1993 Research Report

SMBSC

1/1/1993
Southern Minnesota Beet Sugar Company
SMBSC

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PREVIOUS CROP AND ROTATIONAL PATTERNS

The Cooperative planted a total of 87,200 acres in 1992, and increased to 101,759 acres in 1993 as a result of the final year in the acreage expansion project.

PREVIOUS CROP

A review of the 1992 and 1993 plantings show that corn was the primary previous crop. The following Table 2 shows the percentage and number of acres for each preceding crop.

Table 2. Previous Crop, 1992 - 1993

	1992		1993	
CROP	NO. ACRES	% OF TOTAL	NO. ACRES	% OF TOTAL
Corn	59,209	67.9	74,197	72.9
Soybeans	8,110	9.3	10,046	9.9
Sweet Corn	3,750	4.3	4,649	4.6
Small Grain	3,837	4.4	1,875	1.8
Set Aside	436	0.5	96	0.09
Navy Beans	349	0.4	113	0.1
Peas	262	0.3	977	0.9
Alfalfa	87	0.1	0	0
Fallow	0	0.0	65	0.06
Mixed	11,162	12.8	9740	9.6
TOTAL	87,200	100.0	101,759	100.0

CROP ROTATION

Rotation is defined as the number of intervening crops between sugarbeet crops i.e., a pattern of sugarbeets - soybeans - corn - sugarbeets is a three year rotation (two intervening crops).

Table 3 shows the rotational pattern for 1992 and 1993.

Table 3.

	1992		1993	
YEARS	NO. ACRES	% OF TOTAL	NO. ACRES	% OF TOTAL
New Ground	23,108	26.5	29,803	29.3
2	9,592	11.0	8,937	8.8
3	39,850	45.7	43,917	43.2
4	10,551	12.1	9,848	9.7
5 +	4,098	4.7	9,253	9.0
TOTAL	87,200	100.0	101,759	100.0

TABLE 4. HISTORIC DATA FOR SOUTHERN MINNESOTA SUGAR COOP, 1975-1993

YEAR	PLANTED ACRES	REPLANT ACRES	HARVEST ACRES	NET TONS	AVG. T/A	AVG. % SUGAR	AVG. LTM	DAYS OF SLICE	TONS SLICED/ DAY
1975	49273		48536	766743	15.79	14.41		145	3196
1976	54784		50209	537361	10.71	15.21		106	4966
1977	51614		49345	986056	19.98	14.11		193	4810
1978	51913		50311	916625	18.22	14.48		157	5492
1979	52061	948	48425	727124	15.02	15.88		134	5162
1980	58105	510	57711	948767	16.44	15.53		154	5753
1981	59051	5456	57484	848808	14.77	13.04		157	5088
1982	54095	262	53422	1153158	21.59	15.36		185	5776
1983	57308	1100	56084	1083689	19.32	14.61		150	6697
1984	57240	6500	54085	948553	17.54	15.49		135	6151
1985	59703	7082	58897	1279935	21.73	16.21	1.204	167	6985
1986	66635	4150	65412	986846	15.09	16.22	1.201	121	7745
1987	66860	1450	66488	1498024	22.53	16.98	1.301	197	7158
1988	70646	42000	69500	1229526	17.69	17.15	1.468	159	7154
1989	74943	11000	74040	1507224	20.36	15.91	1.484	172	8013
1990	80783	40350	78781	1411200	17.91	15.63	1.348	161	8283
1991	82285	7600	79672	1303837	16.37	15.42	1.221	161	8484
1992	87324	1019	86292	1866761	21.63	17.59	0.986	205	8598
1993	101760	8814	94679	948619	10.02	17.00	1.064	104	8874

TABLE 5

1993 HARVEST RESULTS BY STATION

STATION	PLANTED ACRES	HARVEST ACRES	NET TONS	T/A	% SUGAR
RENVILLE	38165	35644	358512	10.0	16.93
BIRD ISLAND	16664	15333	148250	9.7	16.81
CC WEST	10495	9960	94257	9.5	17.07
CC EAST	4530	4313	44539	10.3	16.97
HECTOR	14033	12743	132361	10.4	17.04
MAYNARD	3591	3481	26438	7.6	17.05
MILAN	5523	5221	63859	12.2	17.12
MURDOCK	7243	7073	73067	10.3	17.2
REDWOOD FALLS	1516	871	7494	8.6	17.39
TOTAL	**101760**	**94639**	**948777**	**10.0**	**16.98**

TABLE 6

1993 HARVEST RESULTS BY COUNTY

COUNTY	PLANTED ACRES	T/A	HARVEST ACRES	T/A	% SUGAR
BIG STONE	548	5.49	469	6.42	16.90
BROWN	47	6.26	38	7.74	17.72
CHIPPEWA	32280	9.73	30916	10.15	16.96
KANDIYOHI	11430	9.31	10845	9.81	17.05
LAC QUI PARLE	661	13.7	661	13.70	17.45
McLEOD	928	9.37	860	10.11	17.18
MEEKER	725	7.11	679	7.12	16.97
POPE	75	15.49	75	15.49	17.34
REDWOOD	2676	6.27	1879	8.92	17.22
RENVILLE	39295	8.7	35974	9.50	16.88
SIBLEY	4003	11.36	3714	12.24	17.04
STEVENS	51	17.22	50	17.23	17.24
SWIFT	6268	11.31	5993	11.83	17.32
YELLOW MEDICINE	2771	9.25	2485	10.32	16.91
TOTAL	**101760**	**9.32**	**94639**	**10.03**	**16.98**

TABLE 7

SMSC
COMPARISON OF MID-JULY SAMPLES

	1987	1988	1989	1990	1991	1992	1993	1987 - 93 MEAN
NO. BEETS/10'	12.5	13.0	14.0	15.6	13.7	15.4	16.5	14.4
TOP WT./10' (LBS)	19.8	8.3	8.6	9.4	9.2	14.2	4.3	10.5
BEET WT./10' (LBS)	11.4	6.9	4.1	3.1	3.9	6.0	1.5	5.3
AVE. BEET WT. (OZ)	15.2	8.6	5.1	3.2	4.6	6.2	1.4	6.3
TOP/ROOT RATIO	1.7	1.2	2.3	3.0	2.4	2.3	2.9	2.3
FINAL YIELD (T/A)	22.5	17.7	20.2	17.9	16.4	21.6	10.0	18.0

TABLE 8

COMPARISON OF MID-AUGUST PRE-HARVEST SAMPLES (AUG. 20-25)
AUGUST 25, 1993

	1985	1986	1987	1988	1989	1990	1991	1992	1993
NO. BEETS/10'	13.0	12.7	13.0	13.0	13.0	14.3	13.0	13.2	15.5
BEET WT./10' (LBS)	15.2	10.7	17.4	12.8	14.4	12.0	12.4	14.3	8.8
AVE. SUGAR %	12.83	12.13	14.44	15.01	14.31	11.35	12.90	13.50	11.55
PPM K		2629	2265	2523	2164	1962	1905	2209	2105
PPM NA		488	392	380	536	714	566	580	460
PPM AM. N		173	367	548	441	235	180	189	355
LTM %		1.351	1.434	1.751	1.561	1.311	1.153	1.274	1.397
FINAL T/A	21.7	15.1	22.5	17.7	20.2	17.9	16.4	21.6	10.0
FINAL SUGAR %	16.21	16.22	16.98	17.15	15.91	15.63	15.42	17.59	16.98
FINAL LTM %	1.204	1.213	1.376	1.434	1.484	1.347	1.211	0.986	1.064
NET TONS (M)	1.279	0.987	1.498	1.229	1.507	1.411	1.304	1.867	0.948
% SUGAR OPENING OF PREPILE	13.83	14.82	14.53	15.51	12.81	11.95	12.86	14.05	15.38
DATE OF PREPILE	09/14	09/27	09/01	10/03	09/06	09/10	09/19	09/08	09/27

TABLE 9

COMPARISON OF LATE AUGUST - EARLY SEPTEMBER SAMPLES, 1986-1993

	SEPT. 12 1986	AUG. 28 1987	AUG 30 1988	AUG 29 1989	SEPT 6 1990	SEPT 5 1991	SEPT 7 1992	SEPT 7 1993
NO. BEETS/10 FT	13.6	12.7	13.0	13.1	14.2	13.0	13.0	15.1
BEET WT/10 FT (LBS)	14.8	19.4	12.8	14.4	15.5	15.7	17.7	11.1
AVE. BEET WT (LBS)	1.10	1.53	0.98	1.09	1.09	1.20	1.36	0.73
AVE SUGAR %	14.41	14.95	15.01	14.31	11.85	14.65	14.27	13.91
PPM K	2515	2286	2523	2164	1863	1881	1931	2137
PPM NA	362	376	380	536	681	473	308	392
PPM AM. N	158	311	548	411	237	247	182	177
LTM %	1.23	1.66	1.75	1.56	1.27	1.19	1.04	1.15
REC S/T	264	272	265	255	212	269	264	255
REC S/A	4642	6269	4030	4362	3904	5017	5551	3351
CALC T/A*	17.6	23.0	15.2	17.1	18.4	18.7	21.0	13.1
EST. TOTAL TONS	981180	1398000	1061620	1452000	1460000	1405000	1178000	1248232

*NOTE: CALCULATED TONS/ACRE ARE NOT ADJUSTED FOR HARVEST LOSS

FINAL T/A	15.1	22.5	17.7	20.2	17.9	16.4	21.6	10.0
FINAL % SUGAR	16.22	16.98	17.15	15.91	15.63	15.42	17.59	16.98
FINAL % LTM	1.200	1.376	1.434	1.484	1.347	1.220	0.986	1.064
TOTAL NET TONS	986835	1498024	1229433	1507224	1411288	1303837	1866311	0.948

NOTE: 1986 SAMPLES 5-14 DAYS LATER THAN OTHER YEARS.

TABLE 10. HARVEST SUMMARY, 1985-1993

PRE-PILE HARVEST

VARIABLE	1985	1986	1987	1988	1989	1990	1991	1992	1993	AVERAGE
BEGINNING DATE	09/14	09/27	09/01	10/03	09/06	09/10	09/19	09/08	09/27	09/16
LENGTH (DAYS)	23	9	37	5	30	28	18	27	9	21
NET TONS (PREPILE) *	176680	92586	289726	80976	278579	252550	167690	219764	83836	182487
% OF TOTAL TONS	13.8	9.4	19.3	6.6	18.5	17.9	12.9	11.7	8.0	13.12
AVERAGE % SUGAR	14.55	15.10	15.89	16.28	14.21	13.79	13.66	15.36	15.87	14.97
% SUGAR ON FIRST DAY OF FULL HARVEST	16.07	15.8	17.46	16.71	16.3	15.95	15.3	17.83	16.88	16.48
% FINAL SUGAR	16.21	16.22	16.98	17.15	15.91	15.63	15.42	17.59	16.98	16.45

*** BEFORE FINAL DIRT ADJUSTMENT**

TABLE 11. BEET QUALITY ANALYSIS, SMSC, 1985-1993

YEAR	AVERAGE % SUGAR	AVERAGE PPM POT.	AVERAGE PPM SODIUM	AVERAGE AM N	AVERAGE % LTM
1985	16.21	2313	304	209	1.204
1986	16.22	2363	324	185	1.201
1987	16.98	2400	339	344	1.301
1988	17.15	2433	268	394	1.468
1989	15.91	2234	422	402	1.484
1990	15.61	2052	557	296	1.348
1991	15.42	1908	460	270	1.221
1992	17.59	1883	221	184	0.986
1993	16.98	2041	308	171	1.064

TABLE 12. COMPARATIVE HARVEST SUMMARY, 1985-1993

TONS* HARVESTED BY WEEK

HARVEST PERIOD	1985		1986		1987		1988		1989		1990		1991	
	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%
START - 10/06	176680	13.7	147860	14.9	289128	19.3	80992	6.6	318594	21.1	252550	17.8	167690	12.8
10/07 - 10/13	182244	14.1	349263	35.2	534053	35.6	545308	44.3	728313	48.2	554348	39.1	632102	48.4
10/14 - 10/20	269976	20.9	383746	38.6	453468	30.2	520558	42.3	344987	22.8	374776	26.4	365074	27.9
10/21 - 10/27	511174	39.6	105784	10.6	214117	14.3	85076	6.9	117130	7.8	230266	16.2	142193	10.9
10/28 - END	152254	11.8	6887	0.7	11195	0.7	0	0.0	1890	0.1	5758	0.4	0	0.0
TOTALS	1292328	100.0	993540	100.0	1501961	100.0	1231934	100.0	1510914	100.0	1417698	100.0	1307059	100.0

HARVEST PERIOD	1992		1993		AVERAGE	
	TONS	%	TONS	%	TONS	%
START - 10/06	418797	22.4	148301.0	15.6	222288	16.6
10/07 - 10/13	336582	18.0	414837.0	43.5	475228	35.4
10/14 - 10/20	236436	12.7	242202.0	25.4	354580	26.4
10/21 - 10/27	737027	39.5	147921.0	15.4	254521	19.0
10/28 - END	137918	7.4	313.0	0.1	35135	2.6
TOTALS	1866760	100.0	953574	100.0	1341752	100.0

* TONS HARVESTED ARE NOT ADJUSTED FOR FINAL DIRT PERCENTAGE

TABLE 13. COMPARATIVE HARVEST SUMMARY, 1985-1993

% SUGAR BY WEEK

HARVEST PERIOD	1985		1986		1987		1988		1989		1990	
	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU
START - 10/06	14.66	14.55	15.25	15.36	16.58	15.89	16.12	16.18	14.08	14.47	13.60	13.79
10/07 - 10/13	16.19	15.36	16.21	15.91	17.36	16.88	17.05	16.97	16.24	15.71	15.86	15.21
10/14 - 10/20	16.21	15.74	16.46	16.15	17.16	16.98	17.33	17.13	16.45	15.89	16.18	15.50
10/21 - 10/27	16.57	16.11	16.55	16.21	16.95	16.98	17.52	17.16	16.52	15.93	16.33	15.62
10/28 - END	16.72	16.20	16.79	16.21	16.85	16.98	17.52	17.16	16.45	15.93	16.14	15.63
TOTALS		16.20		16.21		16.98		17.16		15.93		15.63

HARVEST PERIOD	1991		1992		1993		AVERAGE	
	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU	% S WK	% S ACCU
START - 10/06	13.78	13.66	16.55	16.55	16.29	16.29	15.21	15.19
10/07 - 10/13	15.47	15.09	17.74	17.08	17.03	16.83	16.57	16.11
10/14 - 10/20	15.77	15.33	17.76	17.25	17.11	16.93	16.71	16.32
10/21 - 10/27	15.65	15.41	17.91	17.53	17.46	17.00	16.83	16.44
10/28 - END	15.83	15.42	18.36	17.59	17.70	17.00	16.92	16.46
TOTALS		15.42		17.59		16.98		16.46

% SUGAR ON:	1986	1987	1988	1989	1990	1991	1992	1993
FIRST DAY OF PREPILE	14.82	14.53	15.51	12.81	11.95	12.86	14.05	15.38
FIRST DAY OF FULL HARVEST	15.80	17.46	16.71	16.30	15.95	15.30	17.83	16.88

TABLE 14

HARVEST RESULTS - FINAL, 1993
SOUTHERN MINNESOTA SUGAR COOP

STATION	PILER	GROSS TONS	1ST TARE	1ST TARE (%)	2ND TARE	NET TONS	% SUGAR	% LTM
RENVILLE	TAN-1	50068	1813	3.62	5.13	45779	16.68	1.087
	SEMI-2	59321	2712	4.57	5.48	53507	16.9	1.058
	TAN-3	30777	1149	3.73	4.84	28195	16.76	1.072
	SEMI-3	34253	1454	4.24	4.35	31372		
	TAN-4	47142	2007	4.26	5.51	42647	16.98	4.069
	SEMI-5	50241	1895	3.77	5.59	45645	17.11	1.048
	TAN-6	34870	1281	3.67	5.41	31770	17.17	1.058
	SEMI-6	49158	1957	3.98	5.31	44695		
	SEMI-7	36423	1105	3.03	5.23	33471	17	1.058
	TOTAL	392254	15374	3.92	5.25	357082	16.95	1.063
	TANDEM	162857	6250	3.84	5.24	148391		
	SEMI	229397	9124	3.98	5.26	208691		

COMBINATION	
TANDEM	0.44
SEMI	0.56

BIRD IS.	TAN-1	45827	1874	4.09	5.65	41472	16.86	1.128
	TAN-2	38804	1270	3.27	4.99	35663	16.72	1.124
	TAN-3	34333	1510	4.4	5.73	30942	16.85	1.114
	SEMI-3	34080	1498	4.4	4.7	31052	16.85	1.114
	DIR. L	6880	271	3.94	4.14	6335	16.69	1.115
	TOTAL	159925	6424	4.02	5.24	145464	16.81	1.121

COMBINATION	
TANDEM	0.502
SEMI	0.498

CC WEST	SEMI-1	43465	2059	4.74	5.96	38938	17.11	1.007
	TAN-2	26102	1203	4.61	6.05	23392	17.09	1.007
	SEMI-2	34832	1811	5.2	6.22	30966	17.09	1.007
	TOTAL	104399	5073	4.86	6.07	93295	17.09	1.007

COMBINATION	
TANDEM	0.478
SEMI	0.522

TABLE 14 (continued)

HARVEST RESULTS - FINAL, 1993
SOUTHERN MINNESOTA SUGAR COOP

STATION	PILER	GROSS TONS	1ST TARE	1ST TARE (%)	2ND TARE	NET TONS	% SUGAR	% LTM
CC EAST	TAN-1	47525	1523	3.20	5.46	43489	16.99	1.024
HECTOR	TAN-1	38115	1413	3.71	4.29	35129	17.05	1.109
	SEMI-1	26951	987	3.66	4.20	24873	17.05	1.109
	TAN-2	69401	3240	4.67	4.52	63269	17.03	1.113
	DIR. L	12595	545	4.33	4.47	11511	17.11	1.099
	TOTAL	147062	6085	4.14	4.39	134783	17.05	1.111
MAYNARD	TAN-1	30388	1177	3.87	5.7	27547	17.07	1.004
MILAN	TAN-1	68806	1757	2.55	4.98	63709	17.15	1.038
MURDOCK	TAN-1	67801	3811	5.62	6.31	59952	17.18	1.008
	TAN-2	15425	650	4.21	5.05	14028	17.20	1.004
	TOTAL	83226	4461	5.36	6.08	73980	17.18	1.008
RW FLS.	TAN-1	10005	301	3.01	4.45	9272	17.37	1.056
TOTAL		1043591	42173	4.04	5.27	948620	17.00	1.063

COMBINATION	
TANDEM	0.586
SEMI	0.414

% 1ST TARE	4.04
% 2ND TARE	5.29
TOTAL	9.31

COMBINATION	
TANDEM	0.478
SEMI	0.522

VARIETY EVALUATION

Twenty-two varieties were approved for planting in the 1994 growing season. There were no test market varieties approved for the 1994 growing season. This was due to the varieties not meeting recoverable sugar per ton and/or cercospora leaf spot requirements.

The approved varieties for Southern Minnesota Sugar Cooperative since 1980 are listed in Table 1. Hilleshog 5135 has been on the list for the last 7 years and ACH 198 for the last 5 years. The remaining 20 varieties have been sold in the SMSC growing area for 3 years or less. This rapid turnover of varieties in the last few years is indicative of genetic improvements and the intense competition for market share in SMSC seed sales. This has also made research hard to manage as genetic material is either changing to meet the market place or withdrawn due to lack of performance in comparison to higher productive upcoming genetic material (varieties).

A comparison of the average performance for all approved varieties is listed in Table 2. The increase in production over the past 14 years is reflected in these data. Table 3 - 6 list the three and two year performance of the 21 approved varieties plus the specialty variety, ACH 205. Coded trial results for all varieties evaluated for the past three years are listed in Table 7 through 14.

The seed issued to Southern Minnesota Sugar Cooperative growers in 1991-1993 was as follows (calculated on a bare seed equivalent basis):

SEED USAGE
SMSC, 1991 - 1993

YEAR	SMALL	MEDIUM	LARGE	X-LARGE	MINI	REGULAR	TOTAL
1991 LBS	20196	77116	32528	26564	4961	1939	163304
%	12.37	47.22	19.92	16.27	3.04	1.19	100.00
1992 LBS	27249	50143	41256	23720	13803	1584	157755
%	17.27	31.79	26.15	15.04	8.75	1.00	100.00
1993 LBS	34119	50748	36134	43010	25964	5068	195043
%	17.49	26.02	18.53	22.05	13.31	2.60	100.00
AVE.	**27188**	**59336**	**36639**	**31098**	**14909**	**2864**	**172034**
%	**15.80**	**34.49**	**21.30**	**18.08**	**8.67**	**1.66**	**100.00**

Mini and regular pellets are adjusted to bare seed basis

Planting rates for 1991-1993 are shown the following table.

SEED USAGE
POUNDS PLANTED PER ACRE
SMSC, 1991-1993

YEAR	ACRES PLANTED	ACRES REPLANTED	TOTAL ACRES	TOTAL SEED USED, LBS.	AVE. SEED/ ACRE LBS.
1991	82284	7600	89884	163304	1.82
1992	87324	1000	88324	157755	1.79
1993	101780	8814	110594	195043	1.76
AVERAGE	**90463**	**5805**	**96267**	**172034**	**1.79**

The most popular varieties grown in 1993 by SMSC growers were:

ACH 198
KW 2249
KW 3145
KW 2398
Beta 2010
KW 1119
Hilleshog 5135

Use of mini and regular pellets has increased from 5% in 1991 to 16% in 1993.

SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties since 1980

Table 1.

1980	1981	1982	1983	1984
ACH 12	ACH 14	ACH 14	ACH 14	ACH 145
ACH 14	ACH 151	ACH 145	ACH 30	ACH 154
ACH 17	ACH 30	ACH 17	Beta 1230	ACH 30
ACH 30	Beta 1230	Beta 1230	Beta 1237	Beta 1230
Beta 1237	Beta 1237	Beta 1237	BJ Monofort	BJ Monofort
Beta 1345	Beta 1345	BJ Monofort	Maribo Ultramono	KW 3394
Beta 1443	Beta 1443	Holly HH33	Mono-Hy M7	Maribo Ultramono
BJ Monofort	BJ Monofort	Mono-Hy E4	Mono-Hy M8	Mono-Hy M7
Holly HH33	Maribo Ultramono	Mono-Hy M7	Mono-Hy R1	Mono-Hy R1
Mono-Hy E4	Maribo Unica	Mono-Hy M8		
Mono-Hy R1	Mono-Hy M7	Mono-Hy R1		
	Mono-Hy M8			
	Mono-Hy R1			
	Mono-Hy X73			

1985	1986	1987	1988	1988 (cont.)
ACH 145	ACH 146	ACH 164	ACH 164	KW 6264
ACH 154	ACH 164	Beta 1230	ACH 178	Maribo 403
ACH 30	ACH 30	Beta 5494	ACH 180	Maribo 411
Beta 1230	Beta 1230	Beta 6264	ACH 181	Maribo Ultramono
BJ Monofort	Beta 6264	BJ 1310	Beta 1230	Mitsui Monohikari
KW 1132	BJ 1310	BJ Monofort	Beta 3614	Mono-Hy R103
KW 3394	BJ Monofort	Hilleshog 4046	Beta 6625	
Maribo 401	KW 1132	Hilleshog 5090	BJ 1310	
Maribo Ultramono	KW 3265	Hilleshog 5135	BJ Monofort	
Mono-Hy M7	KW 3394	KW 1132	Hilleshog 4046	
Mono-Hy R1	Maribo 401	KW 3265	Hilleshog 5090	
	Maribo 403	KW 3394	Hilleshog 5135	
	Maribo Ultramono	Maribo 403	Hilleshog 8277	
	Mono-Hy M7	Maribo Ultramono	KW 1014	
		Mitsui Monohikari	KW 1132	
		Mono-Hy M7	KW 3145	
		Mono-Hy R103	KW 3265	
		Mono-Hy R117	KW 3394	

SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties since 1980

Table 1. (cont.)

1989	1990	1991	1992	1993
ACH 164	ACH 180	ACH 194	ACH 194	ACH 194
ACH 180	ACH 181	ACH 196	ACH 196	ACH 196
ACH 181	ACH 194	ACH 198	ACH 198	ACH 198
ACH 198	ACH 196	Beta 1238	Beta 1238	Beta 2010
Beta 3614	ACH 198	Beta 2988	Beta 2010	Beta 2988
Beta 6269	Beta 3614	Beta 5657	Beta 2988	Hilleshog 5090
Beta 6625	Beta 6269	Beta 6269	Beta 5657	Hilleshog 5133
Hilleshog 4046	Beta 6625	Beta 6625	Beta 6269	HM 2401
Hilleshog 5090	Hilleshog 4046	Hilleshog 2401	Beta 6625	KW 1119
Hilleshog 5135	Hilleshog 5090	Hilleshog 5090	BJ 1330	KW 1800
KW 1014	Hilleshog 5135	Hilleshog 5135	Hilleshog 5090	KW 2249
KW 3145	HM 2410	KW 2398	Hilleshog 5135	KW 2398
KW 3265	KW 1014	KW 3145	HM 2401	KW 3145
KW 3394	KW 3145	KW 3265	KW 1119	KW 3580
Maribo 403	KW 3265	Maribo 403	KW 2398	KW 6770
Maribo 411	KW 3394	Maribo 875	KW 3145	Maribo 875
Maribo Ultramono	Maribo 403	Maribo Ultramono	KW 3265	Seedex Monohikari
Mitsui Monohikari	Maribo 411	Mitsui Monohikari	Maribo 875	VDH 66140
Mono-Hy R103	Maribo 875		Maribo Ultramono	
	Maribo Ultramono		Mitsui Monohikari	
	Mitsui Monohikari			

1994	1994 (cont.)
ACH 194	KW 3580
ACH 196	KW 6770
ACH 198	Maribo 875
ACH 205 (Special)	Mitsui Monohikari
ACH 302	Seedex SX1004
ACH 309	VDH H16640
ACH 311	
Beta 2010	
Hilleshog 5135	
Hill. 7505 (Niagara)	
HM 2401	
KW 1119	
KW 1800	
KW 2249 (Blend)	
KW 2398	
KW 3291	

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

		Recoverable Sugar/Acre	Sugar/Ton	Tons/Acre	% Sugar	Leaf Spot Rating	LTM
Year	No. of Approved	Mean of Approved	Mean of Approved	Mean of Approved	Mean of Approved	Mean of Approved	Mean of Approved
1981 (78-79-80)	15	6724	264.5	25.7	15.40	4.43	2.18
1982 (79-80-81)	12	6282	262.6	23.9	15.50	4.31	2.17
1983 (80-81-82)	9	7053	261.9	26.9	15.60	4.84	2.37
1984 (81-82-83)	9	6823	253.1	26.9	15.30	4.80	2.50
1985 (82-83-84)	11	7682	269.7	28.6	15.90	4.87	2.64
1986 (83-84-85)	14	7837	280.9	27.9	16.10	4.80	2.41
1987 (84-85-86)	18	7764	300.4	25.9	16.70	4.68	1.68
1988 (85-86-87)	24	8884	308.7	28.7	16.95	4.93	1.51
1989 (86-87-88)	19	8689	318.6	27.2	17.40	4.70	1.47
1990 (87-88-89)	21	9078	307.8	29.4	17.10	4.87	1.71
1991 (88-89-90)	19	7554	294.1	25.7	16.39	4.56	1.59
1991 (89-90-91)	21	6831	276.6	24.8	15.50	4.60	1.60
1991 (90-91-92)	19	6943	296.2	23.5	16.30	4.83	1.49
1993 (91-92-93)	21	5961	308.8	19.6	16.90	4.80	1.40

SOUTHERN MINNESOTA SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1994

Table 3. Two year performance summary from coded trials conducted at SMSC, 1991-1993.

Variety	Rec./ Ton	Rec./ Acre	Percent LTM	Leaf Spot**	Percent Sugar	Tons/ Acre	Seed Vig.**	% Field Emerg.
ACH 194	308.3	5843	1.45	5.08	16.87	19.23	1.28	66.20
ACH 196	307.4	6041	1.45	5.05	16.83	19.84	1.39	68.70
ACH 198	305.1	5741	1.50	4.32	16.76	19.17	1.31	69.60
ACH 302	313.5	5922	1.43	4.38	17.11	19.21	1.31	
ACH 309	311.5	5916	1.42	4.31	16.99	19.36	1.32	
ACH 311	310.0	5789	1.51	4.21	17.01	18.97	1.45	
BETA 2010	309.0	6041	1.38	5.02	16.83	19.83	1.73	68.40
HILLESHOG 5135	305.2	6156	1.50	5.05	16.75	20.53	1.42	66.50
HILL. 7505 (NIAGARA)	310.1	5954	1.44	4.65	16.95	19.56	1.81	
HM 2401	304.4	5914	1.45	4.95	16.66	19.66	1.72	69.00
KW 1119	312.0	5722	1.38	5.11	16.99	18.47	1.79	64.60
KW 1800	304.4	6305	1.44	5.10	16.66	20.88	1.79	
KW 2249 (BLEND)	307.2	6054	1.40	5.14	16.77	19.89	1.75	66.90
KW 2398	312.3	5861	1.39	5.14	17.00	19.06	1.64	67.80
KW 3291	317.7	6064	1.38	4.95	17.26	19.33	1.35	
KW 3580	315.5	5911	1.38	5.20	17.15	18.96	1.73	
KW 6770	315.7	6311	1.37	4.95	17.15	20.27	1.59	
MARIBO 875	303.8	5874	1.47	4.98	16.66	19.66	1.16	69.30
MITSUI MONOHIKARI	299.2	5873	1.35	4.80	16.31	19.90	2.52	64.00
SEEDEX SX1004	309.9	5873	1.41	4.31	16.91	19.28	2.14	
VDH H66140	302.7	6013	1.43	5.02	16.56	20.12	1.72	
MEAN OF APP.	308.8	5960.9	1.4	4.8	16.9	19.6	1.6	67.4
ACH 205 (SPECIAL)	297.4	5844	1.35	4.08	16.22	19.98	1.48	73.40

** Lower numbers indicate better resistance and vigor.

SOUTHERN MINNESOTA SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1994
PERCENT OF MEAN OF APPROVED

Table 4. Mean of Three Year Performance Summary of SMSC Commercial Coded Entries. 1991-1993

Description	Rec./ Ton	Rec./ Acre	Percent LTM	Leaf Spot**	Percent Sugar	Tons/ Acre	Seed Vig.**	% Field Emerg.	Estimated Grower Return Per Ton	Per Acre
ACH 194	99.8	98.0	101.7	104.9	100.0	98.2	79.2	98.3	99.7	98.0
ACH 196	99.5	101.3	101.7	104.3	99.8	101.3	86.1	102.0	99.2	100.5
ACH 198	98.8	96.3	105.2	89.2	99.4	97.9	81.1	103.3	97.5	95.5
ACH 302	101.5	99.3	100.3	90.4	101.4	98.1	81.1		103.3	101.4
ACH 309	100.9	99.2	99.6	89.0	100.7	98.9	81.7		101.8	100.7
ACH 311	100.4	97.1	105.9	86.9	100.9	96.9	89.8		100.8	97.7
BETA 2010	100.1	101.3	96.8	103.6	99.8	101.3	107.1	101.5	100.1	101.5
HILLESHOG 5135	98.8	103.3	105.2	104.3	99.3	104.9	87.9	98.7	97.4	102.2
HILL. 7505 (NIAGARA)	100.4	99.9	101.0	96.0	100.5	99.9	112.1		101.0	100.9
HM 2401	98.6	99.2	101.7	102.2	98.8	100.4	106.5	102.4	96.8	97.3
KW 1119	101.0	96.0	96.8	105.5	100.7	94.3	110.8	95.9	102.3	96.6
KW 1800	98.6	105.8	101.0	105.3	98.8	106.6	110.8		97.0	103.5
KW 2249 (BLEND)	99.5	101.6	98.2	106.1	99.4	101.6	108.3	99.3	99.0	100.6
KW 2398	101.1	98.3	97.5	106.1	100.8	97.3	101.5	100.6	102.3	99.7
KW 3291	102.9	101.7	96.8	102.2	102.3	98.7	83.6		106.0	104.7
KW 3580	102.2	99.2	96.8	107.4	101.7	96.8	107.1		104.5	101.3
KW 6770	102.2	105.9	96.1	102.2	101.7	103.5	98.4		104.7	108.4
MARIBO 875	98.4	98.5	103.1	102.7	98.8	100.4	71.8	102.9	96.6	97.0
MITSUI MONOHIKARI	96.9	98.5	94.7	99.1	96.7	101.6	156.0	95.0	93.4	95.0
SEEDEX SX1004	100.4	98.5	98.9	89.0	100.3	98.5	132.5		100.8	99.3
VDH H66140	98.0	100.9	100.3	103.6	98.2	102.8	106.5		95.7	98.4
MEAN OF APP.	308.8	5960.9	1.4	4.8	16.9	19.6	1.6	67.4		
ACH 205 (SPECIAL)	96.3	98.0	94.7	84.2	96.2	102.0	91.6	109.0	92.2	94.1

** Lower numbers indicate better resistance and vigor.

SOUTHERN MINNESOTA SUGAR COOPERATIVE
LIST OF APPROVED VARIETIES FOR 1994

Table 5. Mean of two year performance summary from coded trials conducted at SMSC, 1992-1993.

Variety	Rec./ Ton	Rec./ Acre	Percent LTM	Leaf Spot**	Percent Sugar	Tons/ Acre	Seed Vig.**	%Field Emerg.
ACH 194	325.1	5664	1.275	5.32	17.53	17.365	1.29	69.8
ACH 196	323.15	5864.5	1.31	5.175	17.47	18.025	1.59	70.35
ACH 198	318.9	5421	1.345	4.51	17.29	16.96	1.405	71.75
ACH 302	327.2	5538	1.24	4.62	17.6	16.93	1.46	69
ACH 309	326.25	5435	1.25	4.515	17.565	16.62	1.39	72.3
ACH 311	321.65	5338	1.36	4.315	17.445	16.59	1.655	60.9
Beta 2010	320.5	5695	1.235	5.285	17.26	17.725	1.81	70.15
Hilleshog 5135	324.2	6068	1.315	5.215	17.525	18.74	1.32	69.05
Hilleshog 7505 (Niagara)	326.15	5679	1.265	4.925	17.575	17.39	1.905	53.9
HM 2401	320.4	5790	1.29	5.09	17.305	17.97	1.885	68.85
KW 1119	325.7	5519	1.24	5.49	17.53	16.785	2.055	63.25
KW 1800	317.7	6092.5	1.27	5.405	17.155	18.97	2.06	63.3
KW 2249 (Blend)	322.25	5829	1.255	5.365	17.37	17.955	1.745	69.2
KW 2398	331.5	5665.5	1.23	5.405	17.8	16.97	1.835	68.4
KW 3291	331.9	5800	1.205	5.28	17.805	17.405	1.505	67.6
KW 3580	332.8	5659.5	1.225	5.395	17.86	16.865	1.965	69.25
KW 6770	330.55	6091	1.22	5.19	17.745	18.435	1.65	59.95
Maribo 875	322.95	5736	1.3	5	17.45	17.725	1.175	72.35
Mitsui Monohikari	314.8	5668	1.195	5.17	16.935	17.92	2.585	65.5
Seedex SX1004	324.95	5498	1.245	4.555	17.495	16.855	2.48	52.8
Van der Have H66140	318.75	5951.5	1.27	5.2	17.21	18.595	1.81	67.35
Mean of App.	324.16	5714.4	1.2638	5.0679	17.4724	17.562	1.7417	66.429
ACH 205 (Speacial)	310.9	5634.5	1.195	4.305	16.735	18.1	1.695	74.2

** Lower number indicates better resistance and vigor.

TABLE 7

Three Year Performance Summary of 1993 SMSC Commercial Coded Entries (All Locations)

	-----Rec. / Ton-----					-----Rec. / Acre-----					--Loss to Molasses--					--Cercospora Leaf Spot Ratings--				
Description	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean
ACH 194	274.7	328.1	322.1	308.3	100.0	6201	7618	3710	5843	97.9	1.81	1.22	1.33	1.45	102.1	4.60	5.67	4.97	5.08	105.2
ACH 196	276.0	329.2	317.1	307.4	99.8	6395	7868	3861	6041	101.2	1.74	1.25	1.37	1.45	102.1	4.80	5.38	4.97	5.05	104.6
ACH 198	277.6	322.1	315.7	305.1	99.0	6381	7192	3650	5741	96.2	1.82	1.31	1.38	1.50	105.7	3.94	4.79	4.23	4.32	89.4
ACH 205 (895205 Aph)	270.3	312.6	309.2	297.4	96.5	6264	7344	3925	5844	97.9	1.67	1.18	1.21	1.35	95.1	3.63	4.46	4.15	4.08	84.5
ACH 302 (890126)	286.1	327.7	326.7	313.5	101.7	6690	7182	3894	5922	99.2	1.82	1.22	1.26	1.43	100.7	3.91	4.92	4.32	4.38	90.7
ACH 309 (NC)	282.1	329.4	323.1	311.5	101.1	6879	7205	3665	5916	99.2	1.75	1.22	1.28	1.42	99.6	3.91	4.63	4.40	4.31	89.3
ACH 311 (NC)	286.6	323.7	319.6	310.0	100.6	6691	6968	3708	5789	97.0	1.82	1.35	1.37	1.51	106.4	4.00	4.71	3.92	4.21	87.2
Beta 2010	285.9	323.9	317.1	309.0	100.3	6734	7309	4081	6041	101.2	1.68	1.19	1.28	1.38	97.2	4.49	5.54	5.03	5.02	103.9
Hill. 5135	267.1	323.6	324.8	305.2	99.0	6332	7894	4242	6156	103.2	1.86	1.31	1.32	1.50	105.2	4.71	5.38	5.05	5.05	104.5
Hill. 7505(Niagara NC)	277.9	327.3	325.0	310.1	100.6	6505	7238	4120	5954	99.8	1.80	1.25	1.28	1.44	101.4	4.11	5.17	4.68	4.65	96.3
HM 2401	272.3	326.5	314.3	304.4	98.8	6163	7706	3874	5914	99.1	1.76	1.23	1.35	1.45	101.7	4.66	5.21	4.97	4.95	102.4
KW 1119	284.6	334.1	317.3	312.0	101.2	6129	7589	3449	5722	95.9	1.67	1.18	1.30	1.38	97.2	4.34	5.88	5.10	5.11	105.7
KW 1800	277.7	328.6	306.8	304.4	98.8	6729	8269	3916	6305	105.7	1.78	1.20	1.34	1.44	101.2	4.49	5.83	4.98	5.10	105.6
KW 2249 (Blend)	277.2	329.9	314.6	307.2	99.7	6504	7783	3875	6054	101.5	1.70	1.19	1.32	1.40	98.6	4.69	5.75	4.98	5.14	106.4
KW 2398	273.8	338.5	324.5	312.3	101.3	6252	7642	3689	5861	98.2	1.72	1.19	1.27	1.39	97.9	4.60	5.79	5.02	5.14	106.3
KW 3291 (NC)	289.2	336.6	327.2	317.7	103.1	6591	7770	3830	6064	101.6	1.72	1.18	1.23	1.38	96.8	4.28	5.63	4.93	4.95	102.4
KW 3580	280.8	341.1	324.5	315.5	102.4	6413	7679	3640	5911	99.1	1.69	1.16	1.29	1.38	97.0	4.80	5.79	5.00	5.20	107.6
KW 6770 (NC)	286.1	330.0	331.1	315.7	102.4	6750	7983	4199	6311	105.8	1.67	1.16	1.28	1.37	96.3	4.46	5.33	5.05	4.95	102.4
Maribo 875	265.5	325.9	320.0	303.8	98.6	6151	7563	3909	5874	98.5	1.81	1.25	1.35	1.47	103.3	4.94	5.17	4.83	4.98	103.1
Maribo 923 (NC)		326.8	319.6				7661	4134				1.30	1.37				5.46	4.97		
Mitsui Monohikari	268.0	319.4	310.2	299.2	97.1	6284	7634	3702	5873	98.4	1.65	1.13	1.26	1.35	94.6	4.06	5.54	4.80	4.80	99.4
Seedex SX1004	279.9	329.3	320.6	309.9	100.6	6624	7029	3967	5873	98.4	1.74	1.21	1.28	1.41	99.1	3.83	4.58	4.53	4.31	89.3
Van der Have H66140	270.6	322.7	314.8	302.7	98.2	6137	7724	4179	6013	100.8	1.75	1.22	1.32	1.43	100.5	4.66	5.25	5.15	5.02	103.9
Van der Have H66156	269.7	330.0	319.3	306.3	99.4	6518	7998	4119	6212	104.1	1.76	1.23	1.29	1.43	100.3	5.06	5.67	5.18	5.30	109.8
Mean	277.4	327.8	319.4	308.2	100.0	6449	7577	3889.1	5967	100.0	1.75	1.22	1.31	1.42	100.0	4.39	5.31	4.80	4.83	100.0

TABLE 8

Three Year Performance Summary of 1993 SMSC Commercial Coded Entries (All Locations)

	--Sugar Content (%)--					---Root Yield (T/A)---					---Seedling Vigor---					---Field Emerg (%)---				
Description	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean	1991	1992	1993	3 Yr Mean	3 Yr% Mean
ACH 194	15.54	17.63	17.43	16.87	100.2	22.97	23.22	11.51	19.23	97.9	1.25	1.38	1.20	1.28	79.9	59.0	67.0	72.6	66.2	97.5
ACH 196	15.54	17.71	17.23	16.83	100.0	23.47	23.89	12.16	19.84	101.0	1.00	1.79	1.39	1.39	87.2	65.3	64.2	76.5	68.7	101.1
ACH 198	15.70	17.42	17.16	16.76	99.6	23.60	22.35	11.57	19.17	97.6	1.13	1.29	1.52	1.31	82.2	65.2	66.8	76.7	69.6	102.4
ACH 205 (895205 Aph)	15.18	16.80	16.67	16.22	96.3	23.74	23.53	12.67	19.98	101.7	1.06	1.83	1.56	1.48	92.8	71.7	68.9	79.5	73.4	108.0
ACH 302 (890126)	16.12	17.61	17.59	17.11	101.6	23.78	21.94	11.92	19.21	97.8	1.00	1.63	1.29	1.31	81.8		65.0	73.0		
ACH 309 (NC)	15.85	17.69	17.44	16.99	101.0	24.85	21.90	11.34	19.36	98.6	1.18	1.32	1.46	1.32	82.6			72.3		
ACH 311 (NC)	16.14	17.54	17.35	17.01	101.1	23.72	21.56	11.62	18.97	96.6	1.03	1.07	2.24	1.45	90.5			60.9		
Beta 2010	15.98	17.39	17.13	16.83	100.0	24.03	22.58	12.87	19.83	100.9	1.56	2.33	1.29	1.73	108.0	64.9	64.6	75.7	68.4	100.7
Hill. 5135	15.21	17.49	17.56	16.75	99.5	24.12	24.41	13.07	20.53	104.5	1.63	1.54	1.10	1.42	89.1	61.3	62.2	75.9	66.5	97.8
Hill. 7505 (Niagara NC)	15.69	17.62	17.53	16.95	100.7	23.89	22.12	12.66	19.56	99.6	1.62	1.51	2.30	1.81	113.3			53.9		
HM 2401	15.38	17.55	17.06	16.66	99.0	23.04	23.62	12.32	19.66	100.1	1.38	1.83	1.94	1.72	107.4	69.2	64.0	73.7	69.0	101.5
KW 1119	15.90	17.89	17.17	16.99	100.9	21.83	22.73	10.84	18.47	94.0	1.25	2.17	1.94	1.79	111.8	67.4	58.2	68.3	64.6	95.1
KW 1800	15.67	17.63	16.68	16.66	99.0	24.69	25.18	12.76	20.88	106.3	1.25	1.63	2.49	1.79	112.0		57.5	69.1		
KW 2249 (Blend)	15.56	17.69	17.05	16.77	99.6	23.76	23.61	12.30	19.89	101.3	1.75	2.04	1.45	1.75	109.3	62.3	62.5	75.9	66.9	98.5
KW 2398	15.41	18.11	17.49	17.00	101.0	23.25	22.60	11.34	19.06	97.1	1.25	1.71	1.96	1.64	102.6	66.6	64.0	72.8	67.8	99.8
KW 3291 (NC)	16.18	18.02	17.59	17.26	102.6	23.18	23.11	11.70	19.33	98.4	1.03	1.47	1.54	1.35	84.3			67.6		
KW 3580	15.72	18.21	17.51	17.15	101.9	23.14	22.52	11.21	18.96	96.5	1.25	1.67	2.26	1.73	108.0		64.3	74.2		
KW 6770 (NC)	15.97	17.66	17.83	17.15	101.9	23.93	24.20	12.67	20.27	103.2	1.48	1.75	1.55	1.59	99.7		55.4	64.5		
Maribo 875	15.08	17.55	17.35	16.66	99.0	23.52	23.24	12.21	19.66	100.1	1.13	1.25	1.10	1.16	72.6	63.3	66.0	78.7	69.3	102.1
Maribo 923 (NC)		17.64	17.34				23.44	12.93				1.25	1.13					70.9		
Mitsui Monohikari	15.05	17.10	16.77	16.31	96.9	23.86	23.92	11.92	19.90	101.3	2.38	2.75	2.42	2.52	157.5	63.6	61.6	69.4	64.9	95.5
Seedex SX1004	15.73	17.68	17.31	16.91	100.4	24.12	21.34	12.37	19.28	98.1	1.46	2.54	2.42	2.14	133.9			52.8		
Van der Have H66140	15.27	17.36	17.06	16.56	98.4	23.17	23.95	13.24	20.12	102.4	1.55	2.04	1.58	1.72	107.8		61.6	73.1		
Van der Have H66156	15.23	17.74	17.25	16.74	99.5	24.64	24.25	12.90	20.60	104.9	1.49	1.17	1.45	1.37	85.7			71.3		
Mean	15.61	17.61	17.27	16.83	100.0	23.67	23.13	12.17	19.64	100.0	1.35	1.71	1.69	1.60	100.0	65.0	63.2	70.8	67.9	100.0

+ Lower numbers indicate better vigor.

TABLE 9. COMBINED ANALYSIS

1993 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

24 Entries 13 repsXlocs 2 tests combined 2 Rows/Plot 1 Samples/Plot

ENTRY	CODE	REC/T LBS		REC/A LBS		LTM		SUGAR %		YIELD T/A	
ACH 194	61	322.1	101	3710	95	1.33	102	17.43	101	11.51	95
ACH 196	77	317.1	99	3861	99	1.37	105	17.23	100	12.16	100
ACH 198	72	315.7	99	3650	94	1.38	106	17.16	99	11.57	95
ACH 205	81	309.2	97	3925	101	1.21	92	16.67	96	12.67	104
ACH 302	67	326.7	102	3894	100	1.26	96	17.59	102	11.92	98
ACH 309	70	323.1	101	3665	94	1.28	99	17.44	101	11.34	93
ACH 311	65	319.6	100	3708	95	1.37	105	17.35	100	11.62	96
Beta 2010	64	317.1	99	4081	105	1.28	98	17.13	99	12.87	106
Hilleshog 5135	76	324.8	102	4242	109	1.32	101	17.56	102	13.07	107
Hilleshog 7505 (Niagara)	71	325.0	102	4120	106	1.28	98	17.53	101	12.66	104
HM 2401	62	314.3	98	3874	100	1.35	104	17.06	99	12.32	101
KW 1119	58	317.3	99	3449	89	1.30	100	17.17	99	10.84	89
KW 1800	69	306.8	96	3916	101	1.34	103	16.68	97	12.76	105
KW 2249 (Blend)	66	314.6	98	3875	100	1.32	102	17.05	99	12.30	101
KW 2398	78	324.5	102	3689	95	1.27	97	17.49	101	11.34	93
KW 3291	79	327.2	102	3830	98	1.23	95	17.59	102	11.70	96
KW 3580	63	324.5	102	3640	94	1.29	99	17.51	101	11.21	92
KW 6770	60	331.1	104	4199	108	1.28	98	17.83	103	12.67	104
Maribo 875	73	320.0	100	3909	101	1.35	104	17.35	100	12.21	100
Maribo 923	59	319.6	100	4134	106	1.37	105	17.34	100	12.93	106
Mitsui Monohikari	80	310.2	97	3702	95	1.26	96	16.77	97	11.92	98
Seedex SX1004	74	320.6	100	3967	102	1.28	98	17.31	100	12.37	102
Van der Have H66140	68	314.8	99	4179	107	1.32	101	17.06	99	13.24	109
Van der Have H66156	75	319.3	100	4119	106	1.29	99	17.25	100	12.90	106

General Mean	319.38	3889.07	1.30	17.27	12.17
Coeff. of Var. (%)	2.62	12.56	5.89	2.23	11.69
Variety Mean Square	471.78	444922.87	0.03	1.10	4.59
Error Mean Square B	70.16	232987.65	0.01	0.15	1.97
F Value	6.72 **	1.91**	4.78 **	7.39 **	2.33 **
L.S.D. (.05)	6.46	372.35	0.06	0.30	1.08
L.S.D. (.01)	8.42	485.39	0.08	0.39	1.41

* significant at 5% ** significant at 1% ns not significant
Second column for each trait is percent of check. General Mean used as check.

TABLE 10. COMBINED ANALYSIS

1993 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

24 Entries 13 repsXlocs 2 tests combined 2 Rows/Plot 1 Samples/Plot

ENTRY	CODE	NA	PPM	K	PPM	AM.N.	PPM	GROSS/A LBS		EMERG. %	
ACH 194	61	226	118	2276	103	343	97	4016	95	72.6	103
ACH 196	77	247	129	2285	103	366	103	4193	100	76.5	108
ACH 198	72	182	95	2211	100	415	117	3968	94	76.7	108
ACH 205	81	167	87	1948	88	356	101	4230	101	79.5	112
ACH 302	67	170	89	2084	94	359	101	4193	100	73.0	103
ACH 309	70	163	85	2168	98	361	102	3955	94	72.3	102
ACH 311	65	180	94	2222	100	405	114	4027	96	60.9	86
Beta 2010	64	173	90	2233	101	333	94	4410	105	75.7	107
Hilleshog 5135	76	191	100	2203	100	368	104	4586	109	75.9	107
Hilleshog 7505 (Niagara)	71	187	97	2169	98	347	98	4442	106	53.9	76
HM 2401	62	225	117	2320	105	348	98	4207	100	73.7	104
KW 1119	58	180	94	2206	100	358	101	3730	89	68.3	97
KW 1800	69	187	98	2338	106	352	99	4258	101	69.1	98
KW 2249 (Blend)	66	188	98	2329	105	340	96	4201	100	75.9	107
KW 2398	78	182	95	2240	101	322	91	3976	95	72.8	103
KW 3291	79	153	80	2151	97	330	93	4119	98	67.6	95
KW 3580	63	209	109	2222	100	332	94	3929	93	74.2	105
KW 6770	60	208	109	2201	100	330	93	4522	108	64.5	91
Maribo 875	73	213	111	2357	107	344	97	4238	101	78.7	111
Maribo 923	59	204	106	2412	109	344	97	4487	107	70.9	100
Mitsui Monohikari	80	186	97	2031	92	367	103	4001	95	69.4	98
Seedex SX1004	74	188	98	2133	96	358	101	4282	102	52.8	75
Van der Have H66140	68	200	104	2165	98	375	106	4527	108	73.1	103
Van der Have H66156	75	194	101	2170	98	350	99	4452	106	71.3	101

General Mean	191.75	2211.42	354.33	4206.23	70.81
Coeff. of Var. (%)	16.38	6.49	8.23	12.37	6.26
Variety Mean Square	5745.53	134654.72	6162.47	519239.91	633.92
Error Mean Square B	974.41	20952.54	837.13	264685.79	19.45
F Value	5.90 **	6.43**	7.36**	1.96**	32.60 **
L.S.D. (.05)	24.08	111.66	22.32	396.87	3.40
L.S.D. (.01)	31.39	145.56	29.10	517.36	4.43

* significant at 5% ** significant at 1% ns not significant
Second column for each trait is percent of check. General Mean used as check.
Emergence data collected from 2 locations.

TABLE 11

PERFORMANCE DATA OF SMBSC SEMI COMMERCIAL CODED ENTRIES
ALL LOCATIONS (HECTOR)

Commercial Status			Rec/T		Rec/A		Loss to Mol.		Sugar		Yield		Vigor *	
Ch	Description	Code	Lbs/T	% Mean	Lbs/A	% Mean	%	% Mean	%	% Mean	T/A	% Mean	1-5	% Mean
0	ACH 307	199	312.9	98	3817	99	1.33	100	16.97	98	12.13	100	1.27	70
0	ACH 310	188	310.0	97	3920	101	1.37	103	16.86	98	12.63	104	1.84	102
0	ACH 9100021	190	325.8	102	3725	96	1.31	99	17.60	102	11.42	94	1.41	78
0	ACH 9200085	175	317.2	100	3650	94	1.42	108	17.28	100	11.48	95	2.11	117
0	ACH 9301	181	318.6	100	3496	91	1.39	105	17.31	100	10.93	90	2.11	117
0	Beta 1492	205	316.2	99	3989	103	1.29	98	17.10	99	12.57	104	1.55	86
0	Beta 2633	207	326.8	103	3597	93	1.23	92	17.57	102	10.99	91	1.55	86
0	Beta 3712	187	323.3	102	3923	102	1.14	86	17.31	100	12.11	100	1.55	86
0	Beta 3863	192	321.1	101	3868	100	1.27	96	17.33	101	12.01	99	1.84	102
0	Beta 5823	179	315.4	99	3542	92	1.38	104	17.14	99	11.20	93	1.69	94
0	Beta 6002	176	317.8	100	3998	104	1.30	98	17.19	100	12.58	104	1.55	86
0	Beta 6532	194	317.1	100	4203	109	1.26	95	17.11	99	13.21	109	1.97	109
0	Beta 6863	198	329.2	103	4066	105	1.17	89	17.64	102	12.33	102	1.84	102
0	Bush Johnson 1340	182	302.4	95	3566	92	1.47	111	16.58	96	11.78	97	1.55	86
0	Hilleshog 7034	200	328.0	103	4052	105	1.31	99	17.71	103	12.31	102	1.97	109
0	Hilleshog 7035	180	325.1	102	4249	110	1.35	102	17.60	102	13.03	108	1.84	102
0	Hilleshog 7036	193	314.9	99	3923	102	1.22	91	16.96	98	12.44	103	2.68	148
0	Hilleshog 7514	201	325.9	102	4128	107	1.32	99	17.61	102	12.64	104	1.84	102
0	HM 2416 (Shasta)	191	333.2	105	3773	98	1.26	95	17.93	104	11.30	93	2.11	117
0	HM 2418	204	322.2	101	4066	105	1.26	95	17.37	101	12.56	104	2.40	133
0	Holly 90N146-05	206	311.6	98	3718	96	1.41	107	16.98	99	11.90	98	1.69	94
0	Holly 91N150-013	178	311.6	98	3718	96	1.42	107	16.98	99	11.90	98	2.82	156
0	Holly 93HX102	195	308.1	97	3886	101	1.47	111	16.86	98	12.59	104	2.26	125
0	Maribo 9360	203	318.9	100	3823	99	1.40	106	17.34	101	11.96	99	2.11	117
0	Maribo 9364	177	314.8	99	3790	98	1.29	98	17.03	99	12.01	99	1.13	63
0	Maribo 9368	196	306.1	96	4025	104	1.40	106	16.71	97	13.09	108	0.99	55
0	Maribo 9369	209	311.6	98	4254	110	1.29	97	16.86	98	13.64	113	2.54	141
0	Maribo 9370	184	319.0	100	3560	92	1.33	101	17.28	100	11.15	92	1.69	94
0	Maribo 9371	189	309.6	97	3808	99	1.34	102	16.81	98	12.27	101	1.55	86
0	Seedex SX1006	185	318.6	100	3616	94	1.36	103	17.29	100	11.31	93	2.40	133
0	Van der Have H66168	202	318.6	100	3876	100	1.30	98	17.23	100	12.14	100	1.97	109
c	ACH 194 (Check)	197	325.4	102	4115	107	1.31	99	17.58	102	12.62	104	1.27	70
c	Hilleshog 5135 (Check)	183	314.8	99	3783	98	1.35	102	17.08	99	12.03	99	1.13	63
c	KW 2398 (Check)	186	325.9	102	3738	97	1.28	96	17.57	102	11.45	95	1.84	102
c	Maribo 875 (Check)	208	325.3	102	3915	101	1.33	101	17.60	102	12.03	99	1.13	63
	Mean	35	318.4	100.0	3862.1	100.0	1.32	100.0	17.24	100.0	12.11	100	1.80	100.1

* Vigor data collected from 1 location

TABLE 12. COMBINED ANALYSIS

1993 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

24 Entries **13 repsXlocs** **2 tests combined** **2 Rows/Plot** **1 Samples/Plot**

ENTRY	CODE	BOLTERS %	VIGOR	
ACH 194	61	0.00	1.20	71
ACH 196	77	0.00	1.39	82
ACH 198	72	0.00	1.52	90
ACH 205	81	0.00	1.56	92
ACH 302	67	0.00	1.29	76
ACH 309	70	0.00	1.46	86
ACH 311	65	0.00	2.24	132
Beta 2010	64	0.00	1.29	76
Hilleshog 5135	76	0.00	1.10	65
Hilleshog 7505 (Niagara)	71	0.00	2.30	136
HM 2401	62	0.00	1.94	115
KW 1119	58	0.00	1.94	115
KW 1800	69	0.00	2.94	147
KW 2249 (Blend)	66	0.00	1.45	86
KW 2398	78	0.00	1.96	116
KW 3291	79	0.00	1.54	91
KW 3580	63	0.00	2.26	134
KW 6770	60	0.00	1.55	92
Maribo 875	73	0.00	1.10	65
Maribo 923	59	0.00	1.13	67
Mitsui Monohikari	80	0.00	2.42	143
Seedex SX1004	74	0.00	2.42	143
Van der Have H66140	68	0.00	1.58	93
Van der Have H66156	75	0.00	1.45	86

General Mean	0.00	1.69
Coeff. of Var. (%)	0.00	29.12
Variety Mean Square	0.00	2.60
Error Mean Square B	0.00	0.24
F Value	0.00	10.97**
L.S.D. (.05)	ns	0.38
L.S.D. (.01)	ns	0.49

* significant at 5% ** significant at 1% ns not significant
Second column for each trait is percent of check. General Mean used as check.
Vigor data collected from 2 locations

TABLE 13

1993 CERCOSPORA READINGS FOR SMBSC COMMERCIAL CODED ENTRIES
BETASEED NURSERY - SHAKOPEE, MN
Average Rating at Each Date *

CODE	DESCRIPTION	7/28	8/04	8/10	8/13	8/19	8/24	1993 MEAN	2 YR MEAN	3 YR MEAN	3 YR % MEAN
61	ACH 194	3.0	3.0	4.0	5.0	6.8	8.0	4.97	5.32	5.08	105.2
77	ACH 196	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.18	5.05	104.6
72	ACH 198	2.5	2.8	3.3	4.3	5.5	7.0	4.23	4.51	4.32	89.4
81	ACH 205 (895205 Aph)	2.3	2.8	3.3	4.5	5.5	6.5	4.15	4.31	4.08	84.5
67	ACH 302 (80126)	2.3	3.0	3.3	4.5	5.8	7.0	4.32	4.62	4.38	90.7
70	ACH 309 (NC)	2.8	2.8	3.0	4.8	6.0	7.0	4.40	4.52	4.31	89.3
65	ACH 311 (NC)	2.0	2.8	3.0	4.3	5.1	6.3	3.92	4.32	4.21	87.2
64	Beta 2010	2.8	3.0	3.8	5.0	6.8	8.8	5.03	5.29	5.02	103.9
76	Hilleshog 5135	3.0	3.0	4.0	5.3	7.0	8.0	5.05	5.22	5.05	104.5
71	Hilleshog 7505 (Niagara I	3.0	3.0	3.8	4.5	6.0	7.8	4.68	4.93	4.65	96.3
62	HM 2401	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.09	4.95	102.4
58	KW 1119	3.0	3.5	4.0	5.3	6.8	8.0	5.10	5.49	5.11	105.7
69	KW 1800	3.0	3.3	4.0	5.3	6.3	8.0	4.98	5.41	5.10	105.6
66	KW 2249 (Blend)	3.0	3.3	3.8	5.0	6.8	8.0	4.98	5.37	5.14	106.4
78	KW 2398	3.0	3.0	3.8	5.3	7.0	8.0	5.02	5.41	5.14	106.3
79	KW 3291 (NC)	3.0	3.3	3.8	5.0	6.5	8.0	4.93	5.28	4.95	102.4
63	KW 3580	3.0	3.0	4.0	5.0	7.0	8.0	5.00	5.40	5.20	107.6
60	KW 6770(NC)	3.0	3.0	4.0	5.3	7.0	8.0	5.05	5.19	4.95	102.4
73	Maribo 875	3.0	3.0	3.5	5.0	6.5	8.0	4.83	5.00	4.98	103.1
59	Maribo 923 (NC)	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.22		
80	Mitsui Monohikari	3.0	3.0	3.3	5.0	6.5	8.0	4.80	5.17	4.80	99.4
74	Seedex SX1004	3.0	3.3	3.3	4.5	5.8	7.3	4.53	4.56	4.31	89.3
68	Van der Have H66140	3.0	3.3	4.0	5.3	7.0	8.3	5.15	5.20	5.02	103.9
75	Van der Have H66156	3.0	3.3	3.8	5.5	7.0	8.5	5.18	5.43	5.30	109.8
	LSD .05	0.4	0.4	0.6	0.5	0.6	0.5	0.31			
	CV %	9.8	10	11	7.7	6.2	4.6	4.5			

* Lower numbers indicate better leaf spot resistance (1 = Ex, 9 = Poor)
NC = Non-commercially graded seed used in trials

TABLE 14

1993 CERCOSPORA READINGS FOR CODED TEST ENTRIES
BETASEED NURSERY - SHAKOPEE, MN
Average Rating at Each Date*

Ent	Code	Description	7/28	8/04	8/10	8/13	8/19	8/24	1993 Mean	2 Yr Mean	3 Yr Mean	3 Yr% Mean	1992	1991
123	304	ACH 184 (Rhiz)	2.5	3.0	3.0	4.5	6.0	7.3	4.38	4.63			4.88	
9	9	ACH 192	3.0	3.0	3.8	5.0	6.5	8.0	4.88	5.11	4.97	102.7	5.33	4.71
18	18	ACH 194	3.0	3.0	4.0	5.0	6.8	8.0	4.97	5.32	5.08	104.9	5.67	4.60
14	14	ACH 196	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.18	5.05	104.3	5.38	4.80
45	72	ACH 198	2.5	2.8	3.3	4.3	5.5	7.0	4.23	4.51	4.32	89.2	4.79	3.94
39	53	ACH 205	2.3	2.8	3.3	4.5	5.5	6.5	4.15	4.31	4.08	84.3	4.46	3.63
43	67	ACH 302	2.3	3.0	3.3	4.5	5.8	7.0	4.32	4.62	4.38	90.5	4.92	3.91
122	301	ACH 306 (Rhiz)	3.0	2.8	3.5	4.8	6.3	7.8	4.70	4.79	4.54	93.7	4.88	4.03
3	3	ACH 307	2.5	3.0	3.3	4.3	5.5	7.0	4.27	4.60	4.39	90.6	4.92	3.97
44	70	ACH 309	2.8	2.8	3.0	4.8	6.0	7.0	4.40	4.52	4.31	89.1	4.63	3.91
33	33	ACH 310	2.5	3.0	3.5	5.0	6.5	8.0	4.75	4.90	4.78	98.6	5.04	4.54
42	65	ACH 311	2.0	2.8	3.0	4.3	5.1	6.3	3.92	4.32	4.21	86.9	4.71	4.00
72	109	ACH 890376	3.0	3.3	3.5	5.3	6.5	8.0	4.93					
78	116	ACH 9000219	3.0	3.0	3.5	5.0	6.3	8.0	4.80					
102	149	ACH 9000224	3.0	3.0	3.8	5.3	6.8	8.0	4.98					
109	170	ACH 9000427	3.0	3.0	3.8	5.8	7.5	8.8	5.32					
106	163	ACH 9000502	2.8	2.8	3.5	4.8	6.5	8.0	4.73					
75	113	ACH 9000524	3.0	3.0	4.0	5.3	7.0	8.0	5.05					
53	88	ACH 9000836	2.8	3.0	4.0	4.8	6.8	8.0	4.90					
118	190	ACH 9100021	2.8	3.0	3.8	5.0	6.3	7.5	4.73					
67	103	ACH 9100022	3.0	3.0	4.0	5.3	7.0	8.0	5.05					
90	129	ACH 9100097	2.8	3.3	4.0	5.3	6.8	7.8	5.00					
107	164	ACH 9100171	3.0	3.0	4.0	5.0	7.0	8.3	5.05					
69	106	ACH 9100212	3.0	3.3	4.0	5.5	7.0	7.8	5.10					
111	175	ACH 9200085	2.3	3.0	3.3	4.3	5.5	6.8	4.20					
114	181	ACH 9301	3.0	3.0	3.8	5.0	6.8	8.0	4.93					
96	140	Beta 1252	2.8	3.0	3.3	4.8	6.5	7.8	4.70	5.17			5.63	
71	108	Beta 1273	3.0	3.3	4.0	5.0	7.0	8.0	5.05					
23	23	Beta 1471	3.0	3.7	4.3	5.7	7.3	8.3	5.38	5.80	5.47	113.0	6.21	4.83
88	127	Beta 1492	2.8	3.3	3.8	5.0	6.8	8.0	4.95	5.19			5.42	
8	8	Beta 2010	2.8	3.0	3.8	5.0	6.8	8.8	5.03	5.29	5.02	103.7	5.54	4.49
85	124	Beta 2633	3.0	3.0	3.5	4.8	6.3	7.8	4.73					
27	27	Beta 2988	2.8	3.0	3.6	5.0	6.6	8.0	4.83	5.08	4.82	99.6	5.33	4.31
58	94	Beta 3712	3.0	3.3	3.8	5.0	6.8	8.0	4.98	5.47			5.96	
65	101	Beta 3843	3.0	3.0	3.8	5.0	6.8	8.0	4.93					
119	192	Beta 3863	3.0	3.3	3.8	4.8	6.3	7.8	4.83					
113	179	Beta 5823	2.3	2.8	3.0	4.3	5.3	6.5	4.03					
50	84	Beta 6002	3.0	3.0	4.0	5.3	6.8	8.3	5.07	5.20	3.47	71.6	5.33	
84	123	Beta 6532	3.0	3.3	3.5	5.0	6.8	8.0	4.93	5.24	3.49	72.1	5.54	
76	114	Beta 6863	3.0	3.0	3.8	5.0	6.3	7.8	4.82					
10	10	Bush Johnson 1330	3.0	3.0	4.0	5.3	6.8	8.3	5.07	5.31	5.10	105.2	5.54	4.68
25	25	Bush Johnson 1337	3.0	3.0	3.5	5.0	6.5	7.8	4.80	5.11	5.00	103.2	5.42	4.77
21	21	Bush Johnson 1340	3.0	3.0	3.8	5.0	6.5	8.0	4.88	5.28	5.17	106.8	5.67	4.97
80	118	Bush Johnson 1390	3.0	3.0	4.0	5.3	6.8	8.0	5.02					
56	92	Bush Johnson 1391	3.0	3.0	4.0	5.3	6.8	7.8	4.98					
73	111	Bush Johnson 1392	3.0	3.0	4.0	5.3	7.0	8.0	5.05					
30	30	Hilleshog 5135	3.0	3.0	4.0	5.3	7.0	8.0	5.05	5.22	5.05	104.2	5.38	4.71
1	1	Hilleshog 7017 (Glacier)	3.0	3.3	4.0	5.5	7.5	8.5	5.30	5.42	5.35	110.4	5.54	5.20
61	97	Hilleshog 7024	3.0	4.0	5.0	6.0	8.0	9.0	5.83	6.02			6.21	
91	130	Hilleshog 7033	3.0	3.3	4.0	5.5	7.3	8.0	5.18					
49	83	Hilleshog 7034	2.8	3.0	3.8	5.5	7.0	8.8	5.15					
66	102	Hilleshog 7035	3.0	3.0	4.0	5.0	7.0	8.3	5.05					
120	193	Hilleshog 7036	2.3	3.0	3.0	4.8	6.3	7.0	4.40					
20	20	Hilleshog 7505 (Niagara)	3.0	3.0	3.8	4.5	6.0	7.8	4.68	4.93	4.65	96.1	5.17	4.11
87	126	Hilleshog 7511	3.0	3.0	4.0	5.3	7.0	8.0	5.05					
77	115	Hilleshog 7513	3.0	3.0	4.0	5.8	6.8	8.5	5.18					
94	141	Hilleshog 7514	3.0	3.3	3.8	5.3	7.0	8.0	5.07					
81	119	Hilleshog 7515	3.0	3.0	4.0	5.4	7.4	8.4	5.20					
34	34	Hilleshog 8277	3.0	3.5	4.3	5.3	7.3	8.3	5.28	5.60	5.40	111.5	5.92	5.00
37	42	Hilleshog 8351	2.8	3.0	3.5	5.3	6.8	8.3	4.95	5.23	5.04	104.1	5.50	4.68
70	107	HM 1114	3.0	3.3	4.0	5.8	7.0	8.0	5.18	5.53			5.58	
55	91	HM 1117	2.8	3.3	4.5	5.8	7.8	9.0	5.53					
17	17	HM 2401	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.09	4.95	102.1	5.21	4.66
11	11	HM 2412 (Yukon)	2.5	3.0	3.0	4.5	5.8	7.3	4.35	4.68	4.41	91.1	5.00	3.88
31	31	HM 2416 (Shasta)	3.0	3.5	4.0	5.3	7.3	8.5	5.27	5.51	5.20	107.3	5.75	4.57
63	99	HM 2418	2.8	3.0	3.5	5.0	6.5	8.0	4.80	4.99			5.17	
103	152	Holly 89N147-04	2.8	3.0	3.8	5.0	6.5	7.5	4.77					4.69

TABLE 14 (continued)

1993 CERCOSPORA READINGS FOR CODED TEST ENTRIES
BETASEED NURSERY - SHAKOPEE, MN
Average Rating at Each Date*

Ent	Code	Description	7/28	8/04	8/10	8/13	8/19	8/24	1993 Mean	2 Yr Mean	3 Yr Mean	3 Yr% Mean	1992	1991
79	117	Holly 89N147-05	2.8	3.0	3.8	5.0	6.8	8.0	4.90					
121	206	Holly 90N146-05	3.0	3.0	3.5	5.0	6.0	7.8	4.72					
112	178	Holly 91N150-013	2.8	3.0	3.8	5.0	6.5	7.5	4.77					
94	134	Holly 91T155-06	2.8	3.0	3.5	5.3	6.5	8.0	4.85					
52	86	Holly 93HX101	3.0	3.0	4.0	5.8	7.3	8.3	5.23					
60	96	Holly 93HX102	3.0	3.3	3.8	5.3	7.5	8.3	5.20					
13	13	KW 1119	3.0	3.5	4.0	5.3	6.8	8.0	5.10	5.49	5.11	105.5	5.88	4.34
100	146	KW 1473	2.3	3.0	4.0	5.0	6.3	8.3	4.82					
32	32	KW 1800	3.0	3.3	4.0	5.3	6.3	8.0	4.98	5.41	5.10	105.3	5.83	4.49
22	22	KW 2249 (Blend)	3.0	3.3	3.8	5.0	6.8	8.0	4.98	5.37	5.14	106.1	5.75	4.69
59	95	KW 2262 (Blend)	2.8	3.5	4.0	5.5	6.8	8.0	5.10	5.30			5.50	
47	78	KW 2398	3.0	3.0	3.8	5.3	7.0	8.0	5.02	5.41	5.14	106.1	5.79	4.60
26	26	KW 3291	3.0	3.3	3.8	5.0	6.5	8.0	4.93	5.28	4.95	102.1	5.63	4.28
6	6	KW 3580	3.0	3.0	4.0	5.0	7.0	8.0	5.00	5.40	5.20	107.3	5.79	4.80
12	12	KW 6770	3.0	3.0	4.0	5.3	7.0	8.0	5.05	5.19	4.95	102.1	5.33	4.46
29	29	Maribo 403	3.0	3.0	3.5	5.0	6.0	8.0	4.75	5.19	5.06	104.5	5.63	4.80
2	2	Maribo 410	3.0	3.0	4.0	5.0	6.8	8.0	4.97	5.13	4.89	100.9	5.29	4.40
16	16	Maribo 862	3.0	3.0	4.0	5.0	6.8	8.0	4.97	5.36	5.16	106.6	5.75	4.77
4	4	Maribo 875	3.0	3.0	3.5	5.0	6.5	8.0	4.83	5.00	4.98	102.8	5.17	4.94
36	40	Maribo 897	3.0	3.3	3.8	5.0	6.8	8.0	4.98	5.20	5.08	104.8	5.42	4.83
40	56	Maribo 914	3.0	3.3	4.0	5.0	7.0	8.0	5.05	5.19	5.10	105.2	5.33	4.91
35	36	Maribo 921	3.0	3.0	3.8	5.3	7.0	8.0	5.02	5.30			5.58	
41	59	Maribo 923	3.0	3.0	3.8	5.0	7.0	8.0	4.97	5.22			5.46	
62	98	Maribo 9360	2.8	3.5	4.3	5.3	7.3	8.5	5.28					
74	112	Maribo 9361	3.0	3.3	4.0	5.3	7.0	8.0	5.10					
51	85	Maribo 9362	3.0	3.0	4.0	5.3	7.0	8.3	5.10					
86	125	Maribo 9363	3.0	3.0	3.8	5.0	7.0	8.0	4.97					
64	100	Maribo 9364	3.0	3.0	4.0	5.0	7.0	8.0	5.00					
104	155	Maribo 9365	3.0	3.3	4.3	5.3	7.0	8.0	5.15					
105	162	Maribo 9366	3.0	3.0	4.0	5.3	6.8	8.0	5.02					
93	132	Maribo 9367	3.0	3.0	3.8	5.0	7.0	8.0	4.97					
98	143	Maribo 9368	3.0	3.0	3.5	5.0	6.8	8.0	4.88	5.21	5.13	105.9	5.54	4.97
99	145	Maribo 9369	3.0	3.0	4.0	5.0	7.0	8.0	5.00	5.17	4.80	99.1	5.54	4.06
115	184	Maribo 9370	3.0	3.3	4.3	5.5	7.0	8.0	5.18	5.43			5.50	
117	189	Maribo 9371	2.8	3.0	3.5	5.0	6.5	7.8	4.77	5.34			5.58	
28	28	Maribo Ultramono	3.0	3.0	3.8	5.0	7.0	7.5	4.88	4.83			5.13	
7	7	Mitsui Monohikari	3.0	3.0	3.3	5.0	6.5	8.0	4.80					
89	128	Seedex SX0805	3.0	3.5	4.3	5.5	7.3	8.5	5.35	5.47			5.88	
68	105	Seedex SX0806	3.0	3.0	4.0	5.3	7.0	8.3	5.10	5.28			5.54	
54	90	Seedex SX0807	3.0	3.0	3.3	4.5	6.0	7.3	4.52	4.83			5.33	
82	120	Seedex SX0808	3.0	3.0	4.0	5.0	7.0	7.8	4.97					
110	172	Seedex SX0903	3.0	3.0	4.0	5.3	7.0	8.0	5.05	4.75	4.55	93.9	5.17	4.15
108	166	Seedex SX0904	3.0	3.0	4.0	5.3	6.8	8.0	5.02	4.56	4.31	89.1	4.58	3.83
95	135	Seedex SX0905	2.5	3.0	3.0	4.5	6.0	7.0	4.33					
101	148	Seedex SX0906	2.5	2.8	3.3	4.5	5.5	7.3	4.32	4.87	4.36	90.0	5.25	3.34
24	24	Seedex SX1	2.5	3.0	3.3	4.3	5.5	7.3	4.32	4.83	4.67	96.5	5.13	4.37
46	74	Seedex SX1004	3.0	3.3	3.3	4.5	5.8	7.3	4.53	5.20	5.02	103.7	5.25	4.66
116	185	Seedex SX1006	2.8	2.8	3.3	4.3	5.5	6.5	4.20	5.43	5.30	109.5	5.67	5.06
5	5	Seedex SX2	2.8	2.8	3.3	4.5	6.0	7.5	4.48	5.53	5.32	109.9	5.83	4.91
38	47	Seedex Turbo (SX0902)	2.8	3.0	3.5	4.5	6.0	7.3	4.52	5.37	5.14	106.1	5.75	4.68
15	15	Van der Have H66140	3.0	3.3	4.0	5.3	7.0	8.3	5.15					
19	19	Van der Have H66156	3.0	3.3	3.8	5.5	7.0	8.5	5.18					
57	93	Van der Have H66168	3.0	3.5	4.3	5.5	7.0	8.0	5.22					
92	131	Van der Have H66170	3.0	3.0	3.8	5.0	6.8	8.3	4.98					
83	122	Van der Have H66188	3.0	3.8	4.5	5.8	7.0	8.8	5.48					
48	82	Van der Have H66189	3.0	4.0	4.0	5.4	6.9	9.0	5.38					
		Test Mean	2.9	3.1	3.8	5.1	6.7	7.9	4.89	5.14	4.84	100.0	5.42	4.49
		LSD .05	0.4	0.4	0.6	0.5	0.6	0.5	0.31					
		CV%	9.8	10.3	10.8	7.7	6.2	4.6	4.50					

DATE OF HARVEST SUMMARY

OBJECTIVE

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

EXPERIMENTAL PROCEDURES

Trials were planted at seven locations in 1991 in which six locations were harvested. Trials were planted at four locations in 1992 and 1993 in which three and two locations were harvested, respectively.

The experimental units in 1991 consist of two strip trials planted and maintained with the cooperators equipment. Experimental units in 1992 and 1993 were arranged in a split plot design. The dates of harvest were split into three intervals; early, mid, and late harvest. The dates of harvest were September 17, 10, 9 for early harvest; October 5, 2, 3 for mid harvest; and October 18, 21, 17 for late harvest in 1991, 1992, and 1993, respectively.

The twelve varieties that were planted in 1993 were:

ACH 194	KW 2249
ACH 302	KW 3291
Hilleshog 5135	KW 6670
KW 1119	KW 3580
KW 1800	VDH H66140
Beta 2010	ACH 309

Most of these varieties are relatively new varieties. Varieties ACH 194, KW 1119, and 2249 have been tested for three years. Varieties ACH 302, KW 1800, KW 6770, KW 3580, and Beta 2010 have been tested for two years. All remaining varieties have been tested for only one year except Hilleshog 5135 which has been tested for 7 years.

RESULTS AND DISCUSSION

Growing different varieties to be harvested at different time intervals can be an important tool for SMSC growers. This management practice along with other management practices can be used to enhance growers economic return per acre.

The date of harvest trial discussed here is designed to select from proven varieties the most optimum harvest date of said varieties. The varieties chosen for testing in the date of harvest trials are varieties approved for sale at SMSC. The data obtained from

the date of harvest trials determines at what date or relative time period a particular variety is best harvested.

The 1993 growing season was one of the most difficult and disappointing in the history of SMSC. The above normal precipitation and below normal temperatures resulted in yields far below average. This effect carried over to the experiments. However, all varieties had to endure the same conditions, so the results are considered to be relative among varieties.

VARIETY PERFORMANCE

Typically, varieties that are relatively high in sugar content early in the season are also relatively high late in the season. Previous research has not identified a significant interaction for sugar accumulation among varieties.

Data are presented in Tables 1 - 5 for 1993. Sugar percent (Table 1) increased from early to late harvest averaged 1.40 percent. This increase was slightly lower than that shown on SMSC samples from prepile through full harvest. However, this increase does correlate with the increases observed from within the field locations. The three year average increase for varieties tested is 2.36. Data shows relative ranking remained the same throughout harvest dates. ACH 302 gave the highest sugar percent at all harvest dates. There was a significant difference among and between dates. KW 6770 gave the second highest sugar percent at the first date, but was .83 percent below ACH 302.

Mid harvest percent sugar was topped by ACH 302. Interestingly, Hilleshog 5135 was second highest in sugar percent at date two. Hilleshog 5135 is the oldest variety in this test but still remains one of the best producers year in year out. KW 6770 is third highest for percent sugar. KW 6770 is a new variety with a balance of high sugar and high tonnage.

Percent sugar at late harvest was highest with ACH 302. Hilleshog 5135 was second highest but, .50 percent lower than ACH 302. KW 1119 was the lowest sugar percent at the second and third date of harvest. KW 1119 is typically a high sugar percent type. However, this variety has not performed well in the date of harvest trials for the last two years.

Loss to Molasses (Table 2) is a function of soil fertility, management of fertility levels and climatic conditions. This year produced relatively low loss to molasses which decreased over time. Within harvest date loss to molasses was not significantly different among varieties tested.

Root yield (Table 3) increased from early to late harvest averaging 2.26 tons per acre. This yield increase was greater than that observed for the average field in 1993. The fields where these plots were did yield significantly above average. This would

probably explain why the average increase was greater than observed cooperative wide. Varieties were not significantly different within harvest dates.

Recoverable sugar/ton (Table 4) was highest at all dates of harvest with ACH 302. This data indicates the relative importance of crop quality over quantity. KW 1119 was consistently poor over all harvest dates. KW 1119 typically has very good quality, but in these data KW 1119 performed poorly in this area. KW 1119 is a high sugar type variety that in the past under stressed conditions can perform poorly.

Recoverable sugar per acre (Table 5) is a function of all the yield and quality factors. Thus, the ranking of varieties for recoverable sugar per acre is relatively close to that of recoverable sugar per ton and tons per acre. ACH 302 gave the highest recoverable sugar per acre with Hilleshog 5135 and KW 6770 close behind at all planting dates. There are particular varieties that do perform best at certain harvest dates. Table 6 indicates the top 5 varieties at each harvest dates.

Table 6

EARLY	MID	LATE
ACH 302	ACH 302	ACH 302
KW 6770	Hilleshog 5135	Hilleshog 5135
Beta 2010	KW 6770	KW 6770
Hilleshog 5135	VDH 66140	VDH 66140
KW 2249	KW 2249	KW 2249

Varieties were significantly different among and between dates of harvest.

Average deviation from the mean for each variety tested in 1993 is presented in figure 1 - 5 for sugar percent, ton/acre, loss to molasses, recoverable sugar per ton, and recoverable sugar per acre. These data show how varieties perform in relation to each other and to the mean. Figure 1- 5 also show when a certain variety may best be harvested.

Three year performance data are presented in Tables 6 - 10. Four varieties have been tested for three years. These data indicate that some older varieties as well as some relatively new varieties perform well over multiple years.

Recent efforts in this area of research have emphasized conducting research with varieties at an earlier stage in their commercial sales life. In 1994 nine varieties will be tested for their third year or more. These efforts are to hopefully bring conclusive data to the grower earlier in the commercial sales life of a variety.

Table 1. Combined location performance of date of harvest trials harvested early, mid, and late for sugar % ,1993.

Sugar Percent

Variety	Early Mean	Rank	Mid Mean	Rank	Late Mean	Rank	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	13.45	8	13.96	9	14.59	9	1.14	96.3	96.5	97.9
KW 1119	13.15	11	13.46	12	13.75	12	0.60	94.2	93.0	92.3
ACH 302	15.28	1	15.61	1	16.09	1	0.81	109.3	107.9	108.0
BETA 2010	14.17	3	14.28	7	14.48	10	0.31	101.5	98.7	97.2
KW 1800	13.22	10	14.29	6	14.70	8	1.48	94.6	98.8	98.7
KW 2249	13.56	7	14.53	4	14.89	6	1.33	97.1	100.4	99.9
ACH309	13.03	12	14.28	8	15.00	5	1.98	93.2	98.7	100.7
HILL. 5135	13.80	4	15.28	2	15.59	2	1.79	98.8	105.6	104.6
KW 3580	13.32	9	13.87	10	15.57	3	2.25	95.3	95.8	104.5
VDH H66140	13.57	6	14.52	5	14.86	7	1.29	97.1	100.3	99.7
KW 3291	13.68	5	13.86	11	14.22	11	0.54	97.9	95.8	95.4
KW 6770	14.45	2	14.91	3	15.16	4	0.71	103.5	103.0	101.8
Mean	13.72		14.40		15.00		1.28	100.0	100.0	100.0
LSD(0.05) (within date)	1.39		1.43		1.43					
C.V. % (within date)	14.17		14.10		13.98					
LSD(0.05) (across date)	----------		-----.84------		--------					
C. V. %	----------		-----14.65------		--------					

Table 2. Combined location performance of date of harvest trials harvested early, mid, and late for loss to mollasses ,1993.

Loss to Molasses

Variety	Early Mean	Rank	Mid Mean	Rank	Late Mean	Rank	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	1.15	11	1.12	12	1.09	8	-0.07	102.7	101.6	101.3
KW 1119	1.11	5	1.11	9	1.13	12	0.02	98.7	100.6	104.6
ACH 302	1.11	4	1.11	10	1.13	11	0.02	98.7	101.3	104.5
BETA 2010	1.13	9	1.10	7	1.08	4	-0.05	101.2	100.3	100.0
KW 1800	1.11	6	1.10	6	1.08	5	-0.03	98.8	100.1	100.0
KW 2249	1.13	10	1.11	8	1.10	9	-0.03	101.3	100.5	101.9
ACH 309	1.09	3	1.12	11	1.11	10	0.02	97.4	101.5	102.8
HILL. 5135	1.08	1	1.07	1	1.05	1	-0.03	96.4	97.2	97.2
KW 3580	1.11	7	1.09	5	1.07	3	-0.04	99.5	98.9	99.1
VDH H66140	1.13	8	1.08	4	1.05	2	-0.08	100.8	98.1	97.2
KW 3291	1.09	2	1.08	2	1.08	6	-0.01	97.0	97.7	100.0
KW 6770	1.17	12	1.08	3	1.09	7	-0.07	104.0	97.7	101.3
Mean	1.12		1.10		1.08		-0.04	100.0	100.0	100.0
LSD(0.05) (within date)	NS		NS		NS					
C.V. % (within date)	12.0		17.8		14.3					
LSD(0.05) (across date)	----------		-----.11------		--------					
C. V. %	----------		-----24.17------		--------					

Table 3. Combined location performance of date of harvest trials harvested early, mid, and late for tons per acre ,1993.

Tons/Acre

Variety	Early Mean	Rank	Mid Mean	Rank	Late Mean	Rank	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	13.79	10	15.26	10	16.75	2	2.49	96.7	97.5	101.3
KW 1119	14.23	8	15.50	9	16.32	11	2.09	99.8	99.0	98.7
ACH 302	14.27	6	15.59	8	16.45	7	2.18	100.1	99.6	99.5
BETA 2010	14.41	3	15.92	1	16.33	10	1.92	101.0	101.8	98.8
KW 1800	14.46	1	15.69	5	16.27	12	1.81	101.4	100.3	98.5
KW 2249	14.42	2	15.64	6	16.60	4	2.18	101.1	99.9	100.4
ACH 309	14.29	5	15.59	8	16.56	5	2.27	100.2	99.6	100.2
HILL. 5135	14.35	4	15.78	2	16.68	3	2.34	100.6	100.8	100.9
KW 3580	14.35	4	15.63	7	16.42	8	2.08	100.6	99.8	99.4
VDH H66140	14.35	4	15.76	3	16.79	1	2.43	100.7	100.7	101.5
KW 3291	14.03	9	15.73	4	16.52	6	2.49	98.4	100.5	99.9
KW 6770	14.24	7	15.73	4	16.38	9	2.14	99.9	100.5	99.1
Mean	14.26		15.65		16.53		2.26	100.0	100.0	100.0
LSD(0.05) (within date)	NS		NS		NS					
C.V. % (within date)	9.3		8.6		6.9					
LSD(0.05) (across date)	----------		-----.32------		--------					
C. V. %	----------		-----5.18------		--------					

Table 4. Combined location performance of date of harvest trials harvested early, mid, and late for recoverable sugar per ton ,1993.

Recoverable Sugar/Ton

Variety	Early Mean	Early Rank	Mid Mean	Mid Rank	Late Mean	Late Rank	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	246.0	8	256.8	9	269.9	9	26.4	97.6	96.5	97.0
KW 1119	240.5	11	247.1	12	252.8	12	12.3	95.4	92.8	90.8
ACH 302	282.9	1	290.0	1	299.6	1	16.7	112.3	108.9	107.6
BETA 2010	260.8	3	263.5	7	268.0	10	7.2	103.5	99.0	96.3
KW 1800	242.3	10	263.8	6	272.4	8	30.1	96.1	99.1	97.8
KW 2249	248.5	7	268.4	5	275.8	7	27.3	98.6	100.8	99.1
ACH 309	238.1	12	263.4	8	278.3	5	40.1	94.5	98.9	99.9
HILL. 5135	254.4	4	284.2	2	290.8	2	36.4	100.9	106.8	104.5
KW 3580	244.1	9	255.5	11	289.9	3	45.8	96.9	96.0	104.1
VDH H66140	248.8	6	268.8	4	276.2	6	27.4	98.7	101.0	99.2
KW 3291	251.9	5	255.7	10	262.8	11	10.9	99.9	96.1	94.4
KW 6770	265.8	2	276.7	3	281.4	4	15.6	105.5	103.9	101.1
Mean	252.0		266.2		278.4		26.4	100.0	100.0	100.0
LSD(0.05) (within date)	19.9		22.6		20.1					
C.V. % (within date)	10.8		11.1		9.3					
LSD(0.05) (across date)	----------		-----7.2------		--------					
C. V. %	----------		-----6.2------		--------					

Table 5. Combined location performance of date of harvest trials harvested early, mid, and late for recoverable sugar per acre, 1993.

Recoverable Sugar/Acre

Variety	Early Mean	Rank	Mid Mean	Rank	Late Mean	Rank	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	3392.1	12	3920.1	11	4520.4	8	1128.3	94.4	94.1	98.4
KW 1119	3421.3	10	3829.2	12	4124.9	12	703.6	95.2	91.9	89.8
ACH 302	4037.0	1	4519.9	1	4927.5	1	890.5	112.3	108.5	107.3
BETA 2010	3757.6	3	4196.6	6	4375.1	10	617.5	104.5	100.7	95.2
KW 1800	3503.4	8	4139.8	7	4433.0	9	929.7	97.5	99.4	96.5
KW 2249	3583.5	5	4197.3	5	4578.8	7	995.3	99.7	100.7	99.7
ACH 309	3402.0	11	4104.7	8	4608.3	6	1206.2	94.6	98.5	100.3
HILL. 5135	3649.6	4	4485.6	2	4851.7	2	1202.1	101.5	107.7	105.6
KW 3580	3502.1	9	3993.1	10	4761.3	3	1259.3	97.4	95.8	103.6
VDH H66140	3571.7	6	4235.5	4	4636.3	4	1064.6	99.4	101.7	100.9
KW 3291	3532.5	7	4022.4	9	4340.4	11	807.9	98.3	96.5	94.5
KW 6770	3785.2	2	4351.9	3	4610.1	5	824.9	105.3	104.5	100.4
Mean	3594.8		4166.4		4564.0		969.2	100.0	100.0	100.0
LSD(0.05) (within date)	472.35		618.9		573.4					
C.V. % (within date)	18.31		20.88		18.25					
LSD(0.05) (across date)	----------		-----271.9------		--------					
C. V. %	----------		-----16.4------		--------					

Table 6. Three year performance of date of harvest trials harvested early, mid, and late for sugar %.

Sugar Percent

Variety	Early Mean	Mid Mean	Late Mean	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	13.72	15.21	16.33	2.61	100.1	99.4	100.3
KW 1119	13.71	14.94	15.97	2.26	100.0	97.7	98.1
KW 2249	13.66	15.47	16.37	2.71	99.6	101.1	100.5
HILL. 5135	13.75	15.57	16.46	2.71	100.3	101.8	101.1
Mean	13.71	15.30	16.28	2.57	100.0	100.0	100.0

Table 7. Three year performance of date of harvest trials harvested early, mid, and late for LTM.

Loss to Molasses

Variety	Early Mean	Mid Mean	Late Mean	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	1.11	1.1	1.06	-0.05	101.4	100.4	100.0
KW 1119	1.11	1.1	1.06	-0.05	101.4	100.4	100.0
KW 2249	1.07	1.09	1.06	-0.01	97.7	99.5	100.0
HILL. 5135	1.09	1.08	1.06	-0.03	99.5	98.6	100.0
Mean	1.10	1.09	1.06	-0.04	100.0	100.0	100.0

Table 8. Three year performance of date of harvest trials harvested early, mid, and late for tons/acre.

Tons per Acre

Variety	Early Mean	Mid Mean	Late Mean	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	19.98	21.81	22.34	2.36	99.6	100.6	99.8
KW 1119	19.65	21.17	22.75	3.1	98.0	97.7	101.6
KW 2249	20.34	22.04	22.57	2.23	101.4	101.7	100.8
HILL. 5135	20.27	21.67	21.91	1.64	101.0	100.0	97.8
Mean	20.06	21.67	22.39	2.33	100.0	100.0	100.0

Table 9. Three year performance of date of harvest trials harvested early, mid, and late for sugar per ton.

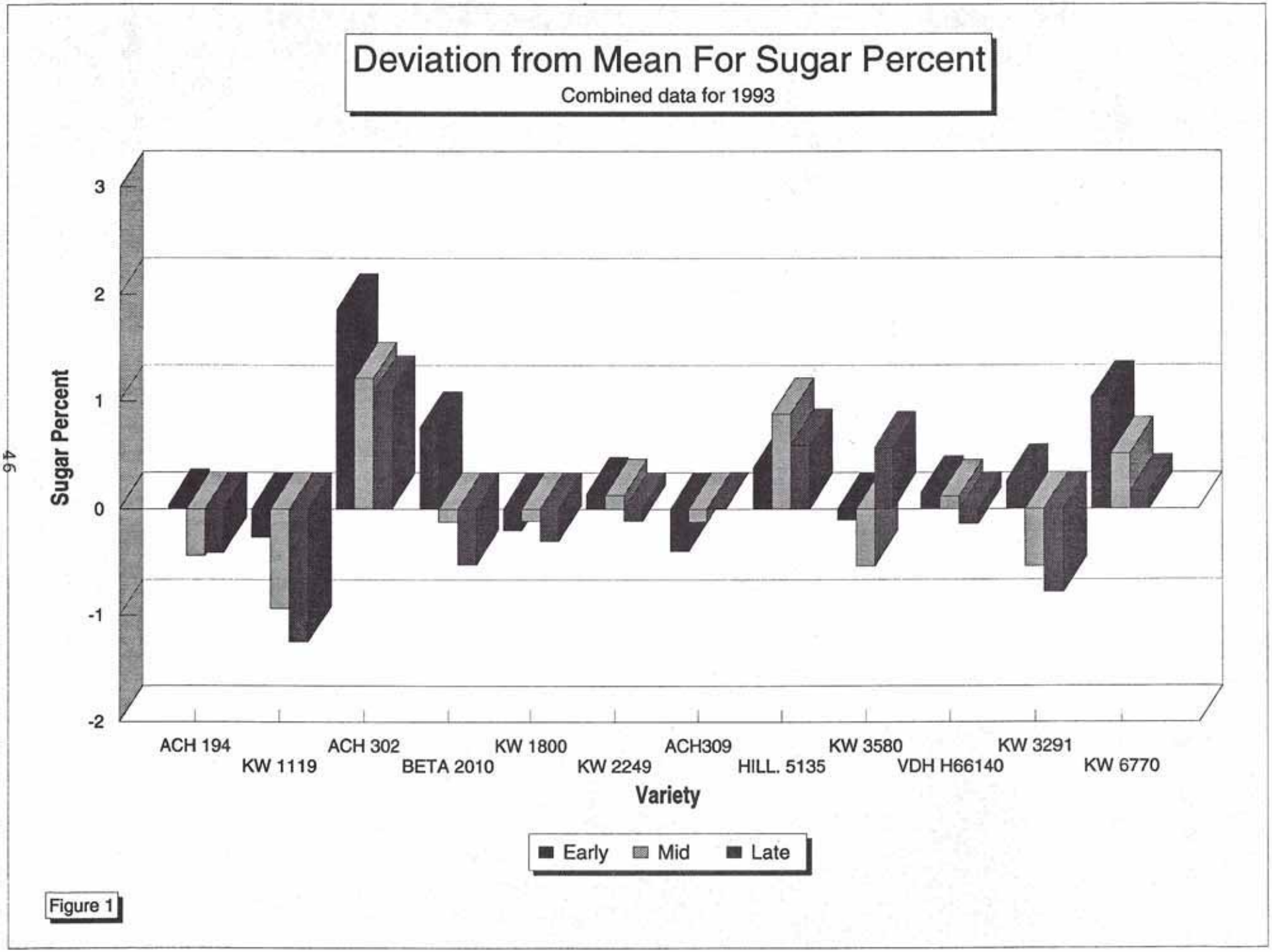
Sugar per Ton

Variety	Early Mean	Mid Mean	Late Mean	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	253.9	284.8	305.3	51.4	100.5	100.0	100.3
KW 1119	252.3	276.9	298.3	46.0	99.8	97.3	98.0
KW 2249	251.4	287.3	305.9	54.5	99.5	100.9	100.5
HILL. 5135	253.2	290.0	308.0	54.8	100.2	101.9	101.2
Mean	252.69	284.76	304.35	51.66	100.0	100.0	100.0

Table 10. Three year performance of date of harvest trials harvested early, mid, and late for sugar per acre.

Sugar per Acre

Variety	Early Mean	Mid Mean	Late Mean	Change E->L	Early % Mean	Mid % Mean	Late % Mean
ACH 194	5199.69	6162.25	7010.92	1811.2	99.8	100.5	101.9
KW 1119	5158.75	5823.95	6733.97	1575.2	99.0	95.0	97.9
KW 2249	5291.52	6284.31	6962.49	1671.0	101.6	102.5	101.2
HILL. 5135	5188.4	6257.97	6813.17	1624.8	99.6	102.1	99.0
Mean	5209.59	6132.12	6880.14	1670.55	100.0	100.0	100.0


Deviation from Mean For Sugar Percent
Combined data for 1993
Sugar Percent
3
2
1
0
-1
-2
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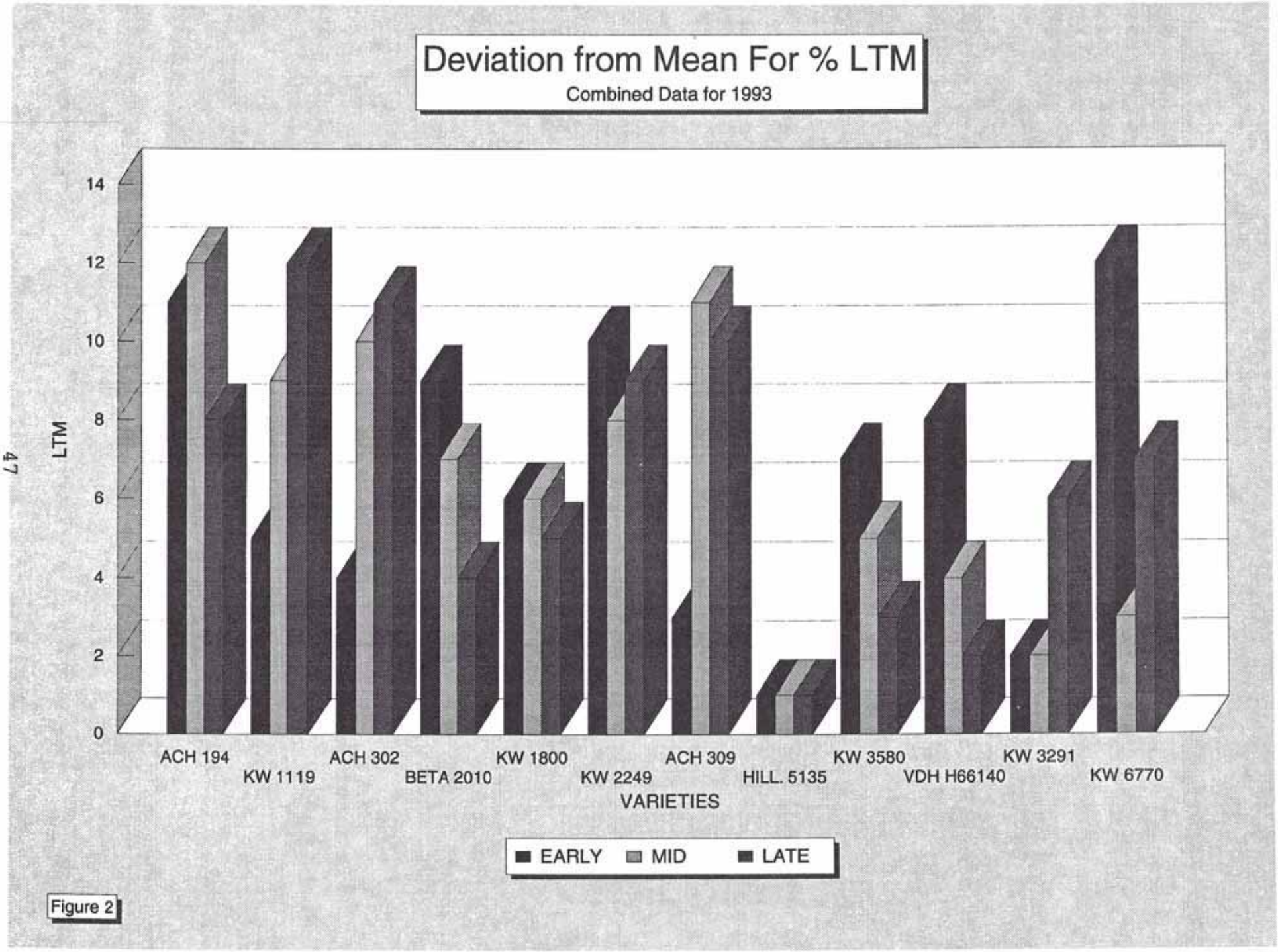
KW 1119
ACH 302
BETA 2010
KW 1800
KW 2249
ACH309
HILL. 5135
KW 3580
VDH H66140
KW 3291
KW 6770
Variety
Early
Mid
Late

Figure 1


Deviation from Mean For % LTM
Combined Data for 1993
LTM
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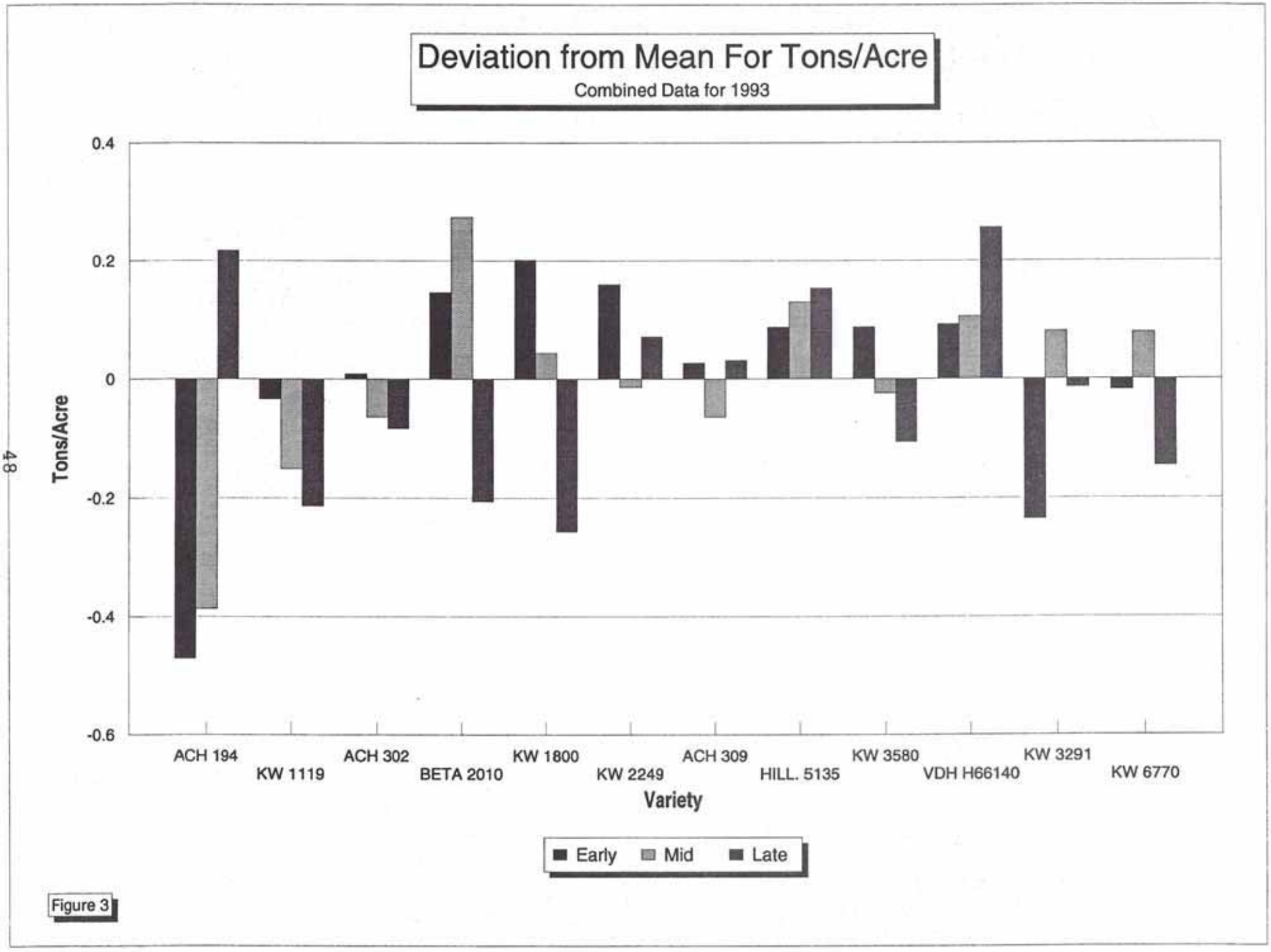
12
10
8
6
4
2
0
ACH 194
KW 1119
ACH 302
BETA 2010
KW 1800
KW 2249
ACH 309
HILL. 5135
KW 3580
VDH H66140
KW 3291
KW 6770
VARIETIES
EARLY
MID
LATE

Figure 2


Deviation from Mean For Tons/Acre
Combined Data for 1993
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0.2
0
-0.2
-0.4
-0.6
Tons/Acre
ACH 194
KW 1119
ACH 302
BETA 2010
KW 1800
KW 2249
ACH 309
HILL. 5135
KW 3580
VDH H66140
KW 3291
KW 6770
Variety
Early
Mid
Late

Figure 3

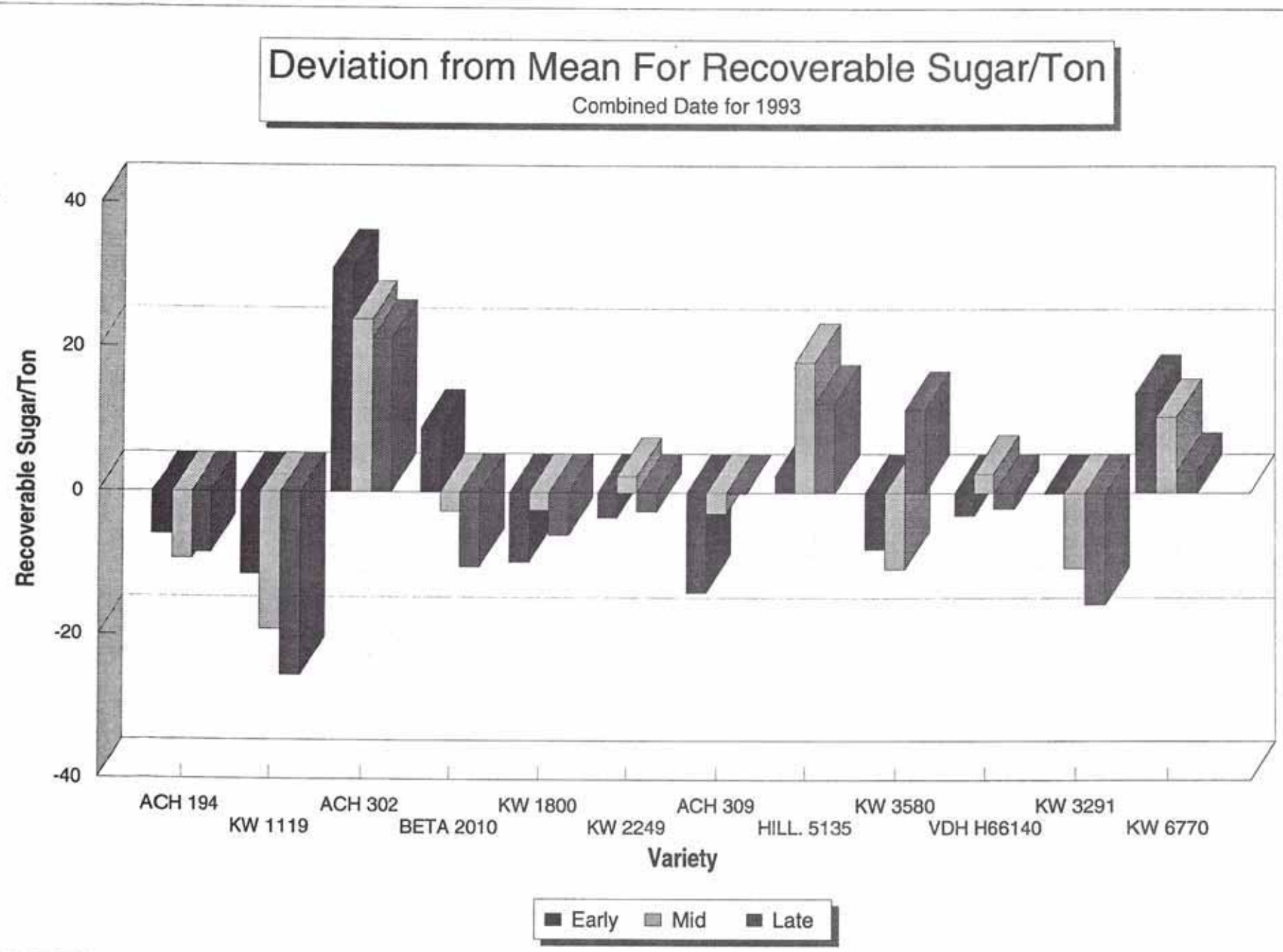

Deviation from Mean For Recoverable Sugar/Ton
Combined Date for 1993
Recoverable Sugar/Ton
40
20
0
-20
-40
ACH 194
KW 1119
ACH 302
BETA 2010
KW 1800
KW 2249
ACH 309
HILL. 5135
KW 3580
VDH H66140
KW 3291
KW 6770
Variety
Early
Mid
Late

Figure 4

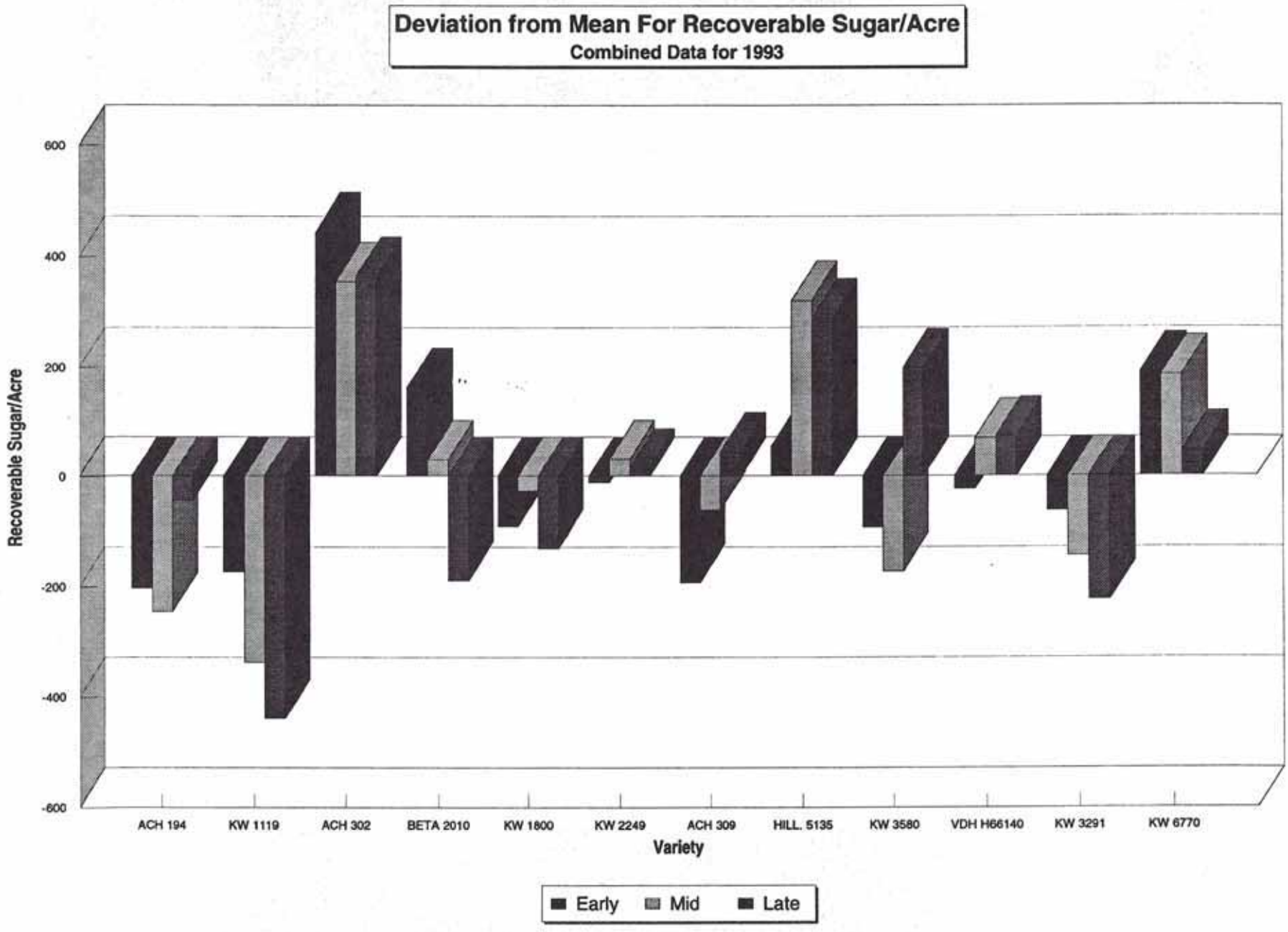

Deviation from Mean For Recoverable Sugar/Acre
Combined Data for 1993
Recoverable Sugar/Acre
600
400
200
0
-200
-400
-600
ACH 194
KW 1119
ACH 302
BETA 2010
KW 1800
KW 2249
ACH 309
HILL. 5135
KW 3580
VDH H66140
KW 3291
KW 6770
Variety
Early
Mid
Late

Figure 5

HIGH SUGAR VARIETY EVALUATION

OBJECTIVES

Evaluate varieties for early sugar accumulation.

EXPERIMENTAL PROCEDURES

Trials were planted at two locations in 1993. Varieties were replicated eight times in a randomized complete block design. Entries were chosen by their abilities to produce high percent sugar. The trials were planted May 5 and 14 for the respective locations.

Experimental units consisted of two row plots. The date of harvest was September 8. Harvest data was collected by hand harvesting 10 feet of row. Sugarbeets were evaluated for yield and quality characteristics.

RESULTS AND DISCUSSION

Varieties with early high sugar accumulation are desired as acres for sugarbeet production increase. The reason for this is that as total production (tons of sugarbeets harvested) increases, processing will begin earlier in the year. Processing started September 1 or before is best initiated when percent sugar is about 14.0 and loss to molasses is as close to 1 as possible or lower. Thus, varieties that possess earlier sugar percent accumulation are desired to meet the processing needs.

Data for sugar percent, tons/acre, loss to molasses (LTM), recoverable sugar per ton, and recoverable sugar per acre are found in Table 1. Sugar percent ranged from 14.88 to 15.33. Hilleshog 5135 gave the highest sugar percent of the currently approved varieties. The top three varieties for sugar percent were varieties not currently approved for Southern Minnesota Sugar.

Loss to molasses ranged from 0.98 to 1.03 percent, a .05 percent difference. There were nine varieties that were not significantly different from Hilleshog 5135 which ranked number one for loss to molasses. Therefore, there was not a large difference among varieties.

Tons per acre did not exceed 11.55 and averaged 10.86. This indicates a slightly higher average than that observed by growers in the SMSC growing area. KW 2249 gave the highest tons per acre. Even though KW 2249 ranked 11 on sugar percent, the higher tons per acre related into a high recoverable sugar/acre. Economic return to the

grower is increased significantly more with quality than quantity of sugarbeets. A variety that is balanced and gives high quantity and quality give the best economic return to the grower.

Recoverable sugar per ton was highest with ACH 9200042. The highest recoverable sugar per ton for an SMSC approved variety was KW 3291, which was ranked 3 overall 12 varieties for recoverable sugar per ton. ACH 194 and Hilleshog 5135 were ranked 4 and 5, respectively.

Recoverable sugar per acre was highest with ACH 9200094. KW 2249, a SMSC approved variety, ranked second.

When considering which varieties should be used for early harvest, the Cooperative needs to look at varieties with adequate sugar percent to economically and feasibly start processing. Thus, the grower will have to consider the processing factor and will also want to look at the return per acre. All the varieties tested would meet the criteria for sugar percent for starting processing. The highest sugar percent gave 8.1 percent higher payment per ton than the lowest sugar percent. When considering return per acre, the variety giving the highest return per acre was ranked five or average for sugar percent.

The general tendency among varieties with extremely high sugar is to be lower than average in yield ability. This trial was designed to evaluate high sugar types, which could show a greater return to growers by planting selected genotypes for early harvest. This research will be continued to further define differences among varieties which could be useful for the early harvest period.

Table 1. Combined location yield and quality performance of early harvest trials with high sugar type varieties.

Variety	Sucrose	% Mean	Tons/ Acre	% Mean	LTM %	% Mean	Rec. Suc. Ton	% Mean	Rec. Suc. Acre	% Mean	Estmated Grower Return Per Ton	Per Acre
KW 1119	15.09	99.9	10.22	94.1	1.03	102.6	281.3	99.8	2879.8	94.1	99.6	93.6
KW 2249	14.89	98.6	11.55	106.4	1.00	100.0	277.8	98.5	3214.9	105.0	96.7	102.7
HILL. 5135	15.15	100.3	10.86	100.0	1.03	102.9	282.4	100.2	3061.5	100.0	100.5	100.4
KW 1800	15.01	99.4	10.15	93.5	1.00	99.6	280.4	99.4	2842.9	92.9	98.8	92.3
KW 3291	15.09	99.9	10.89	100.3	1.01	100.6	281.6	99.9	3073.7	100.4	99.9	100.0
HM 1620	15.28	101.2	9.93	91.4	1.01	101.1	285.5	101.3	2836.9	92.7	103.2	94.2
HM 2720	14.88	98.5	10.89	100.3	1.01	101.4	277.3	98.3	3018.3	98.6	96.3	96.4
HM exp# 2	14.95	99.0	11.31	104.2	0.99	99.4	279.2	99.0	3155.9	103.1	97.9	101.8
ACH 9200094	15.13	100.2	11.49	105.8	1.03	102.6	282.1	100.1	3230.6	105.5	100.3	106.0
ACH 197	15.30	101.4	10.97	101.0	0.99	99.2	286.3	101.5	3145.5	102.8	103.8	104.8
ACH 9200042	15.33	101.5	11.12	102.4	0.98	98.1	286.9	101.8	3195.3	104.4	104.4	106.8
ACH 194	15.11	100.1	10.89	100.3	0.98	98.1	282.6	100.2	3075.9	100.5	100.7	100.8
Mean	15.10	100.0	10.86	100.00	1.00	100.0	281.9	100.0	3060.9	100.0	100.0	100.0
LSD(0.05)	0.28		0.61		0.04		5.7		185.8			
C. V. %	3.76		11.40		8.45		4.1		12.3			

VARIETIES EVALUATED FOR CERCOSPORA LEAF SPOT TOLERANCE

OBJECTIVE

Evaluate varieties for above average cercospora leaf spot tolerance, relative root yields and quality characteristics.

EXPERIMENTAL PROCEDURES

Trials were planted in two locations with varieties that express good tolerance to cercospora leaf spot. There were 12 varieties cooperatively chosen by seed companies and SMSC for the trial. The 12 varieties that were planted are as follows:

Hilleshog - Monohy Experimental #1
Hilleshog - Monohy 2720
Hilleshog - Monohy 1620
Beta 5639
Beta 5315
Beta 5603
ACH 185
ACH 9040013
ACH 9200094
ACH 197
VDH Super C
S 92726

The experimental were arranged in a randomized complete block design. Each experimental unit (plot) had two rows and were 30 feet long. The trials were planted May 1, 1993 and thinned by hand to 150 plants per 100 feet of row. Experimental units were harvested only at one location September 16, 1993. Sugarbeet quality and quantity analysis was conducted in SMSC Tare Laboratory.

RESULTS AND DISCUSSION

This trial was conducted in response to recent changes in CBS fungicide labels and potential loss of such fungicides. One of the purposes of the trial was to evaluate cercospora leaf spot tolerance among varieties with above average levels of genetic resistance. Cercospora leaf spot ratings were collected at first symptom of cercospora leaf spot. Varieties were observed for cercospora leaf spot throughout the remainder of the growing season. Cercospora leaf spot rating for all varieties was insignificant (data not shown). The plot area was sprayed only once. The remainder of the field did not

experience a significant amount of cercospora leaf spot infestation all year, but had three spraying. Thus, an adequate test for the varieties cercospora leaf spot tolerance was obtained.

Quality and quantity characteristics were collected and analyzed (Table 1). Sugar percent among varieties was significant at the 0.05 level. S 92726 gave the highest sugar percent. Many varieties were statistically similar. The sugar percent was relatively competitive with the sugar percent of the commercial field the trial was in.

Tons per acre was highest with ACH 197 at 15.59 ton. The second highest tons per acre was HM 2720 at 15.07 tons. There was 3.01 tons difference between the highest and lowest tonnage. However, there was not a significant difference among the top varieties. This indicates that close to two thirds of the varieties could perform similarly under normal conditions.

Loss to molasses was 1.02 or less. This low of loss to molasses is comparable to that obtained throughout the SMSC growing area.

Recoverable sugar per ton is a function of sugar percent and loss to molasses combined. As a result, the varieties that give high sugar percent and low loss to molasses usually gives the highest recoverable sugar per ton. S 92726 and H 2720 were 1 and 2 respectively for recoverable sugar per ton indicating good quality. There was 9.3 pounds recoverable sugar per ton difference between the highest and lowest variety.

Recoverable sugar per acre was significantly different among varieties. ACH 197 gave the highest sugar per acre. The top 7 varieties performed similarly when considering them statistically. However, there were only 5 varieties with revenues per acre over 100 percent of the mean.

Presently, varieties are approved through the coded trials with a leaf spot rating equivalent to 5.3 or less. The seed policy allows for approval of varieties on a limited on special use basis, provided the variety has some redeeming qualities, but does not meet performance standards.

It is in the Coop's best interest to have available information on varieties with above average leaf spot resistance, even though yield ability is slightly below standard.

This research project will be continued to further evaluate potential germplasm for use in this area under conditions of intense leaf spot pressure.

Table 1. Yield and quality performance of trials with cercospora leaf spot tolerant varieties.

Variety	Sucrose	% Mean	Tons/ Acre	% Mean	LTM %	% Mean	Rec. Suc. Ton	% Mean	Rec. Suc. Acre	% Mean	Revenue per Acre
HM EXP# 1	16.32	101.3	14.32	101.4	1.02	104.9	306.1	101.0	4384.3	102.6	103.6
HM 2720	16.31	101.2	15.07	106.7	0.93	96.1	307.5	101.5	4623.5	108.1	110.1
HM 1620	16.22	100.6	14.52	102.8	0.97	100.4	304.9	100.6	4423.4	103.5	104.1
BETA 5639	16.14	100.1	13.36	94.6	0.99	102.3	303.0	100.0	4051.7	94.8	94.5
BETA 5315	15.93	98.8	14.13	100.1	0.96	98.7	299.4	98.8	4231.7	99.0	97.5
BETA 5603	15.94	98.9	13.93	98.7	0.96	99.1	299.5	98.8	4169.1	97.5	96.1
ACH 185	15.97	99.1	13.43	95.1	0.98	101.0	300.0	99.0	4013.3	93.9	92.9
ACH 9040013	16.15	100.2	14.93	105.8	0.96	99.0	303.7	100.2	4521.4	105.8	106.2
ACH 9200094	15.90	98.7	12.58	89.1	0.93	96.0	299.5	98.8	3755.1	87.8	86.7
ACH 197	16.18	100.4	15.59	110.4	0.93	95.7	305.1	100.6	4746.6	111.0	112.0
VDH SUPER C	16.00	99.2	13.85	98.1	0.98	101.4	300.3	99.1	4156.9	97.2	96.1
SX 92726	16.41	101.8	13.68	96.9	0.97	100.0	308.7	101.8	4225.6	98.8	100.8
Mean	16.12	100.0	14.12	100.00	0.97	100.0	303.1	100.0	4275.2	100.0	100.0
LSD(0.05)	0.28		0.61		0.04		5.7		185.8		
C. V. %	3.76		11.40		8.45		4.1		12.3		

SEED TREATMENTS FOR SEEDLING DISEASE CONTROL WITH A TOLERANT VARIETY

OBJECTIVE

To evaluate seed treatments for control of seedling diseases with a tolerant variety.

PROCEDURES

Tolerant variety ACH 198 was pelleted by Seed Systems. The seed was treated with seed treatments in various combinations at rates in g/100 kg seed. The treatments were as follows:

1. Apron (1.25) + Thiram (5)
2. Thiram (5) + Tachigaren (45)
3. Apron (1.25) + Thiram (5) PAT *
4. Thiram (5) + Tachigaren (45) PAT *
5. Check susceptible variety with Apron + Thiram

* Seed treatment by Seed Systems

The seed was planted June 9 in a randomized complete block design at a 4 inch spacing. Experimental units were 11 x 35 ft. with 30 ft. being taken into consideration for stand counts and harvest. Sugarbeets were thinned as needed. Stand counts were taken at 4 and 8 weeks after emergence and at harvest time. Quality and quantity data were collected at harvest time (12 weeks after emergence).

RESULT AND DISCUSSION

Data from locations one and two could not be combined and will be discussed individually. Location one had a higher degree of seedling disease infestation than location two. Most of the discussion will center around location one due to the lack of seedling disease infestation at location two. An important factor to consider is that these data pertain to a seedling disease tolerant variety.

Sugarbeet stands at locations one and two (Table 2) decreased over time. Stands at location one (Table 2) were significantly higher when Tachigaren was present on the seed. The PAT seed treatment in combination with Tacigharen increased stand over Tachigaren without PAT at location one.

Sugarbeet stands at locations two (Table 1) were not consistently higher over time with or without Tachigaren. There seems to be a trend for Tachigaren treated seed to have a high stand at harvest time, but not significantly higher at location two.

These results indicate that under a situation of low seedling disease infestation (location two) the use of PAT or Tachigaren does not possess an advantage for stand maintenance. This, however, is not the case when seedling disease infestation is high (location one). These data indicate Tachigaren with or without PAT will increase sugarbeet stands significantly under high seedling disease situations.

Yield data for location two (Table 1) was non-significant regardless of factors considered. This is probably a reflection of sugarbeet stands being non-significant at harvest time.

Yield data at location one (Table 1) directly reflected sugarbeet stand with the various treatments. Sugar percent was relatively the same for all treatments except the check in which there were no sugarbeets to harvest. Tons/acre were significantly high when Tachigaren was part of the seed treatment. Tachigaren treated seed was 5.25 to 9.5 tons higher than seed not treated with Tachigaren. Recoverable sugar per ton was not significantly different when comparing treatment with and without Tachigaren. Recoverable sugar per acre did reflect the use of Tachigaren as a seed treatment. Tachigaren treated seed either did or tended to give a higher recoverable sugar per acre.

These data indicate similar results to that obtained in the sugarbeet stand results. Tachigaren as a seed treatment with a tolerant variety increased yield of sugar when seedling disease infestation was high and did not increase sugar production when seedling disease infestation was low.

Table 1. Quantity and Quality of sugarbeets as effected by seed treatments with a tolerant variety.

Location 1

Treatment	Sucrose	LTM	Tons/acre	Rcoverable Sugar/ton	Rcoverable Sugar/acre
Apron (1.25)+Thiram(5)	12.42	1.54	6.55	217	1424
Thiram(5)+Tachigaren(45)	13.06	1.52	16.48	231	3805
Apron(1.25)+Thiram(5)PAT	12.66	1.69	7.88	219	1729
Thiram(5)+Tachigaren(45)PAT	12.37	1.54	13.13	217	2845
Check	0.00	0.00	0.00	0	0
LSD (0.05)	0.76	0.22	4.01	18	1282
C.V.%	4.58	10.13	25.21	6	37

Location 2

Treatment	Sucrose	LTM	Tons/acre	Rcoverable Sugar/ton	Rcoverable Sugar/acre
Apron (1.25)+Thiram(5)	14.17	1.23	18.69	259	4950
Thiram(5)+Tachigaren(45)	14.01	1.27	15.83	255	3585
Apron(1.25)+Thiram(5)PAT	13.72	1.19	17.99	251	4544
Thiram(5)+Tachigaren(45)PAT	14.22	1.20	18.37	260	4655
Check	13.44	1.32	15.50	242	3688
LSD (0.05)	1.17	0.16	NS	26	2045
C.V.%	7.01	11.03	31.21	9	40

Table 2. Sugarbeet Stand as effected by seed treatments with a tolerant variety.

Location 1

Treatment	Weeks After Emergence 4 (PERCENT	8 OF PLANTED	12 STAND)
Apron (1.25)+Thiram(5)	11	8	7
Thiram(5)+Tachigaren(45)	32	28	24
Apron(1.25)+Thiram(5)PAT	9	8	5
Thiram(5)+Tachigaren(45)PAT	40	35	30
Check	0	0	0
LSD (0.05)	----------	5	----------
C.V.%	----------	26	----------

Location 2

Treatment	Weeks After Emergence 4 (PERCENT	8 OF PLANTED	12 STAND)
Apron (1.25)+Thiram(5)	33	28	25
Thiram(5)+Tachigaren(45)	47	39	29
Apron(1.25)+Thiram(5)PAT	41	34	26
Thiram(5)+Tachigaren(45)PAT	39	32	28
Check	38	31	26
LSD (0.05)	----------	10	----------
C.V.%	----------	27	----------

SEED TREATMENTS FOR SEEDLING DISEASE CONTROL WITH A SUSCEPTIBLE VARIETY

OBJECTIVE

To evaluate seed treatments for control of seedling diseases with a susceptible variety.

PROCEDURES

Susceptible variety KW 2398 was pelleted by Seed Systems. The seed was treated with seed treatments in various combinations at rates in g/100 kg seed. The seed treatments were as follows:

1. Apron (1.25) + Thiram (5)
2. Thiram (5) + Tachigaren (45)
3. Thiram (5) + Tachigaren (60)
4. Thiram (5) + Tachigaren (90)
5. Apron (1.25) + Thiram (5) PAT*
6. Thiram (5) + Tachigaren (45) PAT*
7. Check (susceptible variety with Apron + Thiram)

* Seed treatment by Seed Systems

Planting took place later than normal to induce or increase root rot potential. The seed was planted on June 9 in a randomized complete block design at a four inch spacing. Experimental units were 11 x 35 ft. with 30 ft. being taken into consideration for stand counts and harvest. Experimental units were harvested by hand. Sugarbeets were analyzed and evaluated for quantity and quality. Stand counts were taken four and eight weeks after emergence and at harvest time (12 weeks after emergence).

RESULT AND DISCUSSION

Data from locations one and two could not be combined and will be discussed individually. Location one had a higher degree of seedling disease infestation than location two. An important factor to consider is that these data pertain to a seedling disease susceptible variety.

Sugarbeet stand at locations one and two (Table 2) decreased over time. Stands at location two did not reflect any differences among seed treatment. This is a reflection of the lack of seedling disease infection.

Sugarbeet stand at location one (Table 2) was significantly higher when Tachigaren was part of the seed treatment. PAT increased sugarbeet stand at a 4 week interval when comparing treatments with 45 g/100 kg rate of Tachigaren. Tachigaren rate did not influence sugarbeet stand. Tachigaren at 45 g/100 kg gave a sugarbeet stand equal to that of Tachigaren at 90 g/100 kg. These data indicate similar results with a susceptible variety as that received with a tolerant variety. Tachigaren treated seed gave an increase in stand when the seedling disease infection was high but did not increase stand when seedling disease infection was low.

Sugarbeet yield and quality at location two (Table 1) did not reflect changes in seed treatments. Sugarbeet seed with Tachigaren or PAT did not consistently produce higher amounts of sugar in comparison to seed without such treatments.

Sugarbeet yield at location one (Table 1) did reflect seed treatments. Quality of sugarbeets was the same for all treatments that had sugarbeets to be harvested. Tons per acre significantly increased where Tachigaren was used as part of the seed treatments. Tachigaren at 60 g/100 kg gave the highest tons per acre. Tons per acre was significantly less for 45 g/100 kg compared to 60 g/100 kg. However, tons per acre for 45 g/100 kg with PAT gave similar tons per acre as 60 g/100 kg. Recoverable sugar per ton was similar for all treatments except the check which did not have harvestable sugarbeets. Recoverable sugar per acre was greater with Tachigaren treated seed. Sugar per acre yield was highest with seed treated with Tachigaren at 60 g/100 kg. Tachigaren at 60 g/100 kg was not significantly higher than the other seed treated with Tachigaren for recoverable sugar per acre.

These data indicate that sugar production will not be increased by adding Tachigaren to the seed where seedling disease infection was low. However, where seedling disease infection was high, Tachigaren treated seed increased sugar production. Tachigaren at higher rates 60 or 90 g/100 kg tended to increase sugar production per acre.

Table 1. Quantity and Quality of sugarbeets as effected by seed treatments with a susceptible variety.

Location 1

Treatment	Sucrose	LTM	Tons/acre	Rcoverable Sugar/ton	Rcoverable Sugar/acre
Apron (1.25)+Thiram(5)	13.18	1.67	6.22	230	1432
Thiram(5)+Tachigaren(45)	13.37	1.59	14.75	236	3478
Thiram(5)+Tachigaren(60)	13.50	1.54	18.20	239	4351
Thiram(5)+Tachigaren(90)	13.30	1.55	17.44	235	4095
Apron(1.25)+Thiram(5)PAT	13.59	1.53	6.58	241	1585
Thiram(5)+Tachigaren(45)PAT	13.32	1.49	15.96	237	3780
Check	0.00	0.00	0.00	0	0
LSD (0.05)	0.76	0.18	2.98	18	1123
C.V.%	4.48	8.67	18.09	6	29

Location 2

Treatment	Sucrose	LTM	Tons/acre	Rcoverable Sugar/ton	Rcoverable Sugar/acre
Apron (1.25)+Thiram(5)	14.68	1.22	18.00	269	5020
Thiram(5)+Tachigaren(45)	14.74	1.20	23.04	271	6275
Thiram(5)+Tachigaren(60)	14.28	1.20	22.21	262	5851
Thiram(5)+Tachigaren(90)	14.84	1.18	20.18	273	5504
Apron(1.25)+Thiram(5)PAT	14.60	1.22	25.03	268	6686
Thiram(5)+Tachigaren(45)PAT	14.59	1.19	17.90	268	4856
Check	13.44	1.32	15.50	242	3688
LSD (0.05)	0.93	0.17	5.39	21	1762
C.V.%	5.46	12.19	22.56	7	28

Table 2. Sugarbeet Stand as effected by seed treatments with a susceptible variety.

Location 1

	Weeks After Emergence		
	4	8	12
Treatment	(PERCENT OF PLANTED STAND)		
Apron (1.25)+Thiram(5)	8	6	7
Thiram(5)+Tachigaren(45)	37	33	24
Thiram(5)+Tachigaren(60)	35	30	24
Thiram(5)+Tachigaren(90)	38	34	28
Apron(1.25)+Thiram(5)PAT	9	6	3
Thiram(5)+Tachigaren(45)PAT	42	36	28
Check	0	0	0
LSD (0.05)	----------	4	----------
C.V.%	----------	17	----------

Location 2

	Weeks After Emergence		
	4	8	12
Treatment	(PERCENT OF PLANTED STAND)		
Apron (1.25)+Thiram(5)	33	19	17
Thiram(5)+Tachigaren(45)	38	33	28
Thiram(5)+Tachigaren(60)	37	33	29
Thiram(5)+Tachigaren(90)	40	34	28
Apron(1.25)+Thiram(5)PAT	44	36	29
Thiram(5)+Tachigaren(45)PAT	37	29	25
Check	34	28	24
LSD (0.05)	----------	8	----------
C.V.%	----------	24	----------

SUGARBEET QUANTITY AND QUALITY AS INFLUENCED BY FERTILIZER RATE AND TIME OF HARVEST

OBJECTIVE

Evaluate the effects of fertility based on: (1) soil analysis, (2) recommendation of nutrients, and (3) time of harvest.

EXPERIMENTAL PROCEDURES

Three separate experiments were established at each location in a randomized complete block design in 1992 and 1993. Experiments were harvested at three harvest times early, mid, and late. Harvest of experimental units was conducted on September 12 and October 1 and 20 in 1992 and September 9, 29, and October 18 in 1993 for early, mid, and late, respectively.

Fertility rates were 50, 75, 100, 125, and 150 percent of recommended nutrient requirements. The recommended nutrient analysis was 140 - 40 - 200 in 1992 and 122 - 26 - 80 of nitrogen in 1993, phosphate and potassium, respectively. The soil test analysis in the top two feet was 30 - 10 - 100 in 1992 and 18 - 14 - 20 in 1993 of nitrogen, phosphate and potassium, respectively. The recommended analysis was obtained by following guidelines set forth by the North Dakota State Extension bulletin "Fertilizing Sugarbeets". The actual fertilizer analysis applied is found in Table 1 for 1993 and Table 2 for 1992. Fertilizer was spread by hand in 11 x 35 foot plot which were replicated six times.

The experiment was conducted at two locations in both years, 1992 and 1993.. Locations were chosen due to their relatively low fertility as indicated by their fertility test. The data presented is from one location since only one location could be harvested due to climatic conditions causing extreme variability in one of the locations in 1993 and two locations in 1992.

RESULTS AND DISCUSSION

Acreage increases over the past few years have increased the importance of producing sugarbeets with high quality earlier in the harvest season. However, production of high quality and quantity at a cost efficient means is very important to the prosperity of SMSC growers. This means that there is a need to provide effective production practices that may vary dependent on the length of growing season. Thus, fertility rates may need to be altered dependent on length of season or harvest date.

The data presented (Table 3 - 6) are an average of two years data (1992 - 1993). These data were collected from two years of extremes. Growing conditions in 1992 were very favorable for sugarbeet production while growing conditions in 1993 were not favorable for sugarbeet production.

Sugar percent (Table 3) and loss to molasses (Table 4) were inversely related to fertility rate at early harvest. The difference among treatments for sugar percent was largest at early harvest (0.6%). The highest sugar percent at mid and late harvest was obtained at 75, 100 or 125 percent of recommended fertilizer rate.

Tons per acre (Table 5) at early harvest was highest with fertility rates of 75 to 125 percent of recommended fertility rate. Mid and late harvest tons per acre were directly related to fertility rate.

Recoverable sugar per ton (Table 6) was inversely related to fertility rate. Data for recoverable sugar per ton at mid and late harvest only varied 8 and 12 pounds per ton, respectively, for mid and late harvest. Recoverable sugar per ton tended to be higher with fertility rates of 75 to 125% at mid and late harvest.

The payment to SMSC growers is a combination of quality and quantity. The final result of these factors is recoverable sugar per acre. Recoverable sugar per acre (Table 7) at early harvest was highest with 75 percent of recommended fertility. Data at mid and late harvest shows the highest recoverable sugar per acre being obtained at 125 percent of recommended fertility.

Growers need to consider net return from a production practice such as a fertility program. Data presented in Table 8 considers cost of treatment and cost of trucking (lack of or excessive tons/acre) subtracted from gross revenue to obtain net revenue.

Net revenue was highest at 75 percent at early harvest. This was due to good quality and quantity at the 75 percent rate of the early harvest date. The 50 percent rate gave good quality but lacked tons/acre and the 100 percent or higher rates gave good yields but lacked quality in comparison to the 75 percent rate.

Net revenue at mid and late harvest was best achieved at rates of 75 to 125 percent of recommended fertility. Tons per acre at 50 percent was much lower than the other rates of fertilizer resulting in 16 to 18 percent less return per acre than the 75 to 125 percent rate of fertility. Quality of sugarbeets at 150 percent fertility rate was lower than the other fertility rates at mid and late harvest. This resulted in a 4 to 6 percent lower return per acre for the 150 percent rate in comparison to 75 to 125 percent fertility rate.

The conclusion to this experiment would be that fertilizing within 25 percent of the recommended fertilization is the best production practice. The best return for early harvest is to fertilize at 75 percent of recommended fertilizer rate. Fertilizing at 100 percent of the recommended fertilizer rate was the best at mid and late harvest.

Table 1. Fertilizer rates applied and cost for each treatment ,1993.

Fertilizer Rate %	Nitrogen	Phosphate	Potassium	Cost/acre
50%	61	13	40	18.95
75%	92	20	60	28.43
100%	122	26	80	37.90
125%	153	33	100	47.38
150%	183	39	120	56.85

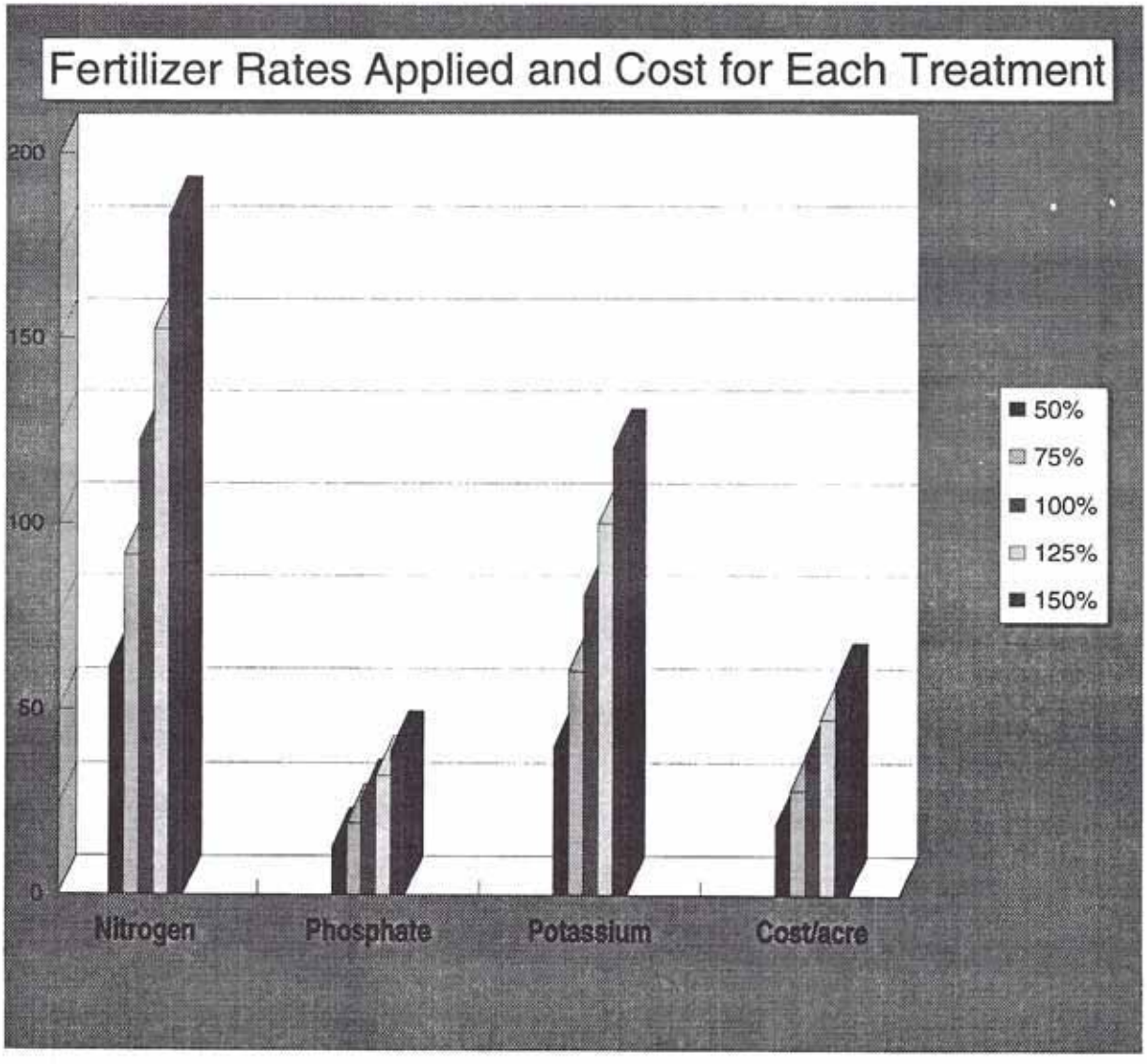


Table 2. Fertilizer rates applied and cost for each treatment ,1992.

Fertilizer Rate %	Nitrogen	Phosphate	Potassium	Cost/acre
50%	58	17	42	19.17
75%	87	26	62	28.75
100%	116	34	83	38.33
125%	145	43	104	47.92
150%	174	51	125	57.50

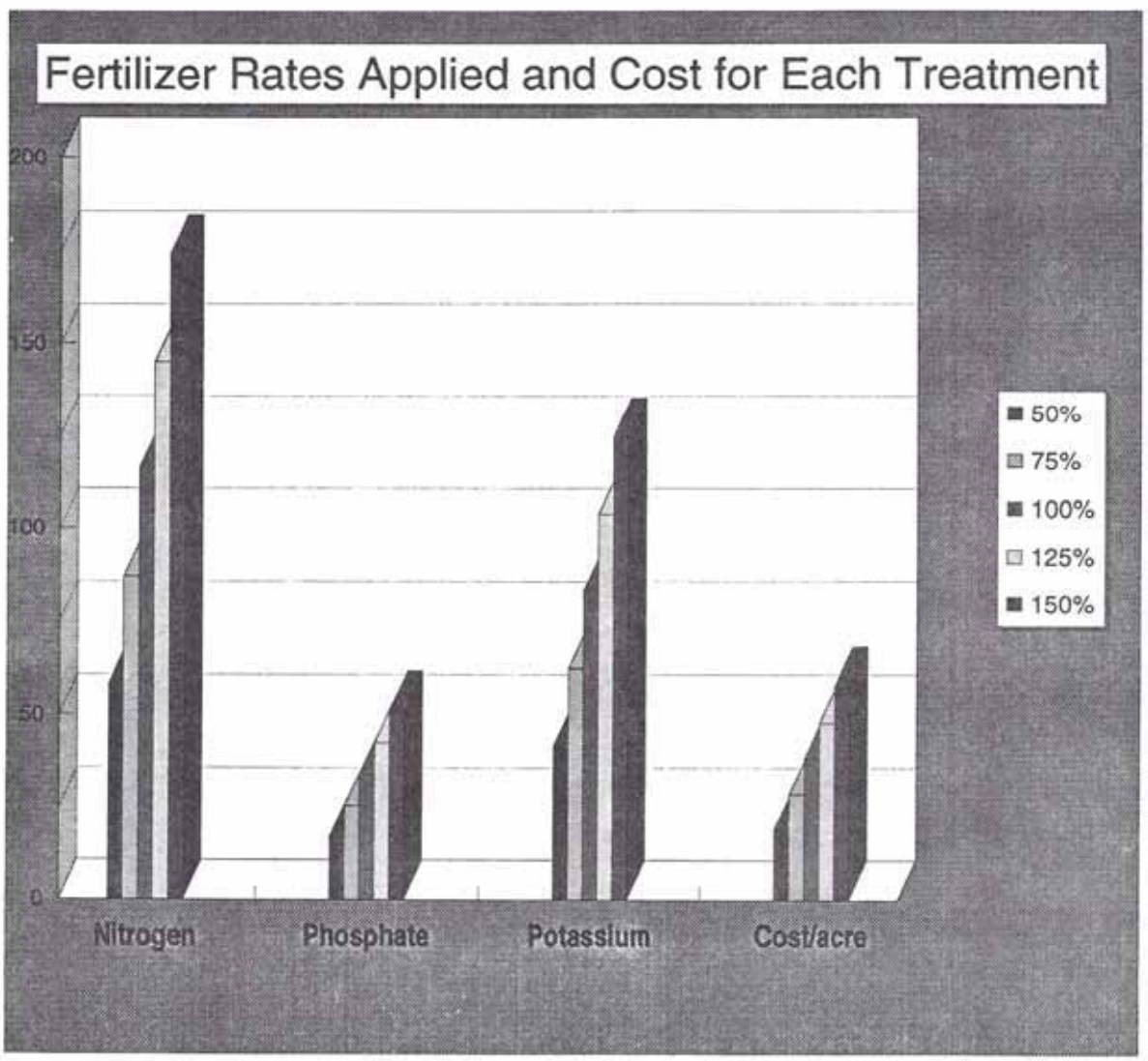


Table 3. Two year performance of Percent of fertility recommendation and time effect on sugar percent, 1992-1993

Fertilizer Rate %	Early	Mid	Late	Change E>L
50%	15.719	16.669	17.5015	1.7825
75%	15.581	16.7025	17.902	2.321
100%	14.715	16.825	17.9055	3.1905
125%	14.4475	16.762	17.872	3.4245
150%	14.118	16.413	17.385	3.267

TWO YEAR PERFORMANCE

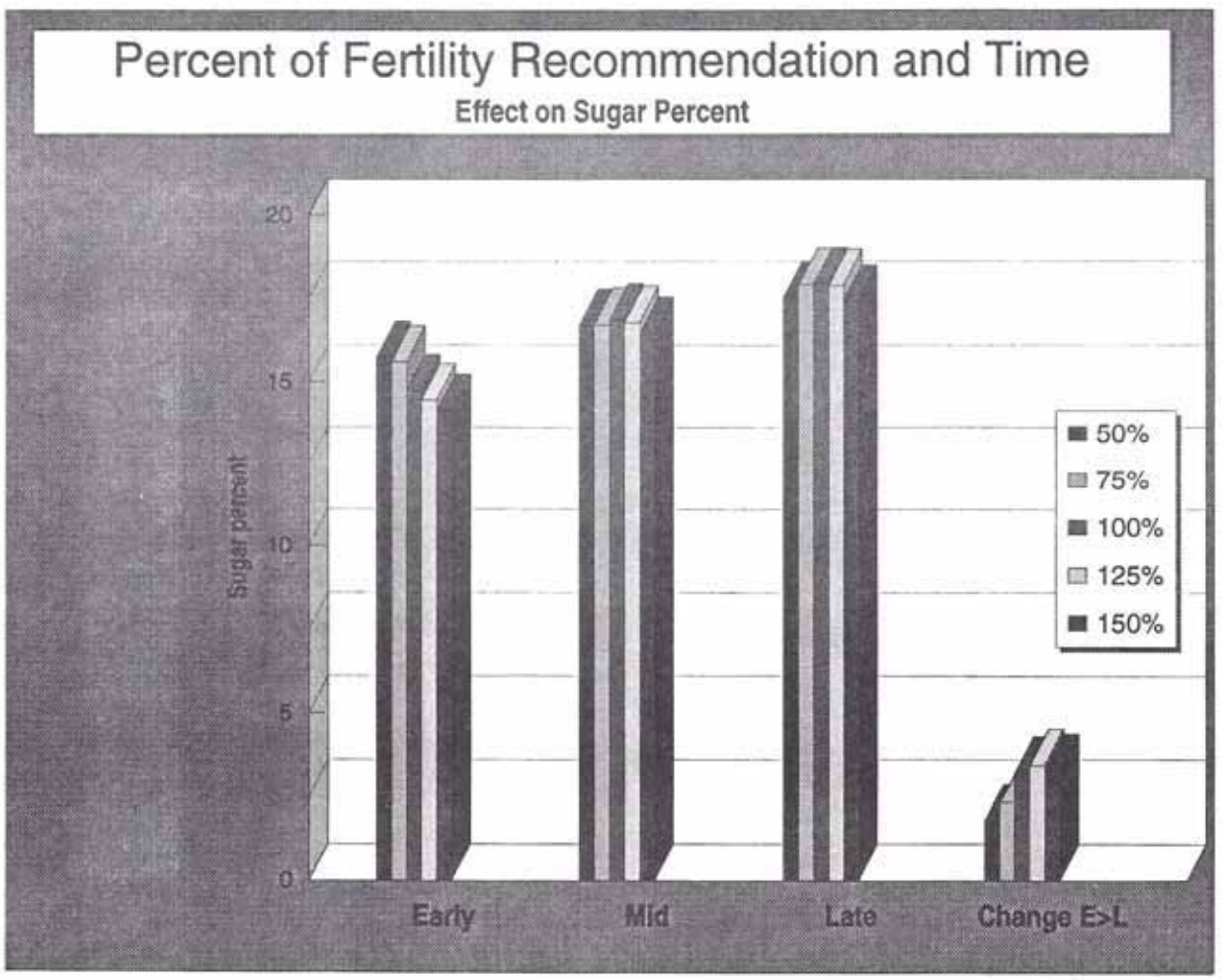


Table 4. Two year performance of Percent of fertility recommendation and time effect on Loss to Molasses, 1992-1993

Fertilizer Rate %	Early	Mid	Late	Change E>L
50%	1.01	0.96	0.93	-0.08
75%	1.00	0.95	0.93	-0.07
100%	1.04	0.98	0.94	-0.10
125%	1.06	0.99	0.96	-0.10
150%	1.13	1.05	1.01	-0.12

TWO YEAR PERFORMANCE

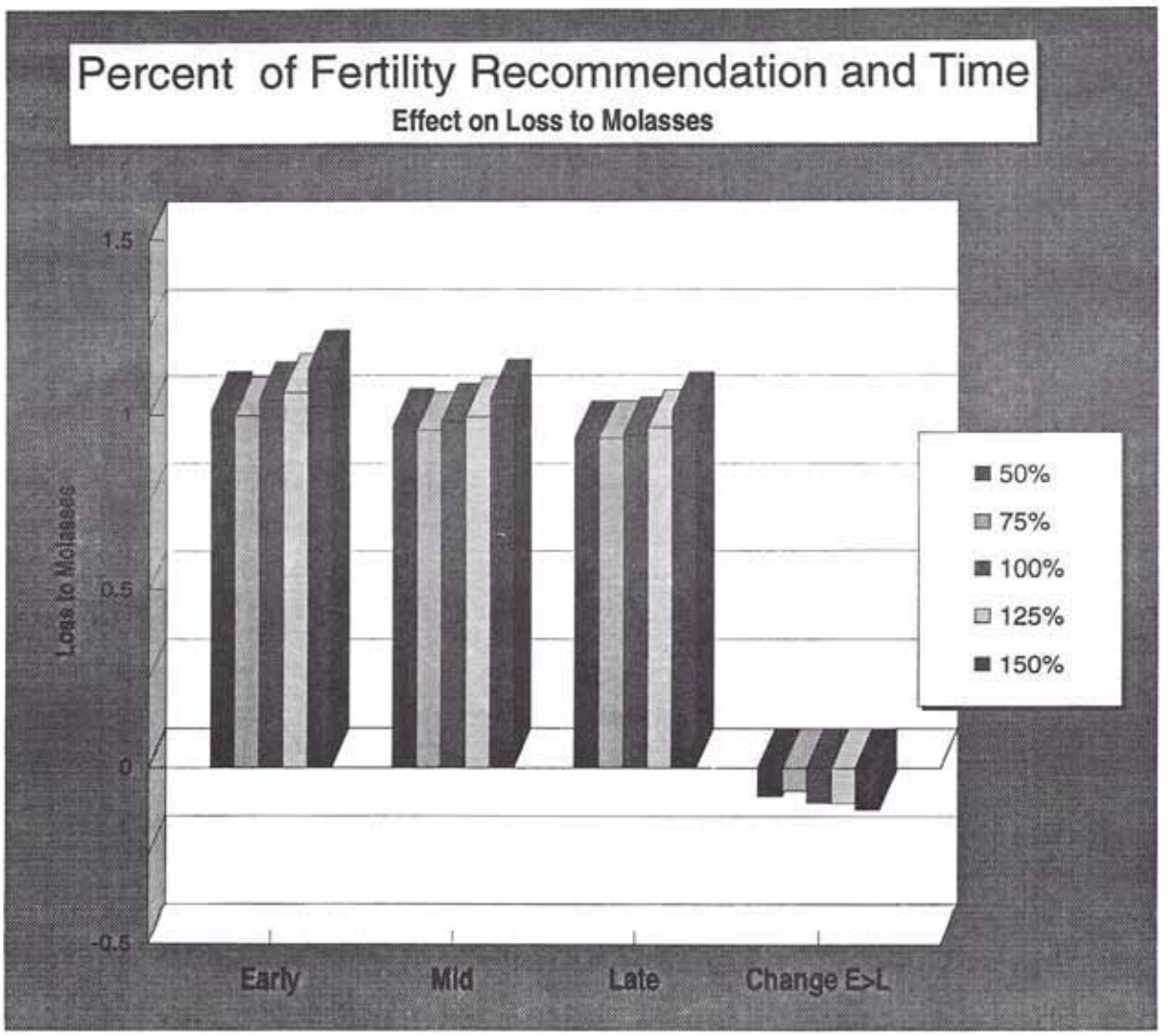


Table 5. Two year performance of Percent of fertility recommendation and time effect on Tons per Acre, 1992-1993

Fertilizer Rate %	Early	Mid	Late	Change E>L
50%	12.70	15.06	15.65	2.95
75%	14.74	17.51	18.45	3.71
100%	14.96	17.60	19.18	4.22
125%	14.78	17.88	19.33	4.55
150%	14.53	18.23	19.38	4.85

TWO YEAR PERFORMANCE

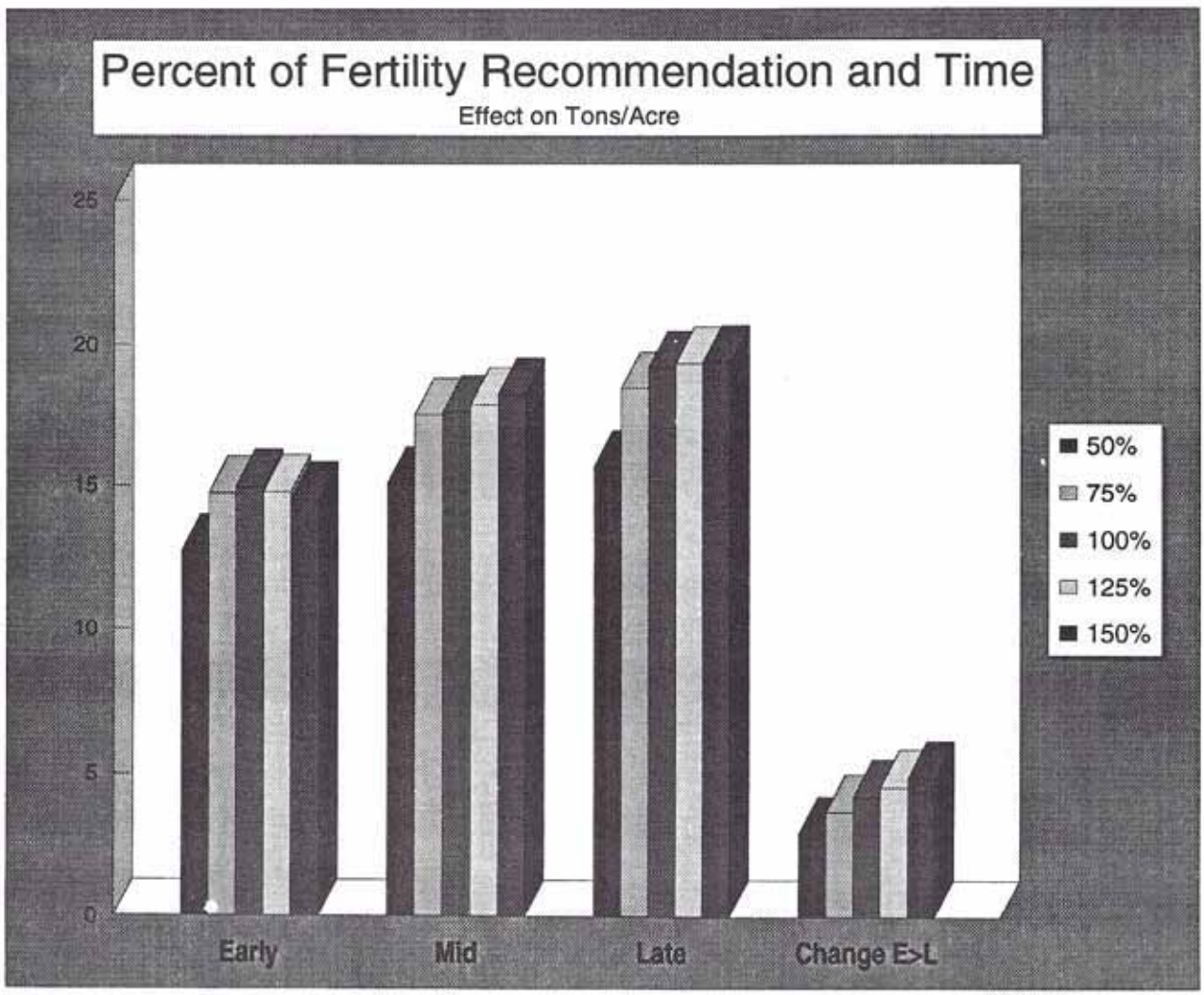


Table 6. Two year performance of Percent of fertility recommendation and time effect on Recoverable Sugar per Ton, 1992-1993

Fertility Rate %	Early	Mid	Late	Change E>L
50%	293.92	314.01	331.83	37.91
75%	284.56	315.47	339.34	54.78
100%	273.57	316.93	339.21	65.64
125%	267.78	315.55	338.04	70.26
150%	259.74	307.54	327.30	67.56

TWO YEAR PERFORMANCE

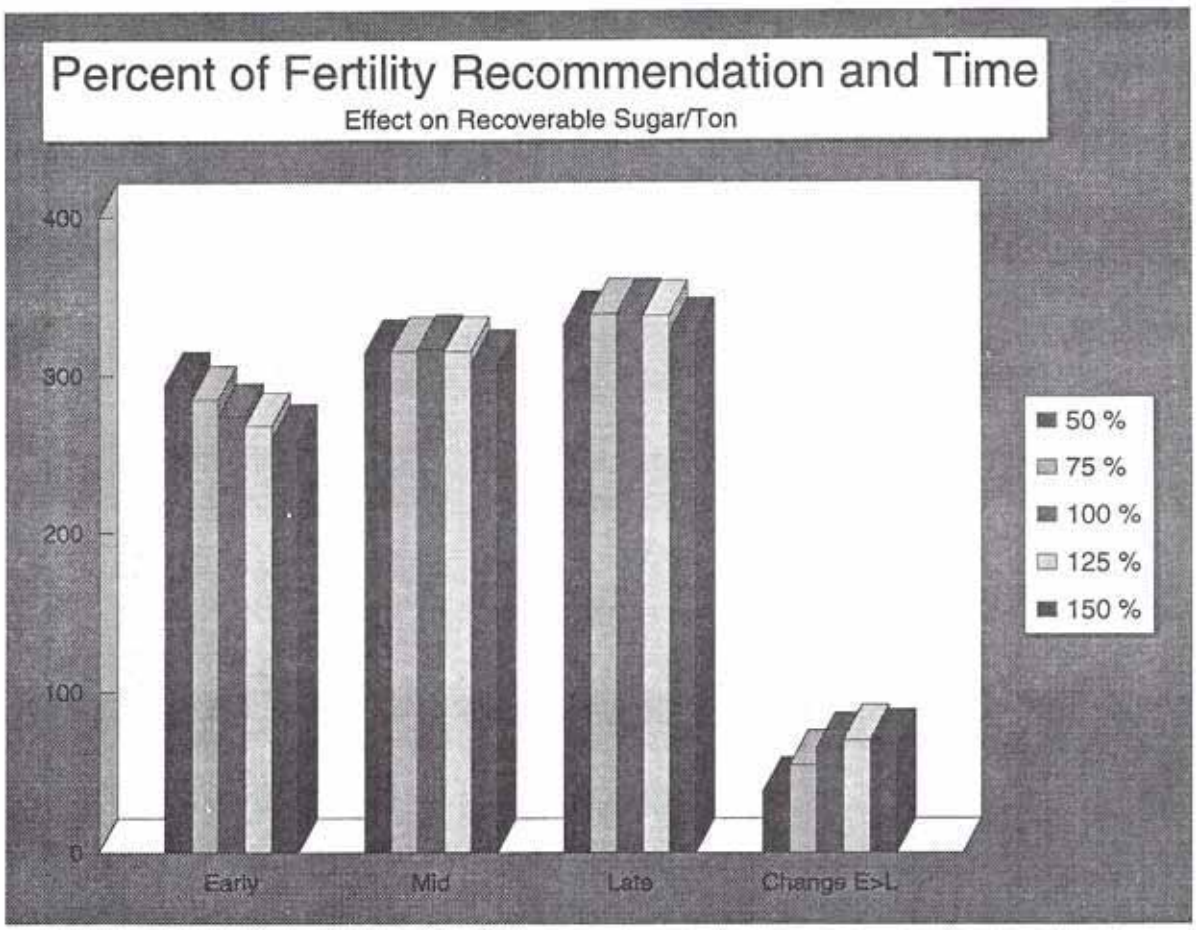


Table 7. Two year performance of Percent of fertility recommendation and time effect on Recoverable Sugar per Acre, 1992-1993

Fertilizer Rate %	Early	Mid	Late	Change E>L
50%	3738.61	4725.80	5184.24	1445.63
75%	4190.01	5528.35	6265.00	2074.99
100%	4078.05	5582.92	6522.34	2444.29
125%	3935.91	5640.10	6547.38	2611.47
150%	3746.04	5562.94	6315.78	2569.74

TWO YEAR PERFORMANCE

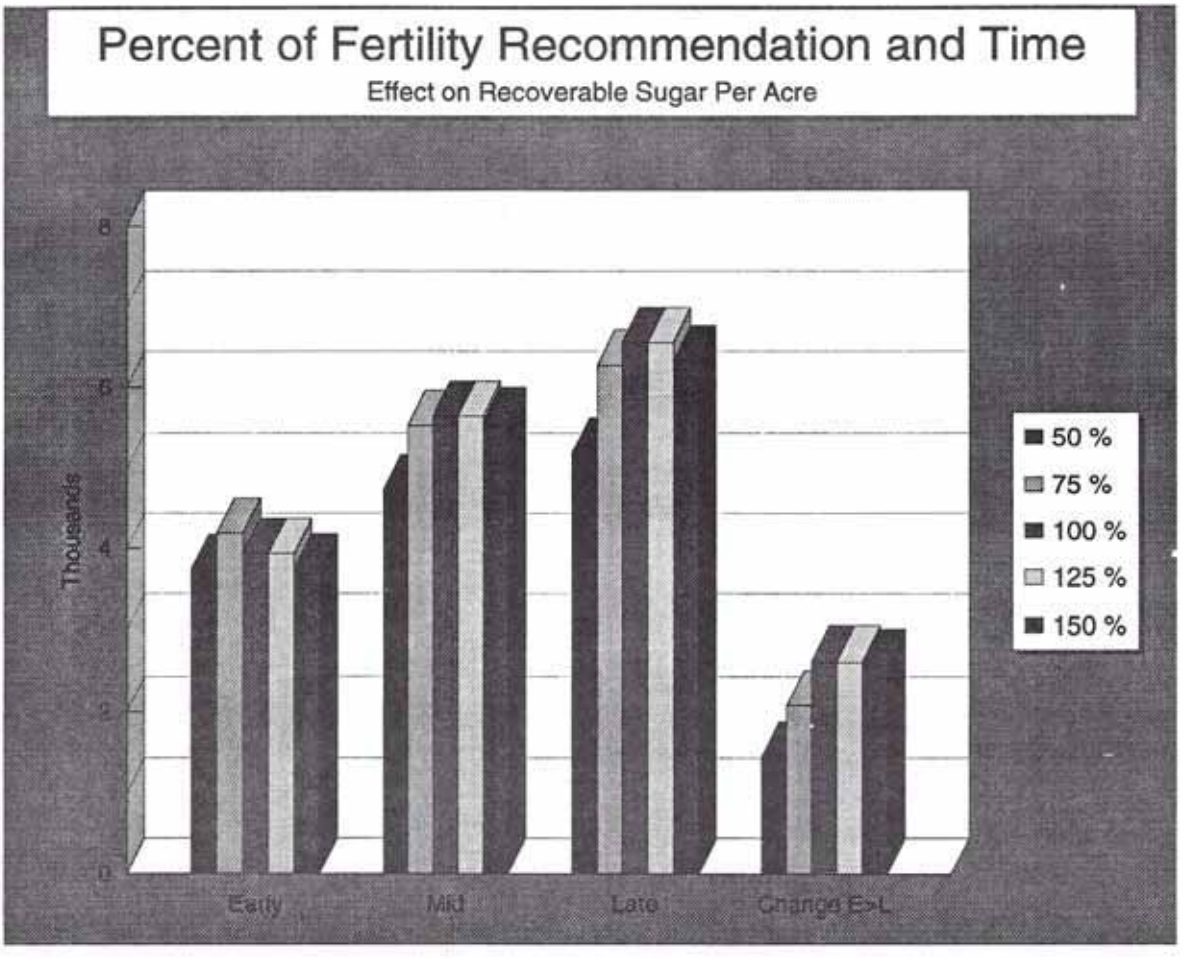
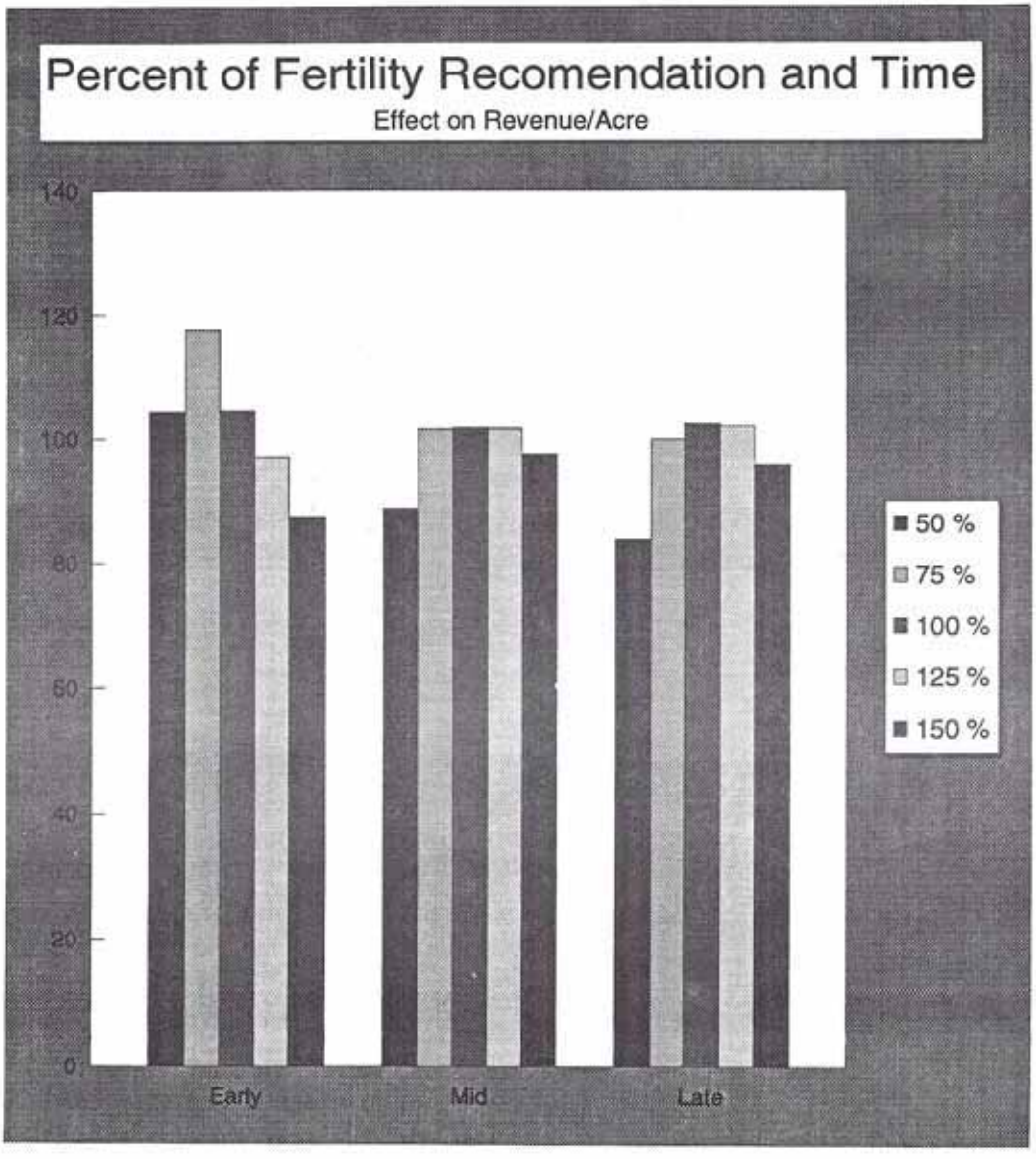


Table 8. Two year performance of percent of fertility recomendation and time effect on revenue per acre, 1992-1993

Fertilizer Rate %	Early	Mid	Late
50%	104.27	88.72	83.81
75%	117.63	101.58	100.04
100%	104.38	101.77	102.45
125%	97.15	101.69	102.04
150%	87.36	97.62	95.95

TWO YEAR PERFORMANCE



EVALUATION OF SIDE DRESS NITROGEN

OBJECTIVE

To evaluate additional nitrogen applied as a side dress application for effect on quality and quantity of sugarbeets

PROCEDURES

Nitrogen was side dressed at 40 pounds per acre in addition to that applied in the spring. Spring application was approximately 140 to 150 pounds nitrogen per acre. Nitrogen was applied at two locations on July 15 and 23, respectively. The location in which applications were made on July 15, Anhydrous (NH_3) was the form of nitrogen. The other location in which applications were made on July 23, 28% liquid nitrogen was the form of nitrogen.

Sugarbeet samples were collected on two dates, September 21 and October 12. These samples were analyzed for quantity and quality.

PRELIMINARY RESULTS AND DISCUSSION

The data from these two trials are being presented as preliminary data (Table 1). This is due to only one years data being collected, presently.

Based on the preliminary data, a general conclusion could be deducted that added nitrogen did not increase ton per acre but did reduce quality. Sugar percent was higher when no nitrogen was added regardless of the form of fertilizer. Loss to molasses was generally higher without nitrogen added than with nitrogen added. This resulted in recoverable sugar per ton and per acre to generally be higher without nitrogen applied than with nitrogen applied.

These data indicate that adding nitrogen as a side dress application was detrimental to the production of sugar. The late date (July 15 and 23) of application may have hindered the effectiveness of such application.

Return per ton and per acre are presented in Table 2, figure 1. These data show a large increase in return when no nitrogen was added as a side dress application. Tons per acre may or may not be increased by a side dress application or addition of nitrogen. However, the increase in nitrogen may not increase return per acre.

When considering the average payment (19 ton and 16.5 percent sugar) (Table 3) you can see that by reducing the tons per acre by 1 ton payment decreases 5.26 percent, but by decreasing sugar percent by .5 percent payment decreases 6.91 percent. This

difference shows that a loss in percent sugar has a much more drastic change in a payment than tons per acre.

These data show the importance of a strict fertility program and a significant emphasis on nitrogen management. Tons per acre can be increased, but what is much more important is to maintain or increase quality. Similar payments can be achieved by having a 16.0 percent sugar at 18.5 tons per acre verses a 15.5 percent sugar at 20 tons per acre. The net return in this scenario would benefit the high sugar percent because of lower hauling costs, less wear and tear on equipment, and lower production cost (fertilizer). Therefore, it is very important to consider these factors when conducting production practices that may have a negative affect on sugar percent.

Table 1. QUANTITY AND QUALITY FOR SIDE DRESSED NITROGEN

	Early Mean NO 28%	Early Mean WITH 28%	LSD(0.05)	Late Mean NO 28%	Late Mean WITH 28%	LSD(0.05)	Early Mean NO NH3	Early Mean WITH NH3	LSD(0.05)	Late Mean NO NH3	Late Mean WITH NH3	LSD(0.05)
SUCROSE	16.708	15.619	0.3326	16.4	0.3867		14.693	0.3472		15.772	0.3818	
LTM	1.03	1.17	0.0503	1.13	NS		1.26	0.0668		1.21	0.06	
TPA	13.24	13.187	NS	15.43	NS		10.94	NS		12.29	NS	
RST	310.79	291.71	7.1871	273.75	8.7054		270.25	NS		291.17	8.68	
RSA	4114.89	3846.75	NS	4223.96	699.18		2956.54	NS		3578.44	467.94	

TABLE 2. REVENUE PER ACRE MINUS COST OF TREATMENT
as a percent of mean

	RETURN/TON EARLY	RETURN/TON LATE	RETURN /ACRE MINUS TREATMENT COST EARLY	RETURN /ACRE MINUS TREATMENT COST LATE
NO 28%	120.10	109.97	111.2	123.69
WITH 28%	100.46	90.79	92.68	99.75
NO NH3	95.21	117.49	105.19	105.01
WITH NH3	84.23	81.75	90.90	71.55

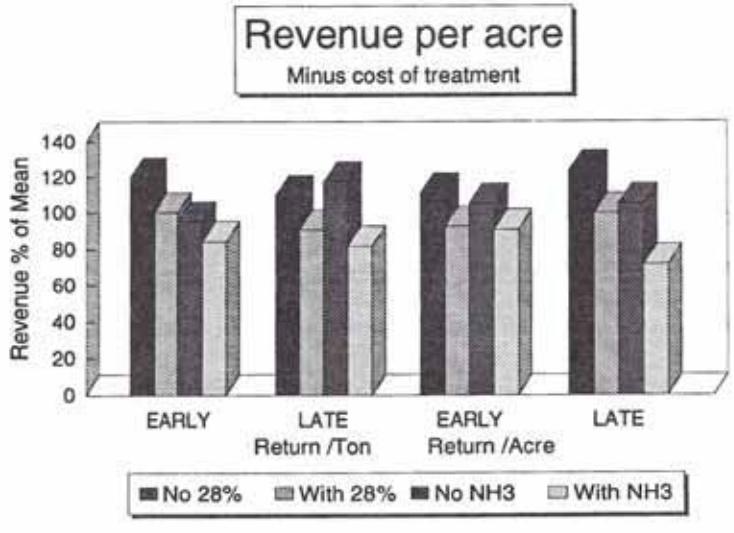


Table 3. Relative grower return with various tons/acre and sugar percent.

**** data in percent of SMSC average 19 tons/acre and 16.5 sugar percent**

Sugar Percent

Tons Per Acre	14	14.5	15	15.5	16	16.5	17	17.5	18
15	51.682	57.135	62.588	68.041	73.494	78.947	84.4	89.854	95.307
15.5	53.405	59.039	64.674	70.309	75.944	81.579	87.214	92.849	98.484
16	55.127	60.944	66.761	72.577	78.394	84.211	90.027	95.844	101.66
16.5	56.85	62.848	68.847	74.845	80.844	86.842	92.841	98.839	104.84
17	58.573	64.753	70.933	77.113	83.294	89.474	95.654	101.83	108.01
17.5	60.296	66.657	73.019	79.381	85.743	92.105	98.467	104.83	111.19
18	62.018	68.562	75.106	81.649	88.193	94.737	101.28	107.82	114.37
18.5	63.741	70.466	77.192	83.917	90.643	97.368	104.09	110.82	117.54
19	65.464	72.371	79.278	86.185	93.093	100	106.91	113.81	120.72
19.5	67.186	74.275	81.365	88.454	95.543	102.63	109.72	116.81	123.9
20	68.909	76.18	83.451	90.722	97.992	105.26	112.53	119.8	127.08

* Loss to Molasses constant at 1.10 percent

PREPLANT INCORPORATED HERBICIDES
RENVILLE, 1993

Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 1:00 pm, May 14 when the air temperature was 76F, soil temperature at six inches was 64F, relative humidity was 29%, wind velocity was 15 mph, and soil moisture was good. Incorporation was with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for SAN-582. 'ACH 198' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. Eastern black nightshade, redroot pigweed, velvetleaf, and green foxtail control and sugarbeet injury were evaluated.

Treatment	Rate LB/A	Sgbt inj%	Ebns cntl%	Rrpw cntl%	Vele cntl%	Grft cntl%
Eptam	2	5	60	60	63	92
RoNeet	4	3	50	60	60	89
Eptam+RoNeet	1+2.5	3	55	45	65	89
Eptam+RoNeet	1.5+2.5	6	55	75	87	96
Eptam+RoNeet	1.5+2	3	63	70	83	97
Eptam+RoNeet	2+2	5	60	61	83	97
Eptam+RoNeet	1+3	3	50	81	77	95
Eptam+RoNeet+Nortron SC	1+2+2	5	90	83	82	94
Eptam+RoNeet+Nortron SC	1+2+3	11	94	92	92	96
RoNeet+Nortron SC	2+2	0	40	8	17	8
SAN-582	1.5	20	99	96	80	96
EXP MEAN		6	65	66	72	86
C.V. %		83	30	15	18	6
LSD 5%		7	NS	14	22	8
# OF REPS		4	2	4	3	4

RESULT AND DISCUSSION

Control of eastern black nightshade was non-significant. When considering means, eastern black nightshade control was highest with SAN-582. Eptam + RoNeet + Nortron SC gave the next highest eastern black nightshade control. Eliminating Eptam from this mixture reduced eastern black nightshade control by 50 percent. Eptam and RoNeet alone or as a mixture at various rates gave eastern black nightshade control between 50 and 63 percent. Eastern black nightshade control tended to increase with the Eptam + RoNeet mixture when the Eptam rate was increased verses the RoNeet rate.

Redroot pigweed control with SAN-582 was better than all other treatments except the treatment with Eptam + RoNeet + Nortron SC. Eptam added to RoNeet at various rates either tended to or did increase redroot pigweed control.

When considering means, Velvetleaf control was highest with Eptam + RoNeet + Nortron SC at 1 + 2 + 3 pounds active ingredient, respectively. However, SAN-582 and Eptam + Roneet at rates as low as 1.5 + 2.5 of Eptam + RoNeet equally controlled velvetleaf when considering data statistically. There appears to have been a greater advantage to increase or maintain Eptam rate verses RoNeet rate. Velvetleaf control was increased from 65 to 87 percent by increasing Eptam rate from 1 to 1.5 pounds ai/acre. The velvetleaf control was maintained at 83 to 87 percent as long as Eptam rate was 1.5 to 2 lb ai/acre. But, when Eptam rate was lowered to 1 lb ai/acre and RoNeet was increased from 2 + 3 lb ai/acre, velvetleaf control decreased from 83 to 77 percent.

Green foxtail control was equally controlled by all treatments except RoNeet + Nortron SC. RoNeet + Nortron SC did not perform well regardless of the weed to be controlled.

When one considers a weed control program, one needs to consider the program that will give the best control of the broadest range of weeds. This seems to have been achieved by SAN-582 and Eptam + RoNeet + Nortron SC at 1 + 2 + 3 lb ai/acre, respectively. These treatments also gave the highest sugarbeet injury. The effect of the increase in sugarbeet injury was not quantified since yield data was not obtained. This type of injury early in the season usually doesn't cause yield reduction.

A producer may also consider the weed spectrum he needs to control. Eptam + RoNeet + Nortron SC at 1 + 2 + 2 lb ai/acre, respectively, gave good to excellent control of all weeds with 5 percent sugarbeet injury. Eptam + RoNeet at 1 + 3 lb ai/acre, respectively, gave good to excellent control of all weeds except eastern black nightshade with 3 percent injury. Thus, to reduce cost Nortron SC could be eliminated from preplant program if eastern black nightshade was not a problem.

MULTISPECIES EVALUATION OF POSTEMERGENCE SUGARBEET HERBICIDES, RENVILLE, 1993

'ACH 198' sugarbeet was seeded in 22 inch rows May 14. The first half of split treatments was applied 2:00 pm, May 20 when the air temperature was 67F, wind velocity was 0-5 mph, soil moisture was good, and sugarbeet was in the cotyledon stage. The second half of split treatments and single application treatments were applied 10:00 am, May 26 when the air temperature was 62F, wind velocity was 0-5 mph, soil moisture was good, and sugarbeet was in the cotyledon stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common lambsquarters, velvetleaf, redroot pigweed, eastern black nightshade, and green and yellow foxtail control were evaluated.

TREATMENT	RATE LB/A	Sgbt inj %	Colq cntl%	Vele cntl%	Rrpw cntl%	Ebns cntl%	G&Y Fxtl cntl%
Betanex/Betanex	0.16/0.25	0	73	5	58	33	38
Betanex/Betanex	0.25/0.33	0	78	8	65	18	58
NA-307/NA-307	0.16/0.25	0	76	18	69	30	59
NA-307/NA-307	0.25/0.33	0	84	18	70	53	70
Stinger/Stinger	0.09/0.09	0	10	0	0	81	0
Betanex+Stinger/Betanex+Stinger	0.25+0.09/0.33+0.09	3	86	20	71	78	56
Betanex+Stinger+Upbeet/same	0.16+0.09+0.0156/0.25+0.09+0.0156	13	93	55	86	96	58
Betanex+Upbeet/same	0.25+0.0156/0.33+0.0156	8	83	41	76	51	61
Betanex+H-273/Betanex+H-273	0.25+0.25/0.33+0.33	3	76	17	65	50	60
Betanex+H-273+AMS/same	0.25+0.25+2.5/0.33+0.33+2.5	5	80	30	61	38	66
--/H-273	--/0.75	0	0	5	0	0	8
--/H-273+AMS	--/0.75+2.5	3	0	13	3	0	5
Betanex+Upbeet+H-273/same	0.25+0.0156+0.25/0.33+0.0156+0.33	8	91	53	85	70	63
NA-307+Upbeet/same	0.16+0.0156/0.25+0.0156	5	79	35	65	60	55
Upbeet+X-77/same	0.0156+0.25%/0.0156+0.25%	0	8	33	15	15	10
EXP MEAN		3	61	23	53	45	45
C.V. %		143	19	66	25	42	30
LSD 5%		6	17	22	19	27	19
# OF REPS		4	4	4	4	4	4

* *X-77 = non-ionic surfactant from Valent; AMS = ammonium sulfate; NA-307 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio*

RESULT AND DISCUSSION

Sugarbeet injury was relatively low except when Betanex + Stinger + Upbeet were applied. However, the injury with the above mentioned treatment was only 13 percent and probably would not cause a yield reduction.

Common lambsquarter control was 85 percent or greater with only three treatments. These treatments were Betanex + Stinger, Betanex + Stinger + Upbeet and Betanex + Upbeet + H-273. Seven other treatments performed statistically similar to the treatment with the greatest common lambsquarter control. However, this author considers 85 percent weed control commercially acceptable for herbicide treatments.

Velvetleaf control was not adequate regardless of treatment. The highest velvetleaf control obtained was 55 percent with Betanex + Stinger +Upbeet. Velvetleaf control does appear to be good with Upbeet, but is inconsistent. There may be other factors such as environment, rate response, climatic conditions, etc. that may influence Upbeets effectiveness on velvetleaf control.

When considering means, redroot pigweed control was highest with Betanex + Stinger + Upbeet. Upbeet and Stinger mixed with Betanex tended to increase redroot pigweed control compared to Betanex alone.

Eastern black nightshade control was highest when Stinger was included in the spray mixture. Stinger alone or with Betamix and/or Upbeet gave 78 to 96 percent control of eastern black nightshade. The next best eastern black nightshade control was obtained when Upbeet was included in the spray mixture. The additive effect of Stinger and Upbeet on Betamix for control of eastern black nightshade is seen in the control achieved by this three way combination (96 percent).

Green and yellow foxtail control was best controlled by NA-307. NA-307 gave only 70 percent control of green and yellow foxtail. Some of the postemergence sugarbeet herbicides give some foxtail control, but should not be depended upon totally for foxtail control.

The best overall treatment for broad spectrum weed control was Betamix + Stinger + Upbeet. Presently there is one problem with using such a treatment, Upbeet is not labeled for use. The next best alternative is probably a Betamix + Stinger or Nortron SC mixture.

KOCHIA CONTROL WITH POSTEMERGENCE SUGARBEET HERBICIDES ORTONVILLE, 1993

'ACH 198' sugarbeet was seeded in 22 inch rows April 29. The first half of split treatments was applied 2:00 pm, May 11 when the air temperature was 75F, soil temperature at six inches was 67F, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the cotyledon stage, and kochia was in the cotyledon to small rosette stage. The second half of split treatments and single application treatments were applied 1:00 pm, May 18 when the air temperature was 60F, soil temperature at six inches was 67F, wind velocity was 0-10 mph, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, and kochia was in the cotyledon stage to 1 inch rosette diameter. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and kochia control were evaluated.

TREATMENT	RATE LB/A	Kochia Control%	Sgrbt Injury%
Betanex/Betanex	0.16/0.25	22	8
Betanex/Betanex	0.25/0.33	19	3
NA-307/NA-307	0.16/0.25	65	6
NA-307/NA-307	0.25/0.33	53	11
Stinger/Stinger	0.09/0.09	4	3
Betanex+Stinger/Betanex+Stinger	0.25+0.09/0.33+0.09	23	5
Betanex+Stinger+Upbeet/same	0..16+0.09+0.0156/0.25+0.09+0.0156	93	11
Betanex+Upbeet/same	0.25+0.0156/0.33+0.0156	98	13
Betanex+H-273/Betanex+H-273	0.25+0.25/0.33+0.33	55	9
Betanex+H-273+AMS/same	0.25+0.25+2.5/0.33+0.33+2.5	36	19
--/H-273	--/0.75	0	3
--/H-273+AMS	--/0.75+2.5	0	3
Betanex+Upbeet+H-273/same	0.25+0.0156+0.25/0.33+0.0156+0.33	89	9
NA-307+Upbeet/same	0.16+0.0156/0.25+0.0156	95	13
Upbeet+X-77/same	0.0156+0.25%/0.0156+0.25%	88	8
EXP MEAN		49	8
C.V. %		26	61
LSD 5%		18	7
# OR REPS		4	9

** X-77 = non-ionic surfactant from Valent; AMS = ammonium sulfate; NA-307 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio*

RESULT AND DISCUSSION

Sugarbeet injury was relatively low except when ammonium sulfate was added to the spray mixture. This trend was observed at all locations.

Kochia control was inadequate unless Upbeet was included in the spray mixture. The best kochia control achieved without Upbeet was 65 percent with NA-307. Kochia control did tend to increase with Upbeet when it was mixed with other herbicides.

This result and discussion has been short due to the fact that Upbeet was needed to obtain adequate control. Upbeet is not currently labeled, but is expected to be labeled by approximately 1996 or 1997.

Since Upbeet is not available at this time one could consider what is the next best product. NA-307 gave the next to best kochia control at 65 percent. NA-307 is not currently a labeled formulation. However, this mixture of herbicides can be achieved by adding Betamix and Nortron SC to achieve a 1:1:1 ratio in lbs. per acre of desmedipham:phenmedipham:ethofumesate. This mixture is not new and has proven to do very good on kochia in the past. A grower may also follow the guidelines adopted by Noram for mixing Betamix and Nortron SC and obtain good results on kochia control.

POSTEMERGENCE HERBICIDES ON SUGARBEETS
BENSON, 1993

Plots 40 feet long and six rows wide were established in a commercial sugarbeet field. The first half of split treatments was applied 1:00 pm, May 12 when the air temperature was 80 F, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the cotyledon stage, and common sunflower and velvetleaf were in the cotyledon to 1 leaf stage. The second half of split treatments and single application treatments were applied 12:00 pm, May 19 when the air temperature was 65 F, wind velocity was 0-5 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, and common sunflower and velvetleaf were in the cotyledon to 2 leaf stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common sunflower and velvetleaf control were evaluated.

TREATMENT	RATE LB/A	Cosf Cntl%	Velv Cntl%	Sgbt Inj%
Betanex/Betanex	0.16/0.25	0	0	0
Betanex/Betanex	0.25/0.33	8	6	13
NA-307/NA-307	0.16/0.25	10	19	9
NA-307/NA-307	0.25/0.33	20	3	14
Stinger/Stinger	0.09/0.09	100	36	0
Betanex+Stinger/Betanex+Stinger	0.25+0.09/0.33+0.09	98	74	5
Betanex+Stinger+Upbeet/same	0.16+0.09+0.0156/0.25+0.09+0.0156	100	87	20
Betanex+Upbeet/same	0.25+0.0156/0.33+0.0156	63	69	14
Betanex+H-273/Betanex+H-273	0.25+0.25/0.33+0.33	25	25	11
Betanex+H-273+AMS/same	0.25+0.25+2.5/0.33+0.33+2.5	33	62	23
--/H-273	--/0.75	18	14	8
--/H-273+AMS	--/0.75+2.5	31	35	4
Betanex+Upbeet+H-273/same	0.25+0.0156+0.25/0.33+0.0156+0.33	76	73	28
NA-307+Upbeet/same	0.16+0.0156/0.25+0.0156	77	70	11
Upbeet+X-77/same	0.0156+0.25%/0.0156+0.25%	70	77	6
EXP MEAN		48	43	11
C.V. %		28	34	104
LSD 5%		20	21	16
# OF REPS		4	4	4

* *X-77 = non-ionic surfactant from Valent; AMS = ammonium sulfate; NA-307 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio*