1986 Research Report
SMBSC

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Southern Minnesota Beet Sugar Company
SMBSC

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INTRODUCTION

This Research Report is a summary of the research programs conducted by SMSC Agricultural Department for growers in the SMSC sugarbeet growing area. The coded variety trials were conducted by the American Crystal Sugar Research Center in cooperation with SMSC.

As margins between profit and loss become smaller, the sugarbeet grower must exercise his production options timely and wisely. The objectives of the research reported in this booklet were intended to increase the overall information on various production inputs so that growers may maximize root yields and still maintain a high level of beet quality.

The average slice per day at SMSC has increased significantly over the past five years. The Cooperative has also experienced a general increase in percent sucrose during this period. Record highs for root yield and percent sugar were established on the 1985 crop (21.7 tons per acre and 16.2% sugar).

There are several advantages for the Cooperative to have a campaign length of 150-170 days or 1,200,000 - 1,375,000 harvested net tons. In order to achieve maximum extraction and minimize losses during storage on this length of campaign, several factors of production must be accomplished in the field:

1. Proper balance of all plant nutrients.
2. Regulation of available nitrates late in the growing season.
3. Develop high levels of beet quality in early September.
4. Maintain optimum level of beet population at harvest.
5. Effective disease control.

6. Proper selection of varieties.
7. Exercise care during harvest in order to deliver clean, unfrozen beets for storage.

The observations and conclusions reported herein are to supplement prior information discussed in the annual 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 Summary - 1986

1. Variety Evaluations. A total of 18 varieties are available to SMSC for use in 1987. In addition, two special varieties are approved for use in areas with high root rot potential. One variety was approved for test market because of the relatively high recoverable sugar per acre and per ton based on data from 1985 and 1986.

2. Date of Harvest. A summary of data from 1985 and 1986 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. Pelleted Sugarbeet Seed. The data for one year only and two locations indicate that the two seed coatings evaluated on two varieties showed no improvement in emergence or stand establishment over bare seed.

4. Late Season Foliar Nitrogen. Foliar nitrogen applied in early August showed no improvement in root yield. There was no significant decrease in beet quality; however, previous results generally show late applications of nitrogen significantly increase the impurity levels and decrease percent extraction.

5. Root Rot Soil Samples. Sixteen beet fields were sampled at the 6-inch depth to determine possible differences in soil nutrients or pH from areas infected with root rots. There was a general tendency for soil pH levels to be more acidic in areas where root rot occurred.

6. Disease Index Summary. A Cercospora leaf spot model was used to determine relative activity of the 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 active.

7. Chlorine Studies. Two sources of chlorine were spring applied to determine possible increased tolerance of sugarbeets to root rots. No apparent benefits could be measured by addition of 50 and 100 lbs. of chlorine.

8. Fungicide Applications Based on Model. Fungicides were applied on a calender basis and intervals based on the disease model. Leaf spot was not a significant problem in 1986, so no conclusions could be drawn on this test. Further evaluation of the model will continue in 1987.

9. Weather Data for 1986. Rainfall was considerably above average for the entire growing season as measured at five official weather stations. A high of 33 inches was recorded at Willmar between April and November. The lowest temperatures recorded during harvest occurred on October 13 and 14.

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Coded Variety Trial

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Seed was furnished by American Crystal, Betaseed, Bush Johnson, Mitsui, Maribo, Mono-Hy Seed and Hilleshog. Pelleted seeds were supplied by Germain and Seed Koat, Inc.

Planned Research for 1987

Many factors affect sugarbeet production and obtaining an optimum yield. Leaf spot, root rot, weeds, insects, nitrogen management, and planting date can greatly affect yield. Research for the 1987 growing season will be geared to address many of the problems associated to the SMSC growing area.

Root rot disease is a major thrust of the program with experiments involving soil moisture, soil fumigation, pH adjustment, herbicide interactions, compaction, sulfur, seed treatments, resistant varieties, and tillage. Weeds continue to be a major problem and various herbicides will be evaluated in 1987. Nitrogen trials will be initiated to evaluate split and foliar applications on yield and quality. Fungicide experiments will be used again to evaluate the Cercospora leaf spot model.

VARIETY EVALUATIONS - SOUTHERN MINNESOTA SUGAR COOPERATIVE (SMSC)

For 1987, SMSC has 18 fully approved varieties, two special varieties which offer some resistance to seedling diseases and one test market variety. Relative performance summaries for these varieties are shown in Tables 1 - 3.

Three-year summaries of all varieties tested in SMSC commercial coded trials for 1986 are shown in Table 4. Semi-commercial coded trials are summarized in Table 5. Leaf spot ratings are presented in Tables 6 and 7.

Table 8 gives the list of approved varieties for SMSC since 1980. BJ Monofort is the only variety remaining in 1987 from the 1980 list. Seventeen varieties which were formerly on the approved list are no longer approved for SMSC. Seven new varieties were added to the approved list for the first time in 1987.

Additionally, special varieties are approved for special conditions, i.e., increased tolerance to leaf spot, seedling diseases or root aphids. These special varieties are generally below the minimum standards in recoverable sugar per acre or recoverable sugar per ton and therefore use is limited to small areas within the Cooperative.

VARIETY APPROVAL POLICY

The current policy for the Cooperative for approval of varieties is as follows:

a. For a variety to remain on the approved list, it must equal or exceed 97% of the 3-year mean of approved varieties for both recoverable sugar per ton and recoverable sugar per acre.

b. For a new variety to be considered for approval, it must exceed the poorest approved variety for recoverable sugar per acre and recoverable sugar per ton.

c. Average Cercospora leaf spot rating must be at or lower than 110% of the mean of approved varieties with an average maximum rating not to exceed 5.3 on a 1-9 rating system.

d. The total amount of all seed that may be issued under the test market status shall not exceed 10% of the total seed usage.

Southern Minnesota Sugar Cooperative
List of Approved Varieties for 1987

Table 1. Three year performance summary of varieties evaluated at SMSC, 1984-1986.

Variety	Recov. Sugar/Acre	Recov. Sugar/Ton	Leaf Spot Rating*	Tons/Acre	% Sugar	Seedling Vigor*	Est. Grower Return/Ton
ACS ACH 164	7713	303.9	4.89	25.4	16.9	1.3	36.93
Betaseed 1230	7899	294.7	4.78	26.9	16.4	2.0	35.18
5494	7651	306.9	4.40	25.0	16.9	1.7	36.93
6264	7704	300.3	4.58	25.8	16.7	1.7	36.23
BJ Monofort	7798	290.3	5.02	27.0	16.3	1.3	34.83
1310	7505	300.5	3.83	24.9	16.7	1.8	36.23
Hilleshog 4046	7827	303.2	5.04	26.0	16.9	1.8	36.93
5090	7768	301.7	4.58	25.8	16.8	1.5	36.58
5135	8072	311.4	4.93	26.0	17.2	1.6	37.98
KW 1132	7775	297.4	4.82	26.3	16.5	1.6	35.53
3265	8068	296.1	4.86	27.3	16.4	1.5	35.18
3394	7829	301.5	4.88	26.1	16.8	1.5	36.58
Maribo Ultramono	7655	301.0	4.89	25.5	16.8	1.2	36.58
403	7876	301.2	4.84	26.2	16.8	1.3	36.58
Mitsui Monohikari	7728	301.5	4.56	25.6	16.6	2.2	35.88
Mono Hy M7	7603	290.7	4.68	26.3	16.3	1.4	34.83
R103	7648	303.2	4.14	25.3	16.9	1.7	36.93
R117	7631	301.2	4.50	25.4	16.8	2.2	36.58
Specialty Varieties							
ACS ACH 146	7371	299.3	4.39	24.7	16.7	1.7	36.23
176	7292	308.1	4.16	23.7	17.1	1.9	37.63
Test Market							
Betaseed 3614	(7663)	(314.8)	(4.77)	(24.4)	(17.1)	(1.3)	(37.63)

*Lower numbers indicate better resistance to leaf spot and seedling vigor.

() Data for 2 years only.

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Table 2 Percent field emergence corrected for twins, doubles, and triples obtained in lab germination tests.

Variety	2 Locations 1986	3 Locations 1985	3 Locations 1984	3-year Mean
Approved Varieties-1986				
ACH 146	56.3	64.7	65.2	62.1
164	61.9	70.1	60.6	64.2
Betaseed 1230	59.5	60.3	60.9	60.2
6264	62.6	65.2	55.1	61.0
B J Monofort	71.3	72.0	61.2	68.2
1310	63.8	62.8	-	(63.3)
K W 1132	63.3	61.8	59.3	61.5
3394	65.0	62.0	62.4	63.1
3265	62.7	62.0	65.0	63.2
Maribo Ultramono	62.9	67.5	61.7	64.0
403	56.7	67.2	62.1	62.0
Mono Hy M7	73.3	71.5	61.7	68.8
MEAN OF APPROVED	63.3	65.6	61.4	63.5
Candidate Varieties (Tested 3 years)				
ACH 176	53.3	64.3		
Beta 5494	59.5	-		
Hilleshog 4046	65.9	63.2		
5090	66.7	70.0		
5135	67.7	66.3		
Mitsui Monohikari	73.1	70.9		
Mono Hy R103	68.1	62.2	56.7	
R117 (82TMS4798)	73.6	-		

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SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties for 1987

Table 3 — % of Mean of Approved Varieties

Variety	Recov Sugar/A	Recov Sugar/T	Leaf Spot Rating*	Tons/ Acre	% Sugar	Seedling Vigor*	Est Grower Return/Ton
ACH 164	99.3	101.2	104.5	97.9	101.2	80.0	101.9
Betaseed 1230	101.7	98.1	102.2	103.7	98.2	122.9	97.0
5494	98.5	102.2	94.0	96.4	101.2	104.4	101.9
6264	99.2	100.0	97.9	99.5	100.0	104.4	99.9
BJ Monofort	100.4	96.6	107.3	104.1	97.6	80.0	96.1
1310	96.7	100.0	81.9	96.0	100.0	110.6	99.9
Hilleshog 4046	100.8	100.9	107.7	100.3	101.2	110.6	101.9
5090	100.0	100.4	97.9	99.5	100.6	92.1	100.9
5135	104.0	103.7	105.4	100.3	102.9	98.3	104.8
KW 1132	100.1	99.0	103.0	101.4	98.8	98.3	98.0
3265	103.9	98.6	103.9	105.3	98.2	92.1	97.0
3394	100.8	100.4	104.3	100.6	100.6	92.1	100.9
Maribo Ultramono	98.6	100.2	104.5	98.3	100.6	73.7	100.9
403	101.4	100.3	103.4	101.0	100.6	80.0	100.9
Mitsui Monohikari	99.5	100.4	97.5	98.7	99.4	135.1	99.0
Mono-Hy M7	97.9	96.8	100.0	101.4	97.6	86.0	96.1
R103	98.5	100.9	88.5	97.6	101.2	104.4	101.9
R117	98.3	100.3	96.2	97.9	100.6	135.1	100.9
MEAN	7764	300.4	4.68	25.9	16.7	1.6	36.25

*Lower numbers indicate better resistance to leaf spot and seedling vigor.

Table 4

Three Year Performance Summary of 1986 SMSC Commercial Coded Entries
Three Locations

Variety	Recoverable Sugar / Ton 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86	Recoverable Sugar / Acre 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86	Loss to Molasses 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86
ACS ACH 146	305.9	296.7	295.2	296.0	299.3	99.4	7599	8419	6094	7257	7371	95.4	1.57	1.68	1.41	1.55	1.55	105.3
ACS ACH 164	305.5	304.0	302.2	303.1	303.9	100.9	8091	9007	6042	7525	7713	99.8	1.53	1.54	1.37	1.46	1.48	100.3
ACS ACH 176	308.0	306.7	309.6	308.2	308.1	102.3	7519	8734	5622	7178	7292	94.3	1.49	1.56	1.31	1.44	1.45	98.5
ACS ACH 178		306.9	311.6	309.3				8823	6103	7463				1.59	1.33	1.46		
ACS ACH 180		299.6	307.1	303.3				8711	6222	7467				1.63	1.34	1.49		
Beta 1230	295.7	288.8	299.6	294.2	294.7	97.9	8255	9179	6263	7721	7899	102.2	1.58	1.57	1.31	1.44	1.49	100.8
Beta 3614 (614)		317.5	312.0	314.8				9248	6078	7663				1.44	1.24	1.34		
Beta 5494 (594)	306.4	303.5	311.0	307.2	306.9	101.9	8158	8714	6082	7398	7651	99.0	1.43	1.51	1.23	1.37	1.39	94.3
Beta 6264	299.7	296.9	304.4	300.7	300.3	99.7	8087	8796	6228	7512	7704	99.7	1.50	1.55	1.29	1.42	1.45	98.1
Beta 6625 (625)		320.7	321.3	321.0				8410	6264	7337				1.46	1.24	1.35		
Bush Johnson 1310	301.7	307.9	291.8	299.9	300.5	99.8	7658	8613	6244	7429	7505	97.1	1.52	1.48	1.32	1.40	1.44	97.6
Bush Johnson Monofort	284.2	291.3	295.5	293.4	290.3	96.4	7859	9253	6283	7768	7798	100.9	1.67	1.57	1.39	1.48	1.54	104.6
Hilleshog 4046	314.9	291.6	303.2	297.4	303.2	100.7	7825	9236	6421	7829	7827	101.3	1.55	1.61	1.37	1.49	1.51	102.4
Hilleshog 5090	305.4	297.5	302.2	299.9	301.7	100.2	8110	8839	6356	7598	7768	100.5	1.57	1.56	1.34	1.45	1.49	101.0
Hilleshog 5135	314.7	308.7	310.9	309.8	311.4	103.4	8313	9470	6433	7952	8072	104.4	1.53	1.49	1.35	1.42	1.46	98.8
KW 1014 (314)		296.3	308.6	302.5				9048	6233	7641				1.61	1.28	1.45		
KW 1132	300.3	291.9	299.9	295.9	297.4	98.8	8071	8847	6407	7627	7775	100.6	1.52	1.59	1.28	1.44	1.46	99.2
KW 3265 (332)	295.4	292.8	300.0	296.4	296.1	98.3	8431	9314	6459	7887	8068	104.4	1.50	1.54	1.26	1.40	1.43	97.2
KW 3394	299.8	299.3	305.4	302.4	301.5	100.1	7905	9271	6310	7791	7829	101.3	1.57	1.55	1.32	1.44	1.48	100.3
Maribo 403	305.4	295.4	302.8	299.1	301.2	100.0	8386	9083	6159	7621	7876	101.9	1.53	1.54	1.42	1.48	1.50	101.5
Maribo 411	309.4	311.4	307.2	309.3	309.3	102.7	8018	9426	6278	7852	7907	102.3	1.53	1.53	1.34	1.44	1.47	99.4
Maribo 851		292.9	302.2	297.5				8962	6034	7498				1.63	1.38	1.51		
Maribo 861			308.9						6169						1.34			
Maribo Ultramono	302.1	298.0	302.8	300.4	301.0	100.0	7956	8932	6076	7504	7655	99.0	1.55	1.62	1.35	1.49	1.51	102.1
Mitsui Monohikari	301.9	302.9	299.6	301.3	301.5	100.1	8185	9613	5386	7500	7728	100.0	1.40	1.36	1.26	1.31	1.34	90.9
Mono-Hy 2601			308.5						6096						1.38			
Mono-Hy 2602			296.7						5680						1.25			
Mono-Hy M7	286.4	290.8	294.9	292.9	290.7	96.5	7699	8660	6450	7555	7603	98.4	1.64	1.64	1.37	1.51	1.55	105.1
Mono-Hy R103	311.0	298.4	300.2	299.3	303.2	100.7	7713	9010	6222	7616	7648	98.9	1.51	1.62	1.38	1.50	1.50	101.9
Mono-Hy R117(82TMS4798)	305.9	304.7	293.0	298.8	301.2	100.0	7635	8933	6324	7629	7631	98.7	1.52	1.54	1.39	1.47	1.48	100.6
Mean	302.8	300.5	303.6	302.0	301.1	100.0	7975	8983	6167	7586	7730	100.0	1.53	1.56	1.33	1.44	1.48	100.0

Three Year Performance Summary of 1986 SMSC Commercial Coded Entries
Three Locations

Variety	Sugar Content (%) 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86	Root Yield (Tons / Acre) 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86	Seedling Vigor Rating 1984	1985	1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86
ACS ACH 146	17.47	16.51	16.18	16.3	16.7	99.9	24.82	28.43	20.79	24.6	24.7	95.9	1.75	1.69	1.77	1.7	1.7	106.7
ACS ACH 164	17.40	16.74	16.48	16.6	16.9	100.8	26.45	29.67	20.08	24.9	25.4	98.7	1.35	1.17	1.50	1.3	1.3	82.3
ACS ACH 176	17.49	16.90	16.79	16.8	17.1	102.0	24.35	28.51	18.24	23.4	23.7	92.1	1.99	1.39	2.24	1.8	1.9	115.1
ACS ACH 178		16.94	16.91	16.9				28.82	19.71	24.3				1.30	1.08	1.2		
ACS ACH 180		16.64	16.69	16.7				29.16	20.37	24.8				1.29	2.01	1.6		
Beta 1230	16.97	16.01	16.29	16.2	16.4	98.2	27.92	31.90	21.01	26.5	26.9	104.7	1.76	1.77	2.39	2.1	2.0	121.2
Beta 3614 (614)		17.32	16.84	17.1				29.15	19.56	24.4				1.14	1.50	1.3		
Beta 5494 (594)	17.35	16.71	16.78	16.7	16.9	101.3	26.56	28.82	19.65	24.2	25.0	97.2	1.41	2.11	1.56	1.8	1.7	104.1
Beta 6264	17.08	16.39	16.51	16.5	16.7	99.6	26.93	29.71	20.64	25.2	25.8	100.1	1.91	1.35	1.83	1.6	1.7	104.2
Beta 6625 (625)		17.53	17.31	17.4				26.30	19.68	23.0				2.06	1.52	1.8		
Bush Johnson 1310	17.21	16.87	15.91	16.4	16.7	99.6	25.31	27.92	21.47	24.7	24.9	96.7	1.93	1.92	1.64	1.8	1.8	112.5
Bush Johnson Monofort	16.48	16.14	16.17	16.2	16.3	97.2	27.67	31.77	21.45	26.6	27.0	104.7	1.39	1.21	1.39	1.3	1.3	81.7
Hilleshog 4046	17.90	16.19	16.53	16.4	16.9	100.8	24.82	31.73	21.32	26.5	26.0	100.8	1.69	1.96	1.67	1.8	1.8	109.0
Hilleshog 5090	17.43	16.44	16.45	16.4	16.8	100.2	26.54	29.81	21.19	25.5	25.8	100.4	1.80	1.31	1.39	1.4	1.5	92.2
Hilleshog 5135	17.87	16.93	16.90	16.9	17.2	103.0	26.38	30.76	20.85	25.8	26.0	101.0	1.65	1.78	1.46	1.6	1.6	100.1
KW 1014 (314)		16.45	16.71	16.6				30.63	20.30	25.5				1.81	1.64	1.7		
KW 1132	17.18	16.19	16.27	16.2	16.5	98.9	26.88	30.41	21.55	26.0	26.3	102.1	1.64	1.35	1.76	1.6	1.6	97.3
KW 3265 (332)	16.87	16.18	16.26	16.2	16.4	98.2	28.51	31.89	21.45	26.7	27.3	106.0	1.39	1.44	1.67	1.6	1.5	92.2
KW 3394	17.16	16.51	16.59	16.6	16.8	100.1	26.34	31.03	20.85	25.9	26.1	101.3	1.61	1.49	1.48	1.5	1.5	93.8
Maribo 403	17.40	16.31	16.56	16.4	16.8	100.1	27.46	30.74	20.51	25.6	26.2	101.9	1.26	1.09	1.54	1.3	1.3	79.7
Maribo 411	17.60	17.12	16.70	16.9	17.1	102.4	25.86	30.29	20.54	25.4	25.6	99.3	1.26	1.00	1.24	1.1	1.2	71.6
Maribo 851		16.29	16.49	16.4				30.68	20.04	25.4				1.17	1.07	1.1		
Maribo 861			16.79						20.10						1.00			
Maribo Ultramono	17.26	16.52	16.49	16.5	16.8	100.1	26.31	29.98	20.18	25.1	25.5	99.0	1.26	1.00	1.37	1.2	1.2	74.3
Mitsui Monohikari	17.09	16.50	16.24	16.4	16.6	99.3	27.06	31.72	18.05	24.9	25.6	99.5	2.20	2.08	2.46	2.3	2.2	138.1
Mono-Hy 2601			16.81						19.90						1.63			
Mono-Hy 2602			16.09						19.20						2.54			
Mono-Hy M7	16.55	16.18	16.12	16.2	16.3	97.3	26.84	29.86	22.11	26.0	26.3	102.0	1.42	1.44	1.33	1.4	1.4	85.8
Mono-Hy R103	17.66	16.54	16.39	16.5	16.9	100.8	24.74	30.21	20.98	25.6	25.3	98.3	1.91	1.77	1.30	1.5	1.7	102.0
Mono-Hy R117(82TMS4798)	17.41	16.81	16.04	16.4	16.8	100.1	24.91	29.45	21.72	25.6	25.4	98.5	2.82	2.53	1.30	1.9	2.2	136.2
Mean	17.28	16.59	16.51	16.5	16.7	100.0	26.32	29.98	20.45	25.3	25.7	100.0	1.69	1.54	1.61	1.6	1.6	100.0

Table 5

COMBINED ANALYSIS

SOUTHERN MINN SEMI COMMERCIAL CODED TEST

All Locations 1986 PAGE 1

AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

29 varieties 19 repsXlocs 3 tests combined

VARIETY	CODE	Rec. lbs/T	Rec. lbs/A	Loss to Mol.	Sugar %	Yield T/A
ACS C84-239	158	306.9(101.0)	6584(101.7)	1.41(104.3)	16.76(101.3)	21.58(100.6)
KW 2915 (315)	159	307.2(101.1)	6569(101.5)	1.24(91.6)	16.60(100.3)	21.51(100.3)
Maribo 864	160	299.5(98.6)	6516(100.7)	1.39(102.7)	16.36(98.9)	21.94(102.2)
Bush Johnson 1322	161	297.8(98.0)	6353(98.2)	1.44(106.0)	16.32(98.7)	21.46(100.0)
ACH 181	162	303.3(99.8)	6548(101.2)	1.39(102.4)	16.55(100.1)	21.73(101.3)
ACH 189	163	312.0(102.7)	6038(93.3)	1.39(102.8)	16.99(102.7)	19.46(90.7)
KW 1286	164	309.2(101.8)	6918(106.9)	1.35(99.3)	16.80(101.6)	22.43(104.5)
Mono-Hy 2603	165	304.9(100.4)	6572(101.5)	1.33(98.0)	16.57(100.2)	21.69(101.1)
Maribo Ultramono (check)	166	303.0(99.7)	6561(101.4)	1.38(102.1)	16.53(99.9)	21.84(101.8)
Hilleshog 8277	167	305.8(100.7)	6257(96.7)	1.37(101.3)	16.66(100.7)	20.60(96.0)
Beta 6186	168	298.7(98.3)	6494(100.3)	1.40(103.6)	16.34(98.7)	21.92(102.2)
ACH 185	169	314.8(103.6)	6057(93.6)	1.34(98.7)	17.08(103.2)	19.35(90.2)
Maribo 862	170	312.0(102.7)	6427(99.3)	1.35(99.7)	16.95(102.4)	20.78(96.8)
Hilleshog 5167	171	300.4(98.9)	6641(102.6)	1.37(101.1)	16.39(99.1)	22.22(103.6)
ACS C84-232	172	312.3(102.8)	6359(98.2)	1.29(95.0)	16.90(102.2)	20.42(95.2)
KW 3145 (335)	173	300.3(98.9)	6596(101.9)	1.32(97.8)	16.34(98.8)	22.01(102.6)
Maribo 868	174	289.5(95.3)	6248(96.5)	1.43(105.4)	15.90(96.1)	21.71(101.2)
Mono-Hy 2605	175	294.3(96.9)	6186(95.6)	1.43(105.9)	16.15(97.6)	21.18(98.7)
Beta 5516	176	304.4(100.2)	6036(93.3)	1.30(96.3)	16.52(99.9)	19.94(92.9)
Beta 5315 (515)	177	307.7(101.3)	6012(92.9)	1.24(91.7)	16.62(100.5)	19.68(91.7)
Maribo 867	178	305.0(100.4)	6235(96.3)	1.36(100.4)	16.61(100.4)	20.57(95.9)
Beta 6269 (615)	179	314.8(103.6)	6619(102.3)	1.27(93.4)	17.00(102.8)	21.19(98.8)
Beta 1230 (check)	180	295.2(97.2)	6615(102.2)	1.37(100.8)	16.13(97.5)	22.61(105.4)
Beta 5266	181	297.2(97.8)	7514(116.1)	1.39(102.4)	16.25(98.2)	25.39(118.4)
Maribo 869	182	309.0(101.7)	6478(100.1)	1.36(100.5)	16.81(101.6)	21.15(98.6)
Hilleshog 8291	183	301.6(99.3)	6744(104.2)	1.32(97.7)	16.40(99.1)	22.51(104.9)
KW 3265 (check)	184	299.8(98.7)	6664(103.0)	1.31(96.5)	16.30(98.5)	22.43(104.6)
Mono-Hy 2604	185	301.8(99.3)	6535(101.0)	1.37(101.1)	16.46(99.5)	21.82(101.7)
Mono-Hy 2606	186	302.1(99.4)	6326(97.7)	1.37(101.5)	16.48(99.6)	21.07(98.2)

	Rec. lbs/T	Rec. lbs/A	Loss to Mol.	Sugar %	Yield T/A
General Mean Across Varieties	303.81	6472.44	1.35	16.54	21.45
Coeff. of Var. (%)	3.03	7.39	8.32	2.39	7.61
Variety Mean Square	748.14	1706423.00	0.05	1.58	26.10
Error Mean Square (Error B)	84.10	229553.10	0.01	0.15	2.70
F Value	8.90**	7.43**	4.19**	10.17**	9.68**
L.S.D. (.05)	5.80	303.00	0.07	0.25	1.04
L.S.D. (.01)	7.41	387.65	0.09	0.32	1.33

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

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

29 varieties 19 repsXlocs 3 tests combined

VARIETY	CODE	Impurity Val.	Na ppm	K ppm	Am.N ppm
ACS C84-239	158	10354(104.3)	227(89.2)	2315(97.5)	397(121.4)
KW 2915 (315)	159	9098(91.6)	258(101.5)	2211(93.1)	281(85.9)
Maribo 864	160	10198(102.7)	317(124.8)	2410(101.5)	322(98.6)
Bush Johnson 1322	161	10528(106.0)	247(97.1)	2553(107.5)	345(105.7)
ACH 181	162	10174(102.4)	273(107.2)	2365(99.6)	348(106.5)
ACH 189	163	10205(102.8)	237(93.2)	2431(102.4)	347(106.2)
KW 1286	164	9864(99.3)	245(96.3)	2484(104.6)	294(90.0)
Mono-Hy 2603	165	9737(98.0)	238(93.5)	2425(102.2)	299(91.5)
Maribo Ultramono (check)	166	10142(102.1)	303(119.0)	2423(102.1)	318(97.4)
Hilleshog 8277	167	10056(101.3)	225(88.5)	2360(99.4)	355(108.4)
Beta 6186	168	10289(103.6)	229(90.2)	2404(101.3)	366(112.0)
ACH 185	169	9799(98.7)	213(83.8)	2231(94.0)	366(111.9)
Maribo 862	170	9901(99.7)	279(109.6)	2405(101.3)	306(93.7)
Hilleshog 5167	171	10041(101.1)	247(97.2)	2427(102.2)	327(100.0)
ACS C84-232	172	9436(95.0)	200(78.7)	2284(96.2)	319(97.4)
KW 3145 (335)	173	9708(97.8)	258(101.2)	2435(102.6)	286(87.6)
Maribo 868	174	10471(105.4)	335(131.7)	2512(105.8)	318(97.2)
Mono-Hy 2605	175	10514(105.9)	240(94.2)	2400(101.1)	387(118.3)
Beta 5516	176	9565(96.3)	262(102.9)	2233(94.1)	323(98.6)
Beta 5315 (515)	177	9105(91.7)	224(87.9)	2233(94.1)	288(88.2)
Maribo 867	178	9972(100.4)	305(119.7)	2398(101.0)	307(93.7)
Beta 6269 (615)	179	9279(93.4)	216(84.8)	2245(94.6)	307(93.8)
Beta 1230 (check)	180	10013(100.8)	279(109.6)	2449(103.2)	307(93.8)
Beta 5266	181	10173(102.4)	236(92.9)	2382(100.3)	357(109.2)
Maribo 869	182	9986(100.5)	300(118.0)	2386(100.5)	313(95.6)
Hilleshog 8291	183	9700(97.7)	212(83.5)	2389(100.6)	314(96.1)
KW 3265 (check)	184	9583(96.5)	276(108.6)	2290(96.5)	304(93.0)
Mono-Hy 2604	185	10042(101.1)	259(101.9)	2377(100.1)	336(102.8)
Mono-Hy 2606	186	10078(101.5)	238(93.5)	2388(100.6)	345(105.5)

	Impurity Val.	Na ppm	K ppm	Am.N ppm
General Mean Across Varieties	9931.44	254.43	2373.88	326.97
Coeff. of Var. (%)	8.32	25.96	4.85	17.82
Variety Mean Square	2896018.00	22506.72	146889.10	17247.43
Error Mean Square (Error B)	690777.80	4463.18	13359.24	3450.60
F Value	4.19**	5.04**	11.00**	5.00**
L.S.D. (.05)	525.31	42.23	73.05	37.13
L.S.D. (.01)	671.28	53.96	93.35	47.44

* 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

All Locations 1986

AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

29 varieties 19 repsXlocs 3 tests combined

VARIETY	CODE	Rec.Sugar %	Gr.Sugar lbs/A	Chem.Purity%	Vigor
ACS C84-239	158	91.5(99.7)	7200(102.0)	94.6(99.9)	1.15(71.7)
KW 2915 (315)	159	92.5(100.8)	7108(100.7)	95.1(100.5)	2.21(137.5)
Maribo 864	160	91.4(99.6)	7133(101.0)	94.5(99.8)	1.08(67.3)
Bush Johnson 1322	161	91.1(99.3)	6975(98.8)	94.3(99.6)	1.29(79.8)
ACH 181	162	91.6(99.8)	7156(101.4)	94.6(99.9)	2.14(133.1)
ACH 189	163	91.8(100.0)	6584(93.3)	94.7(100.0)	1.23(76.1)
KW 1286	164	92.0(100.2)	7521(106.5)	94.8(100.1)	1.70(105.7)
Mono-Hy 2603	165	91.9(100.2)	7152(101.3)	94.8(100.1)	2.46(153.0)
Maribo Ultramono (check)	166	91.5(99.8)	7171(101.6)	94.6(99.9)	1.32(82.1)
Hilleshog 8277	167	91.7(100.0)	6828(96.7)	94.7(100.0)	2.08(129.4)
Beta 6186	168	91.3(99.5)	7115(100.8)	94.4(99.7)	1.38(85.8)
ACH 185	169	92.1(100.4)	6579(93.2)	94.9(100.2)	1.23(76.1)
Maribo 862	170	92.0(100.2)	6997(99.1)	94.8(100.1)	1.30(80.6)
Hilleshog 5167	171	91.6(99.8)	7255(102.8)	94.6(99.9)	1.52(94.6)
ACS C84-232	172	92.4(100.7)	6890(97.6)	95.1(100.4)	1.93(119.8)
KW 3145 (335)	173	91.8(100.1)	7180(101.7)	94.7(100.0)	1.38(85.8)
Maribo 868	174	90.9(99.1)	6872(97.3)	94.2(99.5)	1.07(66.5)
Mono-Hy 2605	175	91.0(99.2)	6798(96.3)	94.3(99.5)	1.92(119.0)
Beta 5516	176	92.0(100.3)	6562(92.9)	94.9(100.2)	1.90(118.3)
Beta 5315 (515)	177	92.5(100.8)	6508(92.2)	95.2(100.5)	1.55(96.1)
Maribo 867	178	91.8(100.0)	6795(96.2)	94.7(100.0)	1.15(71.7)
Beta 6269 (615)	179	92.5(100.8)	7165(101.5)	95.2(100.5)	1.07(66.5)
Beta 1230 (check)	180	91.5(99.7)	7239(102.5)	94.5(99.8)	2.24(139.0)
Beta 5266	181	91.4(99.6)	8223(116.5)	94.5(99.8)	1.57(97.6)
Maribo 869	182	91.8(100.1)	7063(100.1)	94.7(100.0)	1.08(67.3)
Hilleshog 8291	183	91.9(100.1)	7345(104.0)	94.8(100.1)	1.75(108.7)
KW 3265 (check)	184	91.9(100.2)	7263(102.9)	94.8(100.1)	1.75(108.7)
Mono-Hy 2604	185	91.6(99.9)	7136(101.1)	94.6(99.9)	1.77(110.1)
Mono-Hy 2606	186	91.6(99.9)	6911(97.9)	94.6(99.9)	2.45(152.3)

	Rec.Sugar %	Gr.Sugar lbs/A	Chem.Purity%	Vigor
General Mean Across Varieties	91.75	7059.44	94.70	1.61
Coeff. of Var. (%)	0.94	7.43	0.54	31.83
Variety Mean Square	3.30	2085303.00	1.21	2.48
Error Mean Square (Error B)	0.74	276537.40	0.27	0.26
F Value	4.48**	7.54**	4.58**	9.41**
L.S.D. (.05)	0.54	332.56	0.33	0.39
L.S.D. (.01)	0.69	425.48	0.42	0.51

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

Value in parenthesis represents percent of check.
General Mean used as check.
Vigor ratings taken at Bird Island and Renville only.

Table 6

1986 Cercospora Leaf Spot Ratings for SMBSC Commercial Coded Entries
Betaseed Nursery - Shakopee, MN

Code	Entry	Average Rating at Each Date (1986)* 7/23	7/28	7/31	8/5	8/8	8/11	8/14	Mean All Ratings* 1986	2 Yr Mean 85-86	3 Yr Mean 84-86	3 Yr % Mean 84-86
74	ACS ACH 146	2.00	2.75	3.25	4.00	4.50	5.50	6.00	4.00	4.23	4.39	94.5
81	ACS ACH 164	2.25	3.25	3.75	4.75	5.75	6.75	7.25	4.82	4.75	4.89	105.3
68	ACS ACH 176	2.25	3.25	3.50	4.00	4.50	5.50	6.25	4.18	4.09	4.16	89.4
63	ACS ACH 178	2.00	3.00	3.00	4.00	5.00	5.67	6.33	4.14	4.05		
73	ACS ACH 180	2.50	4.00	4.25	4.50	5.75	6.50	7.00	4.93	4.82		
60	Beta 1230	2.25	3.50	3.75	4.50	5.50	6.75	6.75	4.71	4.64	4.78	102.7
82	Beta 3614 (614)	2.00	3.00	3.25	3.75	4.25	5.75	6.25	4.04	4.77		
65	Beta 5494 (594)	1.50	3.00	3.00	4.00	3.75	5.00	6.00	3.75	3.79	4.40	94.7
80	Beta 6264	2.00	3.00	3.50	4.00	5.25	6.00	7.00	4.39	4.50	4.58	98.6
69	Beta 6625 (625)	2.00	3.50	3.25	4.00	5.50	7.00	7.25	4.64	4.86		
70	Bush Johnson 1310	2.00	3.00	3.00	3.75	5.25	5.75	6.50	4.18	3.78	3.83	82.5
59	Bush Johnson Monofort	2.50	3.25	3.75	4.00	5.75	6.75	7.25	4.75	4.91	5.02	108.1
64	Hilleshog 4046	2.50	3.25	3.50	4.50	5.25	6.50	7.25	4.68	4.84	5.04	108.4
85	Hilleshog 5090	2.00	3.00	3.00	3.75	5.00	6.00	6.75	4.21	4.38	4.58	98.6
75	Hilleshog 5135	2.00	3.25	3.50	4.00	5.00	6.25	7.00	4.43	4.73	4.93	106.0
78	KW 1014 (314)	2.00	3.25	3.50	3.75	4.75	5.50	6.50	4.18	4.32		
62	KW 1132	2.25	3.50	4.00	4.75	5.00	6.25	7.00	4.68	4.80	4.82	103.8
61	KW 3265 (332)	2.00	3.00	3.50	3.75	5.50	6.25	6.50	4.36	4.70	4.86	104.5
72	KW 3394	2.25	3.25	3.50	4.25	5.25	6.75	7.00	4.61	4.86	4.88	105.0
79	Maribo 403	2.00	3.00	3.25	4.00	5.00	5.50	5.75	4.07	4.70	4.84	104.2
83	Maribo 411	2.25	3.00	3.00	4.75	5.25	6.00	6.75	4.43	4.61	4.82	103.7
66	Maribo 851	2.25	3.50	3.75	4.25	5.75	6.50	7.25	4.75	4.90		
87	Maribo 861	2.00	3.50	3.25	3.50	5.00	5.50	5.75	4.07			
67	Maribo Ultramono	2.50	3.75	3.75	4.50	5.75	6.50	6.75	4.79	4.82	4.89	105.3
71	Mitsui Monohikari	2.00	3.00	3.00	4.50	5.00	5.50	6.50	4.21	4.36	4.56	98.1
77	Mono-Hy 2601	2.25	3.25	3.75	4.25	5.25	6.75	7.00	4.64			
58	Mono-Hy 2602	2.50	3.75	3.75	4.50	5.50	6.25	7.00	4.75			
86	Mono-Hy M7	2.50	3.50	4.25	4.25	5.75	6.75	7.00	4.86	4.66	4.68	100.6
76	Mono-Hy R103	2.00	3.00	3.50	3.75	4.75	6.00	6.25	4.18	4.20	4.14	89.2
84	Mono-Hy R117(82TMS4798)	1.75	3.00	3.75	3.75	5.00	6.00	6.25	4.21	4.38	4.50	96.8
	Mean	2.14	3.24	3.49	4.13	5.15	6.12	6.67	4.42	4.53	4.65	100.0

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

Table 7

SMBSC Semi Commercial Coded Trials
1986 Cercospora Trial Readings *

Code	Entry	7/23	7/28	7/31	8/5	8/8	8/11	8/14	Average
		Average Rating at Each Date (1986)							
162	ACH 181	2.00	3.00	3.25	4.25	5.00	5.75	6.25	4.21
169	ACH 185	1.50	3.25	3.25	3.50	4.50	5.00	6.50	3.93
163	ACH 189	2.00	3.25	3.25	4.50	5.25	6.25	6.75	4.46
172	ACS C84-232	2.00	2.75	3.00	3.25	4.00	5.25	5.75	3.71
158	ACS C84-239	2.00	3.50	3.50	4.25	4.75	6.00	6.00	4.29
180	Beta 1230 (Check)	2.25	3.50	3.75	4.50	5.50	6.75	6.75	4.71
181	Beta 5266	2.50	3.00	3.25	4.00	5.25	6.25	7.00	4.46
177	Beta 5315 (515)	2.00	3.25	3.50	4.00	5.00	5.75	6.50	4.29
176	Beta 5516	2.00	3.00	3.25	3.75	4.75	5.75	6.25	4.11
168	Beta 6186 (633)	2.00	3.00	3.50	3.50	5.25	5.75	6.50	4.21
179	Beta 6269 (615)	2.25	3.50	4.00	4.25	5.75	6.50	7.00	4.75
161	Bush Johnson 1322	2.25	3.50	3.75	4.25	5.75	6.75	6.75	4.71
171	Hilleshog 5167	2.50	3.50	4.00	4.75	6.25	7.00	7.25	5.04
167	Hilleshog 8277	2.00	3.00	3.00	4.25	5.50	6.50	7.00	4.46
183	Hilleshog 8291	2.50	3.75	4.25	5.00	6.75	7.50	8.00	5.39
164	KW 1286	2.50	3.75	3.75	5.00	6.25	7.50	7.50	5.18
159	KW 2915 (315)	2.25	3.50	4.00	4.75	5.50	6.50	6.75	4.75
173	KW 3145 (335)	2.00	3.00	3.50	4.50	5.75	6.50	6.75	4.57
184	KW 3265 (Check)	2.00	3.00	3.50	3.75	5.50	6.25	6.50	4.36
170	Maribo 862	2.50	4.00	4.25	5.00	6.25	7.25	7.25	5.21
160	Maribo 864	2.50	3.75	4.00	5.00	6.50	6.75	7.25	5.11
178	Maribo 867	2.00	3.00	3.25	3.75	5.25	6.25	6.25	4.25
174	Maribo 868	2.00	3.00	3.00	3.75	5.00	6.00	6.50	4.18
182	Maribo 869	2.00	3.00	3.50	4.75	6.00	6.50	7.25	4.71
166	Maribo Ultramono (Check)	2.50	3.75	3.75	4.50	5.75	6.50	6.75	4.79
165	Mono-Hy 2603	3.00	4.00	4.50	5.00	6.25	7.00	7.50	5.32
185	Mono-Hy 2604	2.00	3.00	3.50	3.75	5.00	5.75	6.25	4.18
175	Mono-Hy 2605	2.25	3.00	4.00	4.25	6.00	6.75	7.25	4.79
186	Mono-Hy 2606	2.25	3.50	4.00	4.25	5.75	6.75	7.25	4.82
	General Mean	2.18	3.30	3.61	4.30	5.46	6.36	6.85	4.58

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

SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties Since 1980.

Table 8

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 30	
	Maribo Unica	ACH 145	
	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

Date of Harvest Study

Objectives:

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

Experimental Procedures

Trials were planted at three locations in 1985 and repeated at three different locations in 1986. Two locations were harvested in 1985, and one location in 1986.

The 10 varieties included in these trials were:

Mono Hy M7	Maribo Ultramono
Mono Hy R103	Maribo 403
Monohikari	ACH 164
Hilleshog 4046	KW 3265
Hilleshog 5135	KW 3394

All Varieties were planted in 4-row plots 30 feet in length and six replications. Planting dates were May 1-2 and May 28-29 for 1985 and 1986, respectively. Harvest dates were scheduled to begin about September 20 for the early date and October 20 for the late harvest. All trials were hand thinned to 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 for the two locations in 1985 are shown in tables 1,2 and 3. The average increase in root yield for all varieties was 4.4 tons per acre over the 4 week period. Average sugar content increased 2.2% over the same period.

The data for 1986 are shown in tables 4 and 5. Root yields showed only a slight increase from early to late harvest dates. Normally, all varieties will have an increase in root yield as the growing season increases in length. The abnormally wet field conditions in 1986 limited the development of the tap root and secondary feeder roots; thus, yields were considerably below average. Since the root yields in the trial do not accurately represent normal development, tonnage information will not be presented in this report. Sugar content increased an average of 2.2 % over the 4-week period.

Average deviations from percent of the mean for percent sugar and recoverable sugar per ton are shown in figures 1 and 2, respectively. Based on these data, 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 show the ability to accumulate ton and sugar mare rapidly than others. These data indicate that Mono Hy R103, Hilleshog 5135, KW 3394, Ultramono and Maribo 403 would be likely candidates for early harvest. Other varieties not included in the 10 evaluated in this study may also be 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. Comparison of varieties harvested early and late Renville MN 1985

Variety	Recov. S/A Early	Recov. S/A Late	Change	Recov. S/Ton Early	Recov. S/Ton Late	Change
Mono Hy M7	4,693	7,698	3,005	240.7	290.5	49.8
Mono Hy R103	4,719	7,968	3,249	243.6	297.3	53.7
Hilleshog 4046	5,326	8,503	3,177	247.6	292.4	44.8
Hilleshog 5135	5,937	8,884	2,947	256.5	305.1	48.6
Monohikari	5,431	8,906	3,475	247.1	297.0	49.9
KW 3394	5,406	8,642	3,236	249.4	298.0	48.6
KW 3265	5,185	8,648	3,463	240.0	293.3	53.3
Maribo Ultramono	5,658	8,249	2,591	249.3	298.2	48.9
Maribo 403	5,449	8,310	2,861	244.6	291.0	46.4
ASC ACH 164	5,331	8,310	2,979	252.1	300.7	48.6
Mean	5,314	8,412	3098	247.1	296.3	49.3
LSD (.05)	655	500		6.9	7.6	
CV %	12.3	5.9		2.8	2.6	

Table 1. Continued

Variety	Tons/Acre Early	Tons/Acre Late	Change	%Sucrose Early	%Sucrose Late	Change
Mono Hy M7	19.5	26.6	7.1	13.37	16.12	2.75
Mono Hy R103	19.4	26.8	7.4	13.59	16.47	2.88
Hilleshog 4046	21.5	29.1	7.6	13.64	16.18	2.54
Hilleshog 5135	23.1	29.2	6.1	14.09	16.77	2.68
Monohikari	21.9	30.0	8.1	13.52	16.17	2.65
KW 3394	21.6	29.1	7.5	13.74	16.41	2.67
KW 3265	21.6	29.5	7.9	13.30	16.11	2.81
Maribo Ultramono	22.6	27.6	5.0	13.76	16.46	2.70
Maribo 403	22.3	28.5	6.2	13.57	16.07	2.50
ASC ACH 164	21.0	27.7	6.7	13.92	16.52	2.60
Mean	21.4	28.4	7.0	13.65	16.33	2.68
LSD (.05)	2.4	1.8		0.32	0.33	
CV %	11.2	6.4		2.4	2.0	

Table 2. Comparison of varieties harvested early and late
Clara City MN 1985

Variety	Recov. S/A Early	Late	Change	Recov. S/Ton Early	Late	Change
Mono Hy M7	7,393	8,556	1,163	272	303	31
Mono Hy R103	7,449	8,715	1,266	286	313	27
Hilleshog 4046	7,828	9,094	1,266	283	305	22
Hilleshog 5135	7,396	9,272	1,876	274	312	38
Monohikari	7,589	9,349	1,760	284	321	37
KW 3394	7,985	9,012	1,027	286	316	30
KW 3265	8,064	9,543	1,479	278	316	38
Maribo Ultramono	7,308	8,985	1,677	283	318	35
Maribo 403	7,545	8,391	846	286	304	18
ASC ACH 164	7,585	9,340	1,755	286	320	34
Mean	7,614	9,026	1,412	282	313	31
LSD (.05)	NS	646		7	8	
CV %	8.2	6.2		3	3	

Table 2. Continued

Variety	Tons/Acre Early	Late	Change	%Sucrose Early	Late	Change
Mono Hy M7	30.8	31.9	1.1	14.9	16.7	1.8
Mono Hy R103	29.7	31.5	1.8	15.5	17.1	1.6
Hilleshog 4046	31.6	33.8	2.2	15.4	16.7	1.3
Hilleshog 5135	30.9	33.8	2.9	15.0	17.0	2.0
Monohikari	30.2	32.7	2.5	15.3	17.3	2.0
KW 3394	32.0	32.4	0.4	15.5	17.3	1.8
KW 3265	33.2	34.2	1.0	15.1	17.2	2.1
Maribo Ultramono	29.7	32.1	2.4	15.4	17.3	1.9
Maribo 403	29.9	31.7	1.8	15.5	16.7	1.2
ASC ACH 164	30.1	32.9	2.8	15.5	17.4	1.9
Mean	30.8	32.7	1.9	15.3	17.1	1.8
LSD (.05)	NS	NS		NS	NS	
CV %	7.2	5.4		2.8	3	

Table 3. Comparison of varieties harvested early and late averaged for both locations in 1985

Variety	Recov. S/A Early	Late	Change	Recov. S/Ton Early	Late	Change
Mono Hy M7	6,043	8,127	2,084	256	297	41
Mono Hy R103	6,084	8,342	2,258	265	305	40
Hilleshog 4046	6,577	8,799	2,222	265	299	33
Hilleshog 5135	6,667	9,078	2,412	265	309	43
Monohikari	6,510	9,128	2,618	266	309	43
KW 3394	6,696	8,827	2,132	268	307	39
KW 3265	6,625	9,096	2,471	259	305	46
Maribo Ultramono	6,483	8,617	2,134	266	308	42
Maribo 403	6,497	8,351	1,854	265	298	32
ASC ACH 164	6,458	8,825	2,367	269	310	41
Mean	6,464	9,026	2,255	282	313	40.2

Table 3. Continued

Variety	Tons/Acre Early	Late	Change	%Sucrose Early	Late	Change
Mono Hy M7	25.2	29.3	4.1	14.1	16.4	2.3
Mono Hy R103	24.6	29.2	4.6	14.5	16.8	2.2
Hilleshog 4046	26.6	31.5	4.9	14.5	16.4	1.9
Hilleshog 5135	27.0	31.5	4.5	14.5	16.9	2.3
Monohikari	26.1	31.4	5.3	14.4	16.7	2.3
KW 3394	26.8	30.8	4.0	14.6	16.9	2.2
KW 3265	27.4	31.9	4.5	14.2	16.7	2.5
Maribo Ultramono	26.2	29.9	3.7	14.6	16.9	2.3
Maribo 403	26.1	30.1	4.0	14.5	16.4	1.9
ASC ACH 164	25.6	30.3	4.8	14.7	17.0	2.3
Mean	26.1	30.6	4.4	14.5	16.7	2.2

Table 4. Sugar content of ten varieties harvested early and late at Sacred heart 1986.

Variety	% Sucrose Early	% Sucrose Late	Change	% of Mean Early	% of Mean Late
M7	13.33	15.97	2.64	93.5	96.7
103	14.39	16.53	2.14	100.9	100.1
4046	14.23	16.53	2.30	99.8	100.1
5135	15.02	17.00	1.98	105.3	103.0
Monohikari	13.99	16.35	2.36	98.1	99.0
3394	14.35	16.48	2.13	100.6	99.8
3265	14.32	16.28	1.96	100.4	98.6
Ultramono	14.71	16.63	1.92	103.2	100.7
403	14.26	16.65	2.39	100.0	100.8
164	13.99	16.65	2.66	98.1	100.8
Mean	14.26	16.51			
LSD(.05)	0.94	0.42			
% CV	4.46	1.72			

Table 5. Recoverable sugar per ton of ten varieties harvested early and late at Sacred Heart 1986.

Variety	Rec. Sug/Ton Early	Rec. Sug/Ton Late	Change	% of Mean Early	% of Mean Late
M7	242	295	53	92.4	95.8
103	265	309	44	101.1	100.3
4046	260	308	48	99.2	100.0
5135	277	318	41	105.7	103.2
Monohikari	259	306	47	98.9	99.4
3394	265	308	43	101.1	100.0
3265	264	305	41	100.8	99.0
Ultramono	272	311	39	103.8	101.0
403	262	312	50	100.0	101.3
164	257	312	55	98.1	101.3
Mean	262	308			
LSD(.05)	19.38	8.96			
% CV	4.98	1.96			

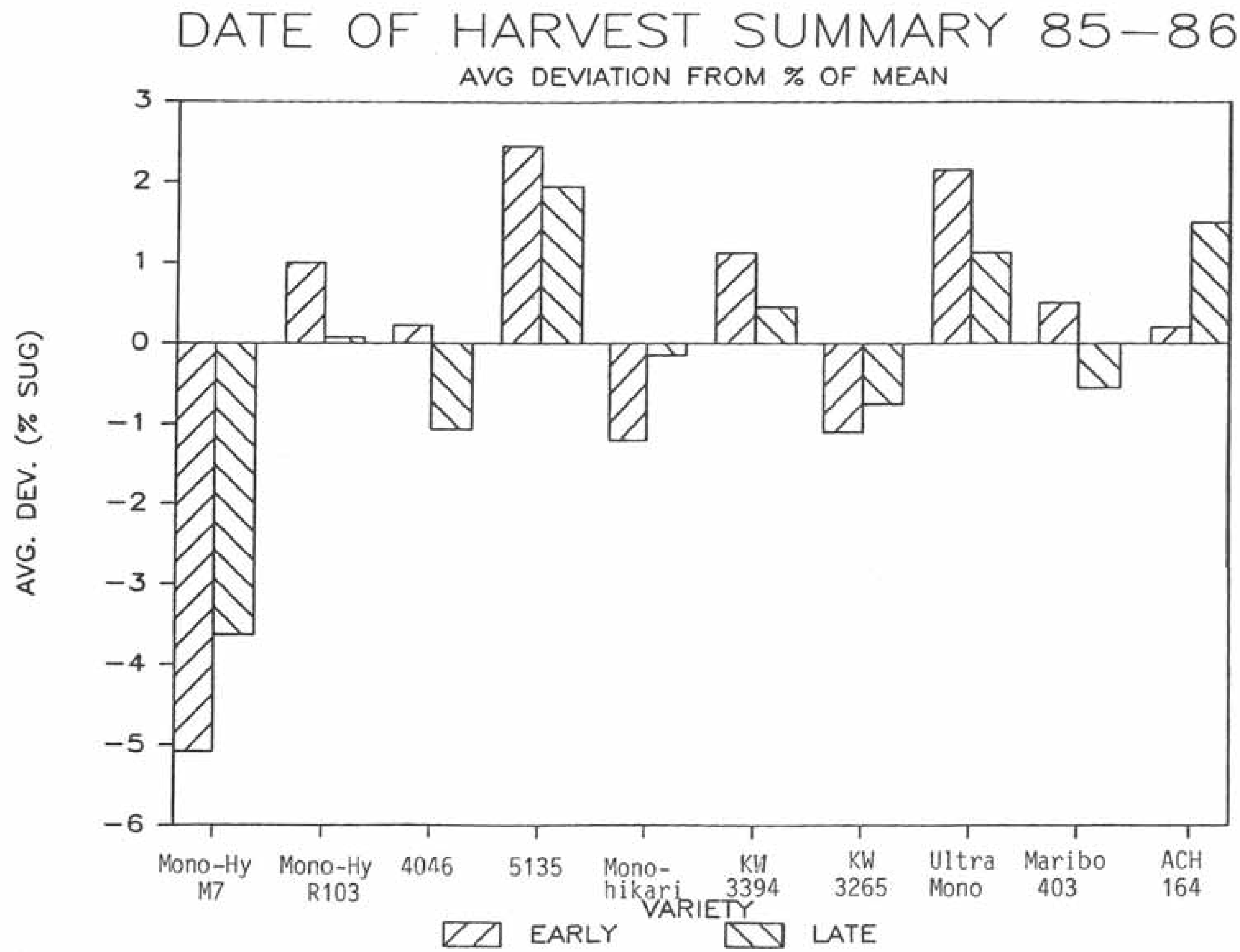

Figure 1. The average deviation from the mean for % sugar combined for 1985 and 1986.

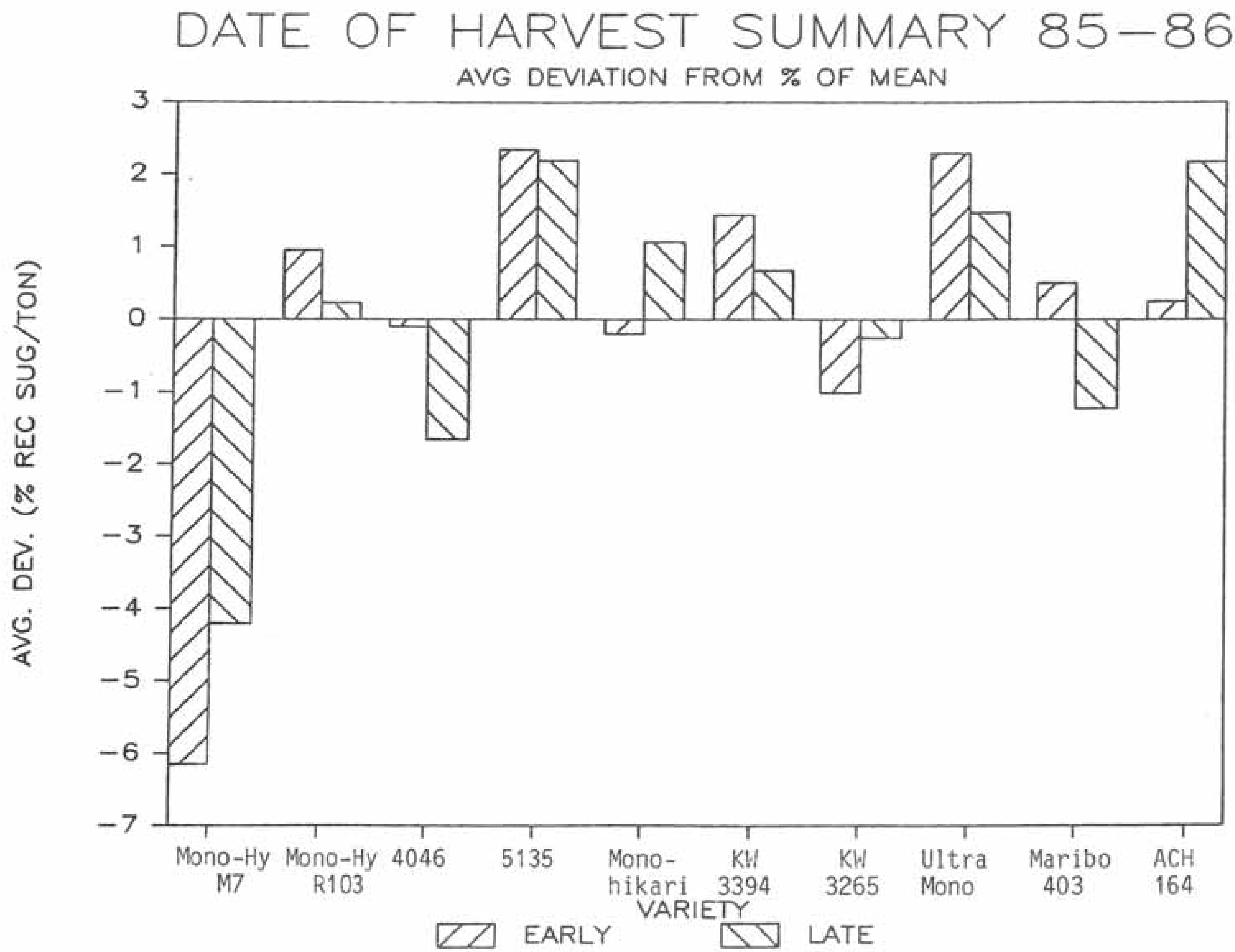

Figure 2. The average deviation from the mean for recoverable sugar per ton combined for 1985 and 1986.

Evaluation of Pelleted Sugarbeet Seed

Objective

Evaluate the effect of two (2) commercial sugarbeet pellets on emergence.

Experimental Procedures

The trials were established at Bird Island, Sacred Heart, and Clara City, Minnesota. Two commercial varieties (Ultramono and 3394) were treated with coatings from Germain and Seedcoat. Treatments of bare (seed with a fungicide treatment) and raw (seed without a fungicide treatment) were also used as a untreated check. The experiments were planted with a four (4) row nodet planter. The plots were four (4) 25 ft rows with a seed spacing of 2.5 inches. The seed bed was adequate and the seeds were planted to a depth of 1 (one) inch. The combinations are shown in table 1 and 2. The treatments were arranged in a randomized complete block design with six (6) replications. The trials were seeded on May 19, 28 and 30 at Bird Island, Sacred Heart, and Clara City, respectively. The final population was 130 plants per 100 feet. Stand counts were the average of a ten ft section of the center two (2) rows and were made on June 2 and June 9 at Bird Island, and June 2 at Sacred Heart.

Stand counts represent the total emergence and does not consider post emergence seedling disease.

Results and Discussion

Table 1 (Bird Island) and table 2 (Sacred Heart) shows the stand counts prior to thinning. The Clara City location received root rot damage and was not reported.

The pellet coatings did not improve stand counts over bare seed (Table 1 and Table 2) at either the Bird Island or Sacred Heart locations. Soil moisture throughout the growing season was excessive and therefore, this conclusion is specific for 1986 and may not hold true for years with different environmental conditions. The unusual variability in this experiment could well be associated to the excessive rainfall in 1986. It is also important to note that some planter types may have difficulty planting pelleted seed.

Table 2. Stand counts for pelleted sugarbeet seeds at Sacred Heart. For each column, values followed by the same letter are not significantly different (P. 0.05).

TRT #	Treatment Averages	Stand/10 ft. Stand Count June 2, 1986
1	KW 3394 Germain	25.25 bc
2	KW 3394 Germain - Mini	26.42 abc
3	KW 3394 Seedcoat	22.17 c
4	KW 3394 Bareseed	33.33 a
5	Ultramono Germain	22.42 c
6	Ultramono Raw	33.75 a
7	Ultramono Seedcoat	23.92 bc
8	Ultramono Bareseed	30.92 ab
	High	33.33
	Low	22.17
	Mean	27.27
	LSD (5%)	7.04
	Coeff of Var.	17.40

Table 1. Stand counts for pelleted sugarbeet seeds at Bird Island. For each column, values followed by the same letter are not significantly different (P. 0.05).

		Treatment Averages Stand/10 ft.	
TRT #		Stand Count June 2, 1986	Stand Count June 9, 1986
1	KW 3394 Germain	23.00 bc	24.17 bc
2	KW 3394 Germain - Mini	19.92 bc	21.00 bc
3	KW 3394 Seedcoat	19.08 c	19.75 c
4	KW 3394 Bareseed	27.00 ab	29.33 ab
5	Ultramono Germain	27.17 ab	27.92 ab
6	Ultramono Raw	32.67 a	33.08 a
7	Ultramono Seedcoat	21.58 bc	22.42 bc
8	Ultramono Bareseed	32.17 a	33.00 a
	High	32.67	33.08
	Low	19.08	19.75
	Mean	25.32	26.33
	LSD (5%)	6.55	6.77
	Coeff of Var.	17.41	17.41

Effect of Foliar Nitrogen on Sugarbeet Quality

Objective:

To Determine the effect of foliar applied nitrogen on subsequent quality.

Experimental Procedure

The experiment was located at Sacred Heart and treatments were 0, 7, 10, 15, and 20 lbs of 28% foliar applied Nitrogen. The experiment was a systematically arranged randomized complete block design with three (3) replications. The nitrogen was applied with 10 gallons carrier volume per acre on August 8, 1986. Two samples were taken on August 19 and September 6, 1986.

Results and Discussion

The samples were evaluated for levels of impurities and there was no evidence that impurity levels increased from additions foliar nitrogen (Tables 1 and 2). The results are similar to that found by Moraghan and Cattanach. None of treatments caused any leaf damage and field evaluations were made to see if the foliage "greened up"; however, no apparent color change took place as a result of the nitrogen application.

Table 1. Effect of foliar applied nitrogen on % sugar, potassium, sodium, harmful amino nitrogen and loss to molasses for the first sampling date, August 19. For each column, values followed by the same letter are not significantly different (5%).

Treatment		Tons/A	% Sugar	K	Na	HAN	LTM
1	0 lbs	9.8a	12.52a	2626a	198a	192a	1.24a
2	7 lbs	10.9a	11.82a	2739a	271a	192a	1.31a
3	10 lbs	10.4a	12.11a	2682a	223a	171a	1.24a
4	15 lbs	8.1a	12.08a	2733a	172a	196a	1.27a
5	20 lbs	11.9a	12.15a	2510a	205a	193a	1.20a
High		11.9	12.52	2739	271	196	1.31
Low		8.1	11.82	2510	172	171	1.20
Mean		10.2	12.13	2658	214	189	1.25
LSD (5%)		9.6	2.53	455	164	90	0.28
Coeff. of Var.		14.6	5.94	4.88	21.8	13.6	6.30

Table 2. Effect of foliar applied nitrogen on % sugar, potassium, sodium, harmful amino nitrogen and loss to molasses for the second sampling date, September 6. For each column, values followed by the same letter are not significantly different (5%).

Treatment		Tons/A	% Sugar	K	Na	HAN	LTM
1	0 lbs	16.8a	15.02a	2638a	117a	115a	1.10a
2	7 lbs	13.3a	14.37a	2657a	197a	139a	1.18a
3	10 lbs	16.3a	14.51a	2781a	185a	154a	1.24a
4	15 lbs	14.0a	14.88a	2587a	157a	150a	1.15a
5	20 lbs	17.2a	15.16a	2383a	154a	138a	1.07a
High		17.2	15.52	2781	197	154	1.24
Low		13.3	13.64	2383	117	115	1.07
Mean		15.5	14.79	2609	162	139	1.15
LSD (5%)		7.2	2.01	535	212	80	0.33
Coeff. of Var.		13.19	3.86	5.83	37.3	16.4	8.27

Survey of Root Rot Soil Samples

Objective:

Obtain a basis for common characteristics associated to root rot infested fields.

Procedure

Samples were taken from root rot infested fields throughout the growing area. Paired samples were taken from an infested area and an unaffected area adjacent to the first sample. These samples were tested for many different characteristics (Table 1).

Results and Discussion

Soil pH was consistently lower in the root rot affected soil samples. Iron (Fe) and actual Ma was higher in all root rot samples. Although these trends were identified there is evidence that the observation made in the SMSC growing area made may not hold true in other sugarbeet areas. These samples were taken in 1986 and more sampling is needed to develope a larger data base of information.

SATATION	ROOT ROT	OM%	Ph	SOIL SALINE	Na	CEC	P	K	Ma	Ca	S	Zn	Fe	Mn	Cu	Act Ca	Act Ma	Act K	Act Na
MILAN #1	YES	4.0%	7.1	0.37	48	23.1	26	261	1260	7000	3	1.49	56.3	67.5	1.43	75.7	22.7	1.4	0.4
MILAN #1	NO	4.1%	7.5	0.46	46	23.9	45	463	1260	7200	4	3.76	17.6	10.0	0.90	75.3	21.9	2.4	0.4
MILAN #2	NO	3.4%	7.7	0.40	42	30.4	21	291	1020	10300	3	1.57	22.0	22.5	1.13	84.7	13.9	1.2	0.3
MILAN #2	YES	4.9%	7.0	0.49	73	26.7	44	331	1790	7500	5	4.38	28.5	20.3	0.96	70.2	27.9	1.5	0.5
REVILLE #1	NO	2.4%	7.8	0.32	40	32.0	31	168	710	11500	2	1.35	8.8	8.0	0.91	89.8	9.2	0.7	0.2
REVILLE #1	YES	3.3%	7.0	0.30	58	20.8	88	223	1180	6200	2	1.72	32.0	18.5	0.92	74.5	23.6	1.3	0.6
CLARA CITY #1	NO	3.6%	7.6	0.39	24	31.8	58	190	800	11300	3	1.88	11.7	8.6	0.94	88.8	10.4	0.7	0.1
CLARA CITY #1	YES	3.9%	6.5	0.27	54	20.8	35	225	1000	6500	10	1.56	52.0	27.8	1.05	78.1	20.0	1.3	0.5
BIRD ISLAND #1	NO	5.5%	7.6	0.47	43	38.4	50	375	1120	13300	3	3.49	24.5	14.2	1.03	86.5	12.1	1.2	0.2
BIRD ISLAND #1	YES	5.8%	6.9	0.35	62	28.9	95	402	1520	8800	3	4.11	41.0	19.7	0.94	76.1	21.9	1.7	0.4
BIRD ISLAND #2	NO	4.6%	6.9	0.50	39	23.6	17	203	1270	7200	3	1.09	46.9	28.2	1.09	76.2	22.4	1.1	0.3
BIRD ISLAND #2	YES	4.4%	6.5	0.33	46	21.3	23	216	1260	6300	3	1.13	63.7	42.2	1.31	73.9	24.6	1.3	0.4
BIRD ISLAND #3	NO	7.4%	7.6	0.50	56	35.0	122	491	1520	11200	4	12.26	18.6	7.1	1.50	80.0	18.0	1.7	0.3
BIRD ISLAND #3	YES	5.8%	7.2	0.45	60	27.5	128	481	1810	7700	5	6.80	51.3	19.1	1.22	69.9	27.4	2.2	0.4
BIRD ISLAND #4	NO	6.5%	7.2	0.54	50	28.2	49	441	1710	8200	4	2.04	21.2	10.6	0.95	72.6	25.2	2.0	0.3
BIRD ISLAND #4	YES	6.5%	7.0	0.50	68	32.5	52	402	2320	8900	4	2.00	24.7	8.6	1.07	68.4	29.7	1.5	0.4
HECTOR #1	NO	4.4%	7.8	0.30	21	31.4	50	473	790	11000	3	1.82	13.5	8.9	0.72	87.5	10.4	1.9	0.1
HECTOR #1	YES	4.5%	7.8	0.30	31	23.8	150	1206	1130	7000	5	2.47	36.6	15.2	1.02	73.5	19.7	6.4	0.2
HECTOR #2	NO	3.5%	7.7	0.35	40	31.2	45	212	1420	10000	4	1.81	9.0	5.1	0.81	80.1	18.9	0.8	0.2
HECTOR #2	YES	3.4%	7.4	0.40	53	24.6	63	234	1370	7400	5	1.26	18.0	14.4	0.98	75.2	23.2	1.2	0.4
HECTOR #3	NO	5.2%	7.8	0.34	29	35.2	23	114	1220	12000	3	0.67	11.0	3.9	0.65	85.2	14.4	0.4	0.1
HECTOR #3	YES	4.6%	7.4	0.30	26	24.9	34	268	1270	7700	5	0.81	11.3	4.3	0.60	77.3	21.2	1.3	0.2
MAYNARD #1	NO	4.5%	7.6	0.37	53	32.5	50	391	1240	10700	7	1.02	14.5	8.7	0.97	82.3	15.8	1.5	0.3
MAYNARD #1	YES	5.5%	6.5	0.33	62	19.5	59	442	1230	5500	3	1.43	58.7	30.6	1.08	70.5	26.2	2.9	0.6
REDWOOD FALLS #1	NO	3.8%	7.3	0.29	34	21.6	66	433	900	6900	4	0.83	31.8	53.2	0.84	79.8	17.3	2.5	0.3
REDWOOD FALLS #1	YES	4.3%	6.6	0.33	46	20.6	64	337	980	6400	3	1.19	61.6	40.8	0.78	77.6	19.8	2.0	0.4
RENVILLE #2	NO	3.4%	7.5	0.40	41	25.2	43	193	1240	7900	3	1.65	18.8	16.6	1.15	78.3	20.5	0.9	0.3
RENVILLE #2	YES	3.4%	7.4	0.34	73	23.0	28	174	1350	6800	3	1.44	76.6	91.2	2.31	73.9	24.4	0.9	0.6
BIRD ISLAND #5	NO	3.8%	7.6	0.37	30	19.6	37	308	710	6500	3	2.14	31.2	10.4	0.85	82.9	15.0	2.0	0.3
BIRD ISLAND #5	YES	3.0%	6.9	0.30	71	17.1	36	184	1080	4900	3	1.29	32.3	19.7	0.74	71.6	26.3	1.3	0.9
RHEINGANS	YES	5.5%	6.1	0.42	44	23.1	103	600	1680	6100	4	1.93	73.3	40.2	1.20	66.0	30.3	3.3	0.4

Table 1. Soil test results from sampled fields infested with root rot.

Disease Index Summary of 1986

Introduction

A remote weather station was installed in a sugarbeet field 1 mile north of Renville. This station monitored: temperature, RH, and leaf wetness on an 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 this program was to give the grower an indication of a high probability of leaf spot infection. The predictive nature of leaf spot lead to the development of a model, using temperature, RH, and time. Sugarbeet fields are highly variable 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 1986 had relatively few days at which the disease index value was in the favorable category (greater than 6-7 for 2 day total or 3-4 on single day) (Figure 1). The few incidences of favorable conditions resulted in a relatively small occurrence of Cercospora. Usually if a particular day had high relative humidity the temperatures were low and visa versa. The spores require high RH (90% to free moisture) and high temperatures (65-80°) and that combination did not develop very often during the 1986 growing season.

Three or four infectious periods occurred during the growing season; July 15-16, July 27, August 14 and Aug 19. Daily temperatures and relative humidity values were not in the optimum range for a substantial period for sporulation and germination to occur, and allow leaf spot to develop to a significant degree

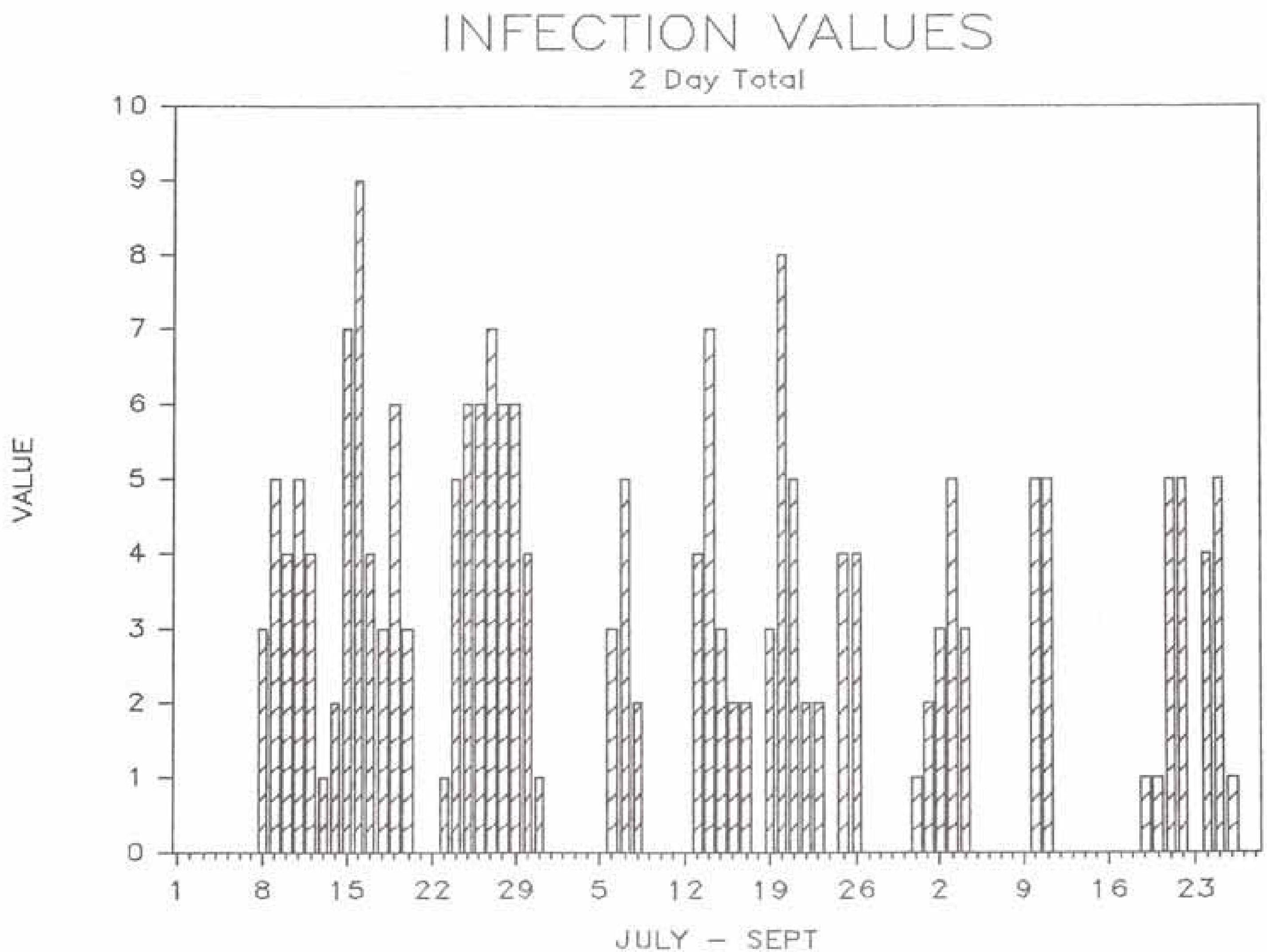

Figure 1. Two day total infection values from July through September 1986.

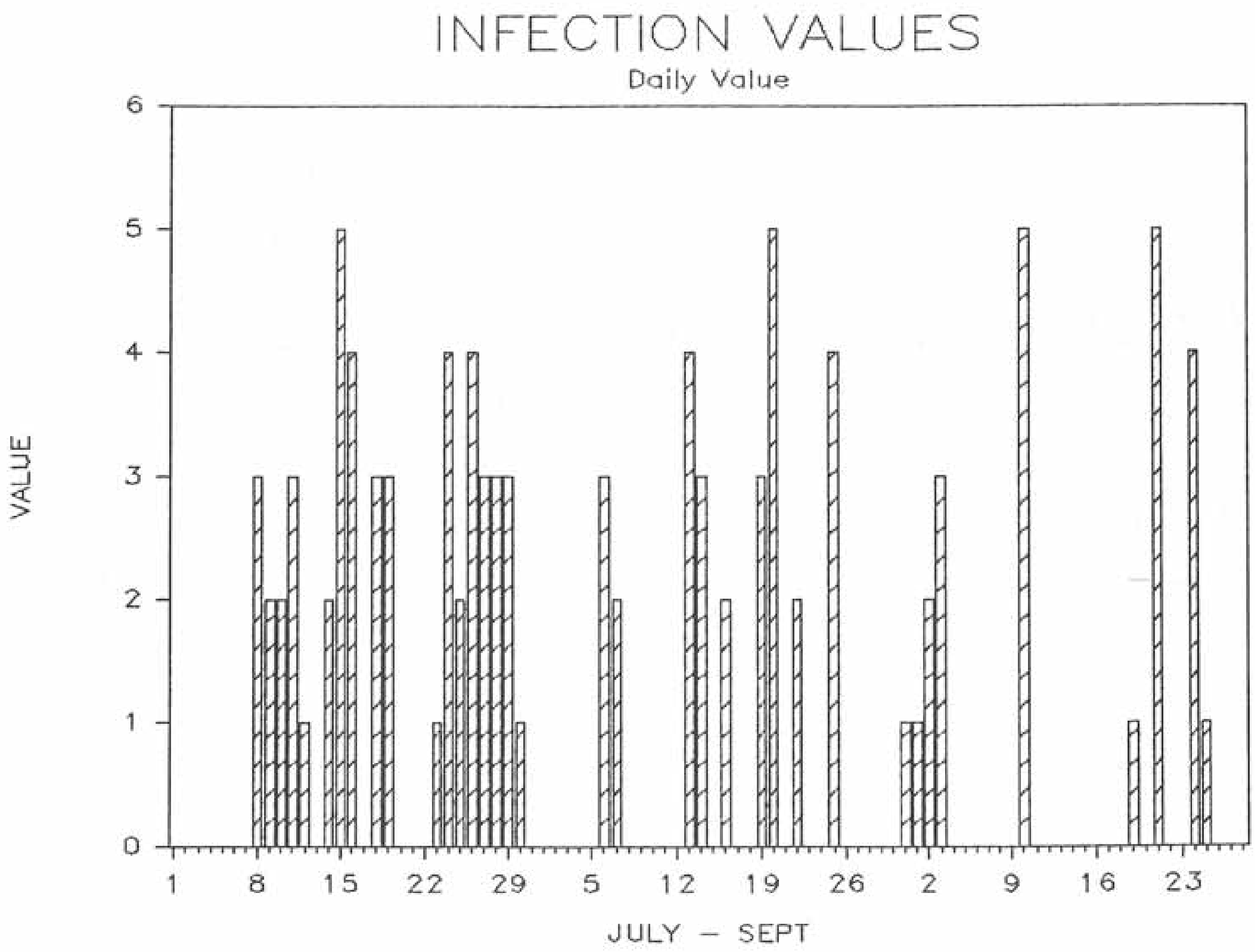

Figure 2. Daily infection values from July through September 1986.

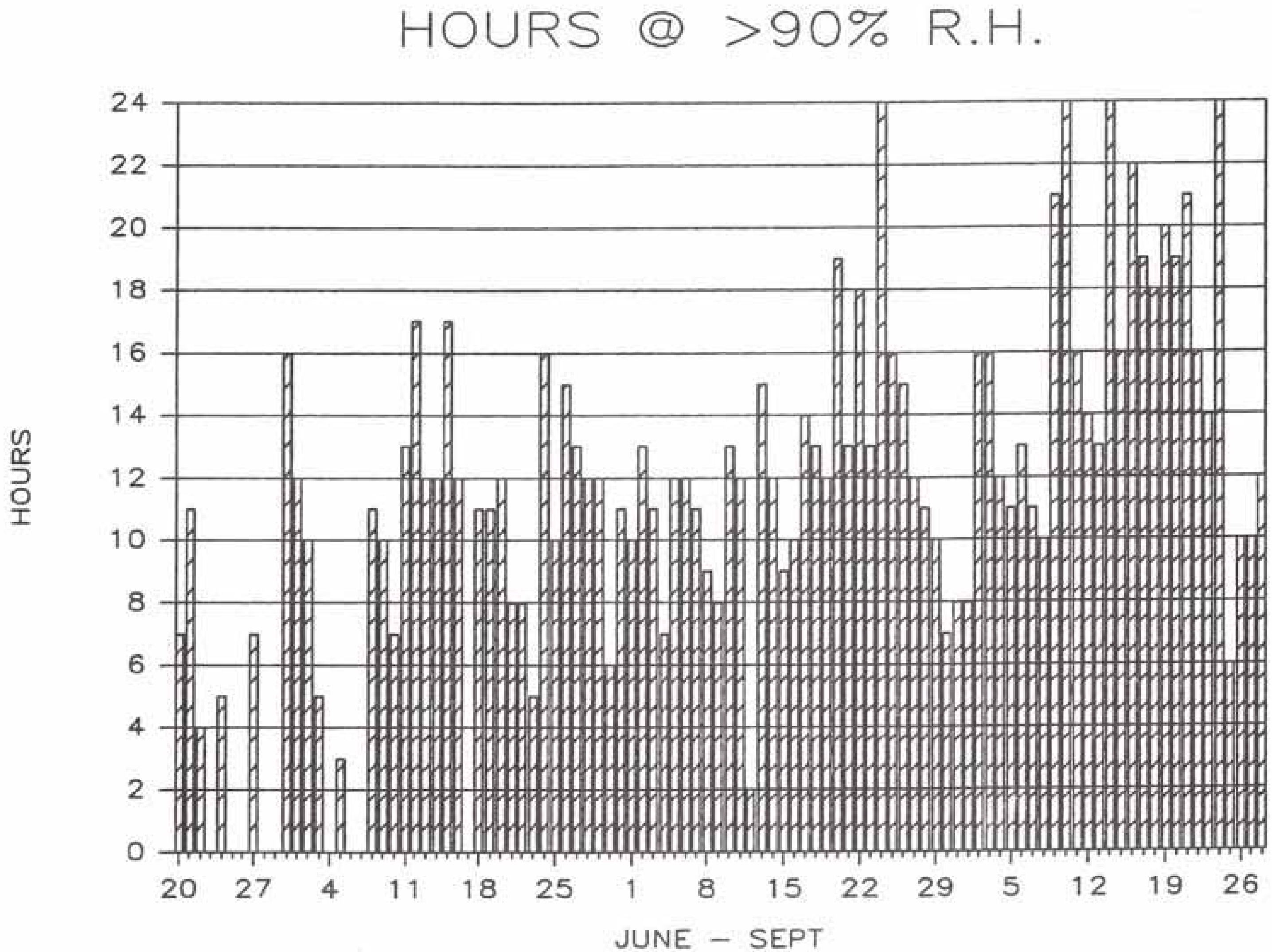

Figure 3. The total number of hours at which the relative humidity was over 90% for June through September 1986.

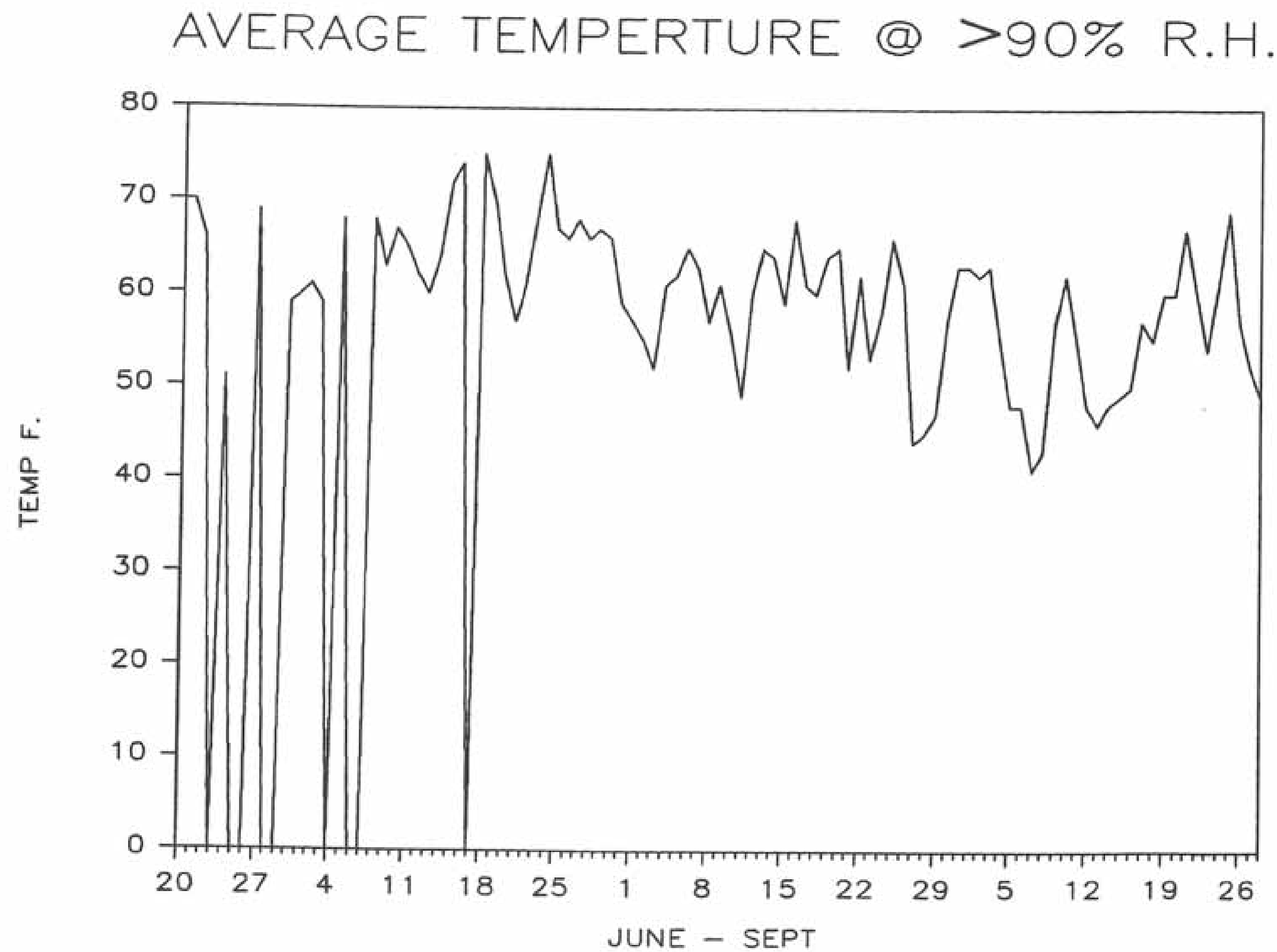

Figure 4. The average temperature at which the relative humidity was over 90% for June through September 1986.

Effect of Chlorine on Sugarbeets

Objective:

Evaluate root rot disease and quality in sugarbeets from the additions of chlorine.

Experimental Procedures

Three locations were chosen for their potential of root rot. The locations were Olivia, Bird Island, and Hector. The experiment consisted of an untreated check, KCl at 50 and 100 lbs applied and CaCl at 50 and 100 lbs applied. The experiment was a randomized complete block design with six (6) replications. The trials were planted May 10, 1986, May 19, 1986, and June 4, 1986, at Bird Island, Olivia, and Hector, respectively.

Results and Discussion

The trials were evaluated throughout the summer to determine if any tolerance could be detected to root rot. There was no evidence that Chlorine increased the tolerance of sugarbeet to root rot (data not presented). The additions of even 100 lbs applied chlorine expressed no significant difference in root rot activity.

Chlorine is an impurity in sugarbeets and could have an effect on loss to molasses. The effect of additions of chlorine were evaluated and are presented in Table 1. No significant difference was evident in additions of 100 lbs of either KCl or CaCl in loss to molasses.

Table 1. Effect of 100 lbs applied chlorine on % sugar, potassium, sodium, harmful amino nitrogen and loss to molasses. For each column, values followed by the same letter are not significantly different (5%).

Treatment		% Sugar	K	Na	HAN	LTM
1	Check	14.67a	2639a	267a	96a	1.15a
2	KCl	14.37a	3319a	220a	98a	1.36a
3	CaCl	15.40a	2598a	212a	83a	1.09a
High		15.40	3319	267	98	1.36
Low		14.37	2598	212	83	1.09
Mean		14.79	2852	233	92	1.20
LSD (5%)		2.09	1620	306	63	0.51
Coeff. of Var.		4.02	16.16	37	19.3	11.99

Fungicide Applications based on the Cercospora Model

Objective:

To evaluate the effect of fungicide applications at labeled intervals and also intervals based on the disease index value of the Cercospora Model.

Experimental Procedure

The experiment was established at Sacred Heart. The treatments were Supertin at 8 oz/acre on a 14 day interval, Supertin at 8 oz/acre based on disease index values, and Dithane FZ at 1 quart/acre on a 10 day interval. The experiment had three (3) replications and was a randomized complete block design. The spray dates are as follows:

Supertin (14 day)	Supertin (Model)	Dithane (10 day)
7/31/86	7/31/86	7/31/86
8/15/86	8/15/86	8/11/86
8/29/86		8/22/86

Results and Discussion

The experiment was evaluated throughout the spray period. There was no evidence of leaf spot, even in the untreated check. These results are typical of the growing area as Cercospora infections were limited to isolated areas and were not very widespread in 1986. To better evaluated the merits of the Cercospora prediction system similar experiments of this nature will continue in 1987.

Weather Data For 1986

The following is summary of the weather data for the 1986 growing season.

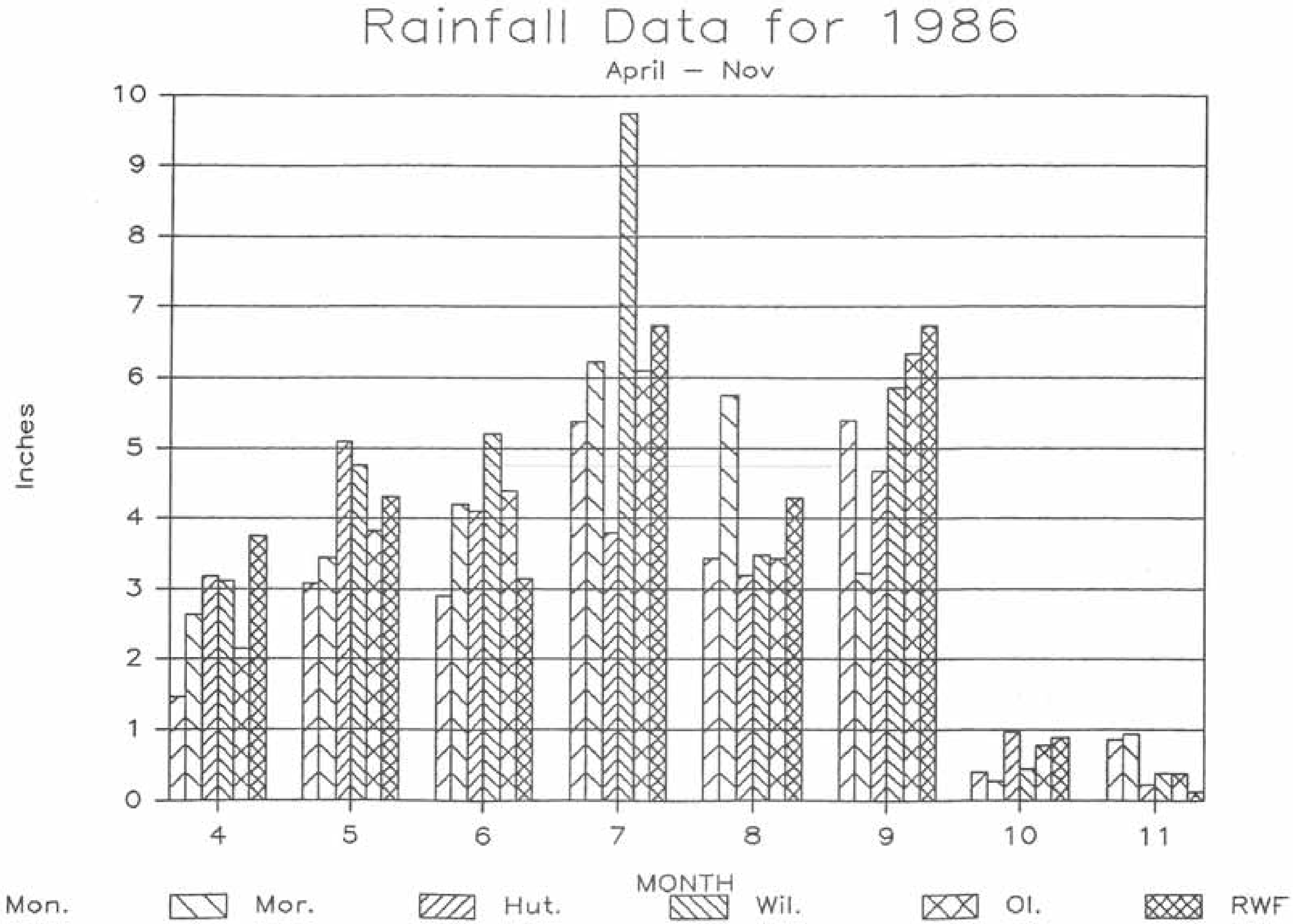

Figure 1. Comparative rainfall amounts between April and November for Morris (Mor.), Hutchinson (Hut.), Willmar (Wil.), Olivia (Ol.), and Redwood Falls (RWF) for 1986.

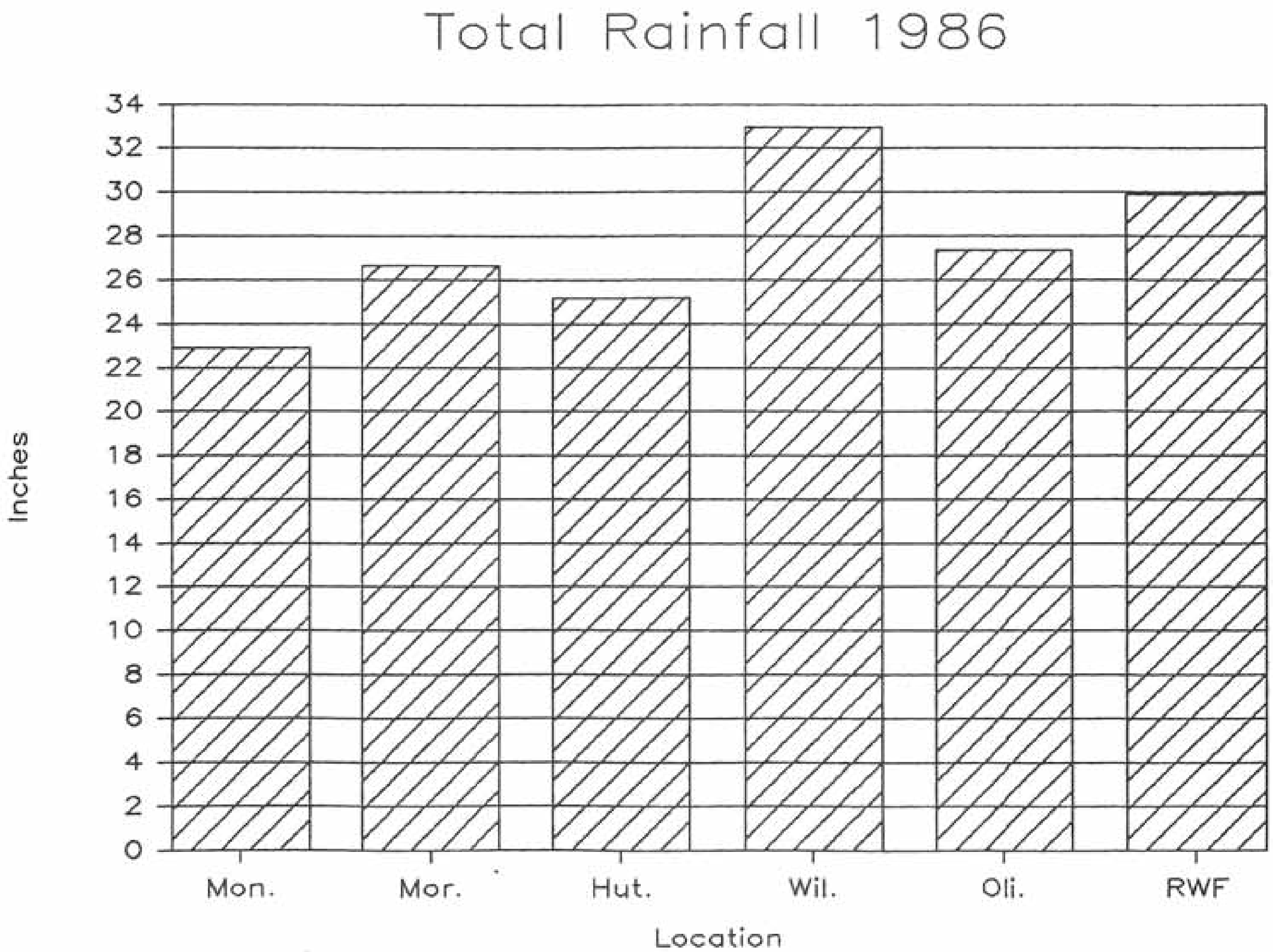

Figure 2. Total rainfall amounts between April and November for Morris (Mor.), Hutchinson (Hut.), Willmar (Wil.), Olivia (Ol.), and Redwood Falls (RWF) for 1986.

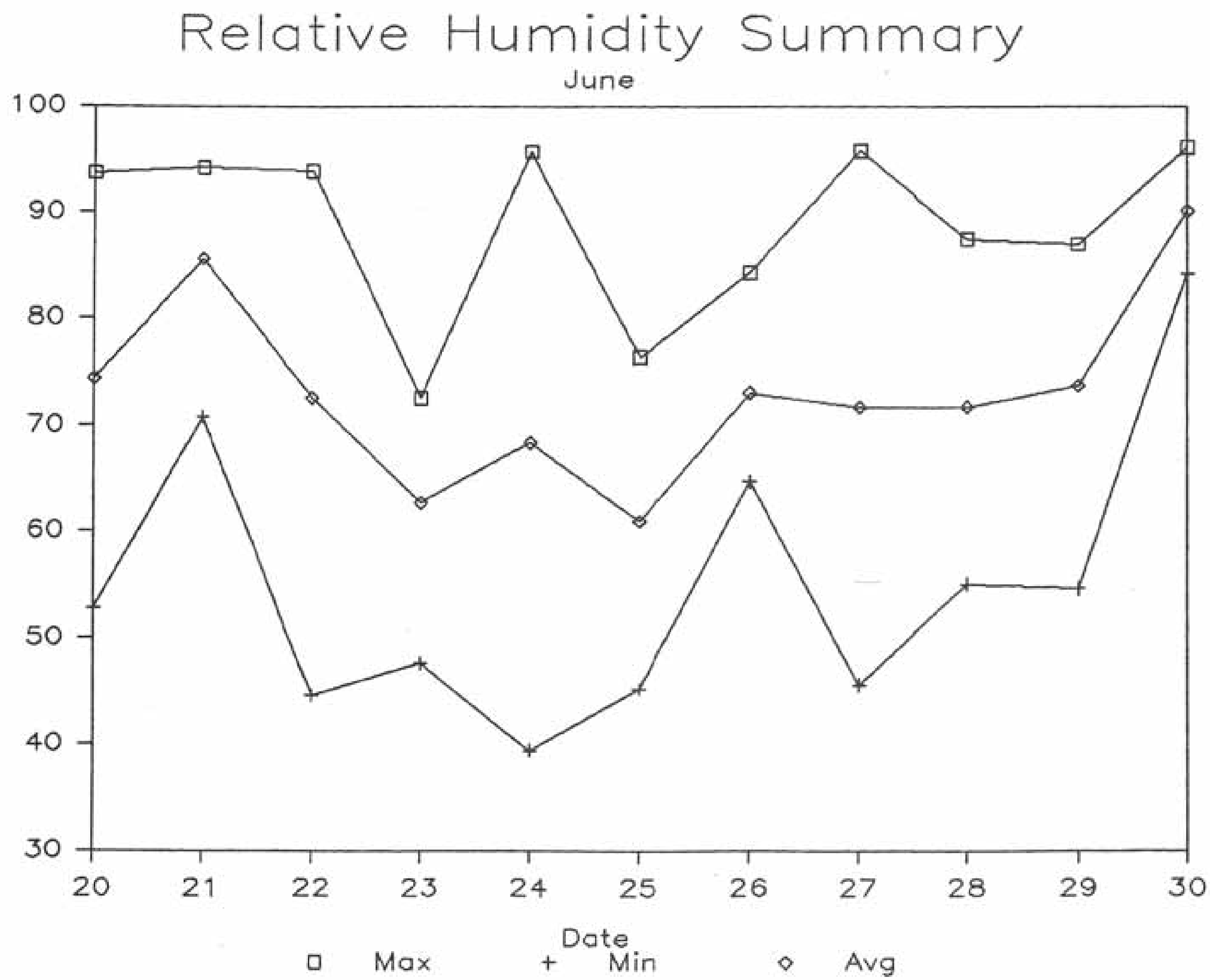

Figure 3. The maximum, minimum and average relative humidity summary for June 1986.

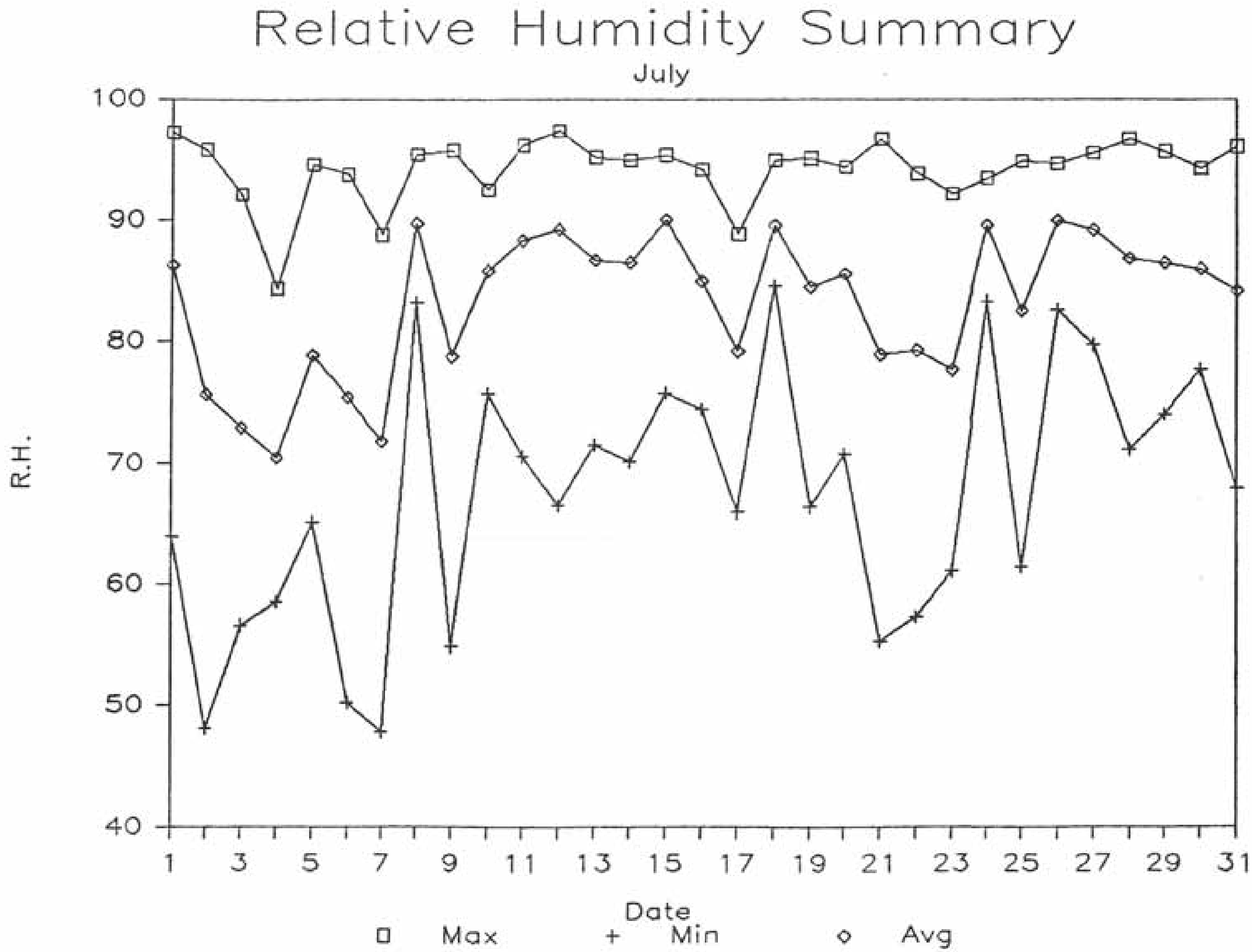

Figure 4. The maximum, minimum and average relative humidity summary for July 1986.

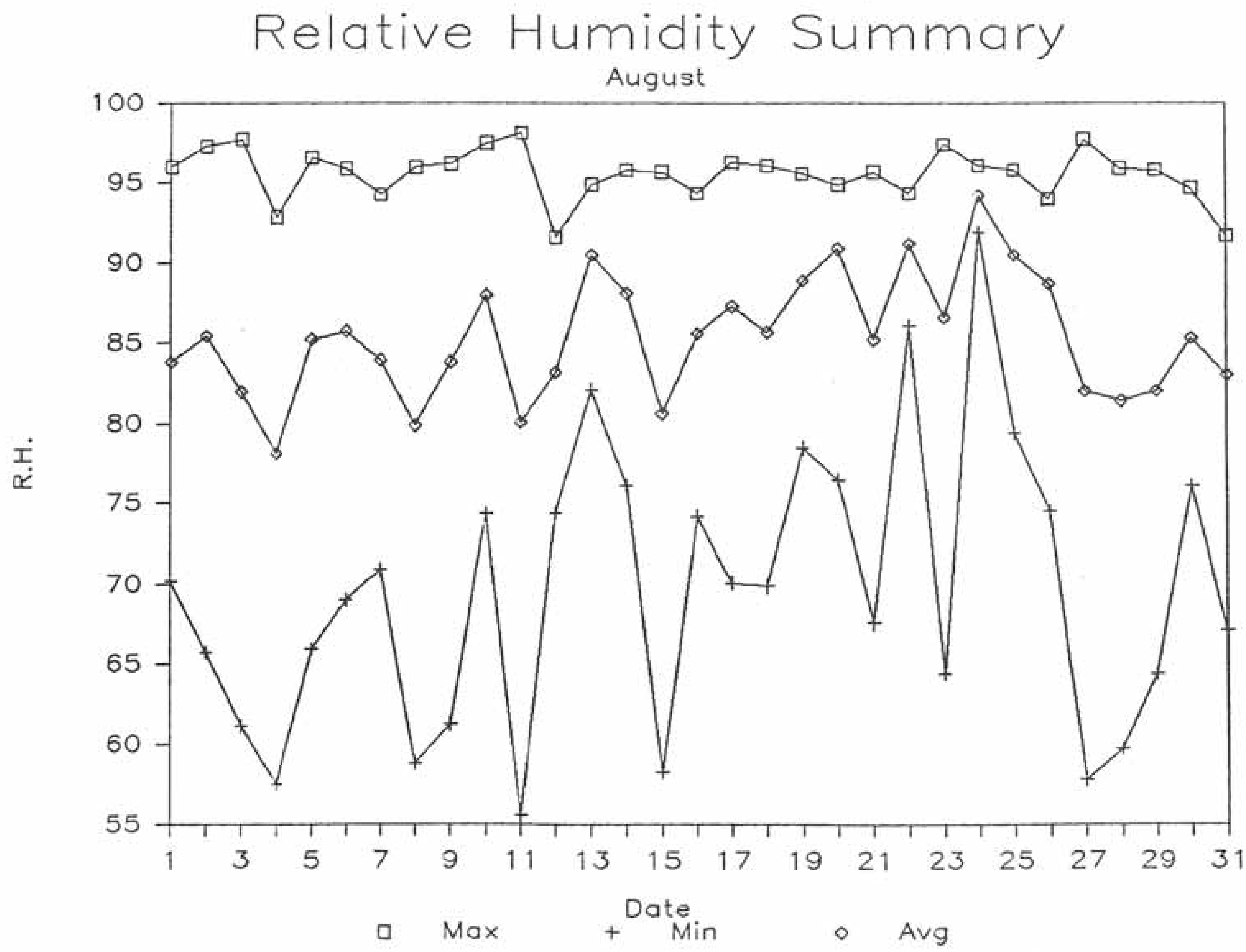

Figure 5. The maximum, minimum and average relative humidity summary for August 1986.

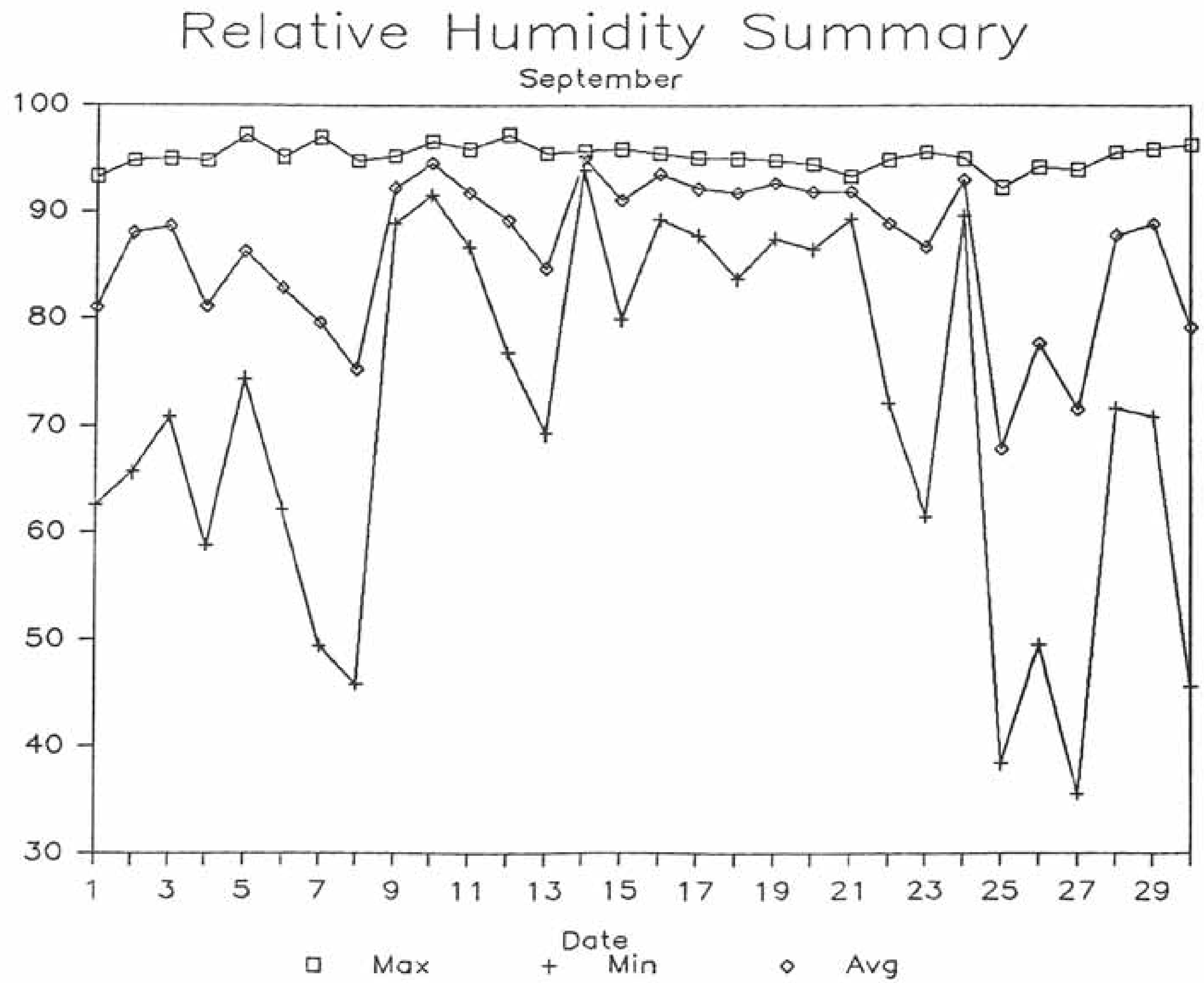

Figure 6. The maximum, minimum and average relative humidity summary for September 1986.

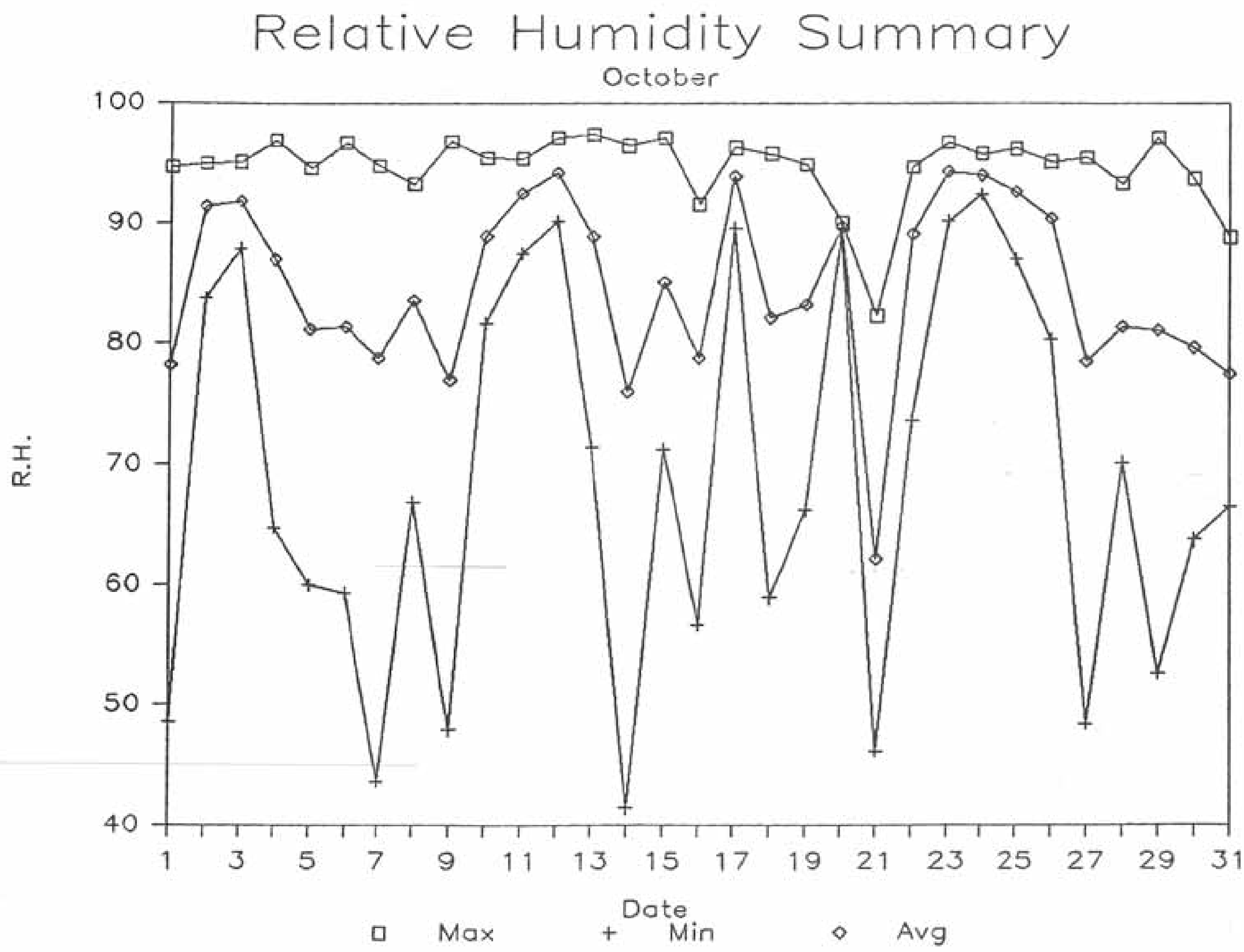

Figure 7. The maximum, minimum and average relative humidity summary for October 1986.

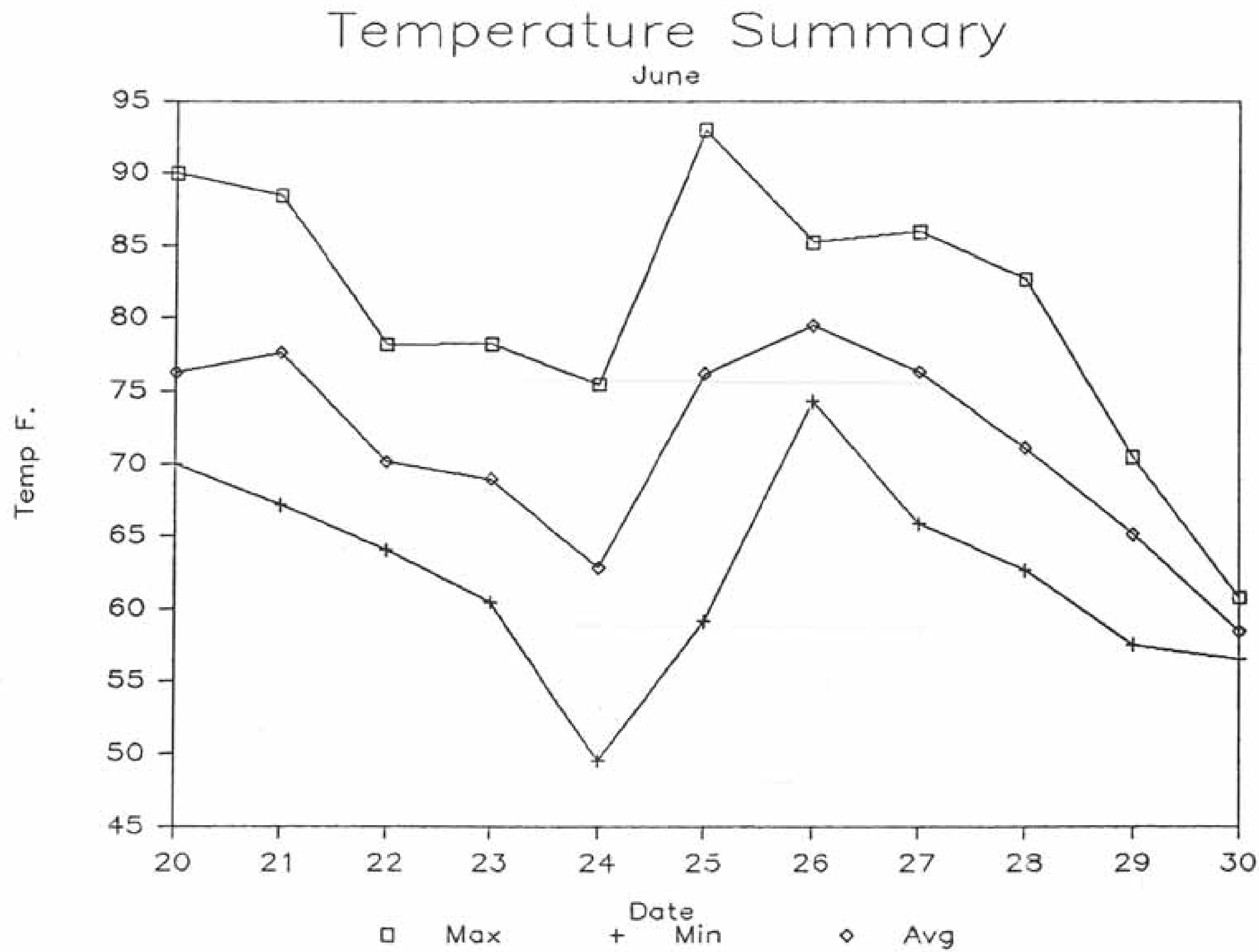

Figure 8. The maximum, minimum and average temperature summary for June 1986.

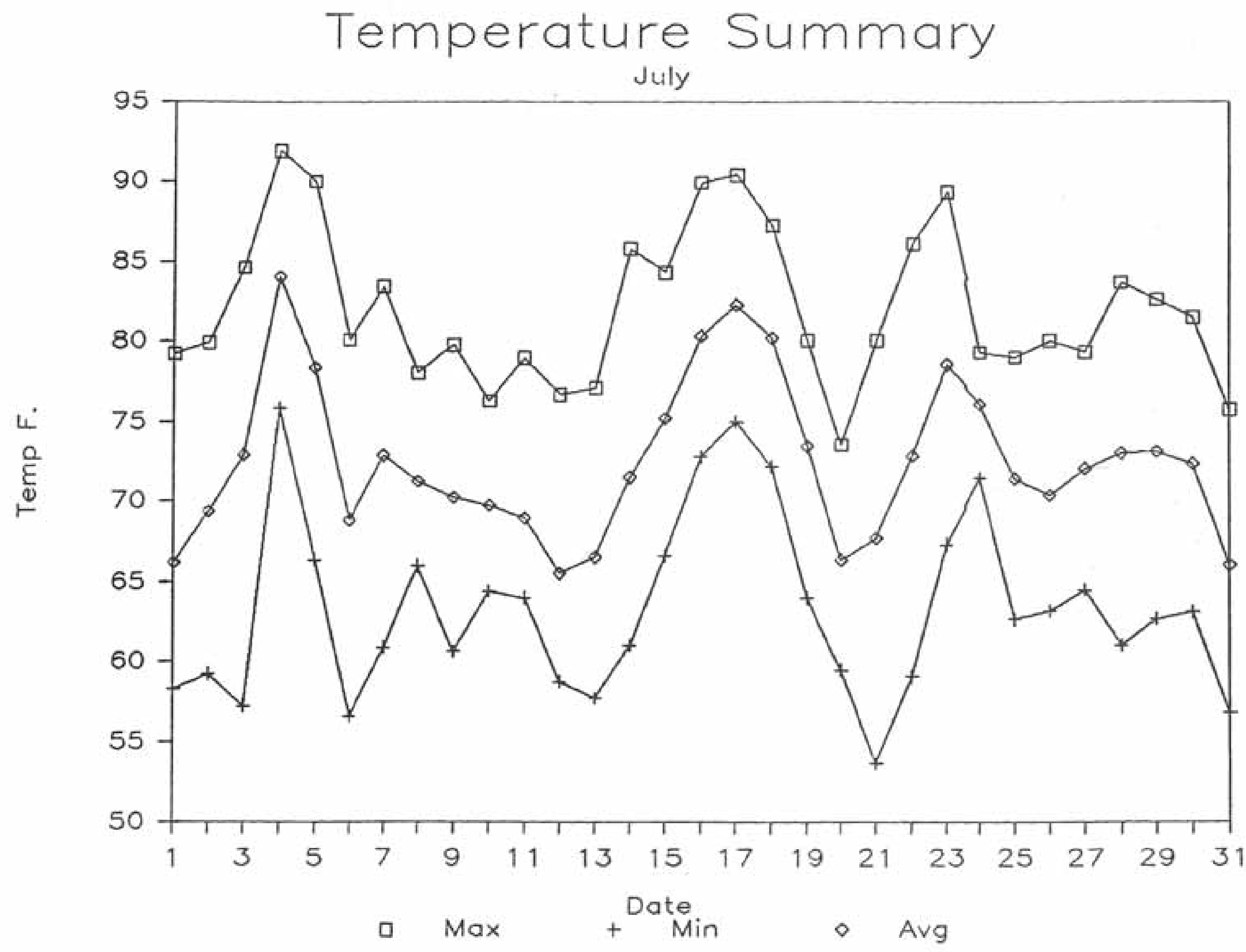

Figure 9. The maximum, minimum and average temperature summary for July 1986.

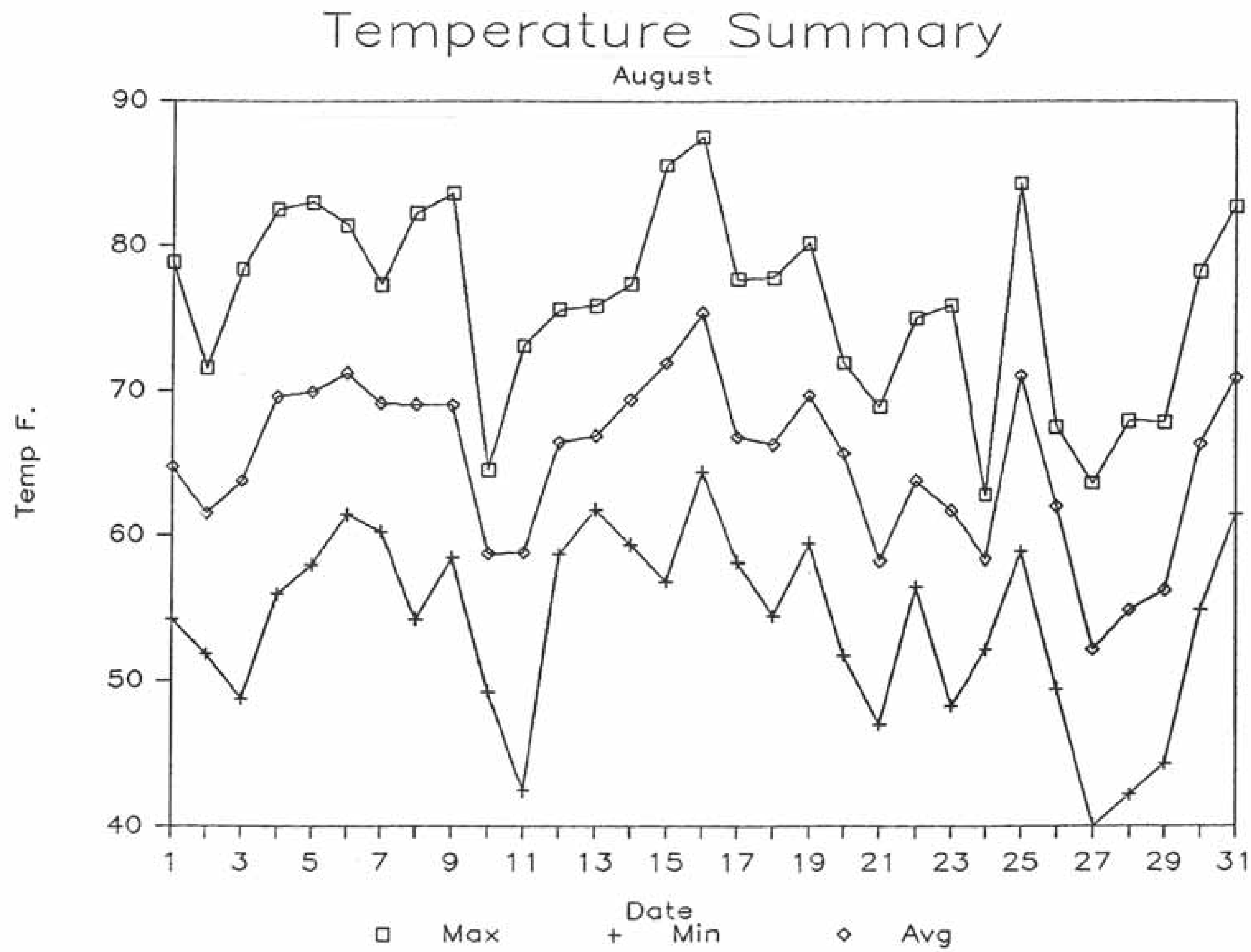

Figure 10. The maximum, minimum and average temperature summary for August 1986.

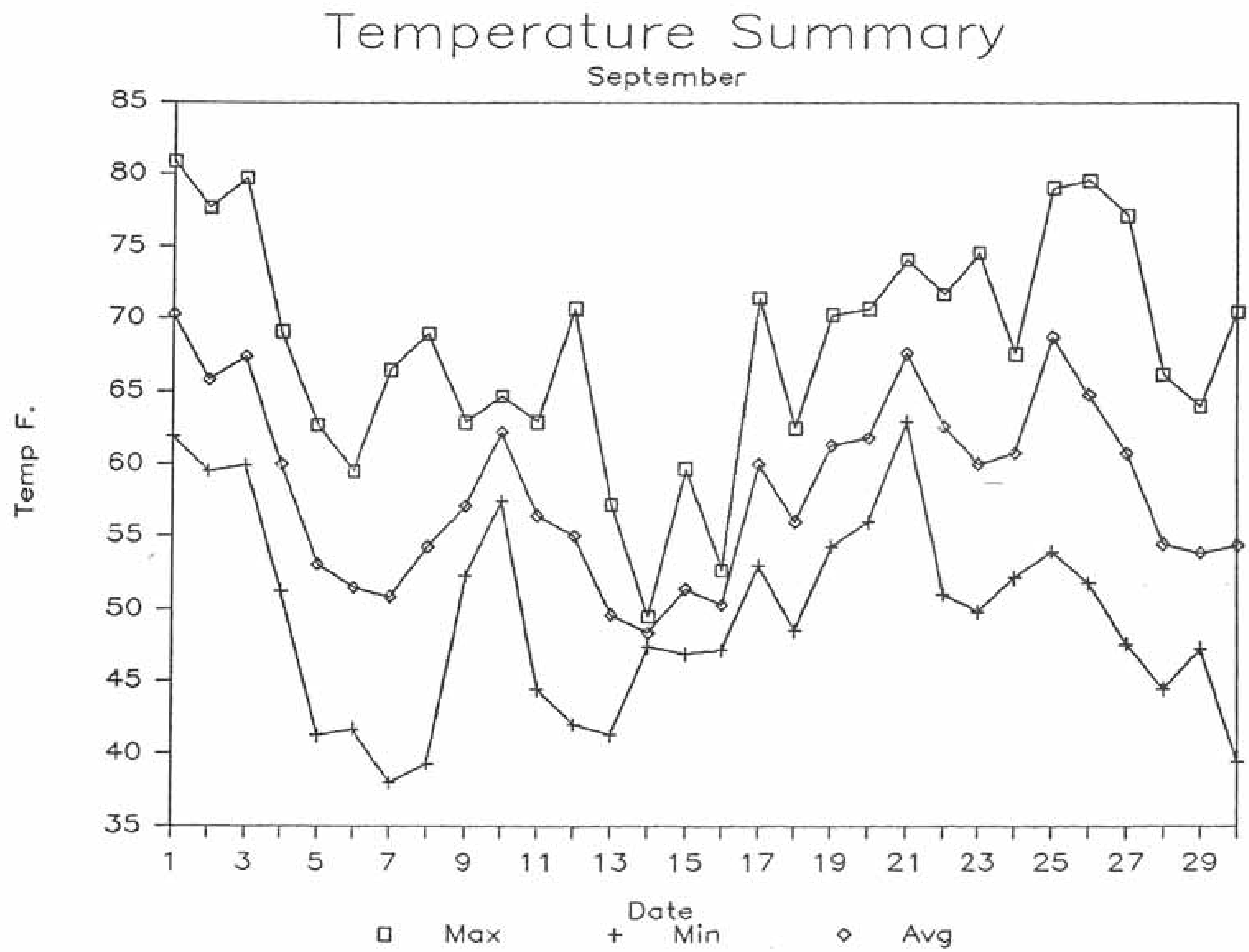

Figure 11. The maximum, minimum and average temperature summary for September 1986.

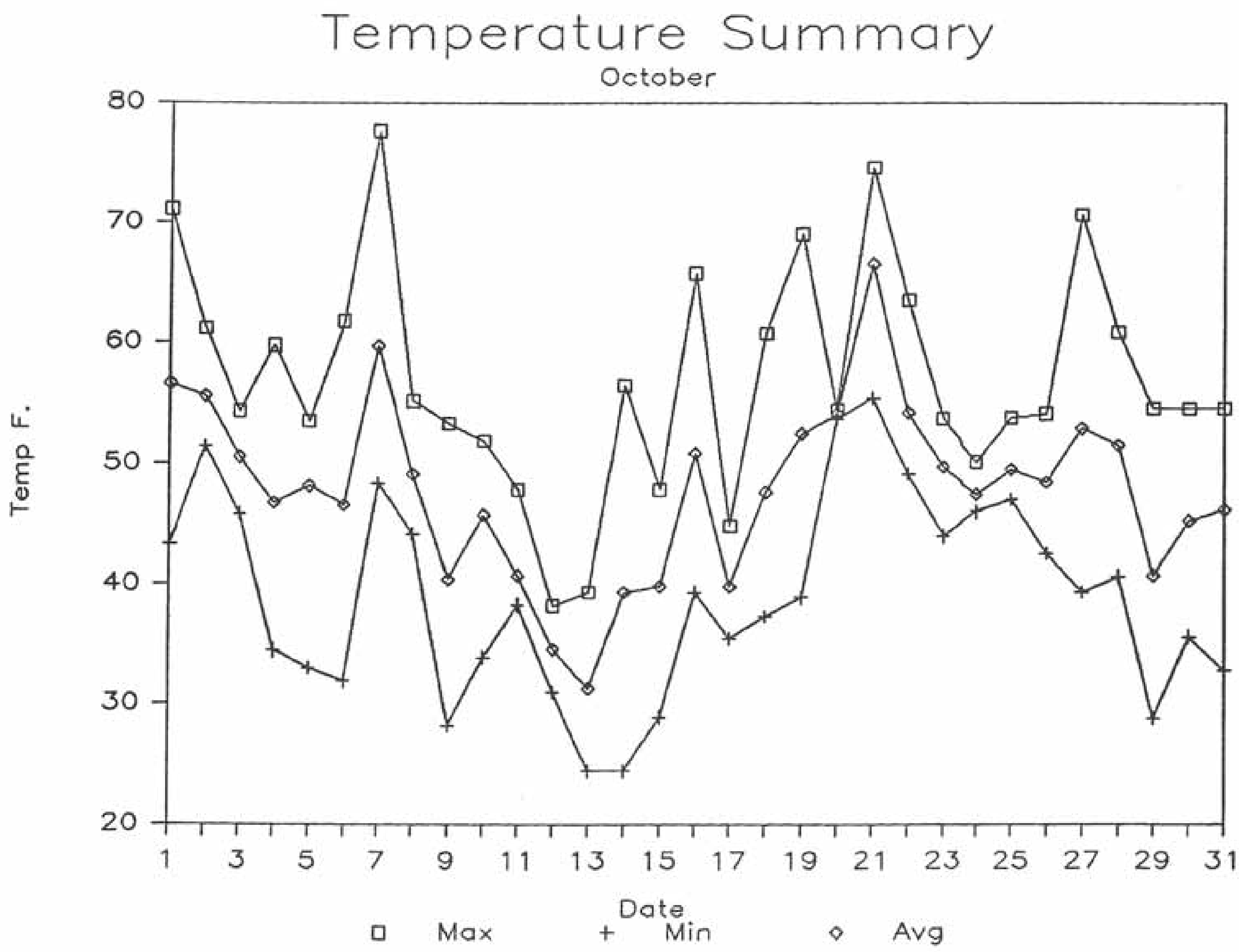

Figure 12. The maximum, minimum and average temperature summary for October 1986.