.7	1.6
KW 3145	9120	304.4	5.17	29.8	16.7	1.6
KW 3265	9112	303.9	4.98	29.9	16.7	1.7
KW 3394	8978	308.4	5.14	29.1	16.9	1.6
Maribo 403	8901	306.5	4.99	29.0	16.9	1.3
Maribo 411	8849	315.3	4.96	28.0	17.3	1.2
Maribo Ultramono	8757	306.3	5.13	28.5	16.9	1.2
Mitsui Monohikari	8814	308.0	4.77	28.4	16.8	1.6
Mono-Hy R-103	8804	307.3	4.49	28.6	16.9	1.5
Mean of Approved	8884	308.7	4.93	28.7	16.95	1.6

* Lower numbers indicate better resistance and seedling vigor.

Southern Minnesota Sugar Cooperative

List of Approved Varieties for 1988

Table 4. Three year performance summary (% of Mean) from coded trials conducted at SMSC 1985-1987.

Variety	Recov. Sugar/Acre	Recov. Sugar/Ton	Leaf Spot Rating *	Tons/Acre	% Sugar	Seedling Vigor *	Est Return Per Ton
ACH 164	97.91	99.59	100.72	98.20	99.71	89.36	99.61
ACH 178	98.03	101.54	89.37	96.81	101.47	82.98	101.94
ACH 180	98.43	100.82	100.31	97.50	100.88	102.13	101.16
ACH 181	101.01	99.50	94.64	101.33	99.71	114.89	99.61
Beta 1230	101.16	97.19	101.33	104.12	97.35	127.66	96.51
Beta 3614	97.31	103.29	103.55	94.02	102.65	82.98	103.49
Beta 6264	99.05	99.56	98.49	99.59	99.71	108.51	99.61
Beta 6625	97.48	106.30	103.35	91.58	105.60	114.89	107.37
BJ 1310	99.02	98.36	84.30	100.29	98.53	114.89	98.06
BJ Monofort	101.61	96.87	107.20	104.82	97.35	89.36	96.51
Hilleshog 4046	100.57	99.72	102.74	100.99	99.71	108.51	99.61
Hilleshog 5090	99.79	99.50	101.53	100.29	99.71	89.36	99.61
Hilleshog 5135	102.84	102.35	102.74	100.64	102.06	95.74	102.71
Hilleshog 8277	101.96	99.53	106.39	102.38	99.71	127.66	99.61
KW 1014	100.58	100.24	95.45	100.29	100.29	102.13	100.39
KW 1132	100.31	98.62	104.77	101.68	98.53	102.13	98.06
KW 3145	102.65	98.62	104.77	103.77	98.53	102.13	98.06
KW 3265	102.56	98.46	100.92	104.12	98.53	108.51	98.06
KW 3394	101.06	99.92	104.16	101.33	99.71	102.13	99.61
Maribo 403	100.19	99.30	101.12	100.99	99.71	82.98	99.61
Maribo 411	99.60	102.15	100.52	97.50	102.06	76.60	102.71
Maribo Ultramono	98.57	99.24	103.96	99.25	99.71	76.60	99.61
Mitsui Monohikari	99.21	99.79	96.66	98.90	99.12	102.13	98.84
Mono-Hy R-103	99.10	99.56	90.99	99.59	99.71	95.74	99.61
Mean of Approved	8884	308.7	4.9	28.7	16.95	1.6	

Table 5

Three Year Performance Summary of 1987 SMSC Commercial Coded Entries
Three Locations

Variety	Recoverable Sugar / Ton (pounds)				Recoverable Sugar / Acre (pounds)				Loss to Molasses (%)			
	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87
ACS ACH 164	315.9	309.1	307.4	99.8	11047	8545	8699	98.1	1.64	1.51	1.52	99.8
ACS ACH 178	321.8	316.7	313.4	101.7	11200	8652	8709	98.2	1.74	1.54	1.55	102.2
ACS ACH 180	326.9	317.0	311.2	101.0	11302	8762	8745	98.6	1.68	1.51	1.55	102.1
ACS ACH 181	319.8	312.3	307.1	99.7	11876	9040	8974	101.2	1.70	1.52	1.58	103.9
ACS ACH 194	335.7				11266				1.65			
Beta 1230	311.6	305.6	300.0	97.4	11520	8892	8987	101.3	1.73	1.52	1.54	101.1
Beta 3614	326.9	319.5	318.8	103.5	10609	8344	8645	97.5	1.62	1.43	1.43	94.3
Beta 6186	314.8	307.5	305.4	99.1	10928	8541	8552	96.4	1.68	1.52	1.52	100.0
Beta 6264	320.6	312.5	307.3	99.7	11377	8803	8800	99.2	1.66	1.48	1.50	98.7
Beta 6625	342.4	331.9	328.1	106.5	11305	8785	8660	97.6	1.62	1.43	1.44	94.7
Bush Johnson 1310	311.2	301.5	303.6	98.6	11535	8890	8797	99.2	1.69	1.51	1.50	98.5
Bush Johnson Monofort	310.3	302.9	299.0	97.1	11544	8914	9027	101.8	1.78	1.59	1.58	104.0
Hilleshog 4046	328.7	316.0	307.8	99.9	11148	8785	8935	100.7	1.67	1.52	1.55	102.0
Hilleshog 5090	321.5	311.9	307.1	99.7	11403	8880	8866	100.0	1.68	1.51	1.53	100.5
Hilleshog 5135	328.1	319.5	315.9	102.5	11508	8971	9137	103.0	1.65	1.50	1.50	98.5
Hilleshog 8277	321.3	314.3	307.2	99.7	11709	8819	9058	102.1	1.70	1.51	1.51	99.1
KW 1014	323.3	316.0	309.4	100.4	11527	8880	8936	100.8	1.61	1.45	1.50	98.8
KW 1132	321.4	310.7	304.4	98.8	11483	8945	8912	100.5	1.67	1.48	1.51	99.6
KW 3145	318.8	310.3	304.4	98.8	11889	9070	9120	102.8	1.68	1.48	1.51	99.6
KW 3265	318.8	309.4	303.9	98.6	11562	9011	9112	102.7	1.69	1.48	1.50	98.5
KW 3394	320.6	313.0	308.4	100.1	11353	8832	8978	101.2	1.68	1.50	1.52	99.8
Maribo 403	321.2	312.0	306.5	99.5	11462	8811	8901	100.4	1.73	1.58	1.56	102.9
Maribo 411	327.3	317.3	315.3	102.3	10843	8561	8849	99.8	1.68	1.51	1.52	99.8
Maribo 861	322.6	315.8			10879	8524			1.71	1.53		
Maribo 865	324.4				11684				1.67			
Maribo Ultramono	318.2	310.5	306.3	99.4	11264	8670	8757	98.7	1.71	1.53	1.56	102.7
Mitsui Monohikari	321.6	310.6	308.0	100.0	11443	8415	8814	99.4	1.57	1.42	1.40	91.9
Mono-Hy M7	304.2	299.6	296.6	96.3	11334	8892	8815	99.4	1.76	1.57	1.59	104.7
Mono-Hy R103	323.2	311.7	307.3	99.7	11179	8701	8804	99.3	1.65	1.52	1.55	102.0
Mean	321.5	312.4	308.1	100.0	11351	8775	8869	100.0	1.68	1.50	1.52	100.0

* 1987 Data from Bird Island, DeGraff and Maynard.

Table 6

Three Year Performance Summary of 1987 SMSC Commercial Coded Entries
Three Locations

Variety	Sugar Content (%)				Root Yield (Tons / Acre)				Seedling Vigor Rating (1=Ex,5=Poor)			
	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87
ACS ACH 164	17.4	17.0	16.9	99.7	34.8	27.4	28.2	98.0	1.4	1.4	1.4	86.0
ACS ACH 178	17.8	17.4	17.2	101.8	34.9	27.3	27.8	96.8	1.5	1.3	1.3	82.4
ACS ACH 180	18.0	17.4	17.1	101.1	34.6	27.5	28.0	97.6	1.5	1.8	1.6	101.9
ACS ACH 181	17.7	17.1	16.9	100.1	37.2	28.8	29.1	101.4	1.5	1.8	1.8	113.0
ACS ACH 194	18.4				33.6				1.2			
Beta 1230	17.3	16.8	16.5	97.7	36.8	28.9	29.9	104.0	1.7	2.0	2.0	124.2
Beta 3614	18.0	17.4	17.4	102.7	32.3	25.9	27.0	94.0	1.3	1.4	1.3	83.9
Beta 6186	17.4	16.9	16.8	99.3	34.6	27.5	27.9	97.0	1.3	1.3	1.3	85.5
Beta 6264	17.7	17.1	16.9	99.6	35.5	28.1	28.6	99.6	1.8	1.8	1.7	106.0
Beta 6625	18.7	18.0	17.9	105.5	33.0	26.4	26.3	91.6	1.8	1.7	1.8	114.4
Bush Johnson 1310	17.3	16.6	16.7	98.5	37.1	29.3	28.8	100.3	1.9	1.8	1.8	116.8
Bush Johnson Monofort	17.3	16.7	16.5	97.7	37.2	29.3	30.1	104.9	1.6	1.5	1.4	89.8
Hilleshog 4046	18.1	17.3	16.9	100.1	34.0	27.6	29.0	100.9	1.6	1.6	1.7	110.2
Hilleshog 5090	17.8	17.1	16.9	99.7	35.5	28.4	28.8	100.4	1.4	1.4	1.4	86.6
Hilleshog 5135	18.1	17.5	17.3	102.2	35.1	28.0	28.9	100.5	1.1	1.3	1.5	92.8
Hilleshog 8277	17.8	17.2	16.9	99.7	36.4	27.9	29.4	102.4	2.4	2.3	2.0	124.8
KW 1014	17.8	17.2	17.0	100.3	35.4	27.9	28.8	100.2	1.3	1.4	1.6	99.8
KW 1132	17.7	17.0	16.7	98.9	35.8	28.7	29.2	101.8	1.8	1.8	1.6	103.2
KW 3145	17.6	17.0	16.7	98.9	37.1	28.9	29.8	103.6	1.5	1.5	1.6	101.7
KW 3265	17.6	16.9	16.7	98.6	36.4	28.9	29.9	104.0	1.9	1.8	1.7	106.0
KW 3394	17.7	17.2	16.9	100.1	35.4	28.1	29.1	101.3	1.8	1.6	1.6	101.5
Maribo 403	17.8	17.2	16.9	99.8	35.7	28.1	29.0	100.9	1.3	1.4	1.3	82.4
Maribo 411	18.1	17.4	17.3	102.1	33.1	26.8	28.0	97.4	1.3	1.3	1.2	75.4
Maribo 861	17.8	17.3			33.6	26.8			1.6	1.3		
Maribo 865	17.9				36.0				1.2			
Maribo Ultramono	17.6	17.1	16.9	99.7	35.5	27.8	28.5	99.3	1.1	1.3	1.2	74.3
Mitsui Monohikari	17.7	16.9	16.8	99.2	35.6	26.8	28.4	99.0	2.3	2.4	2.3	144.2
Mono-Hy M7	17.0	16.5	16.4	97.0	37.3	29.7	29.8	103.6	1.9	1.6	1.6	98.7
Mono-Hy R103	17.8	17.1	16.9	99.9	34.6	27.8	28.6	99.6	1.4	1.3	1.5	94.5
Mean	17.8	17.1	16.9	100.0	35.3	27.9	28.7	100.0	1.6	1.6	1.6	100.0

* 1987 Data from Bird Island, DeGraff and Maynard. 1987 Vigor data is mean of DeGraff and Maynard.

Table 7

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
S. Mn Semi-Commercial Coded Tests 1987
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

29 varieties 24 repsXlocs 3 tests combined

VARIETY	CODE	Rec. lbs/T	Rec. lbs/A	Loss to Mol.	Sugar %	Yield T/A
Mono-Hy 2401	143	334.4(103.9)	11148(99.2)	1.63(96.7)	18.35(103.2)	33.31(95.3)
Bush Johnson 1321	144	324.4(100.8)	11492(102.2)	1.54(91.6)	17.76(99.9)	35.40(101.3)
ACS ACH 195	145	320.4(99.6)	11181(99.5)	1.75(104.1)	17.77(100.0)	34.89(99.8)
Bush Johnson 1331	146	316.0(98.2)	11040(98.2)	1.78(105.5)	17.58(98.9)	34.94(100.0)
Beta 5494	147	323.3(100.5)	10875(96.7)	1.58(93.9)	17.75(99.8)	33.64(96.2)
Maribo 869	148	322.3(100.1)	10887(96.8)	1.73(102.6)	17.84(100.4)	33.81(96.7)
Maribo 873	149	317.5(98.6)	11289(100.4)	1.72(102.3)	17.56(98.8)	35.59(101.8)
KW 3265 (check)	150	314.7(97.8)	11257(100.1)	1.63(96.9)	17.37(97.7)	35.83(102.5)
Maribo 862	151	327.0(101.6)	11116(98.9)	1.66(98.4)	18.01(101.3)	34.00(97.3)
Mitsui 1002	152	312.4(97.1)	11845(105.4)	1.69(100.4)	17.31(97.4)	37.93(108.5)
Beta 5427	153	312.0(96.9)	11268(100.2)	1.73(102.5)	17.32(97.5)	36.15(103.4)
KW 1745	154	325.4(101.1)	11589(103.1)	1.69(100.1)	17.96(101.0)	35.58(101.8)
Beta 2007	155	325.5(101.2)	11369(101.1)	1.66(98.8)	17.94(100.9)	34.94(100.0)
Hilleshog 8291	156	324.2(100.7)	11247(100.1)	1.66(98.3)	17.87(100.5)	34.75(99.4)
Beta 1230 (check)	157	316.4(98.3)	11537(102.6)	1.70(100.9)	17.52(98.6)	36.46(104.3)
Maribo Ultramono (check)	158	320.6(99.6)	11353(101.0)	1.70(101.1)	17.73(99.8)	35.40(101.3)
ACS C85-188	159	330.3(102.6)	10721(95.4)	1.62(96.1)	18.13(102.0)	32.50(93.0)
Maribo 876	160	317.4(98.6)	11070(98.5)	1.75(104.0)	17.62(99.1)	34.88(99.8)
ACS C84-239	161	325.1(101.0)	11350(101.0)	1.69(100.5)	17.95(101.0)	34.96(100.0)
KW 1286	162	318.8(99.1)	11794(104.9)	1.74(103.2)	17.68(99.5)	37.02(105.9)
ACS C85-308	163	324.7(100.9)	10757(95.7)	1.67(99.0)	17.90(100.7)	33.16(94.9)
Beta 5266	164	316.0(98.2)	11832(105.3)	1.70(101.0)	17.50(98.5)	37.48(107.2)
ACS ACH 196	165	330.3(102.6)	11214(99.8)	1.71(101.7)	18.23(102.5)	33.91(97.0)
Bush Johnson 1333	166	315.5(98.0)	10706(95.2)	1.76(104.3)	17.53(98.6)	33.95(97.1)
Mono-Hy 2402	167	316.9(98.5)	11349(101.0)	1.61(95.5)	17.46(98.2)	35.85(102.5)
Maribo 875	168	327.3(101.7)	11427(101.7)	1.71(101.5)	18.07(101.7)	34.89(99.8)
Mono-Hy 2406	169	322.5(100.2)	11276(100.3)	1.66(98.5)	17.79(100.1)	35.00(100.1)
Hilleshog 8292	170	321.4(99.9)	10899(97.0)	1.74(103.1)	17.80(100.2)	33.93(97.1)
Beta 6269	171	330.7(102.8)	11101(98.8)	1.64(97.6)	18.18(102.3)	33.61(96.1)

General Mean Across Varieties	321.84	11241.07	1.68	17.78	34.96
Coeff. of Var. (%)	2.53	5.25	5.78	2.02	5.34
Variety Mean Square	810.57	2284592.75	0.08	1.79	40.15
Error Mean Square (Error B)	66.46	348114.72	0.01	0.13	3.49
F Value	12.20**	6.56**	7.93**	13.92**	11.50**
L.S.D. (.05)	4.55	329.35	0.05	0.20	1.04
L.S.D. (.01)	5.72	414.19	0.07	0.25	1.31

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

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

Table 8

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
S. Mn Semi-Commercial Coded Tests 1987
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

VARIETY	CODE	Na ppm	K ppm	Am.N ppm	Gr.Sugar lbs/A	Vigor [1]
Mono-Hy 2401	143	309(94.2)	2223(98.0)	558(95.8)	12231(98.5)	2.13(118.4)
Bush Johnson 1321	144	310(94.4)	2110(93.0)	521(89.5)	12579(101.3)	2.13(118.4)
ACS ACH 195	145	366(111.5)	2348(103.5)	601(103.3)	12403(99.9)	1.31(73.1)
Bush Johnson 1331	146	374(113.8)	2385(105.1)	606(104.1)	12280(98.9)	2.06(114.9)
Beta 5494	147	290(88.2)	2093(92.3)	563(96.7)	11936(96.1)	1.94(107.9)
Maribo 869	148	358(109.0)	2314(102.0)	593(101.8)	12060(97.1)	1.19(66.1)
Maribo 873	149	405(123.4)	2327(102.6)	571(98.0)	12501(100.7)	1.31(73.1)
KW 3265 (check)	150	335(102.1)	2228(98.2)	550(94.4)	12432(100.1)	1.88(104.4)
Maribo 862	151	358(109.0)	2224(98.1)	562(96.5)	12242(98.6)	1.38(76.6)
Mitsui 1002	152	422(128.4)	2278(100.4)	551(94.7)	13129(105.7)	1.50(83.6)
Beta 5427	153	293(89.2)	2245(99.0)	634(108.8)	12519(100.8)	1.88(104.4)
KW 1745	154	330(100.4)	2303(101.5)	574(98.7)	12783(102.9)	2.13(118.4)
Beta 2007	155	324(98.7)	2240(98.8)	576(98.9)	12532(100.9)	1.56(87.0)
Hilleshog 8291	156	261(79.4)	2225(98.1)	597(102.5)	12406(99.9)	2.50(139.3)
Beta 1230 (check)	157	323(98.2)	2357(103.9)	573(98.4)	12776(102.9)	1.75(97.5)
Maribo Ultramono (check)	158	349(106.3)	2312(101.9)	577(99.1)	12556(101.1)	1.19(66.1)
ACS C85-188	159	236(71.8)	2171(95.7)	591(101.6)	11776(94.8)	2.25(125.3)
Maribo 876	160	405(123.3)	2350(103.6)	585(100.5)	12288(98.9)	1.25(69.6)
ACS C84-239	161	281(85.5)	2226(98.1)	617(106.1)	12536(100.9)	1.63(90.5)
KW 1286	162	360(109.5)	2341(103.2)	593(101.9)	13080(105.3)	1.50(83.6)
ACS C85-308	163	272(82.8)	2175(95.9)	615(105.6)	11866(95.5)	2.44(135.8)
Beta 5266	164	312(94.9)	2283(100.7)	597(102.6)	13109(105.6)	2.13(118.4)
ACS ACH 196	165	319(97.2)	2348(103.5)	587(100.9)	12369(99.6)	1.56(87.0)
Bush Johnson 1333	166	362(110.1)	2333(102.8)	609(104.6)	11901(95.8)	1.63(90.5)
Mono-Hy 2402	167	310(94.2)	2211(97.5)	542(93.2)	12529(100.9)	2.06(114.9)
Maribo 875	168	371(112.9)	2314(102.0)	574(98.6)	12620(101.6)	1.19(66.1)
Mono-Hy 2406	169	283(86.1)	2322(102.4)	566(97.2)	12441(100.2)	2.50(139.3)
Hilleshog 8292	170	316(96.3)	2341(103.2)	607(104.3)	12078(97.3)	2.50(139.3)
Beta 6269	171	293(89.3)	2155(95.0)	594(102.1)	12206(98.3)	1.63(90.5)
General Mean Across Varieties		328.56	2268.36	582.25	12419.32	1.80
Coeff. of Var. (%)		16.52	4.76	10.04	5.18	29.17
Variety Mean Square		48365.52	146023.61	15055.24	2944146.25	2.94
Error Mean Square (Error B)		2946.91	11643.31	3420.28	413280.97	0.27
F Value		16.41**	12.54**	4.40**	7.12**	10.71**
L.S.D. (.05)		30.30	60.23	32.65	358.82	0.36
L.S.D. (.01)		38.10	75.72	41.06	451.15	0.46

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

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

[1] VIGOR NOTES TAKEN AT MAYNARD AND DEGRAFF.

Table 9

COMBINED ANALYSIS
SOUTHERN MINN SEMI COMMERCIAL CODED TEST
S. Mn Semi-Commercial Coded Tests 1987
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

VARIETY	CODE	Bolters %	Emergence %
Mono-Hy 2401	143	0.074(483.3)	0.0(0.0)
Bush Johnson 1321	144	0.000(0.0)	0.0(0.0)
ACS ACH 195	145	0.074(483.3)	0.0(0.0)
Bush Johnson 1331	146	0.000(0.0)	0.0(0.0)
Beta 5494	147	0.000(0.0)	0.0(0.0)
Maribo 869	148	0.223(>999.9)	0.0(0.0)
Maribo 873	149	0.000(0.0)	0.0(0.0)
KW 3265 (check)	150	0.000(0.0)	0.0(0.0)
Maribo 862	151	0.000(0.0)	0.0(0.0)
Mitsui 1002	152	0.000(0.0)	0.0(0.0)
Beta 5427	153	0.000(0.0)	0.0(0.0)
KW 1745	154	0.000(0.0)	0.0(0.0)
Beta 2007	155	0.000(0.0)	0.0(0.0)
Hilleshog 8291	156	0.000(0.0)	0.0(0.0)
Beta 1230 (check)	157	0.000(0.0)	0.0(0.0)
Maribo Ultramono (check)	158	0.000(0.0)	0.0(0.0)
ACS C85-188	159	0.000(0.0)	0.0(0.0)
Maribo 876	160	0.000(0.0)	0.0(0.0)
ACS C84-239	161	0.000(0.0)	0.0(0.0)
KW 1286	162	0.000(0.0)	0.0(0.0)
ACS C85-308	163	0.000(0.0)	0.0(0.0)
Beta 5266	164	0.000(0.0)	0.0(0.0)
ACS ACH 196	165	0.000(0.0)	0.0(0.0)
Bush Johnson 1333	166	0.000(0.0)	0.0(0.0)
Mono-Hy 2402	167	0.000(0.0)	0.0(0.0)
Maribo 875	168	0.000(0.0)	0.0(0.0)
Mono-Hy 2406	169	0.074(483.3)	0.0(0.0)
Hilleshog 8292	170	0.000(0.0)	0.0(0.0)
Beta 6269	171	0.000(0.0)	0.0(0.0)

General Mean Across Varieties	0.02	0.00
Coeff. of Var. (%)	1048.25	0.00
Variety Mean Square	0.05	0.00
Error Mean Square (Error B)	0.03	0.00
F Value	1.96**	0.00
L.S.D. (.05)	0.09	ns
L.S.D. (.01)	0.11	ns

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

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

1987 Cercospora Leaf Spot Ratings for SMBSC Commercial Coded Entries
Betaseed Nursery - Shakopee, MN

Table 10

Code	Entry	Average Rating at Each Date (1987)*						Mean All Ratings*			
		8/4	8/7	8/10	8/14	8/17	8/20	1987	2 Yr Mean 86-87	3 Yr Mean 85-87	3 Yr % Mean 85-87
59	ACS ACH 164	3.25	3.75	5.50	6.00	6.50	7.50	5.42	5.12	4.97	101.1
76	ACS ACH 178	2.75	3.75	5.00	5.50	6.50	7.25	5.13	4.63	4.41	89.6
73	ACS ACH 180	2.50	3.50	5.50	5.75	6.25	7.75	5.21	5.07	4.95	100.6
65	ACS ACH 181	2.75	4.25	5.25	6.00	6.00	7.50	5.29	4.75	4.67	94.9
58	ACS ACH 194	3.25	4.25	5.75	6.25	7.00	8.00	5.75			
68	Beta 1230	3.00	4.25	5.75	6.50	6.75	8.00	5.71	5.21	5.00	101.6
66	Beta 3614	3.25	4.50	5.50	6.50	7.00	8.00	5.79	4.91	5.11	103.8
69	Beta 6186	3.25	4.25	5.75	6.00	6.75	7.50	5.59	4.90	4.66	94.7
67	Beta 6264	3.00	4.25	5.50	6.00	7.00	7.75	5.59	4.99	4.86	98.8
78	Beta 6625	3.25	4.00	5.50	6.25	7.00	7.50	5.58	5.11	5.10	103.6
52	Bush Johnson 1310	2.75	3.50	4.50	5.50	6.25	7.00	4.92	4.55	4.16	84.6
80	Bush Johnson Monofort	3.50	5.25	6.00	6.50	7.25	7.75	6.04	5.40	5.29	107.5
55	Hilleshog 4046	3.25	4.00	5.25	6.00	6.75	8.00	5.54	5.11	5.07	103.1
75	Hilleshog 5090	3.75	4.75	6.50	6.75	7.50	8.50	6.29	5.25	5.01	101.9
57	Hilleshog 5135	3.50	4.50	5.75	6.50	6.75	7.50	5.75	5.09	5.07	103.1
79	Hilleshog 8277	3.75	4.50	6.50	7.00	7.50	8.50	6.29	5.38	5.25	106.7
60	KW 1014	2.75	3.75	5.50	6.25	7.00	7.75	5.50	4.84	4.71	95.8
70	KW 1132	3.25	4.00	5.75	6.25	7.00	8.00	5.71	5.19	5.10	103.8
54	KW 3145	3.25	4.50	5.75	6.25	7.00	8.50	5.88	5.22	5.17	105.1
77	KW 3265	3.00	4.25	5.50	6.25	6.50	7.75	5.54	4.95	4.98	101.2
61	KW 3394	3.25	4.25	5.50	6.25	6.75	8.25	5.71	5.16	5.14	104.5
63	Maribo 403	3.25	4.50	5.25	6.25	6.50	7.75	5.59	4.83	4.99	101.5
74	Maribo 411	3.25	4.25	5.50	6.25	7.00	7.75	5.67	5.05	4.96	100.8
62	Maribo 861	3.50	4.25	6.00	6.50	7.00	8.00	5.88	4.97		
64	Maribo 865	3.00	4.00	4.75	5.75	6.75	7.50	5.29			
53	Maribo Ultramono	3.25	4.25	6.00	6.00	7.00	8.00	5.75	5.27	5.13	104.3
72	Mitsui Monohikari	3.25	4.00	6.00	6.25	6.50	7.50	5.59	4.90	4.77	96.9
56	Mono-Hy M7	3.25	3.75	5.25	5.50	6.75	7.50	5.34	5.10	4.88	99.3
71	Mono-Hy R103	2.50	4.00	5.00	5.50	6.25	7.25	5.08	4.63	4.49	91.3
	Mean	3.16	4.17	5.56	6.15	6.78	7.78	5.60	5.02	4.92	100.00

*Lower numbers indicate better leaf spot resistance. (1=Ex,9=Poor)

1987 Cercospora Leaf Spot Ratings for SMSBC Semi Commercial Coded Entries
Betaseed Nursery - Shakopee, MN

Table 11

Code	Entry	Average Rating at Each Date (1987) * 8/4	8/7	8/10	8/14	8/17	8/20	Mean
145	ACS ACH 195	2.75	3.75	5.25	6.25	6.75	7.75	5.42
165	ACS ACH 196	3.50	4.50	5.75	6.25	7.25	7.75	5.83
161	ACS C84-239	3.00	4.00	4.75	6.00	6.50	7.25	5.25
159	ACS C85-188	2.50	3.50	5.00	5.00	5.75	6.75	4.75
163	ACS C85-308	3.00	4.00	5.25	5.75	6.50	7.25	5.29
157	Beta 1230 (check)	3.00	4.25	5.75	6.50	6.75	8.00	5.71
155	Beta 2007	3.25	4.25	5.75	6.50	7.00	8.00	5.79
164	Beta 5266	3.00	3.25	5.50	5.75	6.25	7.50	5.21
153	Beta 5427	2.75	3.75	5.25	5.75	6.75	7.75	5.34
147	Beta 5494	3.00	4.25	5.75	6.25	6.50	7.50	5.54
171	Beta 6269	3.25	3.75	4.50	5.50	6.25	7.50	5.13
144	Bush Johnson 1321	3.25	4.00	5.75	6.00	6.75	7.50	5.54
146	Bush Johnson 1331	4.00	4.75	6.25	6.25	7.50	7.75	6.08
166	Bush Johnson 1333	3.50	5.00	6.25	6.50	7.25	8.00	6.08
156	Hilleshog 8291	3.75	4.75	6.25	7.00	7.75	8.50	6.33
170	Hilleshog 8292	3.50	5.00	6.25	7.00	7.50	8.50	6.29
162	KW 1286	3.25	4.50	6.25	6.50	7.25	8.25	6.00
154	KW 1745	3.50	4.25	5.75	6.25	7.00	7.75	5.75
150	KW 3265 (check)	3.00	4.25	5.50	6.25	6.50	7.75	5.54
151	Maribo 862	2.75	4.00	5.25	6.00	6.75	7.75	5.42
148	Maribo 869	3.00	3.75	5.50	6.25	6.75	7.75	5.50
149	Maribo 873	3.00	4.25	5.50	6.00	7.00	7.75	5.59
168	Maribo 875	3.00	3.75	5.25	6.25	6.50	7.50	5.38
160	Maribo 876	3.25	3.75	5.50	6.00	6.50	7.25	5.37
158	Maribo Ultramono (check)	3.25	4.25	6.00	6.00	7.00	8.00	5.75
152	Mitsui 1002	3.00	3.75	5.50	6.00	6.50	7.50	5.38
143	Mono-Hy 2401	3.50	4.50	5.75	6.25	6.75	7.75	5.75
167	Mono-Hy 2402	3.00	3.75	5.50	5.75	6.50	7.75	5.38
169	Mono-Hy 2406	4.00	4.75	6.50	7.25	7.75	8.25	6.42
	Mean	3.16	4.13	5.59	6.13	6.79	7.71	5.58

*Lower numbers indicate better leaf spot resistance (1=Ex,9=Poor)

Date of Harvest Study

Objectives

Evaluate 10 sugarbeet varieties for relative root yields and quality characteristics harvested early and late.

Experimental Procedures

Trials were planted at three locations in 1985, 1986 and 1987. Two locations were harvested in 1985, one in 1986, and two in 1987.

The varieties included in these three trials were:

Mono Hy R103	ACH 164
Hilleshog 5135	Beta 3614
Hilleshog 8277	KW 3394
Maribo Ultramono	KW 3265
Maribo 403	Monohikari

The varieties Hilleshog 8277 and Beta 3614 have only 1987 data.

All varieties were planted in 4 row plots 30 ft in length and six replications. Harvest dates were scheduled to begin about September 20 for the early date and October 25 for the late harvest. Planting dates were May 1-2, May 28-29, and April 20-23 for 1985,1986 and 1987, respectively. All trials were hand 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 and late harvest dates are shown in tables 1, 2, 3 and 4. The average increase in root yield for the 1987 data was slightly over 4 tons per acre over the 4 week period. Average sugar content increased over 1.9% during the same period. Data combined for 3 years (1985-1987) increased an average 2.6 tons per acre and 2.1% in sugar.

Average deviations from percent of mean for sugar content, tons per acre, recoverable sugar per ton and recoverable sugar per acre for 1987 are presented in figures 1, 2, 3 and 4. Data for combined 1985-1987 are contained in figures 5, 6, 7 and 8. Certain varieties appear to be better selections than others for early harvest. Although quality increased from early to late harvest, some varieties may show a greater potential to accumulate a relatively higher level of sugar earlier in the growing season. Also certain varieties appear to have the ability to accumulate tons and sugar more rapidly than others. If just 1987 is considered these data would indicate that KW 3614, KW 3394, Ultramono, Maribo 403 and ACH 164 would be likely candidates for early sugar. Varieties particularly strong for early tons per acre would be Hilleshog 5135,

KW 3394, Ultramono and ACH 164. Varieties evaluated for 3 years show that Hilleshog 5135, KW 3394, Ultramono, and Maribo 403 show high sugar content early. Varieties such as Hilleshog 5135, Monohikari, KW 3394, KW 3265 and Maribo 403 had an increase in tons per acre early over other varieties evaluated. Early harvest selections should be selected for both early tons and early sugar. Other varieties not included in this study may also we well suited for early harvest.

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

1) Plant population.
2) General plant growth and development throughout the growing season.
3) Plant stress caused by excess water, hail, insects, 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 1987 Varieties Harvested Early and Late for Sugar Content.

	Sugar Content (%)								
	Early 1987	Late 1987	Change	Early 2 Yr. Mean 86-87	Late 2 Yr. Mean 86-87	Early 3 Yr. Mean 85-87	Late 3 Yr. Mean 85-87	Early 3 Yr. % Mean 85-87	Late 3 Yr. % Mean 85-87
Mono Hy R103	15.85	17.78	1.93	15.12	17.16	14.91	17.04	99.7	99.9
Hilleshog 5135	15.91	17.67	1.76	15.47	17.34	15.14	17.19	101.3	100.7
Hilleshog 8277	15.86	17.91	2.05						
Monohikari	15.82	18.00	2.18	14.91	17.17	14.74	17.02	98.6	99.7
KW 3394	15.98	17.83	1.85	15.17	17.16	14.98	16.92	100.2	99.2
KW 3265	15.91	17.87	1.96	15.12	17.08	14.81	16.95	99.1	99.3
Maribo Ultramono	16.06	17.97	1.91	15.37	17.30	15.12	17.17	101.1	100.6
Maribo 403	16.14	18.07	1.93	15.20	17.36	14.97	17.04	100.1	99.9
ACH 164	16.10	17.91	1.81	15.05	17.28	14.93	17.18	99.9	100.7
Beta 3614	16.05	17.73	1.68						
Mean	15.97	17.87	1.91	15.18	17.23	14.95	17.06	100.0	100.0

* 1987 Data from Bird Island and Maynard.
  1986 Data from Sacred Heart.
  1985 Data from Renville and Clara City.

Table 2. Three Year Performance of 1987 Varieties Harvested Early and Late for Root Yield.

	Root Yield Tons/Acre								
	Early 1987	Late 1987	Change	Early 2 Yr. Mean 86-87	Late 2 Yr. Mean 86-87	Early 3 Yr. Mean 85-87	Late 3 Yr. Mean 85-87	Early 3 Yr. % Mean 85-87	Late 3 Yr. % Mean 85-87
Mono Hy R103	22.41	26.80	4.39	20.54	22.32	21.89	24.62	96.8	97.6
Hilleshog 5135	22.77	28.35	5.58	20.50	22.88	22.66	25.75	100.2	102.0
Hilleshog 8277	24.62	27.40	2.78						
Monohikari	23.08	27.40	4.32	21.13	22.18	22.78	25.25	100.7	100.1
KW 3394	23.54	28.28	4.74	21.53	23.31	23.29	26.00	102.9	103.0
KW 3265	23.26	27.46	4.20	20.89	22.77	23.06	25.81	101.9	102.3
Maribo Ultramono	24.29	27.48	3.19	20.51	22.16	22.41	24.74	99.1	98.0
Maribo 403	22.54	27.78	5.24	20.96	22.34	22.67	24.93	100.2	98.8
ACH 164	23.73	27.18	3.45	20.55	22.02	22.23	24.78	98.3	98.2
Beta 3614	23.54	26.35	2.81						
Mean	23.38	27.45	4.07	20.83	22.50	22.62	25.24	100.0	100.0

* 1987 Data from Bird Island and Maynard.
  1986 Data from Sacred Heart.
  1985 Data from Renville and Clara City.

Table 3. Three Year Performance of 1987 Varieties Harvested Early and Late for Recoverable Sugar/Ton.

	Recoverable Sugar/Ton								
	Early 1987	Late 1987	Change	Early 2 Yr. Mean 86-87	Late 2 Yr. Mean 86-87	Early 3 Yr. Mean 85-87	Late 3 Yr. Mean 85-87	Early 3 Yr. % Mean 85-87	Late 3 Yr. % Mean 85-87
Mono Hy R103	292	330	38	279	320	274	315	99.6	99.4
Hilleshog 5135	292	328	36	285	323	278	318	101.1	100.4
Hilleshog 8277	292	335	43						
Monohikari	291	336	45	275	321	272	317	98.9	100.1
KW 3394	294	333	39	280	321	276	316	100.4	99.8
KW 3265	292	333	41	278	320	272	315	98.9	99.4
Maribo Ultramono	297	335	38	285	323	278	318	101.1	100.4
Maribo 403	298	339	41	280	326	275	316	100.0	99.8
ACH 164	298	334	36	278	323	275	319	100.0	100.7
Beta 3614	296	330	34						
Mean	294	333	39.10	280	322	275	317	100.0	100.0

* 1987 Data from Bird Island and Maynard.
  1986 Data from Sacred Heart.
  1985 Data from Renville and Clara City.

Table 4. Three Year Performance of 1987 Varieties Harvested Early and Late for Recoverable Sugar/Acre.

	Recoverable Sugar/Acre								
	Early 1987	Late 1987	Change	Early 2 Yr. Mean 86-87	Late 2 Yr. Mean 86-87	Early 3 Yr. Mean 85-87	Late 3 Yr. Mean 85-87	Early 3 Yr. % Mean 85-87	Late 3 Yr. % Mean 85-87
Mono Hy R103	6541	8834	2293	5736	7182	5852	7569	96.2	97.2
Hilleshog 5135	6657	9321	2664	5853	7433	6124	7981	100.7	102.5
Hilleshog 8277	7199	9180	1981						
Monohikari	6722	9204	2482	5839	7210	6062	7849	99.6	100.8
KW 3394	7439	9411	1972	6303	7540	6434	7969	105.8	102.3
KW 3265	6776	9273	2497	5842	7407	6103	7970	100.3	102.3
Maribo Ultramono	7208	9205	1997	5876	7241	6078	7699	99.9	98.8
Maribo 403	6709	9385	2676	5880	7339	6086	7676	100.0	98.6
ACH 164	7061	9078	2017	5772	7175	5931	7597	97.5	97.5
Beta 3614	6853	8694	1841						
Mean	6917	9159	2242	5888	7316	6084	7789	100.0	100.0

* 1987 Data from Bird Island and Maynard.
  1986 Data from Sacred Heart.
  1985 Data from Renville and Clara City.

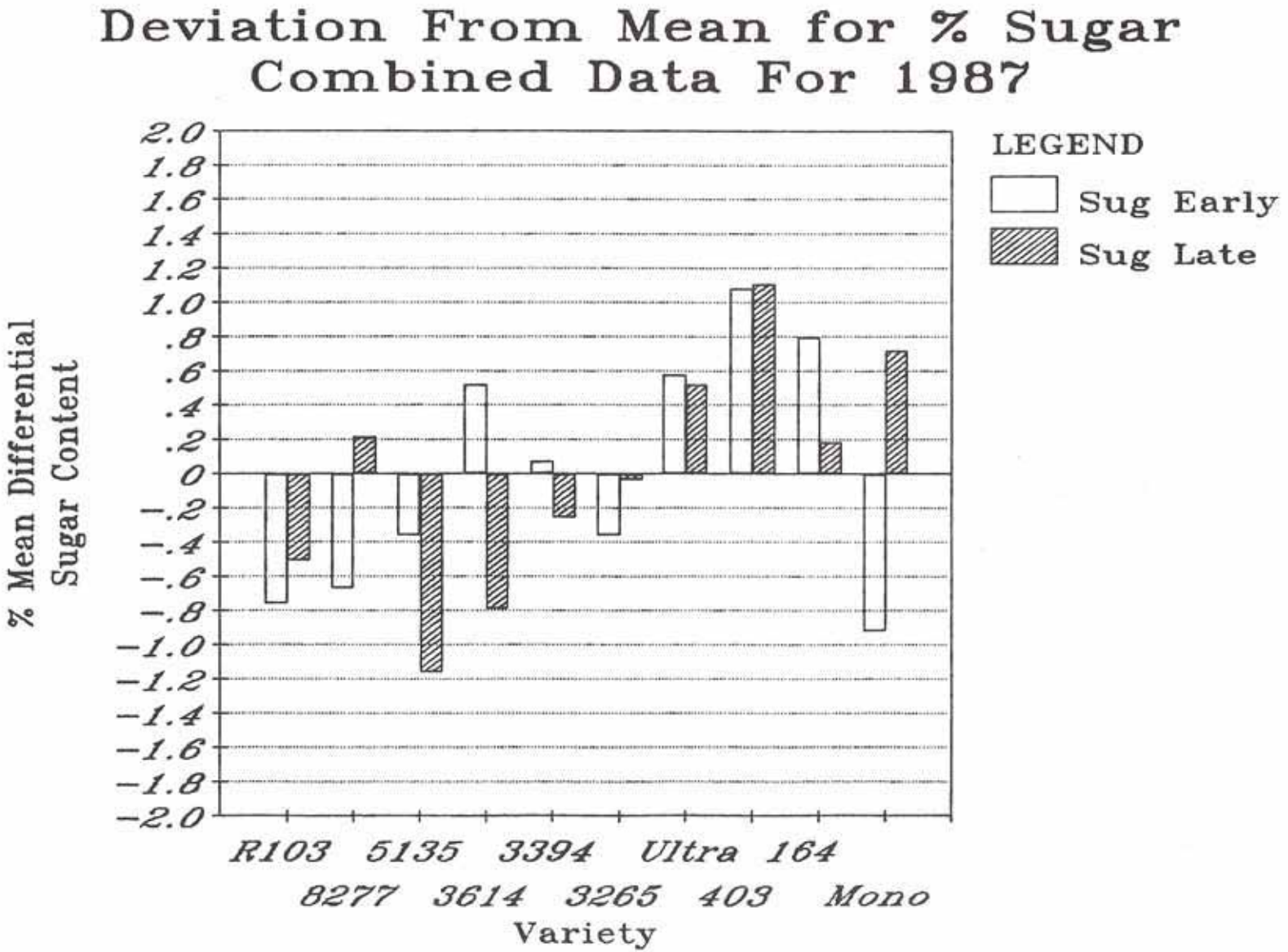

Figure 1. The average deviation from the mean for % sugar in 1987.

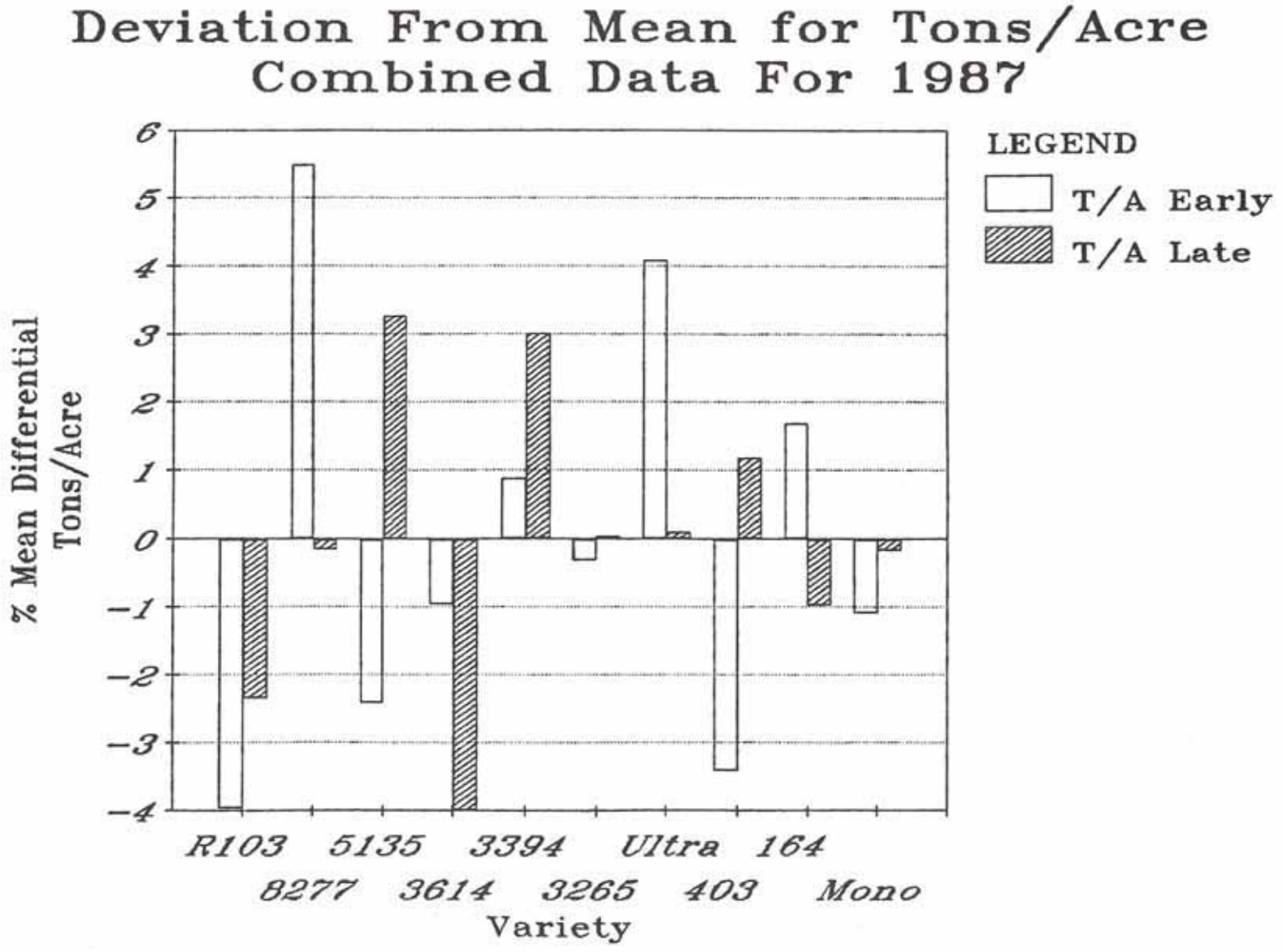

Figure 2. The average deviation from the mean for tons/acre in 1987.

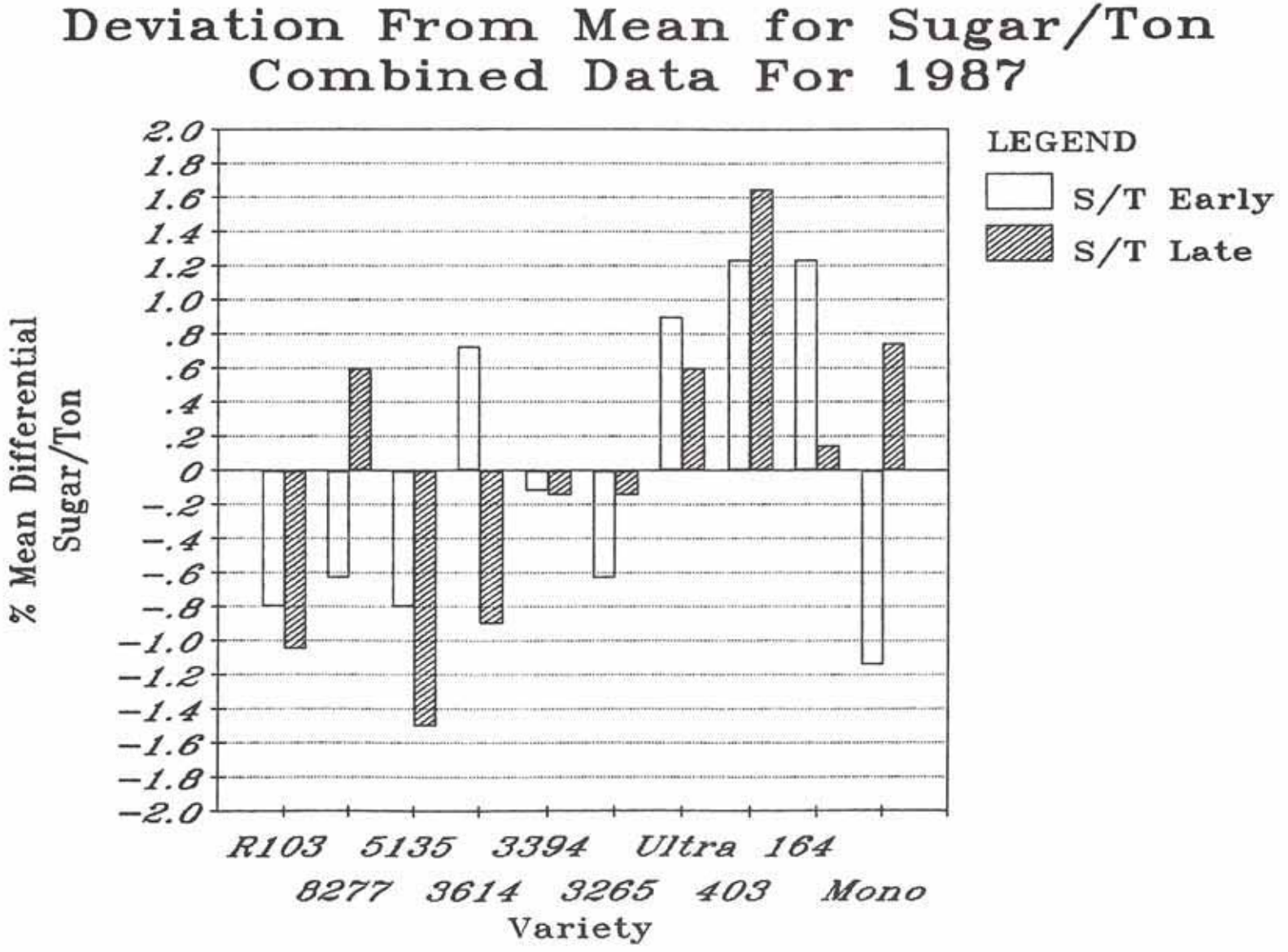

Figure 3. The average deviation from the mean for recoverable sugar per ton in 1987.

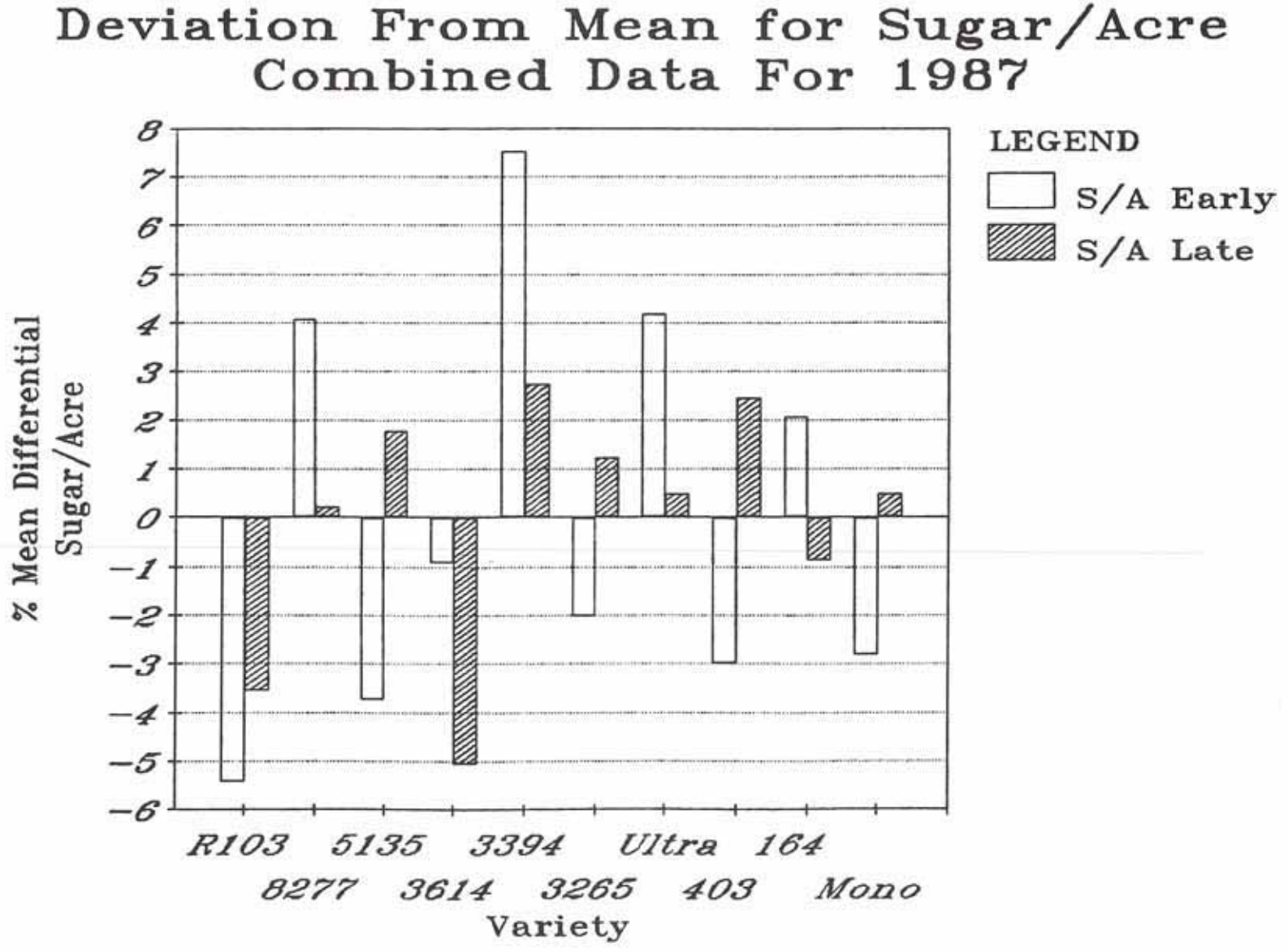

Figure 4. The average deviation from the mean for recoverable sugar per acre in 1987.

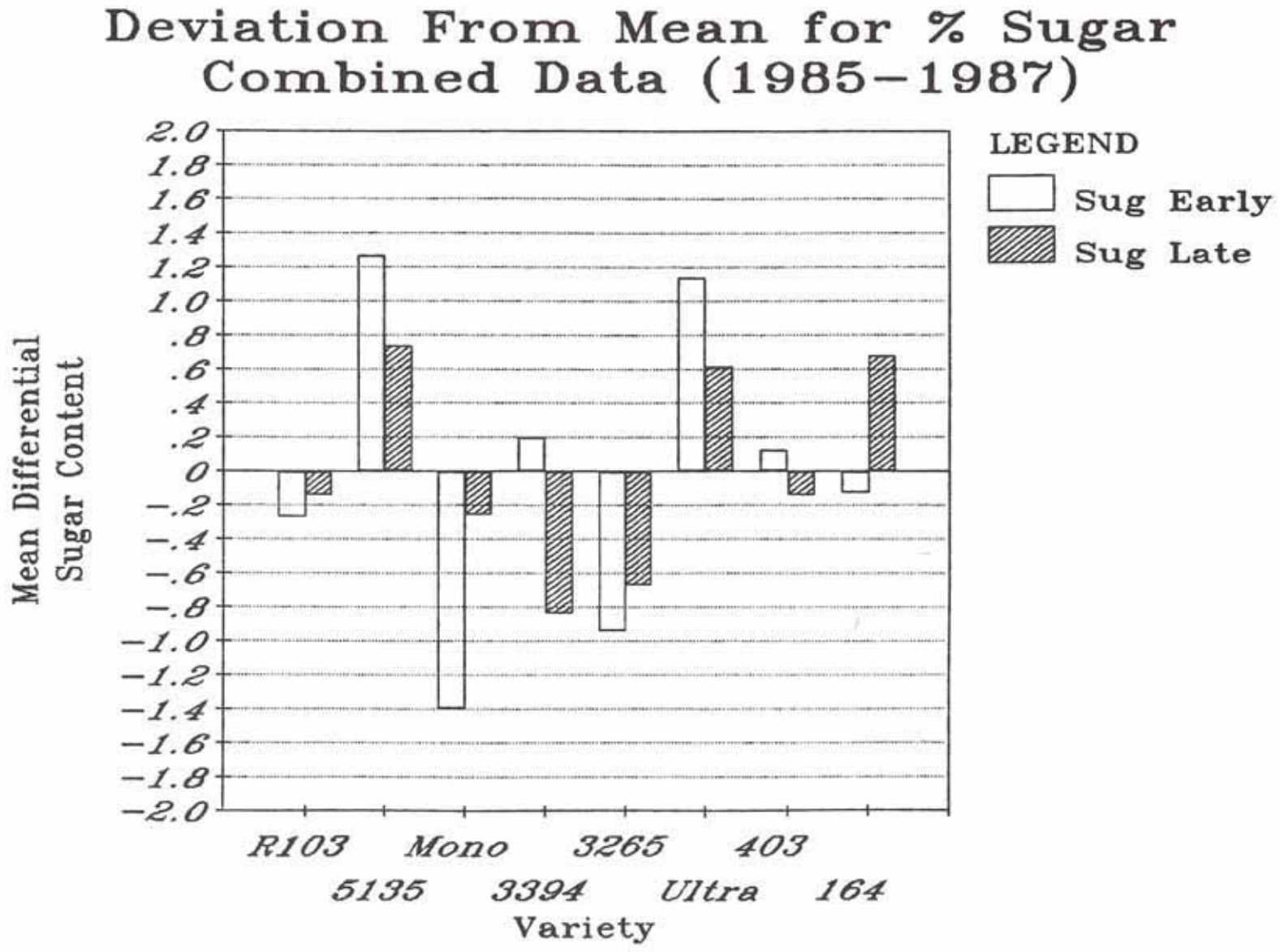

Figure 5. The average deviation of the % of the mean for % sugar combined data 1985 - 1987.

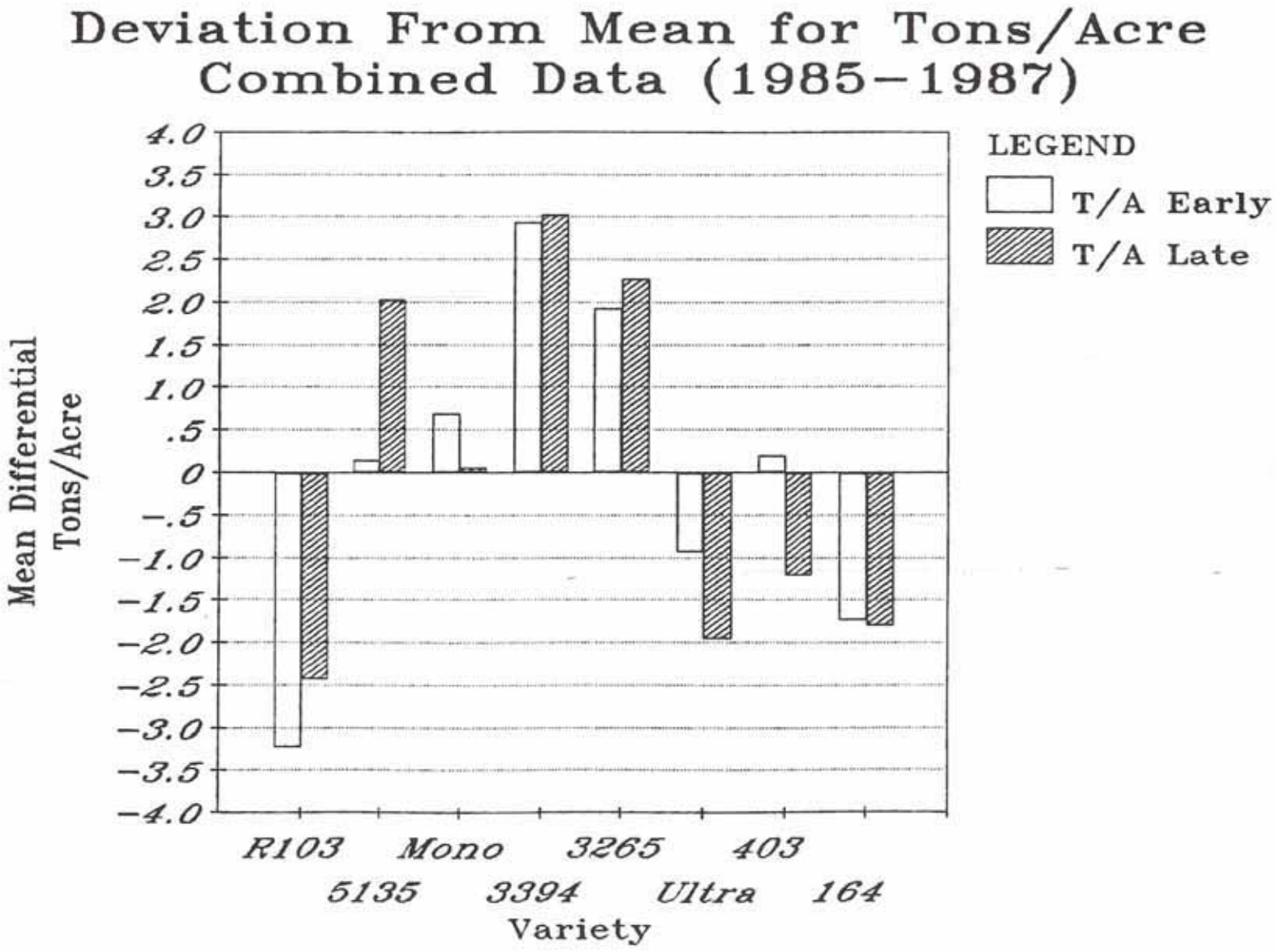

Figure 6. The average deviation of the % of the mean for tons/acre combined data 1985 - 1987.

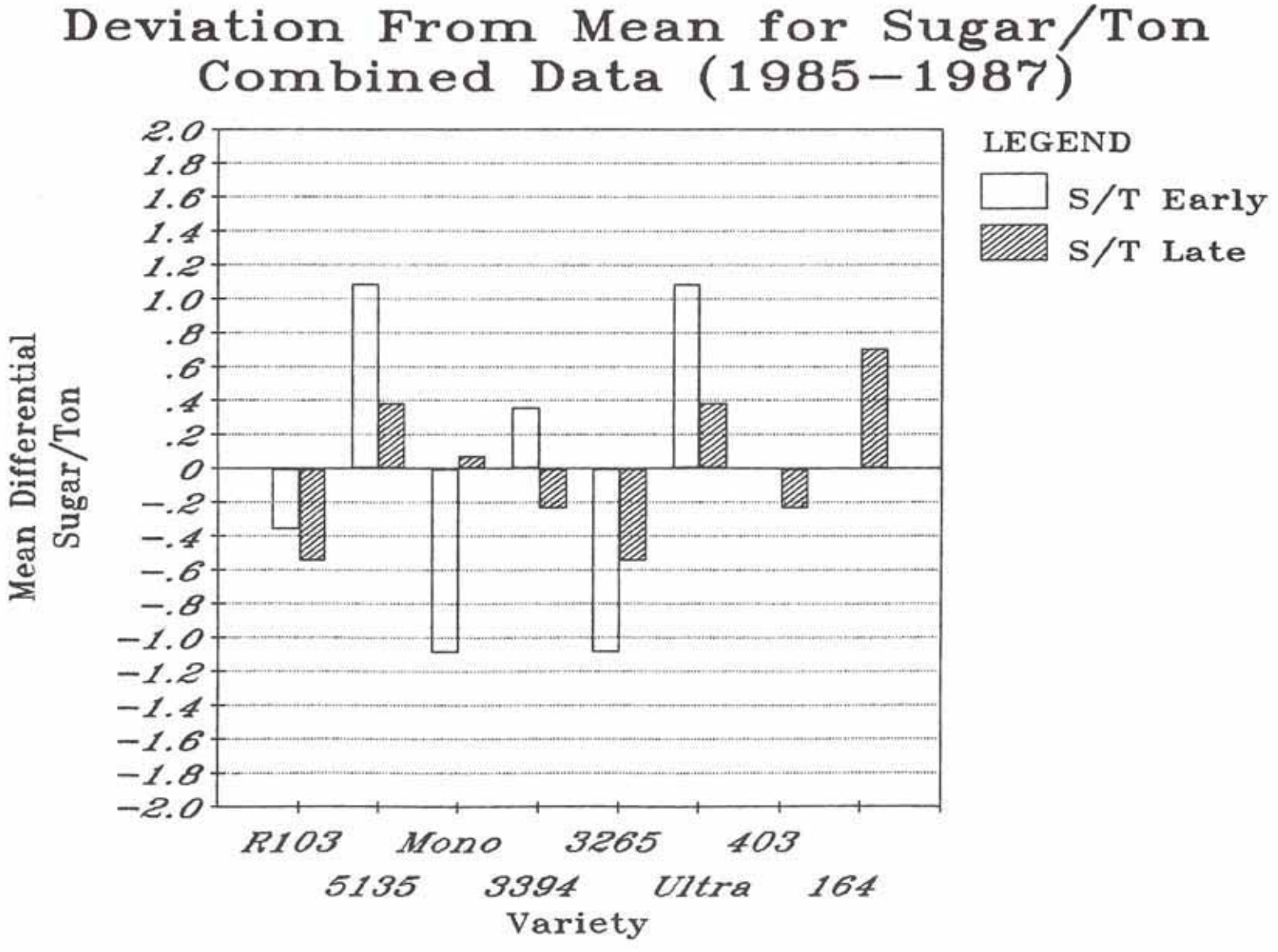

Figure 7. The average deviation of the % of the mean for recoverable sugar/ton combined data 1985 - 1987.

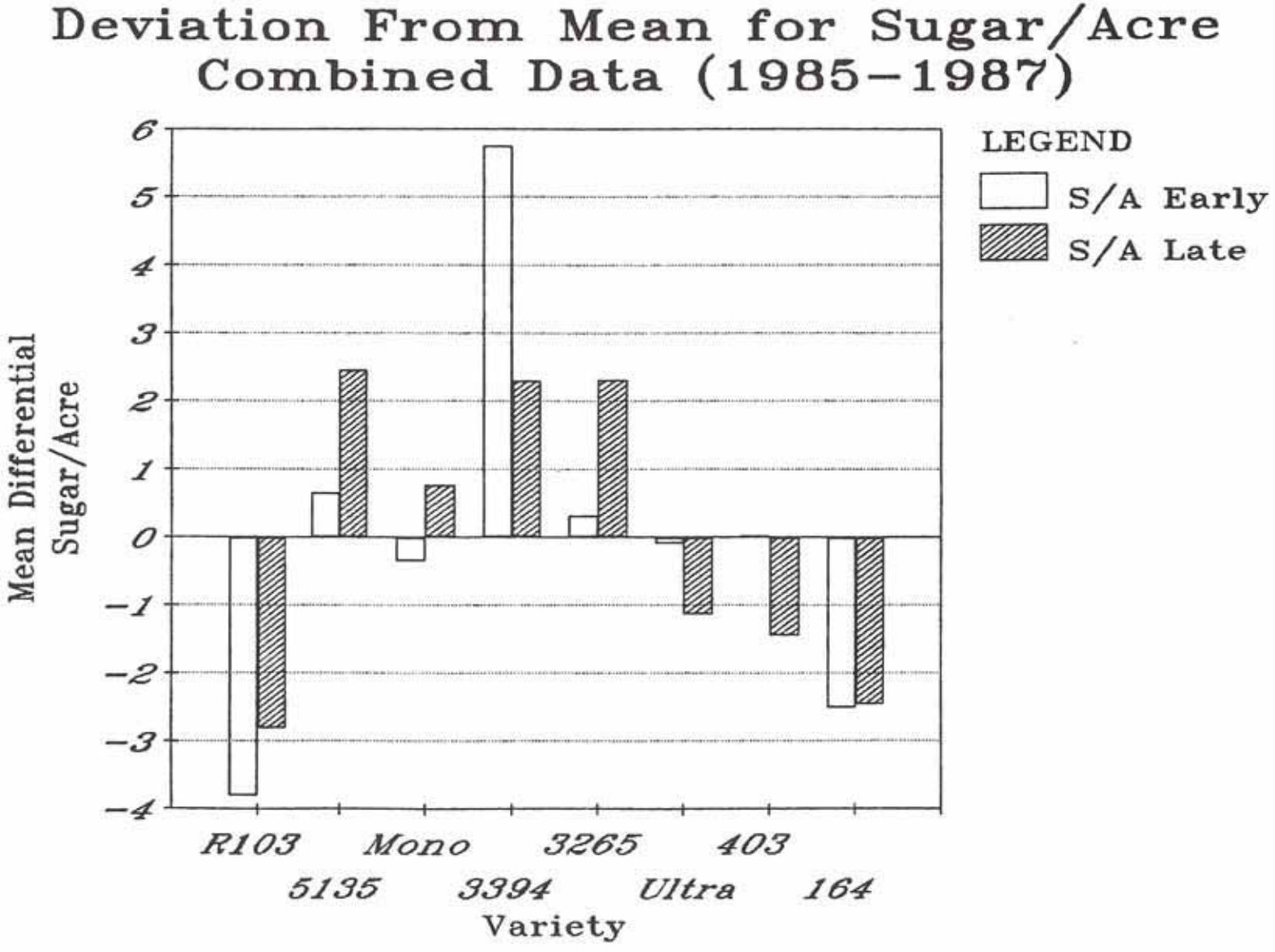

Figure 8. The average deviation of the % of the mean for recoverable sugar/acre combined data 1985 - 1987.

Root Rot Control With Seed Treatments

Objective

To determine if a particular seed treatment will control sugarbeet seedlings infested with Aphanomyces.

Experimental Procedure

One location was selected near Hector Minnesota which has had a high incidence of root rot in past years. Five seed treatments were used to evaluate control (Table 1). The experiment was planted with 4 row plots, 30 ft in lenght. Each treatment was replicated 4 times.

The first two treatments included Thiram, which was used as a commercial check. Treatments 3 and 4 contained a compound called Tachagaren. Tachagaren has been used effectively in Europe to control Aphanomyces, however; Tachagaren is not labeled for use in the United States. Previous work has indicated that for Tachagaren to be active enough to control Aphanomyces, the compound must be applied to a pellet as bare seed does not have enough surface area for the chemical to adhere. The fifth treatment is YEA!, which stands for Yield Enhancing Agent. YEA! is a compound made up of chitosan, a crab shell by-product. YEA! has shown to stimulate root development, resist fungal infection and cause a 20% thicker stem in wheat.

There was poor seedling emergence due to the dry

conditions following planting. The experiment was not harvested, however; 10 seedlings were evaluated visually for root rot symptoms. The following is a list of the criteria used for evaluation.

0) No apparent symptoms.

1) Slightly brown or discolored hypocotyl but firm under pressure. Very little root pruning.

2) Dark and or discolored hypocotyl with slight girdling of the hypocotyl with evident root pruning and slightly soft root tissue.

3) Very dark hypocotyl and roots with collapsing root tissue but not to the degree of 4. Very evident hypocotyl girdling but main tap root intact, however; very soft and deteriorated. Severe root pruning.

4) Very darkly discolored hypocotyl and roots. Root tissue completely collapsed or main tap root severed as a result of severe hypocotyl girdling. No evidence of secondary root system.

5) Dead or dying plant.

Results and Discussion

Both treatments of Tachagaren with Thiram significantly reduced the visual symptoms of the seedling root rot (Table 1). Thiram alone and in a pellet did not reduce the root rot infection. YEA! did not significantly reduce the root rot symptoms. These data correlate with previous work conducted in Europe. Tachagaren appears to be an effective means of control for Aphanomyces, however; due to the labeling restriction Tachagaren can not be used on sugarbeet seed. Research will continue with Tachagaren to evaluate the compound under different environmental conditions.

Table 1. List of treatments and results for seed treatment study.

Treatment No.	Seed Treatment	Rate per cwt seeds	Root Rot Index *
1	Bare Seed Thiram	 8 fl oz	 2.04 a
2	Pellet Thiram	 8 fl oz	 1.96 a
3	Pellet Thiram Tachagaren	 8 fl oz 2 lbs	 0.43 b
4	Pellet Thiram Tachagaren	 8 fl oz 4 lbs	 0.44 b
5	Bare Seed YEA!	 16 fl oz	 1.45 a
	Mean LSD 5%		1.26 0.9

* Means represent a visual rating from 0-5. Means with larger numbers represent more severe visual symptoms. Means within columns for each treatment followed by the same letter do not differ significantly using Duncan's multiple range test at the 5% level.

Root Rot Herbicide Interaction Study

Objective

Determine if various commonly used herbicide treatments predispose sugarbeets to higher levels of infection from root rot diseases.

Experimental Procedure

The trial was located at Hector Minnesota. The location was selected because of the land's history of infectious root rot diseases. The experiment consisted of 20 treatments (Table 1). The variety Maribo Ultramono was selected and planted on 4/21/87 with six 30 ft plots replicated 4 times. The center 4 rows were treated for evaluation. The preplant incorporated treatments were applied on 4/21/87 with an air temperature of 63°F and soil temperature of 52°F. The first postemergence application was applied on 5/12/87 with an air temperature of 75°F, soil temperature of 65°F and the sugarbeets were in the 2 leaf stage. The second postemergence application was applied on 5/19/87 with an air temperature of 73°F, soil temperature of 60°F and the sugarbeets were in the 4 leaf stage.

The precipitation following planting was minimal and consequently the plot was not evaluated for harvest. However, the emerged seedlings were sampled at 10 plants per plot and evaluated for visual root rot symptoms when

they were in the 6-8 leaf stage. The following is a description of the criteria for the evaluations:

0) No apparent symptoms.

1) Slightly brown or discolored hypocotyl but firm under pressure. Very little root pruning.

2) Dark and or discolored hypocotyl with slight girdling of the hypocotyl with evident root pruning and slightly soft root tissue.

3) Very dark hypocotyl and roots with collapsing root tissue but not to the degree of 4. Very evident hypocotyl girdling but main tap root intact, however; very soft and deteriorated. Severe root pruning.

4) Very darkly discolored hypocotyl and roots. Root tissue completely collapsed or main tap root severed as a result of severe hypocotyl girdling. No evidence of secondary root system.

5) Dead or dying plant.

Results and Discussion

The average infection index value for the entire experiment was 2.61 (Table 1). There was no significant treatment that either increased or decreased the visual effects of the root rot.

The results may be affected by the high level of inoculum that exists in that particular site. Any treatment difference may be masked by the overwhelming effect of the disease itself. Some soil applied herbicides have shown to increase the pathogenicity of some organisms in peas and this scenario may carry over in sugarbeets. To further evaluate the herbicide root rot interactions, additional tests should be conducted with different environmental conditions.

Table 1. List of treatments and results for herbicide root rot interaction. Treatments applied on the same day were tankmixed.

Trt.	Chemical	Rate lb ai/A	Timing	Date Applied	Root Rot Index*
1)	Eptam	2.00	PPI	04/21/87	2.47
2)	Eptam	3.00	PPI	04/21/87	2.48
3)	Ro-Neet	4.00	PPI	04/21/87	2.73
4)	Eptam	1.50	PPI	04/21/87	2.68
	Ro-Neet	2.50	PPI	04/21/87	
5)	Eptam	2.00	PPI	04/21/87	2.68
	Ro-Neet	2.00	PPI	04/21/87	
6)	Antor	4.00	PPI	04/21/87	2.16
7)	Antor	6.00	PPI	04/21/87	2.95
8)	Nortron	6.00	PPI	04/21/87	2.82
9)	Dual	2.00	PPI	04/21/87	2.57
10)	Dual	3.00	PPI	04/21/87	2.52
11)	Check				2.46
12)	Betamix	1.00	POST	05/12/87	2.65
13)	Betamix	0.50	POST	05/12/87	2.66
	Betamix	0.50	POST	05/19/87	
14)	Poast	0.20	POST	05/12/87	2.12
	Crop oil	2.00	POST	05/12/87	
15)	Betanex	0.38	POST	05/12/87	2.63
	Dowpon	0.75	POST	05/12/87	
	Betanex	0.38	POST	05/19/87	
	Dowpon	0.75	POST	05/19/87	
16)	Betanex	0.50	POST	05/12/87	2.78
	Dowpon	1.00	POST	05/12/87	
	Betanex	0.50	POST	05/19/87	
	Dowpon	1.00	POST	05/19/87	
17)	Lontrel	0.19	POST	05/12/87	2.42
18)	H-273	0.75	POST	05/12/87	2.45
19)	Betamix	0.50	POST	05/12/87	3.17
	Betamix	0.50	POST	05/19/87	
20)	Betamix	1.00	POST	05/12/87	3.25
	Mean				2.61
	LSD 5%				1.22

* Means represent a visual rating from 0-5. Means with larger numbers represent more severe visual symptoms.

Cocklebur Control With Lontrel.

Objective

Evaluate the effect of Lontrel an cocklebur, sugarbeet and foxtail.

Experimental Procedures

The trial was planted at Lake Ali near Hector Minnesota. Ten herbicide treatments were used to evaluate the herbicidal effect primarily on cocklebur. The treatments are shown in table 1. The first application was on 6/11/87 with an air temperature of 78°F, soil temperature of 65°F and 90% relative humidity. The cocklebur were in the 4-8 leaf stage and 6-10 inches tall. The sugarbeets were in the 6 leaf stage. The second application was on 6/19/87 with an air temperature of 82°F, soil temperature of 75°F and 75% relative humidity. The cocklebur were in the 6-12 leaf stage and 8 to 14 inches tall. The sugarbeets were in the 6-10 leaf stage and foxtail 8 inches tall. During both spray applications, soil moisture was moist to wet. All treatments were sprayed at 10 gallons of water per acre. The first observation was made on 6/19/87 to evaluate the first application. The second observation was made on 6/26/87 to evaluate the experiment in it's entirety.

Results and Discussion

In general, Lontrel provided good control of cocklebur (Table 1.) with little or no signs of phytotoxicity to the sugarbeets. The best treatment for cocklebur control with a single application, was Lontrel at a rate of .2 lb ai/Acre. At 86% control, Lontrel expressed no injury to the sugarbeets and no control of the grass species when sprayed alone. Some cocklebur control was achieved from the .75 lb ai/Acre rate of H-273 but significant sugarbeet injury also occurred. Both rates of Lontrel gave control of cocklebur, however; the .2 lb ai/Acre rate gave significantly higher cocklebur control.

Evaluations made after the second application proved to be similar to the first. Beet injury in general was reduced from from the first evaluation, however; Lontrel continued to perform well. In fact, the plots that were sprayed with Lontrel had a flush of foxtail as the cocklebur competition had diminished.

Conclusions

Lontrel proved to be very effective for the control of cocklebur. Despite the large size of the cocklebur, Lontrel gave good control while sugarbeet injury was indistinguishable. Given proper environmental conditions, the treatment with split applications of Betanex and Dowpon

may give some cocklebur control along with satisfactory foxtail control. Although Lontrel is not labeled at this writing, if labeled, Lontrel could be a viable choice for effective cocklebur control at many different leaf stages. Lontrel also appears to be active on Canada Thistle and Sunflower.

There is currently action on obtaining an experimental use permit for Lontrel. The chemical name for sugarbeets if labeled would be Stinger.

Table 1. List of treatments and results for cocklebur experiment. Treatments applied on the same day were tankmixed.

Trt.	Chemical	Rate lb ai/A	Timing	1st Evaluation* Sugarbeet Injury	1st Evaluation* Cocklebur Control	1st Evaluation* Foxtail Control	2nd Evaluation* Sugarbeet Injury	2nd Evaluation* Cocklebur Control	2nd Evaluation* Foxtail Control
				---(%)---	---(%)---	---(%)---	---(%)---	---(%)---	---(%)---
1)	Lontrel	0.10	06/11/87	0.0 c	60.0 bc	0.0 c	0.0 b	60.0 abcd	0.0 d
2)	Lontrel	0.20	06/11/87	0.0 c	86.3 a	0.0 c	0.0 b	92.5 a	0.0 d
3)	H-273	0.50	06/11/87	21.3 a	48.8 cd	21.3 abc	7.5 ab	26.3 d	18.8 cd
4)	H-273	0.75	06/11/87	25.0 a	60.0 bc	13.8 abc	22.5 a	38.8 cd	23.8 bcd
5)	Betanex	0.50	06/11/87	3.8 bc	21.3 e	13.8 abc	5.0 ab	30.0 cd	17.5 cd
	Betanex	0.50	06/19/87						
6)	Lontrel	0.20	06/11/87	6.3 bc	78.8 ab	6.3 bc	3.8 b	83.8 ab	0.0 d
	Betanex	0.50	06/19/87						
	Betanex	0.50	06/19/87						
7)	Betanex	0.50	06/11/87	16.3 ab	43.8 cd	41.3 abc	17.5 ab	50.0 bcd	83.8 a
	Dowpon	1.00	06/11/87						
	Betanex	0.50	06/19/87						
	Dowpon	1.00	06/19/87						
8)	Betanex	0.50	06/11/87	16.3 ab	46.3 cd	56.3 a	15.0 ab	70.0 abc	78.8 a
	Nortron	1.00	06/11/87						
	Betanex	0.50	06/19/87						
	Nortron	1.00	06/19/87						
9)	Betanex	0.50	06/11/87	21.3 a	33.8 de	35.0 abc	10.0 ab	41.3 cd	53.8 abc
	Nortron	0.20	06/11/87						
	Betanex	0.50	06/19/87						
	Nortron	0.20	06/19/87						
10)	Betanex	0.50	06/11/87	21.3 a	47.5 cd	47.5 ab	12.5 ab	46.3 bcd	57.5 ab
	H-273	0.25	06/11/87						
	Betanex	0.50	06/19/87						
	H-273	0.25	06/19/87						
	Mean			13.1	52.6	23.5	9.4	53.9	33.4
	LSD 5%			13.3	21.1	39.4	15.7	35.5	35.6

* Means within columns for each treatment followed by the same letter do not differ significantly using Duncan's multiple range test at the 5% level.

Effects of Petiole Material on Tare Lab Sugar Analysis

Objectives

To determine the effect of green petiole material on tare lab sugar analysis.

Experimental Procedures

Two locations were selected for this test at both Renville Minnesota and Bird Island Minnesota. A defoliator set too high was driven over the plot site at harvest.

The sugarbeets were hand harvested and each sugarbeet was split down the middle. One half was placed in a tare bag untouched. The other half was scalped by hand to remove any excess green material and then placed into another tare bag. When both bags contained approximately 15 lbs they were sealed and delivered to the tare lab for analysis. The samples were considered paired samples during data analysis. The above procedure was performed on 27 paired samples or a total of 54 tare bags. The tare bags were analyzed for sugar content, and ppm K, Na, Amino N.

Results and Discussion

The sampled data was analyzed with a T Test. The two means were found to be significantly different with a difference of almost .3 for sugar content (Table 1). There were some isolated samples where the difference in sugar

content did not occur (Figure 1). However, in general the sugar content observed in the tare lab was consistently lower on sugarbeets with petiole material as compared to that same sugarbeet with a cleaner crown. In addition to the sugar content, the level of impurities observed were higher on average in poorly topped sugarbeets which reflected in higher loss molasses and lower recoverable sugar per ton.

The emphasis of this experiment is to determine the effects of poorly topped sugarbeets. Excessive scalping could result in reduced yield, however; close scrutiny of the defoliating operation could be rewarded with higher sugars and less impurities.

Table 1. Results from topping experiment with a comparison of topped vs poorly topped sugarbeets and the resultant sugar quality.

	Topped						Poorly Topped					
Sample No.	Sugar Content	K	Na	Amino N	Loss To Mol.	Recov. S/T	Sugar Content	K	Na	Amino N	Loss To Mol.	Recov. S/T
1	17.16	2443	158	150	1.10	321	17.14	2483	169	155	1.13	320
2	17.08	2677	129	165	1.19	318	16.68	2707	172	238	1.31	307
3	18.18	2562	161	130	1.12	341	17.20	2438	175	277	1.27	319
4	17.62	2575	236	138	1.17	329	16.96	2634	243	149	1.21	315
5	17.58	2640	115	197	1.21	327	16.88	2711	168	173	1.23	313
6	17.44	2537	218	136	1.15	326	16.94	2532	169	234	1.25	314
7	16.74	2427	315	175	1.20	311	16.98	2578	244	177	1.22	315
8	17.52	2343	134	117	1.01	330	16.74	2706	283	132	1.23	310
9	17.74	2195	133	162	1.02	334	17.90	2405	165	72	0.99	338
10	16.94	2485	166	202	1.19	315	17.06	2432	195	107	1.06	320
11	17.26	2217	166	74	0.93	327	16.57	2571	208	260	1.31	305
12	17.80	2325	134	84	0.97	337	17.44	2255	151	137	1.02	328
13	17.54	2361	158	101	1.01	331	17.56	2494	194	94	1.06	330
14	17.86	2110	142	126	0.95	338	17.04	2416	148	134	1.07	319
15	17.75	2453	167	142	1.10	333	17.30	2612	196	87	1.10	324
16	15.98	2341	240	271	1.26	294	15.72	2163	234	260	1.19	291
17	15.14	2192	240	381	1.36	276	16.00	2050	221	336	1.24	295
18	16.38	2004	213	273	1.14	305	16.12	1832	191	287	1.09	301
19	15.72	2099	237	236	1.13	292	15.35	2165	212	225	1.13	284
20	15.87	2033	185	271	1.13	295	15.84	2093	189	250	1.13	294
21	16.32	2194	169	253	1.16	303	16.00	2116	252	205	1.11	298
22	15.76	2023	232	304	1.19	291	15.04	2112	214	301	1.21	277
23	15.38	2262	266	332	1.33	281	16.22	2108	323	376	1.36	297
24	16.94	1986	163	236	1.06	318	15.93	1977	240	299	1.18	295
25	16.59	1957	189	297	1.14	309	16.14	1920	253	267	1.12	300
26	16.24	2011	220	298	1.18	301	16.56	2077	269	271	1.19	307
27	16.70	2011	199	275	1.14	311	16.27	2078	205	314	1.21	301
Average	16.86	2276	188	205	1.13	315	16.58	2321	210	215	1.17	308
High	18.18	2677	315	381	1.36	341	17.90	2711	323	376	1.36	338
Low	15.14	1957	115	74	0.93	276	15.04	1832	148	72	0.99	277

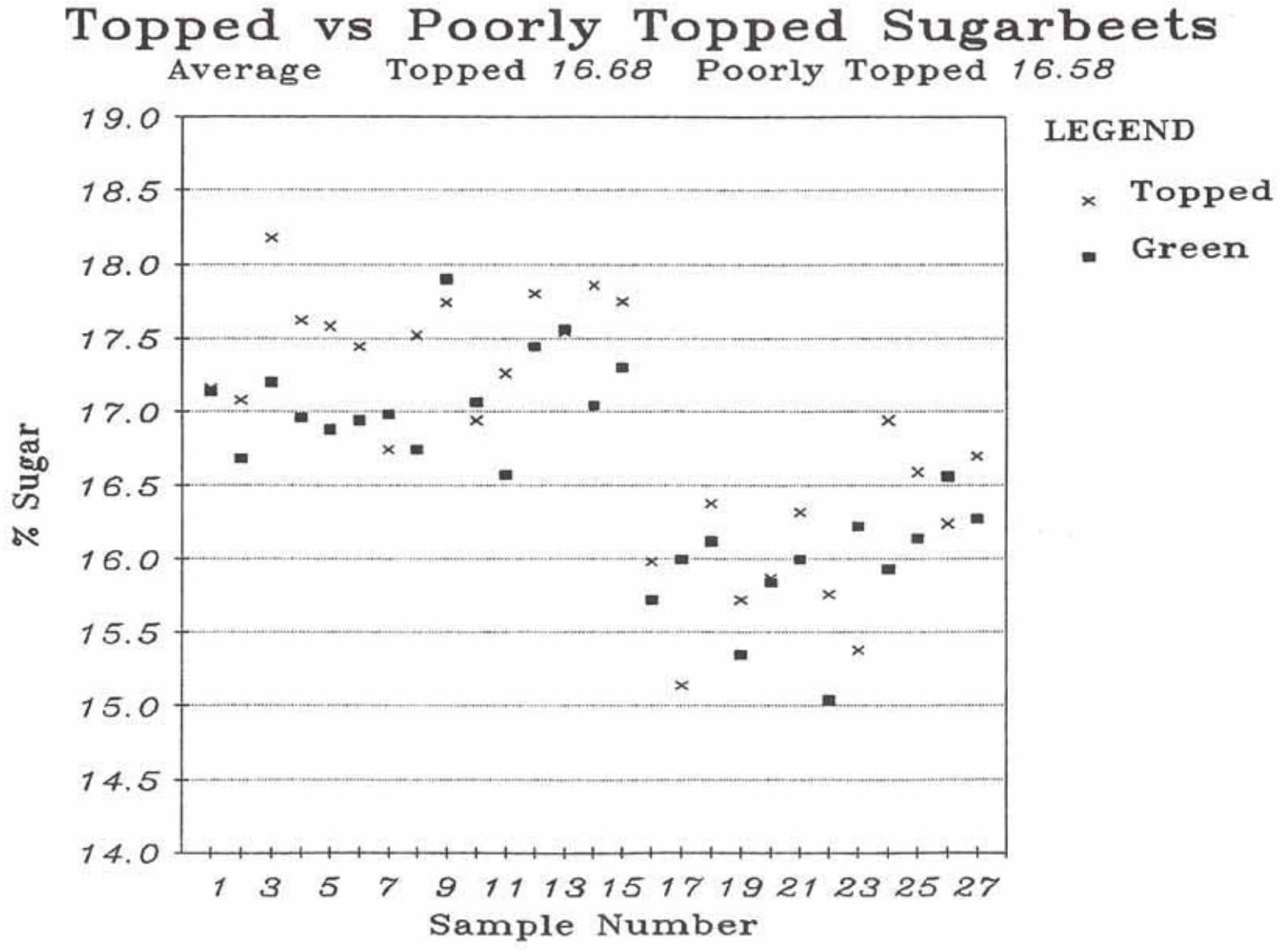

Figure 1. Sugar content comparison for topped vs poorly topped sugarbeets.

Disease Index Summary of 1987

Introduction

A remote weather station was installed in sugarbeets 2 miles south of Sacred Heart, Minnesota. This station monitored air temperature, soil temperature at 4 and 8 inches, relative humidity, leaf wetness and precipitation on a hourly basis. 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 was to give the sugarbeet grower an indication of a 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 adequently model the Cercospora situation. Sugarbeet fields are highly variably in spore number, consequently; the model should be used in conjunction with field disease monitoring. The data are presented in figures 1,2,3 and 4.

Results

The growing season of 1987 had many days at which the disease index value was in the favorable category (greater or equal to 6 for a 2 day total Figure 1; greater or equal to 3 on a single day figure 2). The spores require high relative humidity (90% to free moisture) and high

temperatures (65 - 80°) and that combination was sustained for most of the month of July. Another infectious period developed in mid August and leaf spot spray intervals were shortened to compensate for the high levels of inoculum that was present cooperative wide. The most severe areas where visual symptoms were most obvious were in protected areas such as along groves, power lines etc. Aerial applications did not adequately cover these areas and Cercospora developed very quickly.

In general, leaf spot modeling correlated very well with the visual scouting reports. Two more weather stations will be added in 1988 to compensate for variations in environment from one growing area to another.

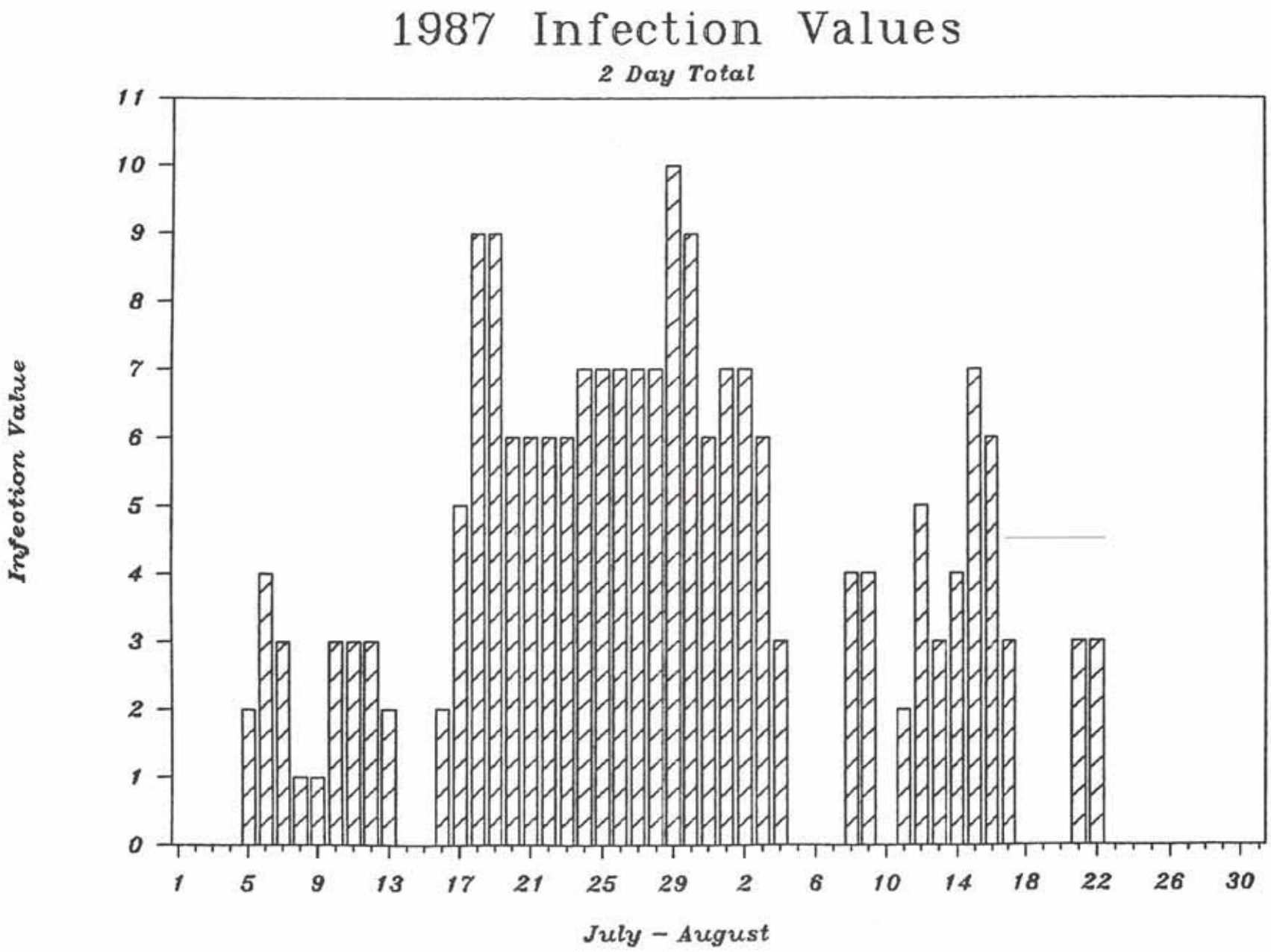

Figure 1. Two day total infection values from July through August 1987.

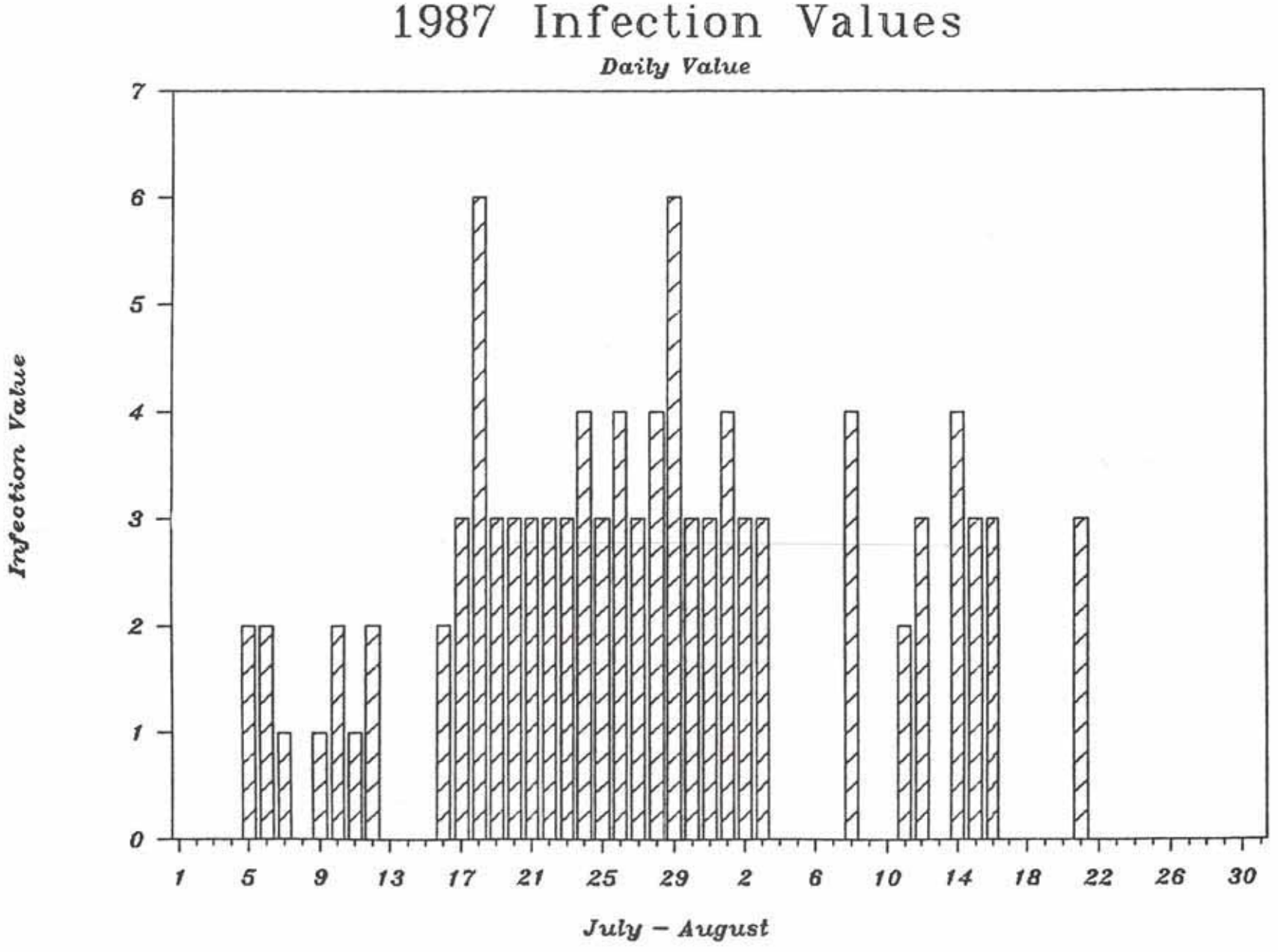

Figure 2. Daily infection values from July through August 1987.

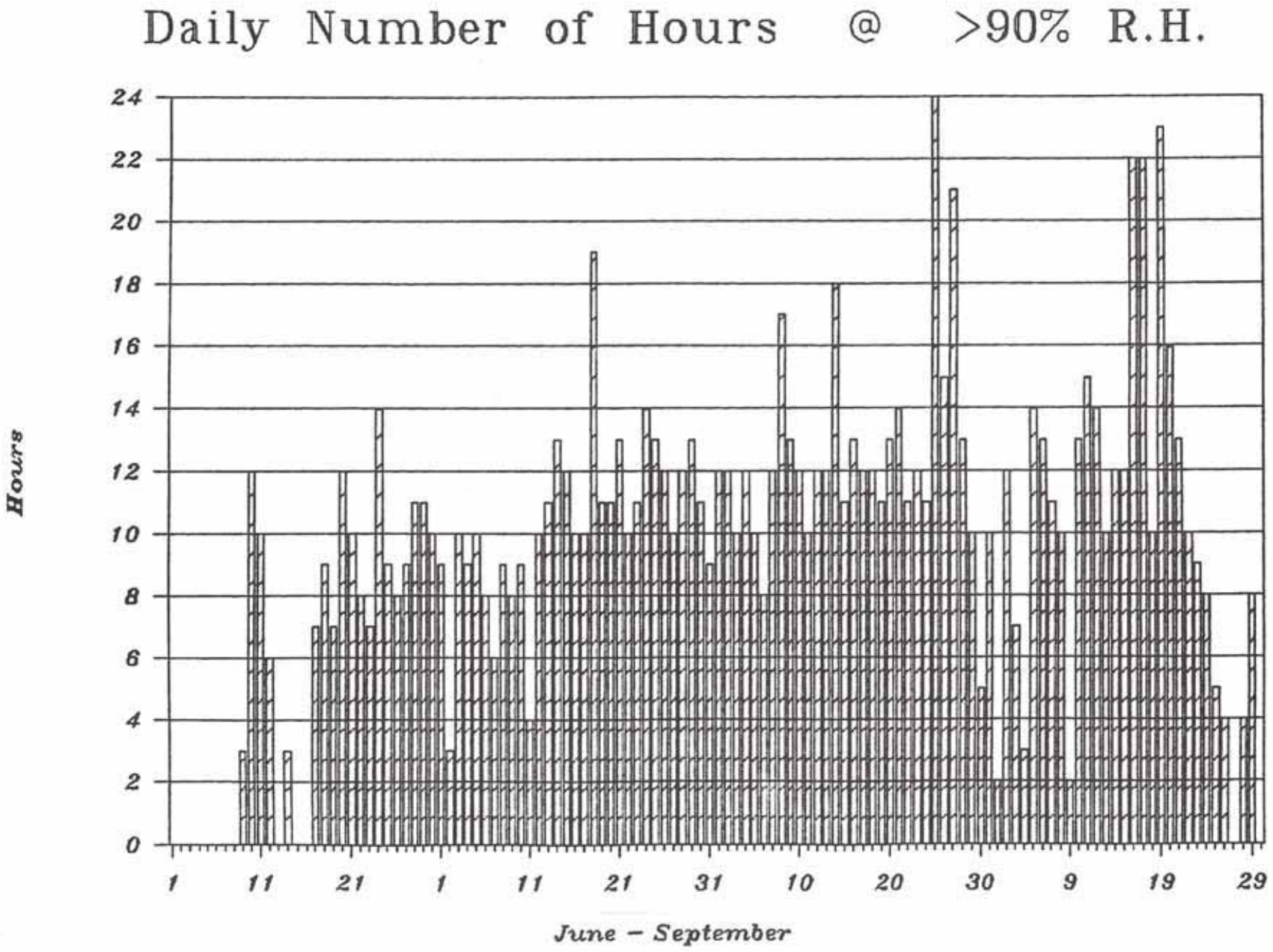

Figure 3. The total number of hours at which the relative humidity was over 90% for June through September 1987.

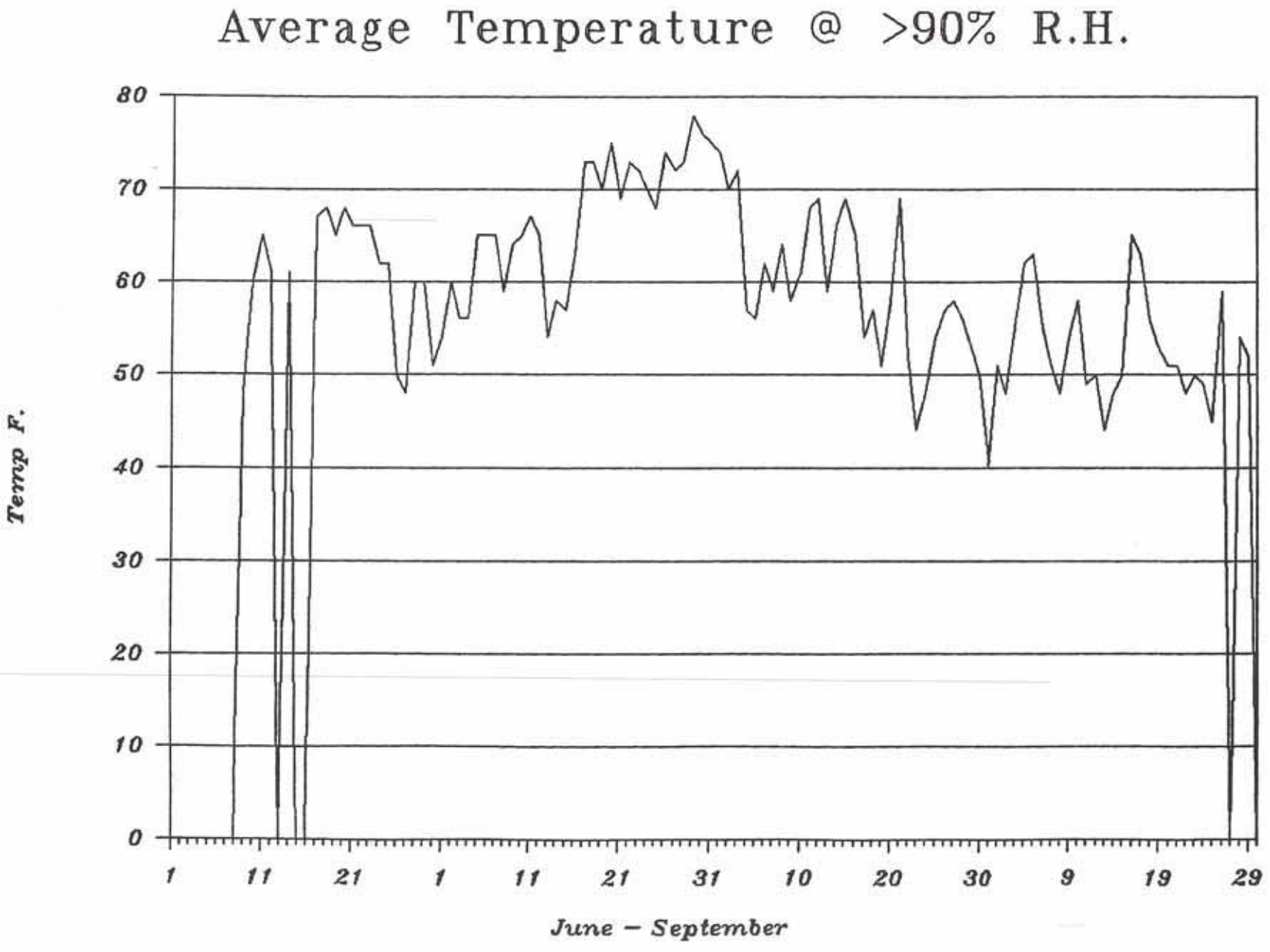

Figure 4. The average temperature at which the relative humidity was over 90% for June through September 1987.

SOUTHERN MINNESOTA SUGAR COOPERATIVE

Harvester Comparisons

The following tables summarize the 1987 data accumulated at the Machinery Fair prior to pre-pile harvest and a comparison of different machines by district and combined over the entire Cooperative.

The harvest conditions of 1987 were generally dry so there was not a wide spread among the various machines on percent first dirt (dirt removed by the piler) and percent tares (dirt that goes into the piles).

Operator of the machines still has a predominant effect on performance. The high and low ranges within each category indicates the advantages of the combined performance of the operation and a properly equipped machine.

SOUTHERN MINNESOTA SUGAR COOPERATIVE
Harvester Demonstration
August 28, 1987

Harvester	Average Depth (In.)	Average Dirt Wt. (Lbs.)	Average Tare (%)	Average Net Wt. (Lbs.)	Average Sugar (%)	Average Harv Loss (Lbs/Sample	Lbs/Acre)	Average Root Loss (Lbs/Sample	Lbs/Acre)	Speed (MPH)	Acres Harvested	Tons/ Acre
#1 - 6 Row	2-1/4	700	4.5	28092	16.67	1.75	875	0.6	300	3.8	.61	23.0
#2 - 6 Row	2-1/2	608	10.0	24701	16.59	2.06	1030	4.8	2400	4.5	.61	20.2
#3 - 6 Row	1-7/8	700	9.4	26248	16.65	1.64	820	3.4	1700	4.8	.61	21.5
#4 - 6 Row	2-5/8	558	6.3	27205	16.52	1.55	775	1.3	650	4.2	.61	22.3
#5 - 6 Row	2-1/4	643	6.1	25843	16.56	1.74	870	1.1	550	4.2	.61	21.2
AVERAGE	2-1/4	642	7.3	26418	16.62	1.75	875	2.2	1100	4.3	.61	21.6
#6 - 4 Row	2-1/4	572	8.5	18748	16.13	0.75	375	0.1	50	4.3	.41	22.9
#7 - 4 Row	2-1/8	795	7.6	19166	15.98	0.52	260	0.2	100	4.2	.41	23.4
#8 - 4 Row	2-1/4	692	5.4	13519	16.22	1.75	875	1.6	800	4.2	.41	23.8
AVERAGE	2-1/4	686	7.2	19144	16.11	1.01	505	0.6	300	4.2	.41	23.4

Averages:
Weights - 3 runs per machine
Tare - 4 per load (total of 12 samples)
% Sugar - 4 per load (total of 12 samples)
Loises - 3 per run (total of 9 samples)
Depth - 3 per run (total of 9 samples)
Harvest loss & root loss were based on three samples of .002 acres each.

JNW/pad
9/15/87

Table 1. Southern Minnesota Sugar Cooperative combined harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	150	10168	2.3	3.5	5.8	2.0	6.4	3.6	10.2
Hesston	4	57	3155	3.3	3.7	7.0	1.0	6.7	2.8	21.2
Hesston w/ Scrubber	4	20	1349	2.5	3.5	6.0	2.3	4.8	4.8	7.5
Hesston w/ Ferris Wheel	4	8	716	2.3	3.4	5.7	2.4	4.1	4.2	6.8
John Deere	4	42	2932	2.8	3.8	6.6	2.5	7.4	4.4	13.2
John Deere Wheel Converted	4	4	246	2.3	3.8	6.0	2.8	5.3	4.7	8.3
Loftness	4	1	124	3.1	3.1	6.2	3.1	3.1	6.2	6.2
WIC	4	28	2823	2.8	3.7	6.5	2.4	5.3	4.3	8.6
FarmHand	4	19	1605	2.7	3.7	6.4	2.6	5.8	4.4	9.3
	Total		23119	2.6	3.6	6.2	2.1	6.2	3.9	11.5
Heath	6	225	17714	2.1	3.3	5.4	2.0	5.0	3.3	8.5
Hesston	6	7	490	2.6	3.5	6.0	2.9	4.8	4.5	7.8
Hesston w/ Scrubber	6	2	111	2.1	3.4	5.5	2.9	3.9	4.8	6.2
John Deere	6	58	5279	2.3	3.5	5.8	1.7	5.1	3.9	8.3
WIC	6	87	9037	2.1	3.5	5.6	1.9	5.1	3.4	8.1
Red River Special	6	19	1602	2.3	3.3	5.6	2.2	4.7	4.0	7.5
FarmHand	6	12	1463	2.5	3.7	6.3	2.9	5.3	5.0	8.1
FarmHand w/ Scrubber	6	4	428	2.0	3.9	5.9	3.3	4.5	5.5	6.3
	Total		36123	2.2	3.4	5.6	2.0	5.0	3.6	8.3
	Grand Total		59242							

Table 2. Renville harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	37	2244	2.7	3.6	6.3	2.2	6.4	3.9	10.2
Hesston	4	13	593	5.5	4.3	9.8	2.7	6.7	5.6	21.2
Hesston w/ Scrubber	4	19	1324	2.5	3.5	6.0	2.3	4.8	4.8	7.5
Hesston w/ Ferris Wheel	4	8	716	2.3	3.4	5.7	2.4	4.1	4.2	6.8
John Deere	4	2	190	3.1	3.6	6.7	3.1	4.1	5.8	7.6
WIC	4	18	1667	2.9	3.7	6.5	2.4	4.8	4.3	8.0
FarmHand	4	10	886	2.8	3.9	6.6	2.9	5.8	5.1	9.3
	Total		7621	2.9	3.6	6.6	2.4	5.5	4.5	9.6
Heath	6	55	4177	2.3	3.3	5.6	2.0	4.6	3.8	7.8
John Deere	6	11	1173	2.3	3.4	5.7	2.3	4.3	4.1	7.4
WIC	6	25	2932	2.3	3.5	5.8	2.4	4.8	4.1	8.1
Red River Special	6	18	1566	2.3	3.3	5.6	2.2	4.7	4.0	7.5
FarmHand	6	12	1463	2.5	3.7	6.3	2.9	5.3	5.0	8.1
	Total		11311	2.3	3.4	5.7	2.3	4.7	4.1	7.9
	Grand Total		18931							

Table 3. Bird Island harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	1	101	2.9	3.7	6.6	3.7	3.7	6.6	6.6
Hesston	4	2	104	3.5	3.4	6.8	2.9	3.8	5.8	7.9
John Deere	4	5	327	2.4	3.2	5.6	2.5	4.2	4.8	6.8
John Deere Wheel Converted	4	4	246	2.3	3.8	6.0	2.8	5.3	4.7	8.3
WIC	4	2	363	2.6	3.1	5.6	2.9	3.2	5.5	5.7
FarmHand	4	3	315	2.4	3.4	5.7	2.6	4.6	4.4	7.9
	Total		1456	2.5	3.3	5.9	2.8	4.2	5.1	7.1
Heath	6	22	1501	2.2	3.5	5.7	2.6	5.0	4.3	8.5
Hesston	6	4	349	2.9	3.7	6.6	3.1	4.8	5.9	7.8
Hesston w/ Scrubber	6	2	111	2.1	3.4	5.5	2.9	3.9	4.8	6.2
John Deere	6	20	1661	2.4	3.6	6.1	2.6	5.1	4.7	8.3
WIC	6	24	2569	1.9	3.2	5.1	1.9	4.7	3.4	8.0
	Total		6191	2.2	3.4	5.6	2.3	4.9	4.1	8.1
	Grand Total		7647							

Table 4. Hector harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	23	1581	2.1	3.3	5.4	2.5	4.3	4.0	7.6
Hesston	4	21	1196	2.3	3.1	5.4	2.5	3.9	4.4	6.8
John Deere	4	7	674	2.8	4.0	6.8	2.8	7.4	4.4	13.2
Loftness	4	1	124	3.1	3.1	6.2	3.1	3.1	6.2	6.2
WIC	4	3	244	2.8	4.0	6.8	3.3	4.6	5.5	7.9
FarmHand	4	5	336	2.8	3.6	6.4	2.7	4.0	4.9	7.2
	Total		4155	2.4	3.4	5.8	2.6	4.6	4.4	8.2
Heath	6	33	2852	1.9	3.1	5.0	2.2	4.2	3.3	6.9
Hesston	6	3	141	2.2	3.1	5.3	2.9	3.3	4.5	5.8
John Deere	6	26	2059	2.3	3.4	5.6	1.7	4.7	3.9	7.3
WIC	6	9	780	1.9	3.5	5.4	2.9	4.1	4.5	6.4
	Total		5832	2.0	3.2	5.3	2.1	4.3	3.7	6.9
	Grand Total		9987							

Table 5. Clara City East harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	29	1983	2.1	3.8	5.8	2.3	4.9	4.3	7.1
Hesston	4	2	111	2.5	4.6	7.1	4.1	5.0	6.5	7.7
Hesston w/ Scrubber	4	1	25	1.9	3.6	5.5	3.6	3.6	5.5	5.5
John Deere	4	9	713	2.5	4.0	6.4	3.2	5.3	4.9	9.8
FarmHand	4	1	68	2.4	4.3	6.7	4.3	4.3	6.7	6.7
	Total		2900	2.2	3.9	6.0	2.6	5.0	4.6	7.8
Heath	6	3	175	2.4	4.0	6.4	2.9	4.6	4.6	7.2
WIC	6	8	600	2.2	4.3	6.4	2.9	5.1	5.1	7.6
FarmHand w/ Scrubber	6	4	428	2.0	3.9	5.9	3.3	4.5	5.5	6.3
	Total		1203	2.1	4.1	6.2	3.0	4.8	5.2	7.1
	Grand Total		4103							

Table 6. Clara City West harvester results 1987.

Harvester	No. Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Avg. % Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
John Deere	4	6	416	3.3	4.1	7.3	2.7	6.1	5.1	11.1
Total			416							
Heath	6	17	1509	2.0	3.3	5.3	2.2	4.8	3.9	7.3
WIC	6	9	1050	2.2	3.7	5.9	3.0	4.9	4.9	7.0
Total			2559	2.1	3.5	5.5	2.5	4.8	4.3	7.1
Grand Total			2975							

Table 7. Murdock harvester results 1987.

Harvester	No. Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Avg. % Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	9	532	2.1	3.0	5.1	2.3	3.7	4.3	6.7
Total			532							
Heath	6	54	4498	2.2	3.3	5.5	2.5	4.9	4.3	7.5
John Deere	6	1	386	2.2	3.1	5.3	3.1	3.1	5.3	5.3
WIC	6	1	214	2.6	4.2	6.8	4.2	4.2	6.8	6.8
Red River Special	6	1	36	2.0	3.5	5.5	3.5	3.5	5.5	5.5
Total			5134	2.2	3.3	5.6	2.6	4.7	4.5	7.3
Grand Total			5665							

Table 8. Maynard harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	27	1937	2.2	3.7	5.9	2.5	4.9	4.3	8.5
Hesston	4	9	426	2.5	3.5	5.9	1.0	4.6	2.8	7.2
John Deere	4	13	613	2.9	3.7	6.6	2.6	6.5	4.4	10.9
	Total		2975	2.4	3.7	6.1	2.3	5.2	4.1	8.8
Heath	6	22	1693	1.9	3.2	5.1	2.1	4.6	3.9	6.8
	Total		1693							
	Grand Total		4668							

Table 9. Milan harvester results 1987.

Harvester	Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	18	1284	2.5	3.5	6.0	2.0	5.2	3.6	9.1
Hesston	4	10	725	3.4	4.2	7.6	3.4	5.7	5.6	12.5
	Total		2009	2.8	3.7	6.6	2.5	5.4	4.4	10.3
Heath	6	19	1310	1.9	3.2	5.0	2.1	3.9	3.6	6.0
WIC	6	7	512	1.9	3.3	5.3	2.4	3.9	3.9	6.4
	Total		1822	1.9	3.2	5.1	2.2	3.9	3.7	6.1
	Grand Total		3831							

Table 10. Redwood Falls harvester results 1987.

Harvester	No. Rows	No. Fields	No. Acres	Avg. % 1st Dirt	Avg. % Tare	Total Dirt	% Tare Range Low	% Tare Range High	Total Dirt Range Low	Total Dirt Range High
Heath	4	6	507	1.6	3.2	4.8	2.5	4.0	4.2	5.5
WIC	4	5	549	2.6	4.1	6.7	3.5	5.3	5.7	8.6
	Total		1056	2.1	3.7	5.8	3.0	4.7	5.0	7.1
WIC	6	4	380	2.2	3.7	5.8	3.5	3.8	5.6	6.1
	Total		380							
	Grand Total		1436							