1998 Research Report

SMBSC

1/1/1998
Southern Minnesota Beet Sugar Company
SMBSC

TABLE OF CONTENTS

SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties since 1980

Seventeen varieties have full approval for planting in the 1999 growing season. The approved varieties for Southern MInnesota Beet Sugar Cooperative since 1980 are listed in Table 1.

A comparison of average performance for all approved varieties is listed in Table 2. Tables 3 and 4 list the usage since 1991. Three and two year performance of the 17 fully approved varieties are in Tables 5 - 7. Performance summaries of 1998 coded variety trials for SMSC are presented in Tables 8-15.

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
	Maribo 875		Maribo Ultramono	
	Maribo Ultramono		Mitsui Monohikari	
	Mitsui Monohikari			

1994	1994 (cont.)	1995	1995 (cont.)
ACH 194	KW 3580	ACH 194	HM 2401
ACH 196	KW 6770	ACH 196	HM 7036 (Special)
ACH 198	Maribo 875	ACH 198	KW 1119
ACH 205 (Special)	Mitsui Monohikari	ACH 205 (Special)	KW 1800
ACH 302	Seedex SX1004	ACH 302	KW 2249
ACH 309	VDH H16640	ACH 309	KW 2398
ACH 311		ACH 311	KW 3291
Beta 2010		Beta 2010	KW 6770
Hilleshog 5135		Beta 1492	Maribo 875
Hill. 7505 (Niagara)		Beta 3712	Maribo 923
HM 2401		Hilleshog 5135	Mitsui Monohikari
KW 1119		Hilleshog 7034	Seedex Laser
KW 1800		Hilleshog 7514	VDH H66140
KW 2249 (Blend)		Hilleshog 2418	
KW 2398		Hilleshog Niagra	
KW 3291		Hilleshog Shasta	

SOUTHERN MINNESOTA SUGAR COOPERATIVE

List of Approved Varieties since 1980

1996	1996 (cont.)	1997	1997 (cont.)	1998
ACH 194	KW 6770	ACH 196	KW 2398	ACH 302
ACH 196	Maribo 875	ACH 302	KW 6770	ACH 309
ACH 302	Maribo 923	ACH 309	Maribo 875	Beta 2074
ACH 309	Mitsui Monohikari	Beta 1492	Maribo 923	Beta 3945
Beta 1492	Seedex Laser (1004)	Beta 6963	Maribo 9363	Beta 5014
Beta 2010	VDH H66140	Beta 1994	SX Laser	Beta 5296
Beta 3712		Beta 2010	VDH 66140	Beta 6863
Beta 6863		Beta 2074		Beta 6904
HM 5135		Beta 5014		HM 7057
HM Niagara (7505)		Beta 6904		HM Hector
HM Shasta (2416)		HM 5135		HM Niagra
HM Hector (2418)		HM Hector		HM Resist
KW 1800		HM Niagara		HM Tahoe
KW 2398		HM Shasta		HM Viking
KW 2249 (Blend)		HM Viking		KW 6770
KW 3291		HM Resist		Maribo 9363
				Seedex SX Laser

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

Year	No. of Approved	Recoverable Sugar/Acre Mean of Approved	Recoverable Sugar/Ton Mean of Approved	Tons/Acre Mean of Approved	% Sugar Mean of Approved	Leaf Spot Rating Mean of Approved	LTM Mean of Approved
1981 (78-79-80)	15	6,724	264.5	25.7	15.40	4.43	2.18
1982 (79-80-81)	12	6,282	262.6	23.9	15.50	4.31	2.17
1983 (80-81-82)	9	7,053	261.9	26.9	15.60	4.84	2.37
1984 (81-82-83)	9	6,823	253.1	26.9	15.30	4.80	2.50
1985 (82-83-84)	11	7,682	269.7	28.6	15.90	4.87	2.64
1986 (83-84-85)	14	7,837	280.9	27.9	16.10	4.80	2.41
1987 (84-85-86)	18	7,764	300.4	25.9	16.70	4.68	1.68
1988 (85-86-87)	24	8,884	308.7	28.7	16.95	4.93	1.51
1989 (86-87-88)	19	8,689	318.6	27.2	17.40	4.70	1.47
1990 (87-88-89)	21	9,078	307.8	29.4	17.10	4.87	1.71
1991 (88-89-90)	19	7,554	294.1	25.7	16.39	4.56	1.59
1991 (89-90-91)	21	6,831	276.6	24.8	15.50	4.60	1.60
1991 (90-91-92)	19	6,943	296.2	23.5	16.30	4.83	1.49
1993 (91-92-93)	21	5,961	308.8	19.6	16.90	4.80	1.40
1994 (92-93-94)	29	6,783	323.0	20.9	17.48	5.02	1.32
1995 (93-94-95)	22	6,259	306.6	20.8	16.79	4.81	1.47
1996 (94-95-96)	24	7,234	304.6	23.5	16.65	4.52	1.42
1997 (95-96-97)	19	5,794	291.9	19.75	15.83	4.38	1.24
1998 (96-97-98)	17	5,606	287.2	19.41	15.44	4.37	1.08

Table 3.

SEED USAGE PERCENTAGE
SMSC, 1991 - 1998

YEAR	SMALL	MEDIUM	LARGE	X-LARGE	MINI	REGULAR	JUMBO	TOTAL
1991	12.37	47.22	19.92	16.27	3.04	1.19	---	100.00
1992	17.27	31.79	26.15	15.04	8.75	1.00	---	100.00
1993	17.49	26.02	18.53	22.05	13.31	2.60	---	100.00
1994	14.90	20.96	12.06	22.97	24.50	3.43	---	100.00
1995	13.55	13.53	15.67	12.68	37.11	7.45	---	100.00
1996	3.67	6.79	9.44	4.05	37.80	38.25	---	100.00
1997	1.20	3.00	2.00	1.30	23.20	45.30	24.00	100.00
1998	1.60	1.60	1.60	1.60	17.50	50.60	30.00	100.00
Average	**10.26**	**18.86**	**13.17**	**11.99**	**20.65**	**18.73**	**27.00**	**100.00**

* Mini and regular pellets were adjusted to bare seed equivalent basis.

Table 4.

SEED USAGE
POUNDS PLANTED PER ACRE
SMSC, 1991 - 1998

YEAR	ACRES PLANTED	ACRES REPLANTED	TOTAL ACRES
1991	82,284	7,600	89,884
1992	87,324	1,000	88,324
1993	101,781	8,814	110,595
1994	111,547	5,048	116,595
1995	109,738	425	110,163
1996	108,783	1,697	110,480
1997	107,715	1,143	108,858
1998	107,746	1,894	109,640
AVERAGE	102,115	3,453	105,567

Table 5. Mean of 3-Year Performance Summary of SMSC Approved Varieties, 1996-98 (Actual Data & Percent of Mean)

Variety	Rec. S./ Ton 3 Yr Mean	Rec. S./ Ton 3 Yr % of Mean	Rec. S./ Acre 3 Yr Mean	Rec. S./ Acre 3 Yr % of Mean	Percent LTM 3 Yr Mean	Percent LTM 3 Yr % of Mean	Leaf * Spot 3 Yr Mean	Leaf * Spot 3 Yr % of Mean	Percent Sugar 3 Yr Mean	Percent Sugar 3 Yr % of Mean	Tons/ Acre 3 Yr Mean	Tons/ Acre 3 Yr % of Mean	Seedling ** Vigor 3 Yr Mean	Seedling ** Vigor 3 Yr % of Mean	Field Emerge % 3 Yr Mean	Field Emerge % 3 Yr % of Mean
Approved Varieties																
Beta 2074	288.4	100.41	5652.5	100.82	1.07	99.05	4.74	108.44	15.49	100.32	19.49	100.41	2.05	89.27	64.2	102.48
Beta 5014	293.4	102.17	5441.6	97.06	1.07	98.74	4.32	98.79	15.74	101.92	18.44	95.03	1.93	83.90	67.0	107.05
Beta 6863	293.3	102.12	5762.1	102.78	1.03	95.05	4.53	103.49	15.70	101.64	19.54	100.68	2.15	93.48	63.0	100.65
Beta 6904	295.0	102.72	5594.9	99.79	1.10	101.20	4.51	103.13	15.85	102.61	18.82	96.99	2.19	95.37	63.9	102.13
Crystal 302	284.3	98.98	5511.4	98.30	1.11	102.43	4.08	93.24	15.32	99.22	19.30	99.44	1.98	86.22	64.4	102.87
Crystal 309	282.6	98.41	5659.4	100.94	1.14	104.89	4.01	91.75	15.27	98.85	19.90	102.53	2.02	87.96	62.5	99.82
HM 7057	287.5	100.11	5709.9	101.84	1.02	94.30	4.0	90.60	15.4	99.70	19.74	101.73	2.09	91.19		
HM Hector	283.9	98.86	5697.0	101.61	1.08	99.66	4.69	107.10	15.27	98.90	19.93	102.67	2.70	117.72	65.1	103.91
HM Niagara	284.7	99.14	5475.8	97.63	1.12	103.35	4.27	97.60	15.36	99.44	19.10	98.41	2.72	118.45	57.8	92.24
HM Resist	282.9	98.51	5568.2	99.32	1.06	97.51	4.09	93.47	15.20	98.44	19.49	100.42	2.66	115.98	63.0	100.70
HM Tahoe	284.6	99.10	5403.3	96.38	1.04	96.35	4.80	109.80	15.28	98.91	18.89	97.32	2.61	113.58		
HM Viking	285.8	99.52	5460.3	97.39	1.10	101.81	4.56	104.25	15.40	99.72	18.98	97.79	2.43	105.67	63.3	101.02
KW 6770	279.6	97.36	5583.3	99.59	1.12	103.66	4.81	109.88	15.11	97.82	19.77	101.87	2.55	111.04	59.4	94.91
Maribo 9363	282.0	98.18	5549.6	98.99	1.12	103.66	4.74	108.42	15.22	98.55	19.60	100.97	2.02	88.11	61.7	98.58
Seedex SX Laser(SX1004)	284.2	98.96	5562.5	99.21	1.09	100.28	3.89	88.88	15.30	99.05	19.46	100.28	2.32	100.88	58.7	93.73
Beta 3945	297.5	103.58	5776.1	103.03	1.05	97.06	4.45	101.70	15.92	103.08	19.38	99.88	2.30	100.16		
Beta 5296	292.6	101.88	5904.5	105.32	1.09	101.02	3.91	89.43	15.73	101.85	20.10	103.57	2.32	101.03		
MEAN	287.20	100.00	5606.49	100.00	1.08	100.00	4.27	100.00	15.44	100.00	19.41	100.00	2.30	100.00	62.61	100.00

* Lower numbers indicate better cercospora resistance (1=excellent, 9=poor) based on 5.5 equivalent. Varieties entered in 1995 or before are evaluated at 5.3 standard. Varieties entered in 1996 or later are evaluated at 5.0 standard.

** Lower numbers indicate better seed vigor (1=excellent, 9=poor)

Table 6. Mean of 2-Year Performance Summary of SMSC Approved Varieties, 1996-98 (Actual Data & Percent of Mean)

Variety	Rec. S./ Ton 2 Yr Mean	Rec. S./ Ton 2 Yr % of Mean	Rec. S./ Acre 2 Yr Mean	Rec. S./ Acre 2 Yr % of Mean	Percent LTM 2 Yr Mean	Percent LTM 2 Yr % of Mean	Leaf * Spot 2 Yr Mean	Leaf * Spot 2 Yr % of Mean	Percent Sugar 2 Yr Mean	Percent Sugar 2 Yr % of Mean	Tons/ Acre 2 Yr Mean	Tons/ Acre 2 Yr % of Mean	Seedling ** Vigor 2 Yr Mean	Seedling ** Vigor 2 Yr % of Mean	Field Emerge % 2 Yr Mean	Field Emerge % 2 Yr % of Mean
1999 Approved Varieties																
Beta 2074	277.98	101.11	5052.15	100.78	1.03	98.06	4.55	103.33	14.93	100.90	18.17	99.66	2.32	92.12	66.99	102.87
Beta 5014	279.72	101.74	4793.09	95.62	1.03	98.54	4.36	98.95	15.02	101.51	17.18	94.23	2.19	87.15	68.83	105.70
Beta 6863	283.76	103.21	5237.65	104.49	0.97	92.80	4.57	103.68	15.16	102.49	18.41	100.98	2.46	97.89	64.24	98.64
Beta 6904	281.48	102.38	5036.13	100.47	1.07	101.89	4.57	103.82	15.14	102.32	17.83	97.80	2.59	102.87	65.44	100.50
Crystal 302	269.23	97.93	4886.63	97.48	1.09	104.28	4.21	95.67	14.55	98.37	18.21	99.91	2.34	93.12	66.66	102.37
Crystal 309	270.12	98.25	5145.19	102.64	1.10	105.24	4.08	92.66	14.61	98.74	19.00	104.22	2.36	93.71	64.48	99.02
HM 7057	276.34	100.51	5132.35	102.38	0.97	92.97	4.05	92.08	14.79	99.97	18.55	101.78	2.05	81.41		
HM Hector	271.49	98.75	5097.56	101.69	1.05	100.45	4.76	108.15	14.62	98.84	18.75	102.85	2.83	112.42	66.31	101.83
HM Niagara	272.29	99.04	4859.12	96.93	1.08	102.85	4.28	97.18	14.69	99.31	17.84	97.85	2.94	116.99	60.23	92.49
HM Resin	268.77	97.76	4868.11	97.11	1.01	96.63	4.24	96.24	14.45	97.66	18.07	99.14	2.81	111.82	65.42	100.46
HM Tahoe	270.95	98.55	4743.56	94.63	1.01	96.15	4.78	108.65	14.56	98.40	17.56	96.34	2.74	108.83	67.65	103.89
HM Viking	272.16	98.99	4815.17	96.06	1.06	100.93	4.59	104.13	14.67	99.18	17.71	97.17	2.65	105.25	66.66	102.36
KW 6770	264.06	96.05	4890.70	97.56	1.10	105.24	4.81	109.12	14.31	96.71	18.46	101.28	2.93	116.40	62.23	95.57
Maribo 9363	270.67	98.45	4961.87	98.98	1.08	103.32	4.72	107.17	14.61	98.77	18.37	100.79	2.24	88.94	65.81	101.06
Seedex SX Laser(SX1004)	273.96	99.65	5096.20	101.66	1.05	99.98	4.07	92.36	14.74	99.65	18.55	101.75	2.58	102.47	60.72	93.24
Beta 3945	290.09	105.51	5200.43	103.74	1.02	97.73	4.42	100.34	15.53	104.96	18.00	98.74	2.46	97.88		
Beta 5296	280.75	102.12	5401.90	107.76	1.08	102.94	3.81	86.48	15.12	102.23	19.23	105.50	2.28	90.73		
MEAN	274.93	100.00	5012.81	100.00	1.05	100.00	4.40	100.00	14.79	100.00	18.23	100.00	2.51	100.00	65.12	100.00

* Lower numbers indicate better cercospora resistance (1=excellent, 9=poor) based on 5.5 equivalent. Varieties entered in 1995 or before are evaluated at 5.3 standard. Varieties entered in 1996 or later are evaluated at 5.0 standard.

** Lower numbers indicate better seed vigor (1=excellent, 9=poor)

Table 7. Average Performance of Speciality Varieties, 1996-98 (Actual Data)

Variety	Rec. S./ Ton 3 Yr Mean	Rec. S./ Ton 3 Yr % of Mean	Rec. S./ Acre 3 Yr Mean	Rec. S./ Acre 3 Yr % of Mean	Percent LTM 3 Yr Mean	Percent LTM 3 Yr % of Mean	Leaf * Spot 3 Yr Mean	Leaf * Spot 3 Yr % of Mean	Percent Sugar 3 Yr Mean	Percent Sugar 3 Yr % of Mean	Tons/ Acre 3 Yr Mean	Tons/ Acre 3 Yr % of Mean	Seedling ** Vigor 3 Yr Mean	Seedling ** Vigor 3 Yr % of Mean	Field Emerge % 3 Yr Mean	Field Emerge % 3 Yr % of Mean
Approved Varieties																
Beta 2074	288.4	100.41	5652.5	100.82	1.07	99.05	4.74	108.44	15.49	100.32	19.49	100.41	2.05	89.27	64.2	102.48
Beta 5014	293.4	102.17	5441.6	97.06	1.07	98.74	4.32	98.78	15.74	101.92	18.44	95.03	1.93	83.90	67.0	107.05
Beta 6863	293.3	102.12	5762.1	102.78	1.03	95.05	4.53	103.49	15.70	101.64	19.54	100.68	2.15	93.48	63.0	100.55
Beta 6904	295.0	102.72	5594.9	99.79	1.10	101.20	4.51	103.13	15.85	102.61	18.82	96.99	2.19	95.37	63.9	102.13
Crystal 302	284.3	98.98	5511.4	98.30	1.11	102.43	4.08	93.24	15.32	99.22	19.30	99.44	1.98	86.22	64.4	102.87
Crystal 309	282.6	98.41	5659.4	100.94	1.14	104.89	4.01	91.75	15.27	98.85	19.90	102.53	2.02	87.96	62.5	99.82
HM 7037	287.5	100.11	5709.9	101.84	1.02	94.30	3.96	90.60	15.40	99.70	19.74	101.73	2.09	91.19		
HM Hector	283.9	98.88	5697.0	101.61	1.08	99.66	4.69	107.10	15.27	98.90	19.93	102.67	2.70	117.72	65.1	103.91
HM Niagara	284.7	99.14	5473.8	97.63	1.12	103.35	4.27	97.60	15.36	99.44	19.10	98.41	2.72	118.44	57.8	92.24
HM Resist	282.9	98.51	5568.2	99.32	1.06	97.51	4.09	93.47	15.20	98.44	19.49	100.42	2.66	115.88	63.0	100.70
HM Tahoe	284.6	99.10	5403.3	96.38	1.04	96.35	4.80	109.80	15.28	98.91	18.89	97.32	2.61	113.59		
HM Viking	285.8	99.52	5460.3	97.39	1.10	101.81	4.56	104.25	15.40	99.72	18.98	97.79	2.43	105.67	63.3	101.02
KW 6770	279.6	97.36	5583.3	99.59	1.12	103.66	4.81	109.88	15.11	97.82	19.77	101.87	2.55	111.04	59.4	94.91
Maribo 9363	282.0	98.18	5549.6	98.99	1.12	103.66	4.74	108.42	15.22	98.55	19.60	100.97	2.02	88.11	61.7	98.58
Seedex SX Laser(SX1004)	284.2	98.95	5562.5	99.21	1.09	100.28	3.89	88.88	15.30	99.05	19.46	100.28	2.32	100.88	58.7	93.73
Beta 3945	297.5	103.57	5776.1	103.03	1.05	97.06	4.45	101.70	15.92	103.10	19.38	99.88	2.30	100.03		
Beta 5296	292.6	101.88	5904.5	105.31	1.09	101.02	3.91	89.43	15.73	101.84	20.10	103.57	2.32	101.17		
MEAN	287.20	100.00	5606.48	100.00	1.08	100.00	4.37	100.00	15.44	100.00	19.41	100.00	2.30	100.00	62.61	100.00
Aphanomyces Specialty Varieties Approved with Three Year Data																
Crystal 205	271.2	94.43	5569.8	99.35	1.12	103.04	3.90	89.23	14.68	95.03	20.41	105.18	2.15	93.48	66.2	105.74

* Lower numbers indicate better cercospora resistance (1=excellent, 9=poor) based on 5.5 equivalent. Varieties entered in 1995 or before are evaluated at 5.3 standard. Varieties entered in 1996 or later are evaluated at 5.0 standard.

** Lower numbers indicate better seed vigor (1=excellent, 9=poor)

Table 8. Combined Commercial

1998 SOUTHERN MINNESOTA COMBINED COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	%	P-Val	Rec/A (lbs) Mean	%	P-Val	Loss To Molasses Mean	%	P-Val	Sugar % Mean	%	P-Val	Yield (T/A) Mean	%	P-Val	NA (ppm) Mean	%	P-Val
Beta 2074 (Aph)	93	276.73	103	0.14	5498.3	102	0.65	1.16	98	0.57	15	103	0.15	19.88	99	0.75	548.68	95	0.64
Beta 3945 (Aph)	106	286.15	107	0	5648.4	104	0.21	1.14	96	0.37	15.45	106	0	19.76	98	0.62	517.92	89	0.35
Beta 5014 (Aph)	89	277.24	103	0.12	5302.6	99	0.79	1.16	98	0.6	15.02	103	0.13	19.37	96	0.28	583.3	101	0.94
Beta 5296 (Aph)	104	280.64	104	0.04	6164.1	114	0	1.19	101	0.89	15.23	104	0.03	21.94	109	0.01	628.56	109	0.45
Beta 8863 (Aph)	94	282.31	105	0.02	5771.1	107	0.06	1.07	91	0.03	15.19	104	0.04	20.35	101	0.68	455.02	79	0.07
Beta 6904 (Aph)	99	279.4	104	0.06	5488.9	101	0.67	1.21	102	0.6	15.18	104	0.04	19.54	97	0.4	564.6	98	0.83
Crystal 205 (Aph)	109	260.15	97	0.13	5571.7	103	0.39	1.2	101	0.82	14.21	97	0.12	21.3	106	0.07	512.91	89	0.31
Crystal 302 (Aph)	86	262.85	98	0.3	5341	99	0.71	1.24	104	0.3	14.36	98	0.37	20.29	101	0.75	692.09	120	0.09
Crystal 309 (Aph)	96	272.21	101	0.51	5948.2	110	0.01	1.22	103	0.54	14.83	101	0.42	21.77	108	0.01	503.11	87	0.25
Crystal 9601 (Aph)	103	262.68	98	0.28	5365.8	99	0.81	1.3	110	0.03	14.43	99	0.47	20.36	101	0.67	683.68	118	0.12
Crystal 9603 (Aph)	90	259.69	97	0.11	5631.1	104	0.24	1.39	117	0	14.38	98	0.37	21.72	108	0.02	603.85	104	0.7
Crystal 9720 (Aph)	97	266.78	99	0.74	5579.3	103	0.37	1.15	97	0.49	14.49	99	0.62	20.83	104	0.25	510.1	88	0.29
Crystal 9744 (Aph)	107	270.18	101	0.77	5343.9	99	0.72	1.12	94	0.17	14.63	100	0.87	19.69	98	0.54	476.69	82	0.12
Filler 8	85	265.06	99	0.52	5324.3	98	0.04	1.11	94	0.13	14.37	98	0.34	19.98	99	0.87	420.6	73	0.02
HM 7087 (Aph)	88	274.12	102	0.32	5507.4	102	0.6	1.06	89	0.02	14.77	101	0.58	20.03	100	0.93	490.41	85	0.18
HM Hector	102	267.04	99	0.77	5309.1	98	0.58	1.2	101	0.83	14.54	100	0.78	19.62	99	0.69	524.75	91	0.41
HM Niagara	56	266.88	99	0.75	5204.9	96	0.27	1.2	101	0.73	14.54	99	0.78	19.43	97	0.31	596.96	103	0.78
HM Resist (Aph)	108	263.49	98	0.35	5170.1	96	0.2	1.14	96	0.38	14.31	98	0.24	19.5	97	0.37	614.83	106	0.58
HM Tahoe	87	264.41	98	0.44	4899.7	91	0.01	1.11	94	0.13	14.34	98	0.29	18.6	93	0.03	614.35	106	0.58
HM Victory	101	255.63	95	0.02	4471.9	83	0	1.25	105	0.22	14.03	96	0.03	17.34	86	0	678.17	117	0.13
HM Viking	91	265.52	99	0.57	5091	94	0.09	1.18	100	0.95	14.48	99	0.55	19.17	95	0.17	620.55	107	0.52
KW 6770	98	259.29	97	0.1	5139.7	95	0.15	1.27	107	0.1	14.23	97	0.15	19.67	98	0.52	685.74	118	0.11
Maribo 9363	105	260.63	97	0.18	5115.1	95	0.12	1.22	103	0.51	14.25	98	0.17	19.57	97	0.43	705.80	122	0.06
Seedex SX Laser	92	274.49	102	0.29	5724.8	106	0.1	1.18	99	0.87	14.9	102	0.27	20.79	104	0.28	599.74	104	0.75
Van der Have H66287	100	261.45	97	0.2	5604	104	0.3	1.18	100	0.94	14.25	97	0.17	21.36	106	0.06	636.17	110	0.38

	Rec/T Mean	%	Rec/A Mean	%	Loss To Molasses Mean	%	Sugar % Mean	%	Yield Mean	%	NA Mean	%
Check Mean	268.6		5411		1.19		14.62		20.08		578.78	
Coeff. of Var. (%)	5.13		9.05		8.88		4.3		7.04		23.7	
F Value	2.28 *		3.39 **		2.05 *		2.16 *		2.58 *		1.5 ns	
Mean LSD (0.05)	16.05	6	546.04	10	0.15	12	0.76	5	1.9	9	191.07	33
Mean LSD (0.01)	21.75	8	740.42	14	0.2	17	1.03	7	2.58	13	258.95	45

* Significant at 5%. ** Significant at 1%. Ns Not signifc.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to ch chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

ENTRY	CODE	K (ppm) Mean	%	P-Val	Am. N. (ppm) Mean	%	P-Val	Tare (%) Mean	%	P-Val	Emergence (%) Mean	%	P-Val	Bolters % Mean	%	P-Val	Vigor Mean	%	P-Val
Beta 2074 (Aph)	93	1530.8	92	0.02	291.28	111	0.27	2.17	71	0.01	66.12	111	0	0			1.58	90	0.3
Beta 3945 (Aph)	106	1612.7	96	0.3	266.29	101	0.89	3.11	101	0.91	37	62	0	0			2.5	142	0
Beta 5014 (Aph)	89	1621.2	97	0.37	253.40	96	0.71	2.71	88	0.32	70.97	120	0	0			1.17	66	0
Beta 5296 (Aph)	104	1709.9	102	0.5	240.6	92	0.39	3.62	118	0.12	35.35	60	0	0			2.42	138	0
Beta 8863 (Aph)	94	1457	87	0	278.72	106	0.53	2.99	98	0.84	60.7	102	0.42	0			2.06	119	0.06
Beta 6904 (Aph)	99	1678	100	0.91	286.53	109	0.35	3.8	124	0.04	63.75	107	0.01	0			1.42	81	0.05
Crystal 205 (Aph)	109	1630.8	98	0.47	306.07	116	0.1	2.80	92	0.51	65.46	110	0	0			1.25	71	0
Crystal 302 (Aph)	86	1712.3	102	0.47	251.01	96	0.84	3.4	111	0.34	65.75	111	0	0			1	57	0
Crystal 309 (Aph)	96	1846.7	110	0	269.52	102	0.82	2.43	79	0.07	62.15	105	0.09	0			1	57	0
Crystal 9601 (Aph)	103	1757.6	105	0.13	288.31	110	0.32	2.84	93	0.52	47.22	80	0	0			2	114	0.15
Crystal 9603 (Aph)	90	1715.3	103	0.44	402.06	153	0	2.87	94	0.58	61.62	104	0.17	0			1.5	85	0.13
Crystal 9720 (Aph)	97	1669.4	100	0.97	261.25	99	0.95	2.98	97	0.8	56.48	95	0.08	0			1.83	104	0.64
Crystal 9744 (Aph)	107	1668	100	0.93	248.31	93	0.57	2.83	93	0.54	57.79	97	0.33	0			1.5	85	0.13
Filler 8	85	1713.2	102	0.48	252.73	96	0.69	3.65	119	0.1	70.41	119	0	0			1.5	85	0.13
HM 7057 (Aph)	88	1610.5	96	0.28	215.60	82	0.07	3.32	108	0.46	48.67	82	0	0			2	114	0.15
HM Hector	102	1592	95	0.18	310.72	118	0.07	3.06	100	0.99	67.43	114	0	0			2.08	119	0.08
HM Niagara	56	1844.7	110	0	222.29	85	0.12	2.75	90	0.37	58.96	99	0.79	0			2.5	142	0
HM Resist (Aph)	108	1590.9	95	0.16	234.64	89	0.27	3.23	105	0.63	64.81	109	0	0			2.25	128	0.01
HM Tahoe	87	1529.5	91	0.02	228.59	87	0.19	3.85	126	0.03	67.63	114	0	0			2	114	0.15
HM Victory	101	1855.8	111	0	224.7	86	0.14	3.05	99	0.96	63.69	107	0.01	0			1.42	81	0.05
HM Viking	91	1778.7	106	0.07	219.19	83	0.1	2.59	85	0.18	64.34	108	0	0			2	114	0.15
KW 6770	98	1802.9	108	0.03	251.34	96	0.60	2.98	98	0.78	58.16	98	0.45	0			2.75	157	0
Maribo 9363	105	1690.9	101	0.73	237.22	90	0.32	2.98	97	0.78	63.89	108	0.01	0			1.33	76	0.02
Seedex SX Laser	92	1656.1	99	0.78	251.81	96	0.67	3.24	106	0.62	57.13	96	0.17	0			1.33	76	0.02
Van der Have H66287	100	1520.3	91	0.01	277.54	106	0.56	3.35	109	0.42	49.02	83	0	0.14			1.5	85	0.13

	K Mean	%	Am. N. Mean	%	Tare Mean	%	Emergence Mean	%	Bolters Mean	%	Vigor Mean	%
Check Mean	1671.8		262.75		3.06		59.39				1.76	
Coeff. of Var. (%)	8.18		19.39		40.77		9.31				28.84	
F Value	3.54 **		2.36 *		1.29 ns		31.37 **				8.86 **	
Mean LSD (0.05)	165.08	10	74.83	28	1	33	4.65	8			0.46	28
Mean LSD (0.01)	223.75	13	101.44	39	1.32	43	6.13	10			0.66	37

Table 9. Degraff Commercial

1998 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs)			Rec/A (lbs)			Loss To Molasses			Sugar %			Yield (T/A)			NA (ppm)		
		Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val
Beta 2074 (Aph)	93	294.01	103	0.19	5801.6	96	0.33	1.2	99	0.78	15.89	102	0.15	19.71	94	0.04	610.03	94	0.49
Beta 3945 (Aph)	106	312.62	109	0	6321.9	105	0.16	1.15	95	0.17	16.78	108	0	20.22	96	0.21	481.47	74	0
Beta 5014 (Aph)	89	291.23	102	0.37	5731.7	95	0.19	1.17	97	0.37	15.74	101	0.41	19.76	94	0.06	704.13	109	0.28
Beta 5296 (Aph)	104	294.01	103	0.16	6497.4	108	0.03	1.2	99	0.78	15.91	102	0.14	21.99	105	0.11	747.91	116	0.06
Beta 6063 (Aph)	94	298.11	104	0.03	6514.3	108	0.02	1.15	95	0.13	16.07	104	0.04	21.97	105	0.11	531.78	82	0.03
Beta 6904 (Aph)	99	303.87	106	0	6318.3	105	0.17	1.2	100	0.89	16.39	106	0	20.71	99	0.65	523.46	81	0.02
Crystal 205 (Aph)	109	267.94	94	0	6381.6	106	0.1	1.24	103	0.42	14.62	94	0	23.71	113	0	663.86	103	0.75
Crystal 302 (Aph)	86	280.29	98	0.27	5872.4	98	0.51	1.18	97	0.44	15.21	98	0.22	20.91	100	0.9	756.09	117	0.04
Crystal 309 (Aph)	98	289.9	101	0.51	6413	107	0.07	1.22	101	0.88	15.7	101	0.5	21.98	105	0.11	574.57	89	0.18
Crystal 9601 (Aph)	103	272.68	95	0.01	5931	99	0.69	1.4	115	0	15.03	97	0.08	21.69	103	0.25	884.08	137	0
Crystal 9603 (Aph)	90	278.38	97	0.15	6139.6	102	0.58	1.52	126	0	15.43	99	0.71	21.98	105	0.1	638.61	99	0.88
Crystal 9720 (Aph)	97	282.65	99	0.53	6197.6	103	0.41	1.21	100	0.93	15.37	99	0.54	21.88	104	0.14	562.27	87	0.11
Crystal 9744 (Aph)	107	285.58	100	0.89	6063	101	0.83	1.11	92	0.02	15.41	99	0.64	21.14	101	0.8	549.41	85	0.07
Filler 8	85	281.49	98	0.38	6189.6	103	0.43	1.08	89	0	15.18	98	0.17	22.1	105	0.07	472.38	73	0
HM 7057 (Aph)	88	294.26	103	0.15	6209.4	103	0.36	1.01	83	0	15.74	101	0.41	21.06	100	0.9	458.36	71	0
HM Hector	102	284.66	99	0.76	5824.1	97	0.38	1.25	103	0.36	15.46	100	0.79	20.22	96	0.21	568.43	88	0.14
HM Niagara	95	284.34	99	0.72	5906.6	98	0.61	1.21	100	0.96	15.43	99	0.7	20.93	100	0.93	693.41	107	0.38
HM Resist (Aph)	108	281.35	98	0.36	5920.1	98	0.66	1.13	94	0.06	15.22	98	0.23	21.02	100	0.96	689.93	107	0.42
HM Tahoe	87	279.71	98	0.23	5365	89	0	1.1	91	0.01	15.1	97	0.1	19.34	92	0.01	650.77	101	0.94
HM Victory	101	278.43	97	0.16	4940.8	82	0	1.28	106	0.09	15.21	98	0.22	17.76	85	0	708.49	110	0.25
HM Viking	91	286.1	100	0.97	5631.2	94	0.06	1.19	99	0.71	15.51	100	0.95	19.71	94	0.04	708.67	110	0.24
KW 6770	98	295.01	103	0.11	6204.7	103	0.39	1.25	103	0.33	15.88	103	0.08	20.95	100	0.96	625.92	97	0.7
Maribo 9363	105	275	96	0.04	5590.7	93	0.05	1.22	101	0.72	14.96	96	0.03	20.28	97	0.24	855.43	132	0
Seedex SX Laser	92	290.85	102	0.41	6303.2	105	0.19	1.27	105	0.12	15.79	102	0.31	21.6	103	0.32	720.59	111	0.17
Van der Have H66287	100	275.3	96	0.05	6146.6	102	0.55	1.3	107	0.03	15.05	97	0.06	22.13	105	0.06	784.11	121	0.01

	Rec/T (lbs)		Rec/A (lbs)		Loss To Molasses		Sugar %		Yield (T/A)		NA (ppm)	
Check Mean	286.32		6017		1.21		15.53		20.99		646.65	
Coeff. of Var. (%)	4.50		9.06		8.38		3.94		7.1		19.83	
F Value	3.36 **		2.79 **		6.03 **		3.41 **		3.63 **		4.46 **	
Mean LSD (0.05)	15.6	5	622.22	10	0.12	10	0.73	5	1.73	8	151.64	23
Mean LSD (0.01)	20.62	7	823.89	14	0.15	13	0.97	6	2.29	11	200.5	31

* Significant at 5%. ** Significant at 1%. Ns Not s.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is di chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

ENTRY	CODE	K (ppm)			Am. N. (ppm)			Tare (%)			Emergence (%)			Bolters %			Vigor		
		Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val
Beta 2074 (Aph)	93	1311.3	88	0	350.83	115	0.06	1.92	80	0.41	65.52	111	0	0			1.67	90	0.36
Beta 3945 (Aph)	106	1476.4	99	0.87	326	107	0.42	2.71	114	0.57	33.31	56	0	0			2.5	135	0
Beta 5014 (Aph)	89	1373.9	93	0.04	281.48	92	0.34	2.16	91	0.69	68.53	116	0	0			1.17	63	0
Beta 5296 (Aph)	104	1493.6	101	0.87	265.79	87	0.11	3.28	138	0.11	34.8	59	0	0			2.67	144	0
Beta 6363 (Aph)	94	1340.7	90	0.01	338.47	111	0.18	2.77	116	0.5	61.76	105	0.2	0			2.5	135	0
Beta 6904 (Aph)	99	1489.4	100	0.94	337.8	111	0.18	3.3	139	0.1	62.98	107	0.06	0			1.67	90	0.36
Crystal 205 (Aph)	109	1441.3	97	0.42	332.86	109	0.26	2.13	89	0.05	68.14	115	0	0			1.17	63	0
Crystal 302 (Aph)	86	1471.2	99	0.8	253.12	83	0.04	2.88	121	0.38	64.34	109	0.01	0			1	54	0
Crystal 309 (Aph)	98	1655.9	112	0	284.5	93	0.41	1.47	62	0.11	58.99	100	0.96	0			1	54	0
Crystal 9601 (Aph)	103	1528.3	103	0.42	359.77	118	0.03	1.76	74	0.27	48.74	82	0	0			1.83	99	0.92
Crystal 9603 (Aph)	90	1598.6	108	0.04	515.6	169	0	2.28	96	0.86	60.13	102	0.62	0			1.5	81	0.09
Crystal 9720 (Aph)	97	1598	107	0.04	318.1	104	0.69	1.76	74	0.27	56.67	96	0.28	0			2	108	0.47
Crystal 9744 (Aph)	107	1486.3	100	0.98	271.09	89	0.17	1.61	68	0.17	58.52	99	0.78	0			1.83	99	0.92
Filler 8	85	1499.3	101	0.79	271.75	89	0.18	3.55	149	0.04	69.13	117	0	0			1.33	72	0.01
HM 7057 (Aph)	88	1445.4	97	0.46	233.59	77	0	3.16	133	0.17	48.74	82	0	0			2.17	117	0.13
HM Hector	102	1397.1	94	0.11	378.01	124	0	2.23	93	0.78	67.83	115	0	0			2.33	126	0.02
HM Niagara	95	1593.2	107	0.05	253.74	83	0.04	2.26	95	0.83	57.81	98	0.53	0			2.83	153	0
HM Resist (Aph)	108	1333.9	90	0.01	272	89	0.18	2.06	86	0.56	63.95	108	0.02	0			2.33	126	0.02
HM Tahoe	87	1343.1	90	0.01	248.49	81	0.02	2.85	120	0.41	66.23	112	0	0			2.33	126	0.02
HM Victory	101	1774.7	120	0	259.11	85	0.06	2.34	98	0.93	65.62	111	0	0			1.5	81	0.09
HM Viking	91	1512.4	102	0.61	271.98	89	0.18	1.89	80	0.39	61.25	104	0.3	0			2	108	0.47
KW 6770	98	1666.2	112	0	285.57	94	0.43	2.02	85	0.52	59	100	0.96	0			2.83	153	0
Maribo 9363	105	1443.4	97	0.44	246.38	81	0.02	1.89	79	0.38	66.28	112	0	0			1.33	72	0.01
Seedex SX Lasnr	92	1507.8	102	0.67	307.36	101	0.92	2.37	100	0.98	59.49	101	0.85	0			1.17	63	0
Van der Have H66287	100	1348.5	91	0.01	360.39	118	0.03	2.93	123	0.33	49.74	84	0	0			1.67	90	0.36

	K (ppm)		Am. N. (ppm)		Tare (%)		Emergence (%)		Bolters %		Vigor	
Check Mean	1485		304.99		2.38		59.1				1.85	
Coeff. of Var. (%)	9.01		19.18		59.04		8.67				27.58	
F Value	4.45 **		5.8 **		1 ns		20.4 **				7.67 **	
Mean LSD (0.05)	154.26	10	70.29	23	1.61	67	5.92	10			0.58	32
Mean LSD (0.01)	203.93	14	92.97	30	2.13	89	7.82	13			0.77	42

Table 10. Clara City Commercial

1998 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	Rec/T %	Rec/T P-Val	Rec/A (lbs) Mean	Rec/A %	Rec/A P-Val	Loss To Molasses Mean	Loss To Molasses %	Loss To Molasses P-Val	Sugar % Mean	Sugar % %	Sugar % P-Val	Yield (T/A) Mean	Yield (T/A) %	Yield (T/A) P-Val	NA (ppm) Mean	NA (ppm) %	NA (ppm) P-Val
Beta 2074 (Aph)	93	259.53	103	0.15	5201.8	108	0.03	1.13	97	0.42	14.1	103	0.14	20.05	105	0.12	489.16	96	0.72
Beta 3945 (Aph)	106	259.62	103	0.14	4937.6	103	0.45	1.13	97	0.49	14.11	103	0.13	19.2	100	0.96	552.36	108	0.5
Beta 5014 (Aph)	89	263.13	105	0.04	4959	103	0.38	1.17	100	0.96	14.31	104	0.02	18.96	99	0.69	468.83	92	0.49
Beta 5296 (Aph)	104	267.24	107	0.01	5849.7	122	0	1.17	100	0.93	14.55	106	0	21.94	114	0	509.66	100	0.98
Beta 6883 (Aph)	94	268.26	106	0.01	4929.5	103	0.48	1.01	87	0	14.33	105	0.02	18.64	97	0.34	387.75	76	0.05
Beta 6904 (Aph)	99	254.83	102	0.51	4621.7	96	0.3	1.23	106	0.14	13.98	102	0.3	18.31	95	0.12	605.48	119	0.12
Crystal 205 (Aph)	109	252.52	101	0.78	4785.4	100	0.91	1.15	99	0.81	13.77	100	0.8	18.87	98	0.58	346.26	68	0.01
Crystal 302 (Aph)	86	245.5	98	0.37	4821.9	100	0.92	1.29	111	0.01	13.55	99	0.56	19.66	103	0.39	628.43	123	0.06
Crystal 309 (Aph)	96	254.44	101	0.55	5536.1	115	0	1.23	106	0.13	13.96	102	0.35	21.71	113	0	437.69	86	0.23
Crystal 9601 (Aph)	103	252.72	101	0.76	4827.2	100	0.9	1.19	102	0.61	13.82	101	0.68	19.05	99	0.83	479.62	94	0.61
Crystal 9603 (Aph)	90	241.25	96	0.11	5199.8	108	0.03	1.26	108	0.04	13.31	97	0.14	21.52	112	0	559.89	110	0.42
Crystal 9720 (Aph)	97	250.7	100	0.98	4983.9	104	0.31	1.08	93	0.06	13.61	99	0.72	19.84	103	0.23	457.66	90	0.38
Crystal 9744 (Aph)	107	264.76	102	0.52	4658	97	0.41	1.11	96	0.27	13.86	101	0.57	18.3	95	0.11	403.33	79	0.08
Filler 8	85	248.79	99	0.73	4427.1	92	0.03	1.13	97	0.48	13.56	99	0.58	17.78	93	0.01	369.36	72	0.02
HM 7057 (Aph)	88	253.82	101	0.61	4804.6	100	1	1.1	95	0.21	13.81	101	0.7	19.01	99	0.76	526.38	103	0.8
HM Hector	102	249.29	99	0.79	4814	100	0.96	1.16	100	0.9	13.62	99	0.76	19.4	101	0.68	479.68	94	0.61
HM Niagara	95	249.18	99	0.78	4413	92	0.03	1.21	104	0.28	13.67	100	0.9	17.84	93	0.02	510.05	100	0.99
HM Resist (Aph)	108	245.26	98	0.35	4338.6	90	0.01	1.15	99	0.85	13.43	98	0.31	17.94	94	0.03	544.57	107	0.58
HM Tahoe	87	249.37	99	0.8	4477.9	93	0.07	1.12	97	0.4	13.58	99	0.63	17.95	94	0.03	581.19	114	0.25
HM Victory	101	232.95	93	0	3957.6	82	0	1.21	104	0.27	12.86	94	0	16.87	88	0	645.43	126	0.03
HM Viking	91	245.05	98	0.33	4530.3	94	0.12	1.16	100	0.98	13.42	98	0.28	18.57	97	0.27	534.67	105	0.7
KW 6770	98	223.58	89	0	4117.5	86	0	1.3	111	0	12.48	91	0	18.46	96	0.2	741.63	145	0
Maribo 9363	105	246.27	98	0.44	4653.4	97	0.39	1.22	105	0.21	13.54	99	0.52	18.87	98	0.58	554.9	109	0.47
Seedex SX Laser	92	258.2	103	0.22	5139.6	107	0.06	1.09	94	0.12	14	102	0.27	19.94	104	0.17	472.75	93	0.53
Van der Have H66	100	247.64	99	0.59	5139	107	0.06	1.07	92	0.04	13.44	98	0.31	20.67	108	0.01	495.76	95	0.68
Check Mean		250.88			4805			1.16			13.71			19.17			510.91		
Coeff. of Var. (%)		5.69			8.62			9.33			4.7			6.83			28.3		
F Value		2.5 **			5.45 **			2.19 **			2.7 **			5.15 **			2.1 **		
Mean LSD (0.05)		17.02	7		503.38	10		0.13	11		0.76	6		1.57	8		174.37	34	
Mean LSD (0.01)		22.51	9		665.92	14		0.17	15		1.01	7		2.08	11		230.63	45	

* Significant at 5%. ** Significant at 1%. Ns.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this siz/chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

ENTRY	CODE	K (ppm) Mean	K (ppm) %	K (ppm) P-Val	Am. N. (ppm) Mean	Am. N. (ppm) %	Am. N. (ppm) P-Val	Tare (%) Mean	Tare (%) %	Tare (%) P-Val	Emergence (%) Mean	Emergence (%) %	Emergence (%) P-Val	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Beta 2074 (Aph)	93	1748.8	94	0.06	232.08	105	0.52	2.42	64	0	66.38	111	0.01	0			1.51	91	0.44
Beta 3945 (Aph)	106	1749.7	94	0.06	207.41	94	0.47	3.51	94	0.59	40.66	68	0	0			2.51	151	0
Beta 5014 (Aph)	89	1882.3	101	0.68	224.89	102	0.81	3.25	87	0.25	73.39	123	0	0			1.17	70	0.02
Beta 5296 (Aph)	104	1910.2	103	0.38	215.16	98	0.77	4	107	0.56	35.76	60	0	0			2.18	131	0.01
Beta 6863 (Aph)	94	1579.5	85	0	218.24	99	0.9	3.19	85	0.2	60.26	101	0.82	0			1.66	100	1
Beta 6904 (Aph)	99	1868.9	101	0.86	235.5	107	0.41	4.3	115	0.2	64.62	108	0.05	0			1.17	70	0.02
Crystal 205 (Aph)	109	1839.5	99	0.74	279.93	127	0	3.52	94	0.61	62.9	105	0.2	0			1.33	80	0.1
Crystal 302 (Aph)	86	1951.7	105	0.11	248.17	113	0.13	3.87	103	0.77	66.79	112	0.01	0			1.02	61	0
Crystal 309 (Aph)	96	2036	110	0	252.74	115	0.08	3.37	90	0.38	65.21	109	0.03	0			0.98	59	0
Crystal 9601 (Aph)	103	1984	107	0.03	216.38	98	0.82	3.94	105	0.68	45.73	77	0	0			2.17	131	0.01
Crystal 9603 (Aph)	90	1834	99	0.67	288.98	131	0	3.42	91	0.45	62.73	105	0.23	0			1.49	90	0.41
Crystal 9720 (Aph)	97	1740.8	94	0.05	203.95	92	0.36	4.19	112	0.3	56.71	95	0.24	0			1.67	100	0.98
Crystal 9744 (Aph)	107	1847.6	99	0.85	225.55	102	0.79	4.09	109	0.43	57.1	96	0.31	0			1.18	71	0.02
Filler 8	85	1922.9	103	0.27	233.44	106	0.47	3.76	101	0.96	71.81	120	0	0			1.64	99	0.92
HM 7057 (Aph)	88	1759.4	95	0.09	197.28	89	0.2	3.54	94	0.63	48.73	82	0	0			1.83	110	0.41
HM Hector	102	1783.2	96	0.2	244.18	111	0.19	3.88	104	0.75	67.51	113	0	0			1.82	110	0.42
HM Niagara	95	2099.8	113	0	190.36	86	0.1	3.26	87	0.28	59.96	100	0.91	0			2.17	131	0.01
HM Resist (Aph)	108	1848.8	99	0.87	196.83	89	0.18	4.35	116	0.16	65.69	110	0.02	0			2.14	129	0.02
HM Tahoe	87	1706.1	92	0.01	209.13	95	0.53	4.79	128	0.02	68.61	115	0	0			1.68	101	0.91
HM Victory	101	1941.4	104	0.16	190.71	86	0.1	3.74	100	0.99	62.02	104	0.36	0			1.34	81	0.11
HM Viking	91	2055.5	111	0	165.9	75	0	3.37	90	0.39	66.78	112	0.01	0			2.03	122	0.07
KW 6770	98	1937	104	0.18	217.94	99	0.89	3.93	105	0.67	58.29	98	0.58	0			2.67	161	0
Maribo 9363	105	1949.6	105	0.12	226.08	103	0.76	4.01	107	0.54	60.98	102	0.61	0			1.32	80	0.1
Seedex SX Laser	92	1792.5	96	0.26	197.48	90	0.2	4.18	112	0.31	54.95	92	0.06	0			1.5	90	0.43
Van der Have H66	100	1695.4	91	0.01	194.44	88	0.15	3.74	100	1	48.43	81	0	0.28			1.34	81	0.11
Check Mean		1858.6			220.51			3.75			59.68						1.66		
Coeff. of Var. (%)		7.44			19.45			28.31			9.99						29.79		
F Value		4.37 **			2.33 **			1.21 ns			13.6 **						5.01 **		
Mean LSD (0.05)		166.13	9		51.58	23		1.23	33		7.2	12					0.57	35	
Mean LSD (0.01)		219.72	12		68.22	31		1.63	44		9.53	16					0.76	46	

Table 11. Hector Commercial

1998 SOUTHERN MINNESOTA COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	Rec/T %	Rec/T P-Val	Rec/A (lbs) Mean	Rec/A %	Rec/A P-Val	Loss To Molasses Mean	Loss To Molasses %	Loss To Molasses P-Val	Sugar % Mean	Sugar % %	Sugar % P-Val	Yield (T/A) Mean	Yield (T/A) %	Yield (T/A) P-Val	NA (ppm) Mean	NA (ppm) %	NA (ppm) P-Val
Beta 2074 (Aph)	93	304.96	106	0.01	4307.1	86	0.07	1.08	88	0	16.33	105	0.01	14.45	81	0.01	273.51	84	0.19
Beta 3945 (Aph)	106	297.73	104	0.09	5611.9	110	0.18	1.27	103	0.46	16.15	104	0.06	19.04	107	0.33	320.05	99	0.9
Beta 5014 (Aph)	89	298.32	104	0.07	5647.6	111	0.15	1.27	103	0.46	16.2	104	0.04	18.72	105	0.46	331.02	102	0.88
Beta 5296 (Aph)	104	294.81	103	0.22	5927.7	116	0.03	1.2	97	0.53	15.93	102	0.23	20.08	113	0.08	340.69	105	0.68
Beta 6663 (Aph)	94	298.94	104	0.06	4836.5	91	0.23	1.14	93	0.08	16.09	103	0.09	15.61	88	0.11	319.92	98	0.9
Beta 6904 (Aph)	99	304.16	106	0.01	5295.3	104	0.6	1.17	95	0.23	16.38	105	0.01	17.44	98	0.81	330.73	102	0.88
Crystal 205 (Aph)	109	279.24	97	0.25	6878.3	135	0	1.18	96	0.38	15.16	97	0.19	24.51	138	0	225.68	69	0.01
Crystal 302 (Aph)	86	279.24	97	0.25	5640.7	111	0.15	1.35	110	0.02	15.31	98	0.4	20.24	114	0.06	412.72	127	0.03
Crystal 309 (Aph)	96	289.39	101	0.67	5523.9	108	0.26	1.31	107	0.1	15.78	101	0.47	19.27	109	0.25	313.69	97	0.77
Crystal 9601 (Aph)	103	284.4	99	0.73	4878.6	96	0.58	1.38	112	0	15.6	100	0.91	17.25	97	0.7	393.99	121	0.08
Crystal 9603 (Aph)	90	264.43	92	0	4199.3	82	0.02	1.43	116	0	14.05	94	0	15.97	90	0.18	380.34	117	0.16
Crystal 9720 (Aph)	97	286.33	100	0.96	7714.2	151	0	1.16	94	0.16	15.48	99	0.79	26.84	151	0	235.35	72	0.02
Crystal 9744 (Aph)	107	284.82	99	0.75	7085	139	0	1.23	100	0.95	15.46	99	0.74	24.44	138	0	281.65	87	0.27
Filler 8	85	280.49	98	0.34	3984.7	78	0	1.19	97	0.42	15.21	98	0.25	14.29	80	0.01	260.4	80	0.1
HM 7057 (Aph)	88	292.53	102	0.36	4252.5	84	0.03	1.14	93	0.08	15.77	101	0.5	14.47	82	0.01	300.79	93	0.53
HM Hector	102	275.33	96	0.08	4727.9	93	0.34	1.24	100	0.91	15.01	96	0.07	16.83	95	0.48	330.62	102	0.88
HM Niagara	95	281.31	98	0.41	4301.8	84	0.04	1.32	107	0.08	15.38	99	0.55	15.34	86	0.07	313.43	96	0.77
HM Resist (Aph)	108	276.33	96	0.11	5410.4	106	0.39	1.27	104	0.38	15.1	97	0.13	19.72	111	0.14	392.95	121	0.08
HM Tahoe	87	281.4	98	0.42	4388.7	86	0.07	1.23	100	0.96	15.3	98	0.4	15.43	87	0.08	315.72	97	0.81
HM Victory	101	282.6	99	0.53	2942	58	0	1.24	101	0.79	15.36	99	0.5	10.22	58	0	271.04	84	0.17
HM Viking	91	286.73	100	0.99	5128.4	101	0.92	1.29	105	0.27	15.61	100	0.87	18.04	102	0.83	383.33	118	0.14
KW 6770	98	284.2	99	0.7	3816.9	75	0	1.12	91	0.04	15.33	99	0.45	13.44	76	0	328.5	101	0.93
Maribo 9363	105	285.57	100	0.87	4034.2	79	0.01	1.26	102	0.56	15.53	100	0.93	14.4	81	0.01	433.06	133	0.01
Seedex SX Laser	92	290.59	101	0.54	6722	132	0	1.17	95	0.24	15.7	101	0.65	22.94	129	0	298.76	92	0.5
Van der Have H66287	100	282.77	99	0.55	4157.1	82	0.02	1.11	90	0.02	15.23	98	0.28	14.6	83	0.03	334.43	103	0.81
Check Mean		286.66			5092.5			1.23			15.50			17.75			324.92		
Coeff. Of Var (%)		4.24			14.43			7.69			3.68			14.42			22.58		
F Value		2.11 **			8.66**			2.06 **			2.03*			8.57 **			1.84 *		
Mean LSD (0.05)		18.57	6		1095.3	22		0.15	12		0.87	6		3.77	21		111.55	34	
Mean LSD (0.01)		24.69	9		1455.1	29		0.19	16		1.16	7		5	28		148.3	46	

* Significant at 5%. ** Significant at 1%. Ns Not signifi.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

ENTRY	CODE	K (ppm) Mean	K (ppm) %	K (ppm) P-Val	Am. N. (ppm) Mean	Am. N. (ppm) %	Am. N. (ppm) P-Val	Tare (%) Mean	Tare (%) %	Tare (%) P-Val	Emergence (%) Mean	Emergence (%) %	Emergence (%) P-Val	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Beta 2074 (Aph)	93	1696	89	0	281.12	85	0.05	2.13	97	0.89	61.37	108	0.04	0			1.26	74	0.07
Beta 3945 (Aph)	106	1910.3	101	0.84	350.41	106	0.42	2.64	120	0.29	35.17	62	0	0			2.27	133	0.03
Beta 5014 (Aph)	89	1814.4	96	0.23	393.91	119	0.01	1.91	87	0.5	63.64	112	0	0			1.21	71	0.04
Beta 5296 (Aph)	104	1986.5	105	0.19	279.93	85	0.05	2.5	114	0.46	37.26	66	0	0			2.52	147	0
Beta 6663 (Aph)	94	1567.8	83	0	330.24	103	0.72	3.23	148	0.01	62.66	111	0.01	0			1.76	103	0.83
Beta 6904 (Aph)	99	1730.1	91	0.02	327.71	99	0.91	2.18	99	0.95	63.39	112	0	0			1.22	72	0.05
Crystal 205 (Aph)	109	1930.3	102	0.62	324.68	98	0.82	2.24	102	0.91	67.36	119	0	0			1.26	74	0.07
Crystal 302 (Aph)	86	1856.4	98	0.56	399.63	121	0.01	2.14	98	0.91	63.73	112	0	0			1.02	60	0.01
Crystal 309 (Aph)	96	2094	110	0	339.97	103	0.7	1.56	71	0.13	57.44	101	0.75	0			0.98	57	0
Crystal 9601 (Aph)	103	2045.5	108	0.03	375.29	114	0.08	2.59	118	0.34	49.11	87	0	0			2	117	0.23
Crystal 9603 (Aph)	90	2063.5	109	0.02	420.11	127	0	1.61	73	0.17	60.48	105	0.21	0			1.48	86	0.34
Crystal 9720 (Aph)	97	1832.8	97	0.35	325.42	98	0.84	1.96	89	0.58	47.72	84	0	0			2.25	131	0.03
Crystal 9744 (Aph)	107	1924.3	101	0.66	344	104	0.59	2.32	106	0.75	50.9	90	0.01	0			1.53	90	0.47
Filler 8	85	1934.3	102	0.58	313.17	95	0.48	1.37	63	0.05	67.28	119	0	0			1.71	100	1
HM 7057 (Aph)	88	1748.4	92	0.03	306.84	93	0.39	1.76	80	0.3	45.45	80	0	0			2.27	133	0.02
HM Hector	102	1984	105	0.2	323.28	98	0.78	2.08	95	0.79	61.08	108	0.05	0			1.75	102	0.87
HM Niagara	95	2021.3	107	0.07	366.44	111	0.15	2.19	100	0.99	59.7	105	0.18	0			2.5	146	0
HM Resist (Aph)	108	1915.3	101	0.78	344.34	104	0.58	2.41	110	0.59	63.27	111	0	0			2.01	117	0.23
HM Tahoe	87	1923.5	101	0.69	333.48	101	0.9	2.16	99	0.98	65.21	115	0	0			2.23	131	0.03
HM Victory	101	2013.2	106	0.09	320.97	97	0.71	2.37	108	0.66	59.77	105	0.17	0			1.52	89	0.43
HM Viking	91	1886	99	0.88	340.36	103	0.69	2.7	123	0.22	59.18	104	0.27	0			1.99	116	0.25
KW 6770	98	1981.8	104	0.21	227.15	69	0	2.82	129	0.14	48.12	85	0	0			2.76	161	0
Maribo 9363	105	1845	97	0.45	324.57	98	0.82	1.82	88	0.52	62.29	110	0.01	0			1.01	59	0.01
Seedex SX Laser	92	1922.5	101	0.7	291.44	88	0.12	2.11	96	0.85	58.16	102	0.52	0			1.27	74	0.06
Van der Have H66287	100	1784.3	94	0.1	264.24	80	0.01	1.87	85	0.44	49.91	88	0	0			0.97	57	0
Check Mean		1896.4			330.39			2.19			56.76						1.71		
Coeff. Of Var (%)		7.33			14.3			38.91			7.37						28.53		
F Value		3.21 **			2.92* *			0.97 ns			15.50* *						4.84 **		
Mean LSD (0.05)		195.84	10		71.82	22		1.2	55		6.26	11					0.7	41	
Mean LSD (0.01)		259.82	14		95.47	29		1.59	73		8.32	15					0.93	54	

Table 12. Hector Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	%	P-Val	Rec/A (lbs) Mean	%	P-Val	Loss To Molasses Mean	%	P-Val	Sugar % Mean	%	P-Val	Yield (T/A) Mean	%	P-Val
Beta 5216 (Aph)	222	290.98	103	0.22	6005.6	90	0.13	1.14	94	0.3	15.69	102	0.28	20.53	87	0.03
Beta 6904 (check #1)	254	298.16	105	0.02	6434.5	96	0.56	1.24	101	0.82	16.16	105	0.01	21.57	91	0.15
Beta M701 (Aph)	221	315.02	111	0	7601.6	114	0.05	0.99	81	0	16.75	109	0	24.13	102	0.72
Beta M703 (Blend)(Aph)	236	282.38	100	0.88	7156.2	107	0.31	1.23	101	0.93	15.33	100	0.84	25.42	108	0.21
Beta M704 (Aph)	255	283.89	100	0.92	6844.4	102	0.74	1.07	87	0.04	15.28	99	0.65	24.08	102	0.74
Beta M705 (Rzm-Aph)	242	282.51	100	0.9	6170	92	0.24	1.17	96	0.51	15.3	99	0.75	21.87	93	0.22
Beta M706 (Rzm-Aph)	232	295.6	104	0.05	6844.3	102	0.74	1.16	95	0.39	15.93	104	0.06	23.14	98	0.74
Beta M724 (Rzm)	279	269.77	95	0.03	6618.8	99	0.86	1.22	100	0.95	14.71	96	0.02	24.58	104	0.5
Beta M725 (Rzm)	256	244.63	86	0	6832.4	102	0.76	1.35	110	0.09	13.58	88	0	27.83	118	0
Beta M811 (Rzm-Aph)	274	289.28	102	0.34	7661	114	0.03	1.04	85	0.01	15.49	101	0.72	26.44	112	0.05
Beta M812 (Rzm-Aph)	247	280.45	99	0.65	7262.7	108	0.21	1.32	108	0.21	15.34	100	0.87	25.9	110	0.11
Beta M813 (Rzm-Aph)	264	286.81	101	0.57	6735.9	101	0.93	1.26	103	0.59	15.6	101	0.45	23.54	100	0.96
Beta M814 (Aph)	234	298.17	105	0.02	6694.1	100	1	1.21	99	0.89	16.11	105	0.01	22.38	95	0.39
Beta M815 (Aph)	219	305.37	108	0	7464.8	111	0.09	1.16	95	0.43	16.44	107	0	24.45	104	0.56
Beta M816 (Aph)	268	292.05	103	0.16	6455.3	96	0.59	1.15	94	0.34	15.75	102	0.2	22.12	94	0.3
Croplan CL 103	251	274.29	97	0.15	6193.9	93	0.27	1.22	100	0.95	14.92	97	0.1	22.59	96	0.47
Croplan CL 104	231	274.47	97	0.16	6117.1	91	0.2	1.21	99	0.84	14.93	97	0.1	22.26	94	0.34
Crystal 222 (Aph)	220	273.07	96	0.1	6980.7	104	0.52	1.31	107	0.25	14.98	97	0.15	25.45	108	0.2
Crystal 309 (check #2)	244	280.38	99	0.64	7370.9	110	0.14	1.22	100	0.85	15.25	99	0.62	26.24	111	0.07
Crystal 555 (Aph)	267	292.17	103	0.16	6981	104	0.52	1.31	107	0.23	15.91	103	0.06	23.81	101	0.89
Crystal 9708	258	280.16	99	0.61	6762	101	0.88	1.25	102	0.7	15.28	99	0.69	24.04	102	0.76
Crystal 9711	277	286.93	101	0.56	5755.3	86	0.04	1.08	89	0.07	15.43	100	0.87	20.07	85	0.02
Crystal 9817	229	268.02	95	0.02	6148.1	92	0.22	1.18	96	0.56	14.59	95	0.01	22.86	97	0.6
Crystal 9832	239	269.17	95	0.03	5215.4	78	0	1.31	107	0.25	14.77	96	0.03	18.88	80	0
Crystal 9835 (Aph)	252	299.68	106	0.01	6617.3	99	0.86	1.23	100	0.96	16.22	105	0	22.11	94	0.29
Crystal 9837	217	272.08	96	0.08	5179	77	0	1.22	100	0.98	14.84	96	0.05	19.04	81	0
Crystal 9845 (Aph)	276	289.77	102	0.3	6473.1	97	0.62	1.37	112	0.05	15.85	103	0.1	22.3	94	0.36
Crystal 9849	253	258.62	91	0	6307.9	94	0.39	1.3	106	0.3	14.23	92	0	24.18	102	0.69
Crystal 9855 (Aph)	227	294.91	104	0.07	6706.4	100	0.98	1.21	99	0.91	15.94	104	0.05	22.71	96	0.53
Crystal 9877	248	268.32	95	0.02	4963.1	74	0	1.18	97	0.58	14.59	95	0.01	18.08	77	0
Filler-3	269	300.72	106	0.01	6650.9	99	0.92	1.07	88	0.05	16.1	105	0.01	22.09	94	0.29
HM 1643	237	290.13	102	0.27	7022.2	105	0.47	1.02	83	0.01	15.51	101	0.65	24.19	102	0.68
HM 7066	223	284.56	100	0.84	7038.3	105	0.44	1.23	100	0.95	15.44	100	0.86	24.77	105	0.42
HM 7073 (Rzm)	270	280.48	99	0.65	7034.4	105	0.45	1.27	104	0.53	15.29	99	0.74	25.13	106	0.29
HM 7076 (Rzm)	263	268.95	94	0.01	6967.2	104	0.52	1.4	115	0.02	14.75	96	0.03	26.07	110	0.09
HM 7080	238	290.96	103	0.22	6804.6	102	0.81	1.13	92	0.2	15.68	102	0.3	23.43	99	0.9
HM 7082	230	282.58	100	0.91	6342.5	95	0.43	1.16	95	0.44	15.3	99	0.76	22.45	95	0.41
HM 7083 (Rzm)	259	278.17	98	0.41	6515.3	97	0.69	1.22	100	0.98	15.13	98	0.35	23.41	99	0.88
HM Hector (check #3)	218	293.38	104	0.11	5881.5	88	0.07	1.28	104	0.47	15.94	104	0.05	20.16	85	0.02
HM RH5	262	285.02	101	0.78	7057	105	0.42	1.15	94	0.36	15.38	100	0.98	24.7	105	0.45
Holly 97HX708	216	281.65	99	0.79	6255.4	93	0.33	1.28	104	0.46	15.35	100	0.9	22.13	94	0.3
Holly 97HX712	265	296.8	105	0.03	7179.1	107	0.28	1.32	108	0.17	16.16	105	0.01	24.1	102	0.73
Holly 97HX713	272	300.09	106	0.01	6769.4	101	0.87	1	82	0	16.03	104	0.03	22.58	96	0.47
Holly 98APH03 (Aph)	245	268.72	95	0.02	7311.7	109	0.17	1.38	113	0.03	14.8	96	0.04	27.28	116	0.01
Holly 98HX806	228	274.27	97	0.15	6243	93	0.31	1.25	102	0.74	14.96	97	0.13	22.77	96	0.55
Holly 98HX825	250	279.19	99	0.51	5911.5	88	0.08	1.3	106	0.3	15.25	99	0.62	21.1	89	0.08
Holly 98HX826	225	273.06	96	0.1	6002.6	90	0.13	1.26	103	0.6	14.9	97	0.08	22.04	93	0.27
Holly 98HX828	260	274.11	97	0.14	6168.3	92	0.24	1.22	100	0.95	14.91	97	0.09	22.59	96	0.47
Holly 98HX829	243	300.44	106	0.01	8013.9	120	0	1.21	99	0.87	16.24	106	0	26.61	113	0.04
Holly Rival (Rzm)	226	263.28	93	0	6592.9	98	0.82	1.38	113	0.04	14.55	95	0	25.03	106	0.32
Maribo 9363 (check #4)	275	277.71	98	0.37	5899.4	88	0.08	1.27	104	0.49	15.15	98	0.41	21.26	90	0.1
Maribo 9757	278	281.85	99	0.82	6789.2	101	0.83	1.17	96	0.46	15.26	99	0.65	24	102	0.78
Maribo 9767	261	278.66	98	0.48	6166.6	92	0.24	1.41	116	0.01	15.36	100	0.93	22.23	94	0.33
Seedex SX1012	224	287.06	101	0.55	7202.1	108	0.26	1.19	97	0.64	15.55	101	0.56	24.97	106	0.34
Seedex SX1015	266	288.63	102	0.39	6630.6	99	0.89	1.27	104	0.52	15.71	102	0.25	23.02	98	0.68
Seedex SX1016	249	283.9	100	0.92	6729.2	101	0.94	1.2	98	0.82	15.39	100	0.98	23.74	101	0.83
Van der Have H46109	257	302.48	107	0	8535.1	127	0	1.1	90	0.1	16.23	105	0	28.54	121	0
Van der Have H46109rr (Aph-Rzm)	273	281.2	99	0.74	7563.8	113	0.06	1.22	100	0.99	15.28	99	0.7	26.89	114	0.02
Van der Have H46140	233	286.08	101	0.66	7285.5	109	0.19	1.15	94	0.37	15.46	101	0.78	25.4	108	0.21
Van der Have H66339	246	262.99	93	0	5574.5	83	0.01	1.24	102	0.77	14.39	94	0	21.28	90	0.1
Van der Have H68108 (Aph)	271	285.57	101	0.71	7688.9	115	0.03	1.3	106	0.32	15.59	101	0.48	26.84	114	0.03
Van der Have H68151 (Aph)	235	300.43	106	0.01	7258.4	108	0.21	1.21	99	0.83	16.25	106	0	24.13	102	0.72
Van der Have H68152rr (Aph-Rzm)	240	283.84	100	0.93	7682.1	115	0.03	1.34	110	0.11	15.52	101	0.63	27.29	116	0.01
Van der Have H68153 (Aph)	241	268.08	95	0.03	7147.4	107	0.32	1.29	106	0.33	14.75	96	0.03	26.51	112	0.05

	Rec/T Mean	%	Rec/A Mean	%	Loss Mean	%	Sugar Mean	%	Yield Mean	%
Check Mean	283.3		6695.3		1.22		15.39		23.61	
Coeff. of Var. (%)	2.88		8.77		8.18		2.38		7.91	
F Value	4.26 **		2.29 **		1.68 *		4.61 **		2.47 **	
Mean LSD (0.05)	17.68	6	1274	19	0.21	17	0.79	5	4.05	17
Mean LSD (0.01)	23.55	8	1697	25	0.28	23	1.06	7	5.39	23

* Significant at 5%. ** Significant at 1%. Ns Not significant.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

Table 12. Hector Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	NA (ppm) Mean	NA (ppm) %	NA (ppm) P-Val	K (ppm) Mean	K (ppm) %	K (ppm) P-Val	Am. N. (ppm) Mean	Am. N. (ppm) %	Am. N. (ppm) P-Val	Tare (%) Mean	Tare (%) %	Tare (%) P-Val
Beta 5216 (Aph)	222	267.75	79	0.16	1658.7	93	0.2	345.63	100	0.97	2.79	122	0.45
Beta 6904 (check #1)	254	426.39	126	0.08	1724.1	96	0.52	349.11	101	0.96	1.89	83	0.55
Beta M701 (Aph)	221	279.99	83	0.24	1636.8	91	0.14	236.32	68	0.01	2.38	104	0.88
Beta M703 (Blend)(Aph)	236	258.98	78	0.11	1768.6	99	0.82	390.75	113	0.27	2.28	100	1
Beta M704 (Aph)	255	250.47	74	0.08	1903.4	106	0.27	235.05	68	0.01	2.21	97	0.92
Beta M705 (Rzm-Aph)	242	308.73	91	0.55	1811.3	101	0.84	323.48	93	0.55	4.46	195	0
Beta M706 (Rzm-Aph)	232	258.38	76	0.11	1776.9	99	0.89	334.39	96	0.75	2.56	112	0.67
Beta M724 (Rzm)	279	407.78	121	0.17	1619.5	90	0.1	361.06	104	0.7	1.82	80	0.49
Beta M725 (Rzm)	256	398.04	118	0.23	1812	101	0.83	415.76	120	0.06	1.17	51	0.1
Beta M811 (Rzm-Aph)	274	276.78	82	0.22	1731.3	97	0.56	248.23	72	0.01	2.45	107	0.8
Beta M812 (Rzm-Aph)	247	250.63	74	0.08	2105.7	118	0	368.66	106	0.58	1.75	77	0.43
Beta M813 (Rzm-Aph)	264	267.07	79	0.15	1843.8	103	0.6	393.66	113	0.24	2.03	89	0.71
Beta M814 (Aph)	234	289.78	86	0.33	1630.6	91	0.12	397.12	114	0.21	3.02	132	0.27
Beta M815 (Aph)	219	260.34	77	0.12	1742.7	97	0.64	346.24	100	0.99	2.55	112	0.69
Beta M816 (Aph)	268	278.49	82	0.23	1527.9	85	0.01	381.08	110	0.39	2.29	100	0.98
Croplan CL 103	251	454.74	134	0.02	1655.7	92	0.19	340.75	98	0.87	1.22	54	0.12
Croplan CL 104	231	339.48	100	0.98	1813.5	101	0.82	327.1	94	0.61	1.69	74	0.37
Crystal 222 (Aph)	220	416.79	123	0.12	1852.3	103	0.55	371.03	107	0.54	2.8	123	0.44
Crystal 309 (check #2)	244	305.13	90	0.5	1826.8	102	0.72	345.68	100	0.97	1.35	59	0.16
Crystal 555 (Aph)	267	289.68	86	0.33	1825.1	102	0.74	428.93	124	0.04	3.62	159	0.05
Crystal 9708	258	358.96	106	0.68	1711	96	0.44	383.59	111	0.35	2.22	97	0.93
Crystal 9711	277	391.3	116	0.29	1619.9	90	0.1	269.69	78	0.05	1.79	78	0.46
Crystal 9817	229	510.34	151	0	1751.4	98	0.7	258.55	75	0.03	2.12	93	0.8
Crystal 9832	239	403.04	119	0.2	1878.4	105	0.39	355.19	102	0.83	1.26	55	0.13
Crystal 9836 (Aph)	252	369.86	109	0.53	1811.1	101	0.84	336.51	97	0.77	1.68	74	0.37
Crystal 9837	217	376.4	111	0.44	1833.6	102	0.67	321.16	93	0.51	2.67	117	0.56
Crystal 9845 (Aph)	276	212.32	63	0.01	1767.5	99	0.82	514.27	148	0	2.81	123	0.43
Crystal 9849	253	507.55	150	0	1615.1	90	0.09	390.51	113	0.27	3.33	146	0.12
Crystal 9855 (Aph)	227	277.76	82	0.22	1823.6	102	0.75	352.67	102	0.88	2.83	124	0.41
Crystal 9877	248	475.28	140	0.01	1785.5	100	0.96	252.79	73	0.02	2.38	104	0.89
Filler-3	269	230.49	68	0.03	1690	94	0.33	299.52	86	0.23	2.85	125	0.4
HM 1643	237	271.1	80	0.18	1426.3	80	0	308.4	89	0.33	2.43	106	0.83
HM 7066	223	341.01	101	0.96	1609	90	0.08	399.73	115	0.18	2.72	119	0.51
HM 7073 (Rzm)	270	343.56	102	0.92	1872.3	105	0.42	347.42	100	0.99	2.99	131	0.29
HM 7076 (Rzm)	263	443.55	131	0.04	2281.3	126	0	326.12	94	0.6	1.44	63	0.21
HM 7080	238	348.96	103	0.83	1571.5	88	0.04	327.55	94	0.62	2.13	93	0.82
HM 7082	230	252.59	75	0.09	1903.9	106	0.27	303.01	87	0.27	1.5	66	0.24
HM 7083 (Rzm)	259	428.33	127	0.07	1635.8	91	0.13	356.18	103	0.81	2.88	126	0.37
HM Hector (check #3)	218	268.72	79	0.16	1778.6	99	0.91	404.2	116	0.15	3.13	137	0.21
HM RH5	262	277.04	82	0.22	1887.9	105	0.34	294.88	85	0.19	1.6	70	0.31
Holly 97HX708	216	319.36	94	0.7	1831.2	102	0.69	389.33	112	0.28	3.72	163	0.03
Holly 97HX712	265	365.09	108	0.59	1864.4	104	0.47	398.66	115	0.19	2.14	94	0.83
Holly 97HX713	272	315.63	93	0.65	1590.6	89	0.05	238.03	69	0.01	2.53	111	0.71
Holly 98APH03 (Aph)	245	379	112	0.41	1930.4	108	0.17	411.9	119	0.1	1.94	85	0.61
Holly 98HX806	228	352.82	104	0.77	1665.2	93	0.22	385.35	111	0.33	1.86	81	0.53
Holly 98HX825	250	372.02	110	0.5	1715.3	96	0.46	412.73	119	0.1	2.11	92	0.8
Holly 98HX826	225	369.91	109	0.53	1819.5	102	0.78	366.54	106	0.62	1.77	78	0.44
Holly 98HX828	260	396.62	117	0.24	1702.2	95	0.39	349.33	101	0.95	2.35	103	0.92
Holly 98HX829	243	227.52	67	0.03	1918.6	107	0.21	345.53	100	0.97	3.93	172	0.02
Holly Rival (Rzm)	226	339.3	100	0.99	2269.2	127	0	343.77	99	0.94	1.97	86	0.64
Maribo 9363 (check #4)	275	408.63	121	0.16	1652.1	92	0.18	383.61	111	0.35	2.13	93	0.82
Maribo 9757	278	373.85	111	0.47	1760.5	98	0.77	305.82	88	0.3	3.21	141	0.17
Maribo 9767	261	441.72	131	0.04	2109.6	118	0	371.6	107	0.53	2.01	88	0.60
Seedex SX1012	224	227.32	67	0.03	1769.3	99	0.84	371.01	107	0.54	1.7	75	0.39
Seedex SX1015	266	380.07	112	0.4	1932	108	0.17	330.03	95	0.67	1.59	70	0.3
Seedex SX1016	249	272.69	81	0.19	1845.8	103	0.59	342.04	99	0.9	1.53	67	0.26
Van der Have H46109	257	218.59	65	0.02	1803.7	101	0.9	278.19	80	0.08	2.13	93	0.82
Van der Have H46109rr (Aph-Rzm)	273	270.07	80	0.17	1766.5	99	0.81	377.24	108	0.44	2.11	92	0.79
Van der Have H46140	233	291.8	86	0.35	1788	100	0.98	320.17	92	0.5	2.44	107	0.81
Van der Have H66339	246	400.25	118	0.22	1689.1	94	0.32	369.58	107	0.57	1.6	70	0.31
Van der Have H68108 (Aph)	271	393.56	116	0.27	1969.5	110	0.08	342.7	99	0.91	3.02	132	0.27
Van der Have H68151 (Aph)	235	354.16	105	0.75	1855.2	104	0.53	310.94	90	0.36	1.65	72	0.34
Van der Have H68152rr (Aph-Rzm)	240	430.22	127	0.07	2004.3	112	0.04	347.02	100	1	1.28	56	0.14
Van der Have H68153 (Aph)	241	384.02	113	0.36	1841.3	103	0.62	372.64	107	0.51	2.24	98	0.96

	NA Mean	NA %	K Mean	K %	Am. N. Mean	Am. N. %	Tare Mean	Tare %
Check Mean	338.37		1790.5		346.96		2.28	
Coeff. of Var. (%)	19.24		7.6		15.55		40.12	
F Value	2.31 **		2.43 **		1.69 *		1.05 ns	
Mean LSD (0.05)	141.12	42	290.4	16	111.72	32	1.09	83
Mean LSD (0.01)	187.97	56	386.55	22	148.58	43	2.52	110

Table 12. Hector Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Beta 5216 (Aph)	222	0			1.61	93	0.75
Beta 6904 (check #1)	254	0			1.42	82	0.4
Beta M701 (Aph)	221	0			1.94	113	0.55
Beta M703 (Blend)(Aph)	236	0			2.19	127	0.2
Beta M704 (Aph)	255	0			2.56	148	0.03
Beta M705 (Rzm-Aph)	242	0			1.47	85	0.49
Beta M706 (Rzm-Aph)	232	0			2.11	122	0.29
Beta M724 (Rzm)	279	0			0.94	55	0.04
Beta M725 (Rzm)	256	0			1.17	67	0.13
Beta M811 (Rzm-Aph)	274	0			2.56	148	0.03
Beta M812 (Rzm-Aph)	247	0			1.53	88	0.58
Beta M813 (Rzm-Aph)	264	0			2.03	117	0.41
Beta M814 (Aph)	234	0			2.92	168	0
Beta M815 (Aph)	219	0			2.53	146	0.03
Beta M816 (Aph)	268	0			1.53	88	0.58
Croplan CL 103	251	0			2.44	142	0.05
Croplan CL 104	231	0			2.22	128	0.18
Crystal 222 (Aph)	220	0			1.78	103	0.88
Crystal 309 (check #2)	244	0			1.5	87	0.53
Crystal 555 (Aph)	267	0			1	58	0.05
Crystal 9708	258	0			1.89	109	0.71
Crystal 9711	277	0			2.58	150	0.02
Crystal 9817	229	0			1.94	113	0.55
Crystal 9832	239	0			1.94	113	0.55
Crystal 9836 (Aph)	252	0			1.92	111	0.6
Crystal 9837	217	0			2.56	148	0.03
Crystal 9845 (Aph)	276	0.85			2.08	121	0.33
Crystal 9849	253	0			0.83	48	0.02
Crystal 9855 (Aph)	227	0			1.58	92	0.69
Crystal 9877	248	0			1.03	60	0.06
Filler-3	269	0			0.97	56	0.04
HM 1643	237	0			2.14	124	0.26
HM 7066	223	0			1.5	87	0.53
HM 7073 (Rzm)	270	0			1.58	92	0.69
HM 7076 (Rzm)	263	0			0.97	56	0.04
HM 7080	238	0			1.36	79	0.32
HM 7082	230	0			0.86	50	0.02
HM 7083 (Rzm)	259	0			1.89	109	0.65
HM Hector (check #3)	218	0			2.03	117	0.41
HM RH5	262	0			3.17	183	0
Holly 97HX708	216	0			1.06	61	0.07
Holly 97HX712	265	0			2	116	0.45
Holly 97HX713	272	0.85			1.31	76	0.25
Holly 98APH03 (Aph)	245	0			2.11	122	0.29
Holly 98HX806	228	0			1	58	0.05
Holly 98HX825	250	0			1.69	98	0.93
Holly 98HX826	225	0			1.08	63	0.08
Holly 98HX828	260	0			1	58	0.05
Holly 98HX829	243	0			1.53	88	0.58
Holly Rival (Rzm)	226	0			2.42	140	0.06
Maribo 9363 (check #4)	275	0			1.14	66	0.11
Maribo 9757	278	0			1.92	111	0.6
Maribo 9767	261	0			1.97	114	0.5
Seedex SX1012	224	0			0.89	52	0.02
Seedex SX1015	266	0			1.56	90	0.64
Seedex SX1016	249	0			1.11	64	0.09
Van der Have H46109	257	0			1.97	114	0.5
Van der Have H46109rr (Aph-Rzm)	273	0			1.47	85	0.49
Van der Have H46140	233	0			1.94	113	0.55
Van der Have H66339	246	0			1.58	92	0.69
Van der Have H68108 (Aph)	271	0			1.83	106	0.77
Van der Have H68151 (Aph)	235	0			1.39	81	0.36
Van der Have H68152rr (Aph-Rzm)	240	0			1.92	111	0.6
Van der Have H68153 (Aph)	241	0			2.36	137	0.08

	Bolters %	Vigor Mean	Vigor %
Check Mean		1.73	
Coeff. of Var. (%)		28.55	
F Value		2.32 **	
Mean LSD (0.05)		1.03	60
Mean LSD (0.01)		1.37	80

Table 13. Clara City Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	Rec/T (lbs) %	Rec/T (lbs) P-Val	Rec/A (lbs) Mean	Rec/A (lbs) %	Rec/A (lbs) P-Val	Loss To Molasses Mean	Loss To Molasses %	Loss To Molasses P-Val	Sugar % Mean	Sugar % %	Sugar % P-Val	Yield (T/A) Mean	Yield (T/A) %	Yield (T/A) P-Val
Beta 5216 (Aph)	222	265.46	105	0.03	5710	108	0.06	1.16	101	0.78	14.43	105	0.01	21.61	103	0.39
Beta 6904 (check #1)	254	276.92	110	0	4926.6	93	0.08	1	87	0	14.85	108	0	17.77	85	0
Beta M701 (Aph)	221	252.55	100	0.96	5581.8	105	0.2	1.14	99	0.89	13.77	100	0.93	22.16	106	0.11
Beta M703 (Blend)(Aph)	236	259.44	103	0.25	5511.5	104	0.34	1.05	91	0.04	14.02	102	0.37	21.19	101	0.77
Beta M704 (Aph)	255	268.88	106	0.01	5703.3	107	0.07	1.03	90	0.02	14.48	105	0.01	21.17	101	0.79
Beta M705 (Rzm-Aph)	242	240.26	95	0.03	4827.8	91	0.03	1.16	103	0.55	13.2	96	0.02	20.21	96	0.3
Beta M706 (Rzm-Aph)	232	250.6	99	0.69	5230.1	99	0.73	1.27	110	0.02	13.8	100	0.99	20.89	100	0.91
Beta M724 (Rzm)	279	233.86	92	0	4755.5	90	0.01	1.12	97	0.5	12.81	93	0	20.44	97	0.47
Beta M725 (Rzm)	256	227.13	90	0	4936.3	93	0.09	1.17	102	0.69	12.53	91	0	21.76	104	0.29
Beta M811 (Rzm-Aph)	274	275.84	109	0	7068.4	133	0	1.04	90	0.03	14.84	108	0	25.53	122	0
Beta M812 (Rzm-Aph)	247	242.18	96	0.06	4922.4	93	0.08	1.14	99	0.84	13.26	96	0.03	20.29	97	0.35
Beta M813 (Rzm-Aph)	264	258.97	102	0.28	5638.9	106	0.12	1.06	92	0.06	14.01	102	0.4	21.84	104	0.24
Beta M814 (Aph)	234	277.85	110	0	5532.3	104	0.29	1.02	88	0.01	14.91	108	0	19.96	95	0.17
Beta M815 (Aph)	219	282.62	112	0	7026.8	132	0	1	87	0	15.13	110	0	24.88	119	0
Beta M816 (Aph)	268	262.16	104	0.1	5250.9	99	0.8	1.09	95	0.24	14.2	103	0.11	19.98	95	0.17
Croplan CL 103	251	242.91	96	0.08	4749.3	90	0.01	1.12	98	0.59	13.27	96	0.04	19.65	94	0.07
Croplan CL 104	231	245.55	97	0.2	5187.2	98	0.58	1.05	92	0.05	13.33	97	0.07	21.12	101	0.84
Crystal 222 (Aph)	220	252.46	100	0.95	4998.6	94	0.15	1.11	96	0.39	13.73	100	0.82	19.77	94	0.1
Crystal 309 (check #2)	244	253.37	100	0.93	5281.5	100	0.91	1.21	105	0.25	13.86	101	0.74	20.86	99	0.88
Crystal 555 (Aph)	267	272	108	0	5252.9	99	0.81	1.11	96	0.39	14.71	107	0	19.28	92	0.02
Crystal 9708	258	241.1	95	0.04	4668.8	88	0	1.28	112	0.01	13.34	97	0.07	19.4	92	0.03
Crystal 9711	277	256.98	102	0.28	5040.8	95	0.22	1.09	95	0.24	14.04	102	0.33	19.5	93	0.05
Crystal 9817	229	251.59	99	0.82	5064.9	95	0.26	1.11	97	0.43	13.69	99	0.7	20.15	96	0.26
Crystal 9832	239	249.46	99	0.55	5002.6	94	0.16	1.17	101	0.76	13.64	99	0.55	20	95	0.19
Crystal 9835 (Aph)	252	261.97	104	0.11	4966.5	94	0.12	1.16	101	0.89	14.26	103	0.07	19.07	91	0.01
Crystal 9837	217	244.87	97	0.16	5108.7	96	0.36	1.18	103	0.52	13.42	97	0.14	20.82	99	0.83
Crystal 9845 (Aph)	276	260.04	103	0.21	4749.7	90	0.01	1.17	102	0.69	14.17	103	0.13	18.25	87	0
Crystal 9849	253	258.98	102	0.28	4768.6	90	0.01	1.09	95	0.2	14.04	102	0.34	18.36	88	0
Crystal 9855 (Aph)	227	243.83	96	0.11	4999.5	94	0.16	1.29	112	0.01	13.47	98	0.21	20.63	98	0.64
Crystal 9877	248	222.28	88	0	4131.1	78	0	1.28	111	0.01	12.4	90	0	18.73	89	0
Filler-3	269	256.56	101	0.51	4779.9	90	0.02	1.2	104	0.33	14.03	102	0.35	18.8	90	0
HM 1643	237	258.74	102	0.3	5333.2	101	0.9	1.17	102	0.72	14.1	102	0.22	20.59	98	0.6
HM 7066	223	242.39	96	0.07	5132.3	97	0.42	1.18	103	0.5	13.3	96	0.05	21.1	101	0.87
HM 7073 (Rzm)	270	261.64	103	0.12	5416.6	102	0.6	1.13	98	0.66	14.21	103	0.1	20.68	99	0.68
HM 7076 (Rzm)	263	239.99	95	0.02	5351.7	101	0.83	1.31	114	0	13.31	96	0.06	22.5	107	0.04
HM 7080	238	251.01	99	0.75	5712.8	108	0.06	1.16	101	0.91	13.71	99	0.73	22.82	109	0.01
HM 7082	230	249.81	99	0.59	4954.6	93	0.1	1.15	100	0.97	13.64	99	0.55	19.85	95	0.13
HM 7083 (Rzm)	259	242.53	96	0.07	4992.3	94	0.15	1.33	116	0	13.46	98	0.19	20.61	98	0.62
HM Hector (check #3)	218	247.26	98	0.33	5298.6	100	0.97	1.22	106	0.17	13.59	98	0.41	21.44	102	0.53
HM RH5	262	270.95	107	0	5812.8	110	0.02	0.99	86	0	14.54	105	0	21.49	102	0.48
Holly 97HX708	216	251.68	100	0.84	5332.1	100	0.9	1.16	101	0.86	13.75	100	0.85	21.21	101	0.75
Holly 97HX712	265	262.39	104	0.09	5186.3	98	0.58	1.04	91	0.03	14.18	103	0.15	19.83	95	0.12
Holly 97HX713	272	249.34	98	0.43	5370.6	101	0.76	1.17	101	0.76	13.59	99	0.41	21.54	103	0.44
Holly 98APH03 (Aph)	245	254.2	101	0.81	6114.4	115	0	1.25	108	0.06	13.95	101	0.54	24.18	115	0
Holly 98HX806	228	264.38	105	0.04	5872.5	111	0.01	1.05	91	0.04	14.27	103	0.06	22.14	106	0.12
Holly 98HX825	250	246.05	97	0.23	5061	95	0.28	1.18	103	0.51	13.49	98	0.23	20.5	98	0.52
Holly 98HX826	225	246.85	98	0.29	4859.8	92	0.04	1.16	101	0.89	13.5	98	0.24	19.73	94	0.09
Holly 98HX828	260	231.58	92	0	4352.1	82	0	1.22	106	0.19	12.79	93	0	18.82	90	0
Holly 98HX829	243	264.86	105	0.03	6466.1	122	0	1.12	98	0.58	14.37	104	0.02	24.3	116	0
Holly Rival (Rzm)	226	229.14	91	0	4730.5	89	0.01	1.32	115	0	12.78	93	0	20.54	98	0.56
Maribo 9363 (check #4)	275	254.09	100	0.83	4841.6	91	0.03	1.23	107	0.1	13.94	101	0.57	19.13	91	0.01
Maribo 9757	278	249.91	99	0.61	4971.5	94	0.12	1.22	106	0.14	13.72	99	0.77	20	95	0.19
Maribo 9767	261	231.77	92	0	4412.7	83	0	1.31	114	0	12.9	94	0	19.02	91	0.01
Seedex SX1012	224	258.79	102	0.3	5420.9	102	0.59	1.09	94	0.19	14.02	102	0.36	20.98	100	1
Seedex SX1015	266	229.92	91	0	4421.6	83	0	1.19	103	0.44	12.68	92	0	19.27	92	0.02
Seedex SX1016	249	258.13	102	0.35	5433.3	102	0.55	1.06	92	0.06	13.96	101	0.5	21.07	100	0.9
Van der Have H46109	257	265.54	105	0.03	6588.9	124	0	1.08	94	0.14	14.36	104	0.03	24.77	118	0
Van der Have H46109rr (A	273	264.90	105	0.03	6216.1	117	0	1.1	95	0.27	14.34	104	0.03	23.53	112	0
Van der Have H46140	233	261.63	103	0.12	5738.3	108	0.05	1.09	94	0.2	14.17	103	0.14	21.89	104	0.22
Van der Have H66338	246	245.3	97	0.18	4824.2	91	0.03	1.11	97	0.44	13.38	97	0.1	19.64	94	0.07
Van der Have H68108 (Ap	271	255.37	101	0.66	6133.9	116	0	1.26	109	0.03	14.02	102	0.36	24.09	115	0
Van der Have H68151 (Ap	235	264.44	105	0.04	6692.4	126	0	1.07	93	0.09	14.29	104	0.05	25.21	120	0
Van der Have H68152rr (A	240	248.38	98	0.43	6197.3	117	0	1.22	106	0.15	13.64	99	0.64	25.17	120	0
Van der Have H68153 (Ap	241	239.39	95	0.02	4954.7	93	0.1	1.22	106	0.13	13.2	96	0.02	20.8	99	0.82

	Rec/T (lbs)		Rec/A (lbs)		Loss To Molasses		Sugar %		Yield (T/A)	
Check Mean	252.84		5305.8		1.15		13.79		20.98	
Coeff. of Var. (%)	5.27		9.59		10.12		4.3		8.34	
F Value	5.21 **		8.13 **		2.99 **		5.45 **		6.12 **	
Mean LSD (0.05)	15.91	6	603.98	11	0.14	12	0.71	5	2.07	10
Mean LSD (0.01)	20.96	8	795.67	15	0.18	16	0.93	7	2.72	13

* Significant at 5%. ** Significant at 1%. Ns Not sig.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

Table 13. Clara City Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	NA (ppm)			K (ppm)			Am. N. (ppm)			Tare (%)		
		Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val
Beta 5216 (Aph)	222	441.27	88	0.23	1817.7	99	0.72	261.59	119	0.03	3.06	99	0.95
Beta 6904 (check #1)	254	452.95	90	0.34	1677.7	91	0.01	170.51	78	0.01	3.28	106	0.6
Beta M701 (Aph)	221	518.35	103	0.73	1602.6	87	0	270.81	123	0.01	3.48	113	0.29
Beta M703 (Blend)(Aph)	236	462.18	92	0.44	1673.7	91	0.01	198.9	91	0.29	2.32	75	0.04
Beta M704 (Aph)	255	392.97	78	0.03	1734.2	94	0.09	192.45	88	0.16	3.26	106	0.64
Beta M705 (Rzm-Aph)	242	500.44	100	0.99	1958.3	106	0.06	211.7	97	0.69	2.78	90	0.4
Beta M706 (Rzm-Aph)	232	538.87	108	0.45	2087.8	113	0	230.64	105	0.56	3.45	112	0.33
Beta M724 (Rzm)	279	575.73	115	0.13	1699.4	92	0.03	204.63	93	0.45	2.36	77	0.05
Beta M725 (Rzm)	256	598.13	119	0.05	1731.2	94	0.08	227.2	104	0.69	3.29	107	0.58
Beta M811 (Rzm-Aph)	274	383.46	77	0.02	1694.1	92	0.02	215.13	98	0.83	2.49	81	0.1
Beta M812 (Rzm-Aph)	247	485.93	97	0.76	1833	100	0.91	218.28	100	0.96	3.46	112	0.31
Beta M813 (Rzm-Aph)	264	415.66	83	0.09	1817.8	99	0.73	184.68	84	0.07	2.39	77	0.06
Beta M814 (Aph)	234	336.55	67	0	1769.6	96	0.26	194.65	89	0.2	2.43	79	0.07
Beta M815 (Aph)	219	356.27	71	0	1666.5	91	0.01	201.69	92	0.36	2.88	93	0.57
Beta M818 (Aph)	268	511.85	102	0.82	1517.6	82	0	255.07	116	0.07	2.33	75	0.04
Croplan CL 103	251	551.86	110	0.31	1718	93	0.05	212.87	97	0.74	2.97	96	0.75
Croplan CL 104	231	427.5	85	0.14	1868.1	102	0.65	165.11	75	0.01	2.9	94	0.61
Crystal 222 (Aph)	220	413.47	83	0.08	1794.7	98	0.47	228.49	104	0.64	2.8	91	0.44
Crystal 309 (check #2)	244	500.35	100	0.99	2072.8	113	0	199.77	91	0.31	5.13	166	0
Crystal 555 (Aph)	267	362.47	72	0.01	1813.1	99	0.67	243.64	111	0.21	4.68	151	0
Crystal 9708	258	579.72	116	0.11	2008	109	0.01	249.52	114	0.12	2.38	77	0.05
Crystal 9711	277	536.77	107	0.47	1817.1	99	0.72	169.19	77	0.01	2.63	85	0.21
Crystal 9817	229	551.56	110	0.31	1781.4	97	0.35	182.78	83	0.08	2.27	73	0.03
Crystal 9832	239	484.67	97	0.74	1833.7	100	0.92	239.55	109	0.3	3.04	98	0.9
Crystal 9835 (Aph)	252	477.88	95	0.64	1807.2	98	0.6	243.25	111	0.22	3.03	98	0.88
Crystal 9837	217	563.81	113	0.21	1962.3	107	0.05	189.42	86	0.12	2.39	77	0.06
Crystal 9845 (Aph)	276	434.74	87	0.18	1962.2	107	0.05	224.81	103	0.77	3.48	113	0.28
Crystal 9849	253	466.22	93	0.49	1794.9	98	0.47	194.95	89	0.21	3.16	102	0.85
Crystal 9855 (Aph)	227	603.17	120	0.04	1953.8	106	0.07	261.4	119	0.03	3.27	106	0.63
Crystal 9877	248	680.77	136	0	1992.8	108	0.02	212.85	97	0.74	2.89	94	0.6
Filler-3	269	496.28	99	0.93	1926.9	105	0.17	234.59	107	0.43	5.27	171	0
HM 1643	237	530.04	106	0.56	1630.1	89	0	278.28	127	0	3.44	111	0.34
HM 7066	223	479.84	96	0.67	1809.8	98	0.63	261.02	119	0.03	3.16	102	0.84
HM 7073 (Rzm)	270	451.22	90	0.32	1930.6	105	0.15	194.15	89	0.19	3.05	99	0.92
HM 7076 (Rzm)	263	564.51	113	0.2	2128.8	116	0	244.59	112	0.19	3.24	105	0.68
HM 7080	238	502.87	100	0.97	1855.5	101	0.8	218.5	100	0.96	2.37	77	0.05
HM 7082	230	435.82	87	0.19	1809.5	98	0.63	250.36	114	0.11	2.88	93	0.58
HM 7083 (Rzm)	259	607.53	121	0.03	2073.6	113	0	259.34	118	0.04	3.41	111	0.38
HM Hector (check #3)	218	535.05	107	0.49	1816.4	99	0.71	263.11	120	0.02	3.36	109	0.46
HM RH5	262	413.71	83	0.08	1694	92	0.02	163.98	75	0	2.63	85	0.22
Holly 97HX708	216	469.57	94	0.53	1840.5	100	0.99	235.68	107	0.4	2.75	89	0.36
Holly 97HX712	265	491.86	98	0.86	1694.2	92	0.02	179.64	82	0.04	3.25	105	0.65
Holly 97HX713	272	574.14	115	0.14	1796.2	98	0.49	213.86	97	0.78	2.7	87	0.29
Holly 98APH03 (Aph)	245	454.99	91	0.36	1962.7	107	0.05	279.97	128	0	2.98	97	0.78
Holly 98HX806	228	428	85	0.14	1676.6	91	0.01	207.36	95	0.53	3.36	109	0.45
Holly 98HX825	250	604.05	121	0.04	1824	99	0.8	210.06	96	0.63	2.34	76	0.04
Holly 98HX826	225	607.95	121	0.03	1737	94	0.1	212.74	97	0.73	2.34	76	0.04
Holly 98HX828	260	662.28	132	0	1906.5	104	0.29	192.74	88	0.17	3.38	109	0.47
Holly 98HX829	243	390.41	78	0.03	1876.2	102	0.56	227.56	104	0.67	3.72	120	0.09
Holly Rival (Rzm)	226	561.84	112	0.22	2187.2	119	0	238.55	109	0.32	2.97	96	0.74
Maribo 9363 (check #4)	275	580.1	116	0.11	1998.2	109	0.01	211.38	96	0.68	2.74	89	0.35
Maribo 9757	278	641.08	128	0.01	1944.1	106	0.1	196.56	90	0.24	3.33	108	0.51
Maribo 9787	261	727.28	145	0	1896.2	103	0.37	243.15	111	0.22	3.18	103	0.8
Seedex SX1012	224	403.82	81	0.05	1851.2	101	0.86	202.52	92	0.38	3.02	98	0.86
Seedex SX1015	266	622.53	124	0.02	1765.4	96	0.24	224.67	103	0.76	3.84	124	0.04
Seedex SX1016	249	479.58	96	0.67	1705.2	93	0.03	190.4	87	0.13	3.81	123	0.05
Van der Have H46109	257	383.4	77	0.02	1804	98	0.57	215.83	98	0.85	3.44	111	0.34
Van der Have H46109rr (/	273	352.82	78	0.03	1760.6	96	0.21	239.23	109	0.3	3.47	112	0.29
Van der Have H46140	233	410.65	82	0.07	1784.1	97	0.38	216.66	99	0.89	3.32	108	0.52
Van der Have H66339	246	509.67	102	0.86	1806.2	96	0.59	195.82	89	0.22	2.88	93	0.58
Van der Have H68108 (A	271	442.72	88	0.24	2114.8	115	0	251.9	115	0.09	3.13	101	0.9
Van der Have H68151 (A	235	455.8	91	0.37	1678.7	91	0.01	212.83	97	0.74	2.85	92	0.52
Van der Have H68152rr (/	240	520.34	104	0.7	2038.5	111	0	217.46	99	0.92	2.73	89	0.32
Van der Have H68153 (A	241	619.48	124	0.02	1966.1	107	0.05	198.78	91	0.29	3.02	98	0.85

	NA (ppm)		K (ppm)		Am. N. (ppm)		Tare (%)	
Check Mean	500.89		1839.9		219.36		3.09	
Coeff. of Var. (%)	23.54		8.12		20.75		28.53	
F Value	2.97 **		4.85 **		2.14 **		2.6 **	
Mean LSD (0.05)	139.63	28	176.15	10	54.16	25	1.03	33
Mean LSD (0.01)	183.94	37	232.04	13	71.35	33	1.35	44

Table 13. Clara City Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

		Bolters %			Vigor		
ENTRY	CODE	Mean	%	P-Val	Mean	%	P-Val
Beta 5218 (Aph)	222	0			1.01	60	0
Beta 6904 (check #1)	254	0			1.67	100	0.97
Beta M701 (Aph)	221	0			1.83	109	0.47
Beta M703 (Blend)(Aph)	236	0			2	119	0.14
Beta M704 (Aph)	255	0			2.5	149	0
Beta M705 (Rzm-Aph)	242	0			1.83	109	0.47
Beta M706 (Rzm-Aph)	232	0			1.52	91	0.46
Beta M724 (Rzm)	279	0			1.67	99	0.97
Beta M725 (Rzm)	256	0			1.17	70	0.02
Beta M811 (Rzm-Aph)	274	0			2.02	120	0.12
Beta M812 (Rzm-Aph)	247	0			1.83	109	0.48
Beta M813 (Rzm-Aph)	264	0			1.83	109	0.48
Beta M814 (Aph)	234	0			1.84	110	0.45
Beta M815 (Aph)	219	0			2.34	139	0
Beta M816 (Aph)	268	0			1.35	81	0.13
Croplan CL 103	251	0			1.49	89	0.38
Croplan CL 104	231	0			2	120	0.13
Crystal 222 (Aph)	220	0			2.15	128	0.03
Crystal 309 (check #2)	244	0			0.99	59	0
Crystal 555 (Aph)	267	0			1.84	110	0.45
Crystal 9708	258	0			1.67	100	0.99
Crystal 9711	277	0			2.67	159	0
Crystal 9817	229	0			1.82	109	0.5
Crystal 9832	239	0			1.85	110	0.43
Crystal 9835 (Aph)	262	0			2.34	140	0
Crystal 9837	217	0			2	119	0.14
Crystal 9845 (Aph)	276	0			1.83	109	0.49
Crystal 9849	253	0			1.84	110	0.46
Crystal 9855 (Aph)	227	0			1.34	80	0.12
Crystal 9877	248	0			1.48	88	0.36
Filler-3	269	0			1.48	88	0.35
HM 1643	237	0			1	59	0
HM 7066	223	0			1.84	109	0.46
HM 7073 (Rzm)	270	0			2.16	129	0.03
HM 7076 (Rzm)	263	0			1.51	90	0.42
HM 7080	238	0			1.33	79	0.11
HM 7082	230	0			1	60	0
HM 7083 (Rzm)	259	0			2.17	129	0.02
HM Hector (check #3)	218	0			1.67	100	0.97
HM RH5	282	0			2.16	129	0.03
Holly 97HX708	216	0			1.67	99	0.96
Holly 97HX712	265	0			1.34	80	0.12
Holly 97HX713	272	0			1.33	79	0.11
Holly 98APH03 (Aph)	245	0			1.5	89	0.41
Holly 98HX808	228	0			1.15	69	0.01
Holly 98HX825	250	0			1.18	70	0.02
Holly 98HX826	225	0			1.16	69	0.02
Holly 98HX828	260	0			1.17	70	0.02
Holly 98HX829	243	0			2	119	0.13
Holly Rival (Rzm)	226	0			1.34	80	0.12
Maribo 9363 (check #4)	275	0			1.5	89	0.41
Maribo 9757	278	0			2	119	0.14
Maribo 9767	261	0			1.49	89	0.38
Seedex SX1012	224	0			1.51	90	0.44
Seedex SX1015	266	0			1.67	100	0.98
Seedex SX1016	249	0			1	60	0
Van der Have H46109	257	0			1.67	99	0.96
Van der Have H48109rr (A	273	0			1.66	99	0.95
Van der Have H46140	233	0			1.83	109	0.47
Van der Have H66339	246	0			1.5	90	0.42
Van der Have H68109 (A	271	0			1.83	109	0.47
Van der Have H68151 (A	235	0			2.14	128	0.03
Van der Have H68152rr (A	240	0			2.02	120	0.12
Van der Have H68153 (A	241	0			1.66	99	0.95

	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Check Mean				1.68		
Coeff. of Var. (%)				31.47		
F Value				3.15 **		
Mean LSD (0.05)				0.6	36	
Mean LSD (0.01)				0.8	47	

Table 14. DeGraff Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs) Mean	Rec/T (lbs) %	Rec/T (lbs) P-Val	Rec/A (lbs) Mean	Rec/A (lbs) %	Rec/A (lbs) P-Val	Loss To Molasses Mean	Loss To Molasses %	Loss To Molasses P-Val	Sugar % Mean	Sugar % %	Sugar % P-Val	Yield (T/A) Mean	Yield (T/A) %	Yield (T/A) P-Val
Beta 5216 (Aph)	222	306.41	106	0	7006.2	102	0.53	1.13	93	0.08	16.45	105	0	22.88	96	0.25
Beta 6904 (check #1)	254	303.74	105	0	6559.5	96	0.26	1.13	93	0.07	16.32	104	0	21.5	90	0
Beta M701 (Aph)	221	306.86	106	0	7649.2	112	0	1.05	87	0	16.4	105	0	25	105	0.1
Beta M703 (Blend)(Aph)	236	300.91	104	0.01	7308.7	107	0.07	1.11	92	0.03	16.16	103	0.02	24.28	102	0.5
Beta M704 (Aph)	255	315.6	110	0	7663.9	112	0	1.09	90	0.01	16.87	108	0	24.28	102	0.5
Beta M705 (Rzm-Aph)	242	295.07	102	0.18	6497.4	95	0.17	1.15	95	0.19	15.9	102	0.23	22.05	93	0.03
Beta M706 (Rzm-Aph)	232	298.88	104	0.04	7248.9	106	0.12	1.21	100	0.99	16.16	103	0.02	24.26	102	0.51
Beta M724 (Rzm)	279	281.88	98	0.22	6739.1	98	0.68	1.11	92	0.03	15.21	97	0.08	23.88	101	0.87
Beta M725 (Rzm)	256	245.54	85	0	6432.3	94	0.11	1.39	114	0	13.66	87	0	26.19	110	0
Beta M811 (Rzm-Aph)	274	293.06	102	0.34	7796.5	114	0	1.07	88	0	15.72	101	0.68	26.74	113	0
Beta M812 (Rzm-Aph)	247	271.53	94	0	6875	100	0.91	1.32	109	0.02	14.9	95	0	25.24	106	0.05
Beta M813 (Rzm-Aph)	264	291.22	101	0.55	6518.8	95	0.2	1.13	93	0.07	15.69	100	0.77	22.4	94	0.07
Beta M814 (Aph)	234	321.93	112	0	7053.6	103	0.42	1.14	94	0.14	17.24	110	0	21.94	92	0.02
Beta M815 (Aph)	219	320.19	111	0	8276.3	121	0	1.01	83	0	17.02	109	0	25.92	109	0
Beta M816 (Aph)	268	301.66	105	0.01	6124.4	89	0.01	1.14	94	0.13	16.23	104	0.01	20.27	85	0
Croplan CL 103	251	279.18	97	0.08	6482.4	95	0.16	1.25	103	0.46	15.21	97	0.08	23.16	97	0.43
Croplan CL 104	231	282.96	98	0.31	6489.4	95	0.14	1.24	103	0.52	15.39	99	0.33	22.91	96	0.27
Crystal 222 (Aph)	220	287.92	100	0.97	6661.5	97	0.47	1.32	109	0.02	15.72	101	0.67	23.22	98	0.48
Crystal 309 (check #2)	244	288.24	100	0.99	7077.9	103	0.37	1.27	105	0.2	15.68	100	0.78	24.46	103	0.34
Crystal 555 (Aph)	267	299.89	104	0.02	7026.5	103	0.48	1.22	101	0.85	16.22	104	0.01	23.44	99	0.68
Crystal 9708	258	298.1	103	0.05	6564.8	96	0.27	1.16	96	0.26	16.06	103	0.06	21.96	92	0.02
Crystal 9711	277	287.96	100	0.97	6868.3	100	0.93	1.25	103	0.37	15.65	100	0.89	23.92	101	0.83
Crystal 9817	229	279.73	97	0.1	7249.4	106	0.12	1.28	106	0.14	15.27	98	0.13	25.93	109	0
Crystal 9832	239	278.27	97	0.05	5943.1	87	0	1.25	103	0.47	15.16	97	0.05	21.42	90	0
Crystal 9835 (Aph)	252	296.78	103	0.09	7295.7	107	0.08	1.27	105	0.21	16.11	103	0.04	24.57	103	0.29
Crystal 9837	217	279.6	97	0.1	6308.1	92	0.04	1.36	112	0	15.34	98	0.23	22.61	95	0.13
Crystal 9845 (Aph)	276	293.96	102	0.26	6670.8	97	0.5	1.3	107	0.07	16	102	0.11	22.64	95	0.14
Crystal 9849	253	283.78	98	0.39	6353.7	93	0.06	1.27	105	0.24	15.46	99	0.49	22.37	94	0.07
Crystal 9855 (Aph)	227	288.12	100	1	6908	101	0.81	1.23	101	0.73	15.64	100	0.95	23.91	101	0.85
Crystal 9877	248	279.78	97	0.1	7134	104	0.26	1.21	100	0.95	15.2	97	0.07	25.45	107	0.03
Filler-3	269	297.3	103	0.07	7106.5	104	0.31	1.11	91	0.03	15.97	102	0.13	23.88	100	0.88
HM 1643	237	290.38	101	0.66	6955	102	0.67	1.13	93	0.08	15.65	100	0.9	23.97	101	0.78
HM 7066	223	283.26	98	0.34	6815	100	0.9	1.22	101	0.84	15.39	99	0.32	24.03	101	0.72
HM 7073 (Rzm)	270	277.42	96	0.04	6578	96	0.29	1.29	106	0.11	15.16	97	0.05	23.72	100	0.95
HM 7076 (Rzm)	263	266.01	92	0	7004.5	102	0.54	1.41	117	0	14.72	94	0	26.36	111	0
HM 7080	238	294.77	102	0.2	7404.1	108	0.03	1.17	97	0.39	15.91	102	0.22	25.05	105	0.09
HM 7082	230	284.81	99	0.52	6380.9	93	0.07	1.19	98	0.6	15.43	99	0.42	22.36	94	0.07
HM 7083 (Rzm)	259	270.31	94	0	6517.6	95	0.2	1.27	105	0.24	14.78	95	0	24.11	101	0.65
HM Hector (check #3)	218	281.15	98	0.17	6156.1	90	0.01	1.18	98	0.55	15.24	98	0.11	21.86	92	0.01
HM RH5	262	302.35	105	0.01	6716.3	98	0.61	1.02	84	0	16.13	103	0.03	22.21	93	0.04
Holly 97HX708	216	272.4	95	0	6316.6	92	0.04	1.31	108	0.04	14.93	96	0	23.16	97	0.43
Holly 97HX712	265	288.79	100	0.9	5930	87	0	1.26	104	0.3	15.7	101	0.73	20.49	86	0
Holly 97HX713	272	290.62	101	0.63	6377.7	93	0.07	1.25	103	0.48	15.78	101	0.5	21.86	92	0.01
Holly 98APH03 (Aph)	245	276.72	96	0.03	7429.2	109	0.02	1.28	105	0.18	15.11	97	0.03	26.86	113	0
Holly 98HX806	228	293.29	102	0.31	6842.8	100	0.99	1.18	97	0.45	15.84	101	0.34	23.39	98	0.63
Holly 98HX825	250	292.02	101	0.45	6651.5	97	0.45	1.18	97	0.49	15.78	101	0.5	22.69	95	0.16
Holly 98HX826	225	283.31	98	0.35	5342.3	78	0	1.21	100	0.98	15.38	98	0.31	18.87	79	0
Holly 98HX828	260	269.58	94	0	5651.9	83	0	1.26	104	0.27	14.74	94	0	21.02	88	0
Holly 98HX829	243	301.97	105	0.01	7974.1	116	0	1.07	88	0	16.17	103	0.02	26.38	111	0
Holly Rival (Rzm)	226	276.02	96	0.02	6787.9	99	0.82	1.32	109	0.02	15.12	97	0.03	24.65	104	0.24
Maribo 9363 (check #4)	275	285.86	99	0.66	6528.8	95	0.22	1.25	103	0.39	15.55	100	0.76	22.85	96	0.23
Maribo 9757	278	290.72	101	0.62	7007.3	102	0.53	1.23	101	0.73	15.77	101	0.53	24.05	101	0.71
Maribo 9767	261	289.9	101	0.73	7244.1	106	0.12	1.27	105	0.21	15.77	101	0.53	24.88	105	0.14
Seedex SX1012	224	290.35	101	0.67	7052.3	103	0.42	1.13	93	0.08	15.65	100	0.9	24.29	102	0.49
Seedex SX1015	266	278.89	97	0.07	6239.8	91	0.02	1.25	103	0.38	15.2	97	0.07	22.36	94	0.07
Seedex SX1016	249	276.43	96	0.02	6077.2	89	0	1.34	110	0.01	15.16	97	0.05	22.01	93	0.02
Van der Have H46109	257	306	106	0	7881.5	115	0	1.04	85	0	16.34	105	0	25.86	109	0.01
Van der Have H46109rr (A	273	298.47	104	0.04	7685.1	112	0	1.06	88	0	15.98	102	0.12	25.68	108	0.01
Van der Have H46140	233	301.56	105	0.01	7361.9	108	0.04	1.1	91	0.02	16.18	104	0.02	24.32	102	0.46
Van der Have H66339	246	270.39	94	0	6181.9	90	0.01	1.38	114	0	14.9	95	0	22.92	96	0.27
Van der Have H68108 (A	271	280.17	97	0.12	7650.3	112	0	1.3	107	0.08	15.3	98	0.16	27.28	115	0
Van der Have H68151 (A	235	281.7	98	0.21	7187.3	105	0.18	1.24	102	0.57	15.32	98	0.21	25.45	107	0.03
Van der Have H68152rr (A	240	274.04	95	0.01	7327.3	107	0.06	1.34	111	0.01	15.05	96	0.02	26.72	112	0
Van der Have H68153 (A	241	265.33	92	0	7003.2	102	0.54	1.31	108	0.04	14.56	93	0	26.33	111	0

	Rec/T (lbs)		Rec/A (lbs)		Loss To Molasses		Sugar %		Yield (T/A)	
Check Mean	288.14		6845.7		1.21		15.62		23.76	
Coeff. of Var. (%)	4.25		8.93		9.22		3.59		7.7	
F Value	6.97 **		5.02 **		4.13 **		6.62 **		5.47 **	
Mean LSD (0.05)	14.36	5	718.37	10	0.13	11	0.66	4	2.13	9
Mean LSD (0.01)	18.92	7	946.31	14	0.17	14	0.87	6	2.81	12

* Significant at 5%. ** Significant at 1%. Ns Not sig.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

Table 14. DeGraff Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	NA (ppm) Mean	NA (ppm) %	NA (ppm) P-Val	K (ppm) Mean	K (ppm) %	K (ppm) P-Val	Am. N. (ppm) Mean	Am. N. (ppm) %	Am. N. (ppm) P-Val	Tare (%) Mean	Tare (%) %	Tare (%) P-Val
Beta 5216 (Aph)	222	352.91	71	0	1459	97	0.38	354.69	99	0.93	3.56	93	0.56
Beta 6904 (check #1)	254	432.54	86	0.15	1399.3	93	0.03	343.68	96	0.61	4.98	130	0.02
Beta M701 (Aph)	221	374.59	75	0.01	1434.8	96	0.18	295.97	83	0.02	3.06	80	0.1
Beta M703 (Blend)(Aph)	236	427.49	85	0.12	1428.5	95	0.13	322.2	90	0.18	3.41	89	0.36
Beta M704 (Aph)	255	342.78	69	0	1456.9	97	0.35	328.47	92	0.27	3.27	85	0.23
Beta M705 (Rzm-Aph)	242	413.99	83	0.07	1560.3	104	0.21	325.85	91	0.23	4.06	106	0.64
Beta M706 (Rzm-Aph)	232	431.7	86	0.15	1635.5	109	0	346.64	97	0.69	3.07	80	0.1
Beta M724 (Rzm)	279	468.08	94	0.5	1432.3	95	0.15	311.81	87	0.08	3.31	86	0.27
Beta M725 (Rzm)	266	709.71	142	0	1440.3	96	0.2	426.54	120	0.01	3.06	80	0.1
Beta M811 (Rzm-Aph)	274	460.63	92	0.4	1508.3	101	0.87	254.68	71	0	4.02	105	0.7
Beta M812 (Rzm-Aph)	247	544.7	109	0.35	1625.5	108	0.01	391.63	110	0.18	4.7	122	0.07
Beta M813 (Rzm-Aph)	264	436.93	87	0.18	1532.1	102	0.5	303.71	85	0.04	2.85	74	0.04
Beta M814 (Aph)	234	302.1	60	0	1452.6	97	0.31	387.57	109	0.23	3.36	88	0.31
Beta M815 (Aph)	219	358.8	72	0	1388.2	93	0.02	284.18	80	0	3.41	89	0.36
Beta M816 (Aph)	268	381.02	76	0.01	1335.3	89	0	392.51	110	0.17	4.48	117	0.17
Croplan CL 103	251	553.13	111	0.26	1410.9	94	0.06	389.96	109	0.2	3.97	103	0.78
Croplan CL 104	231	497.9	100	0.96	1444.7	96	0.24	399.34	112	0.11	3.04	79	0.09
Crystal 222 (Aph)	220	426.33	85	0.12	1546.9	103	0.33	461.71	129	0	3.83	100	0.98
Crystal 309 (check #2)	244	486.88	97	0.78	1745.4	116	0	343.67	96	0.61	4.23	110	0.4
Crystal 555 (Aph)	267	329.74	66	0	1451.1	97	0.29	439.9	123	0	7.32	191	0
Crystal 9708	258	500.44	100	1	1430	95	0.13	333.57	93	0.36	4.33	113	0.3
Crystal 9711	277	602.89	121	0.03	1525.6	102	0.6	342.51	96	0.57	2.98	78	0.07
Crystal 9817	229	689.91	138	0	1493.1	100	0.87	343.88	96	0.61	3.02	79	0.08
Crystal 9832	239	537.9	108	0.43	1477.2	98	0.62	374.9	105	0.48	3.69	96	0.75
Crystal 9835 (Aph)	252	502.2	100	0.97	1512.2	101	0.81	399.72	112	0.1	4.13	108	0.54
Crystal 9837	217	597.78	119	0.04	1605.8	107	0.03	403.4	113	0.07	3.46	90	0.43
Crystal 9845 (Aph)	276	491.83	98	0.86	1589.5	106	0.06	402.26	113	0.08	4.41	115	0.23
Crystal 9849	253	537.36	107	0.43	1412.6	94	0.06	406.95	114	0.05	4.36	114	0.27
Crystal 9855 (Aph)	227	485.78	97	0.76	1490.1	99	0.82	378.71	106	0.4	4.34	113	0.29
Crystal 9877	248	574.08	115	0.12	1536.7	102	0.44	318.4	89	0.12	2.16	56	0
Filler-3	269	391.67	78	0.02	1485.4	99	0.75	317.32	89	0.12	4.64	121	0.09
HM 1643	237	461.58	92	0.41	1276	85	0	367.01	103	0.7	5.14	134	0.01
HM 7066	223	463.2	93	0.43	1317.1	88	0	427.03	120	0.01	3.19	83	0.17
HM 7073 (Rzm)	270	568.65	114	0.15	1549.2	103	0.3	381.78	107	0.33	3.46	90	0.42
HM 7076 (Rzm)	263	713.11	143	0	1795.3	120	0	357.96	100	0.97	3.63	94	0.65
HM 7080	238	529.33	106	0.54	1399.7	93	0.03	340.92	96	0.53	4.28	111	0.35
HM 7082	230	346.33	69	0	1513	101	0.79	391.59	110	0.18	3.72	97	0.8
HM 7083 (Rzm)	259	639.47	128	0	1593.5	106	0.05	325.09	91	0.22	3.91	102	0.88
HM Hector (check #3)	218	497.69	99	0.96	1427.3	95	0.12	352.42	99	0.86	5.23	136	0
HM RH5	262	355.29	71	0	1399.6	93	0.03	288.73	81	0.01	3.96	103	0.8
Holly 97HX708	216	585.74	117	0.07	1467.3	98	0.48	405.27	114	0.06	3.41	89	0.37
Holly 97HX712	265	595.51	119	0.04	1422.1	95	0.1	380.55	107	0.36	4.06	106	0.63
Holly 97HX713	272	606.67	121	0.03	1439.5	96	0.2	358.12	100	0.96	4.02	105	0.7
Holly 98APH03 (Aph)	245	572.62	114	0.13	1589.9	106	0.06	354.09	99	0.91	3.68	96	0.74
Holly 98HX806	228	466.04	93	0.47	1434.4	96	0.16	363.87	102	0.79	4.45	116	0.19
Holly 98HX825	250	556.89	111	0.23	1395.7	93	0.03	334.7	94	0.39	2.88	75	0.04
Holly 98HX826	225	595.2	119	0.05	1333.6	89	0	368.29	103	0.72	5.23	136	0
Holly 98HX828	260	717.87	143	0	1355.3	90	0	358.37	100	0.96	3.7	96	0.77
Holly 98HX829	243	334.35	67	0	1565.3	104	0.17	288.46	81	0.01	3.42	89	0.37
Holly Rival (Rzm)	226	491.53	98	0.85	1766	118	0	374.72	105	0.49	3.09	80	0.11
Maribo 9363 (check #4)	275	626.57	125	0.01	1538.2	103	0.42	331.03	93	0.31	4.21	110	0.44
Maribo 9757	278	588.58	118	0.06	1457	97	0.35	347.18	97	0.7	4.21	110	0.44
Maribo 9767	261	605.5	121	0.03	1507.9	100	0.88	362.77	102	0.82	3.21	84	0.19
Seedex SX1012	224	394.52	79	0.03	1551.7	103	0.28	320.36	90	0.16	4.28	111	0.36
Seedex SX1015	256	513.68	103	0.78	1432.9	95	0.15	402.06	113	0.08	3.05	79	0.1
Seedex SX1016	249	550.59	110	0.29	1571.9	105	0.13	415.08	116	0.02	3.16	82	0.15
Van der Have H46109	257	320.44	64	0	1542.7	103	0.37	279	78	0	4.46	116	0.19
Van der Have H46109rr (/	273	376.03	75	0.01	1477.8	98	0.63	290.05	81	0.01	4.89	127	0.03
Van der Have H48140	233	332.19	66	0	1615.3	108	0.02	302.96	85	0.04	4.12	107	0.55
Van der Have H66339	246	569.1	114	0.15	1539.5	103	0.41	450.12	126	0	3.03	79	0.09
Van der Have H68108 (A	271	504.98	101	0.92	1684.8	112	0	370.6	104	0.6	3.75	98	0.85
Van der Have H68151 (A	235	539.38	108	0.41	1603.5	107	0.03	332.45	93	0.34	3.51	91	0.49
Van der Have H68152rr (/	240	737.4	147	0	1582.9	105	0.08	350.37	98	0.8	3.06	80	0.1
Van der Have H68153 (A	241	620.65	124	0.01	1645.7	110	0	350.68	98	0.81	3.79	99	0.91

	NA (ppm)		K (ppm)		Am. N. (ppm)		Tare (%)	
Check Mean	500.3		1500.6		356.94		3.84	
Coeff. of Var. (%)	22.4		7.5		17.39		30.12	
F Value	5.35 **		4.92 **		2.89 **		2.75 **	
Mean LSD (0.05)	132.51	26	131.97	9	72.05	20	1.32	34
Mean LSD (0.01)	174.56	35	173.84	12	94.91	27	1.74	45

Table 14. DeGraff Semi Commercial

1998 SOUTHERN MINNESOTA SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Beta 5216 (Aph)	222	0			1.84	100	0.99
Beta 6904 (check #1)	254	0			2	108	0.48
Beta M701 (Aph)	221	0			1.83	99	0.94
Beta M703 (Blend)(Aph)	236	0			2.17	117	0.13
Beta M704 (Aph)	255	0			3	163	0
Beta M705 (Rzm-Aph)	242	0			2.17	118	0.12
Beta M706 (Rzm-Aph)	232	0			2.34	127	0.02
Beta M724 (Rzm)	279	0			1.35	73	0.02
Beta M725 (Rzm)	258	0			0.97	53	0
Beta M811 (Rzm-Aph)	274	0			2	108	0.48
Beta M812 (Rzm-Aph)	247	0			1.49	81	0.1
Beta M813 (Rzm-Aph)	264	0			2.15	116	0.15
Beta M814 (Aph)	234	0			2.01	109	0.44
Beta M815 (Aph)	219	0			2.69	146	0
Beta M816 (Aph)	268	0			1.99	108	0.51
Croplan CL 103	251	0			2.34	127	0.02
Croplan CL 104	231	0			2.17	117	0.13
Crystal 222 (Aph)	220	0			1.51	82	0.12
Crystal 309 (check #2)	244	0			1.31	71	0.01
Crystal 555 (Aph)	267	0			1.47	80	0.08
Crystal 9708	256	0.28			2.01	109	0.43
Crystal 9711	277	0			2.37	128	0.02
Crystal 9817	229	0			1.35	73	0.02
Crystal 9832	239	0			2.03	110	0.39
Crystal 9835 (Aph)	252	0			2.01	109	0.45
Crystal 9837	217	0			1.83	99	0.93
Crystal 9845 (Aph)	276	0			1.99	108	0.49
Crystal 9849	253	0			2.16	117	0.14
Crystal 9855 (Aph)	227	0			1.68	91	0.43
Crystal 9877	248	0			1.34	73	0.02
Filler-3	269	0			1.65	89	0.35
HM 1643	237	0			1.18	64	0
HM 7066	223	0			2.51	136	0
HM 7073 (Rzm)	270	0			2.34	127	0.02
HM 7076 (Rzm)	263	0			1.32	71	0.01
HM 7080	238	0			1.81	98	0.86
HM 7082	230	0			1.17	63	0
HM 7083 (Rzm)	259	0			2.5	136	0
HM Hector (check #3)	218	0			2.51	136	0
HM RH5	262	0			2.82	153	0
Holly 97HX708	216	0			1.48	80	0.09
Holly 97HX712	265	0.28			1.64	89	0.33
Holly 97HX713	272	0			1.5	81	0.11
Holly 98APH03 (Aph)	245	0.28			1.71	92	0.51
Holly 98HX806	228	0			1.40	80	0.09
Holly 98HX825	250	0			1.31	71	0.01
Holly 98HX826	225	0			1.64	89	0.33
Holly 98HX828	260	0			1.65	89	0.36
Holly 98HX829	243	0			2.17	117	0.13
Holly Rival (Rzm)	226	0.28			2.01	109	0.43
Maribo 9363 (check #4)	275	0			1.36	74	0.02
Maribo 9757	278	0			1.48	80	0.09
Maribo 9767	261	0			1.34	72	0.02
Seedex SX1012	224	0			1.66	90	0.39
Seedex SX1015	266	0			2.16	117	0.15
Seedex SX1016	249	0			1.17	64	0
Van der Have H46109	257	0			1.83	99	0.93
Van der Have H46109rr (A	273	0			2.32	126	0.03
Van der Have H46140	233	0			2	108	0.46
Van der Have H66339	246	0			1.83	99	0.94
Van der Have H68108 (Ap	271	0			1.49	81	0.1
Van der Have H68151 (Ap	235	0			1.18	64	0
Van der Have H68152rr (A	240	0			2.18	118	0.12
Van der Have H68153 (Ap	241	0			2.17	118	0.13

	Bolters %	Vigor	Vigor %
Check Mean		1.85	
Coeff. of Var. (%)		28.06	
F Value		4.38 **	
Mean LSD (0.05)		0.6	32
Mean LSD (0.01)		0.78	42

Table 15. Combined Semi Commercial

1998 SOUTHERN MINNESOTA COMBINED SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Rec/T (lbs)			Rec/A (lbs)			Loss To Molasses			Sugar %			Yield (T/A)		
		Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val	Mean	%	P-Val
Beta 5216 (Aph)	222	285.19	105	0.01	6369	105	0.25	1.15	97	0.51	15.41	105	0	22.33	100	0.96
Beta 6904 (check #1)	254	290.08	107	0	5740	94	0.19	1.07	90	0.02	15.57	106	0	19.68	88	0
Beta M701 (Aph)	221	279.59	103	0.08	6613.8	109	0.04	1.1	93	0.08	15.08	103	0.11	23.56	105	0.13
Beta M703 (Blend)(Aph)	236	280.22	104	0.06	6401.5	105	0.2	1.08	92	0.03	15.09	103	0.1	22.7	101	0.87
Beta M704 (Aph)	255	293.01	108	0	6691.5	110	0.02	1.05	89	0.01	15.7	107	0	22.72	102	0.66
Beta M705 (Rzm-Aph)	242	267.9	99	0.62	5671.9	93	0.11	1.16	99	0.71	14.56	99	0.53	21.14	95	0.13
Beta M706 (Rzm-Aph)	232	274.79	102	0.41	6252.3	103	0.49	1.24	105	0.22	14.98	102	0.24	22.62	101	0.75
Beta M724 (Rzm)	279	257.84	95	0.02	5745.5	95	0.19	1.12	94	0.16	14	95	0	22.18	99	0.81
Beta M725 (Rzm)	256	235.99	87	0	5678.1	93	0.12	1.28	108	0.04	13.06	89	0	23.97	107	0.05
Beta M811 (Rzm-Aph)	274	284.18	105	0.01	7425	122	0	1.05	89	0.01	15.27	104	0.02	26.08	117	0
Beta M812 (Rzm-Aph)	247	257.34	95	0.01	5896.1	97	0.48	1.23	104	0.31	14.09	96	0.01	22.74	102	0.63
Beta M813 (Rzm-Aph)	264	274.88	102	0.4	6066.8	100	0.97	1.09	92	0.06	14.84	101	0.58	22.09	99	0.72
Beta M814 (Aph)	234	300.15	111	0	6300.8	104	0.37	1.08	91	0.03	16.08	109	0	20.97	94	0.08
Beta M815 (Aph)	219	301.46	111	0	7652.2	126	0	1.01	85	0	16.08	109	0	25.38	113	0
Beta M816 (Aph)	268	282.11	104	0.03	5689.1	94	0.13	1.11	94	0.14	15.22	103	0.03	20.11	90	0.01
Croplan CL 103	251	261.17	97	0.08	5615.3	92	0.07	1.18	100	0.97	14.24	97	0.05	21.43	96	0.24
Croplan CL 104	231	264.9	98	0.26	5838.2	96	0.35	1.15	97	0.48	14.39	98	0.18	22.02	98	0.66
Crystal 222 (Aph)	220	270.66	100	0.97	5830.3	96	0.33	1.21	102	0.54	14.74	100	0.87	21.45	96	0.25
Crystal 309 (check #2)	244	270.94	100	0.93	6177.5	102	0.69	1.24	105	0.2	14.79	101	0.72	22.68	101	0.7
Crystal 555 (Aph)	267	285.78	106	0	6151.1	101	0.77	1.16	99	0.72	15.46	105	0	21.4	96	0.22
Crystal 9709	258	269.67	100	0.87	5618.6	92	0.07	1.23	104	0.35	14.71	100	0.99	20.71	93	0.04
Crystal 9711	277	272.78	101	0.66	5947.1	98	0.61	1.18	99	0.89	14.82	101	0.84	21.69	97	0.39
Crystal 9817	229	265.52	98	0.34	6159.6	101	0.74	1.19	101	0.77	14.47	98	0.32	23.02	103	0.41
Crystal 9832	239	263.53	97	0.18	5484.2	90	0.02	1.21	102	0.59	14.38	98	0.17	20.7	93	0.04
Crystal 9835 (Aph)	252	279.29	103	0.09	6130.6	101	0.83	1.21	103	0.5	15.18	103	0.05	21.82	98	0.49
Crystal 9837	217	262.05	97	0.11	5700.7	94	0.14	1.27	108	0.05	14.37	98	0.16	21.71	97	0.4
Crystal 9845 (Aph)	276	277.03	102	0.21	5706.1	94	0.16	1.24	105	0.24	15.09	103	0.1	20.44	91	0.02
Crystal 9849	253	270.91	100	0.94	5535.9	91	0.04	1.18	100	0.94	14.72	100	0.94	20.3	91	0.01
Crystal 9855 (Aph)	227	265.67	98	0.35	5953.2	98	0.63	1.26	106	0.1	14.54	99	0.47	22.32	100	0.95
Crystal 9877	248	251.46	93	0	5642.5	93	0.09	1.24	105	0.18	13.82	94	0	22.09	99	0.73
Filler-3	269	277.1	102	0.2	5957.2	98	0.64	1.15	98	0.56	15.01	102	0.19	21.38	96	0.21
HM 1643	237	274.12	101	0.48	6138.7	101	0.8	1.15	97	0.52	14.86	101	0.52	22.29	100	0.92
HM 7066	223	262.92	97	0.15	5957.4	98	0.64	1.2	102	0.64	14.35	98	0.12	22.52	101	0.85
HM 7073 (Rzm)	270	269.6	100	0.86	5999.7	99	0.76	1.21	102	0.58	14.69	100	0.94	22.18	99	0.81
HM 7076 (Rzm)	263	253.16	94	0	6196.6	102	0.63	1.36	115	0	14.02	95	0	24.48	109	0.01
HM 7080	238	272.81	101	0.68	6558.7	108	0.06	1.16	99	0.72	14.8	101	0.7	23.96	107	0.05
HM 7082	230	267.48	99	0.56	5683.3	93	0.11	1.17	99	0.75	14.54	99	0.48	21.09	94	0.11
HM 7083 (Rzm)	259	255.91	95	0.01	5748.2	95	0.2	1.3	110	0.01	14.1	96	0.01	22.34	100	0.97
HM Hector (check #3)	218	264.08	98	0.22	5726.7	94	0.17	1.2	102	0.65	14.41	98	0.2	21.63	97	0.35
HM RH5	262	286.34	106	0	6255.3	103	0.48	1	85	0	15.32	104	0.01	21.83	98	0.49
Holly 97HX708	216	262.66	97	0.13	5843.4	96	0.36	1.23	105	0.25	14.37	98	0.15	22.22	99	0.06
Holly 97HX712	265	275.29	102	0.38	5544.9	91	0.04	1.15	99	0.56	14.92	101	0.37	20.14	90	0.01
Holly 97HX713	272	269.93	100	0.91	5885.2	97	0.45	1.21	102	0.6	14.7	100	1	21.71	97	0.4
Holly 98APH03 (Aph)	245	265.12	98	0.3	6761.8	111	0.01	1.26	107	0.08	14.62	99	0.41	25.61	114	0
Holly 98HX806	228	279.01	103	0.1	6355.7	105	0.27	1.11	94	0.13	15.06	102	0.13	22.73	102	0.65
Holly 98HX825	250	269.05	99	0.78	5861.9	96	0.4	1.16	100	0.95	14.64	100	0.77	21.61	97	0.34
Holly 98HX826	225	264.8	98	0.27	5096.0	84	0	1.19	100	0.92	14.42	98	0.23	19.31	86	0
Holly 98HX828	260	250.55	93	0	4995.9	82	0	1.24	105	0.2	13.77	94	0	19.9	89	0
Holly 98HX829	243	283.39	105	0.02	7224	119	0	1.1	93	0.08	15.27	104	0.02	25.33	113	0
Holly Rival (Rzm)	226	252.66	93	0	5761.3	95	0.22	1.32	112	0	13.95	95	0	22.59	101	0.78
Maribo 9363 (check #4)	275	270.18	100	0.95	5690.8	94	0.13	1.24	105	0.2	14.75	100	0.85	20.98	94	0.09
Maribo 8757	278	270.65	100	0.98	5990.2	99	0.74	1.23	104	0.34	14.76	100	0.83	22.03	98	0.67
Maribo 9767	281	260.85	96	0.07	5829.7	96	0.33	1.29	109	0.02	14.33	97	0.11	21.96	98	0.61
Seedex SX1012	224	274.54	101	0.44	6237.6	103	0.52	1.11	94	0.11	14.83	101	0.56	22.63	101	0.74
Seedex SX1015	266	254.64	94	0	5337.3	88	0	1.22	103	0.39	13.95	95	0	20.83	93	0.05
Seedex SX1016	249	267.07	99	0.51	5749.5	95	0.2	1.2	101	0.73	14.55	99	0.51	21.53	96	0.29
Van der Have H46109	257	285.62	106	0	7225.9	119	0	1.05	89	0.01	15.34	104	0.01	25.25	113	0
Van der Have H46109rr (Aph-Rzm)	273	281.12	104	0.04	6942	114	0	1.08	91	0.03	15.14	103	0.07	24.61	110	0.01
Van der Have H46140	233	281.81	104	0.03	6555.6	108	0.06	1.09	92	0.06	15.18	103	0.04	23.12	103	0.34
Van der Have H66339	246	257.92	95	0.02	5498.6	91	0.03	1.25	106	0.16	14.14	96	0.02	21.25	95	0.16
Van der Have H68108 (Aph)	271	267.83	99	0.61	6896.5	114	0	1.28	108	0.04	14.67	100	0.87	25.71	115	0
Van der Have H68151 (Aph)	235	273.48	101	0.56	6949.4	114	0	1.15	98	0.57	14.83	101	0.59	25.34	113	0
Van der Have H68152rr (Aph-Rzm)	240	261.16	97	0.08	6756.2	111	0.01	1.28	108	0.04	14.33	97	0.11	25.95	116	0
Van der Have H68153 (Aph)	241	252.74	93	0	5993.4	99	0.74	1.26	107	0.08	13.9	95	0	23.62	106	0.12

	Rec/T (lbs)		Rec/A (lbs)		Loss To Molasses		Sugar %		Yield (T/A)	
Check Mean	270.49		6075.8		1.18		14.71		22.37	
Coeff. of Var. (%)	4.74		9.31		9.65		3.94		8.03	
F Value	5.68 **		4.54 **		2.82 **		5.64 **		4.21 **	
Mean LSD (0.05)	14.69	5	717.21	12	0.13	11	0.66	4	2.24	10
Mean LSD (0.01)	19.53	7	953.45	16	0.18	15	0.88	6	2.98	13

* Significant at 5%. ** Significant at 1%. Ns Not significant.
2nd column for each trait is percent of check. General Mean used as check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance. chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

Table 15. Combined Semi Commercial

1998 SOUTHERN MINNESOTA COMBINED SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	NA (ppm) Mean	NA %	NA P-Val	K (ppm) Mean	K %	K P-Val	Am. N. (ppm) Mean	Am. N. %	Am. N. P-Val	Tare (%) Mean	Tare %	Tare P-Val
Beta 5216 (Aph)	222	398.52	80	0.01	1638.9	98	0.53	310.58	108	0.36	3.3	95	0.68
Beta 6904 (check #1)	254	444.17	89	0.16	1539.3	92	0.01	258.8	89	0.2	4.13	119	0.1
Beta M701 (Aph)	221	445.24	89	0.17	1521.1	91	0	284.59	99	0.88	3.26	94	0.61
Beta M703 (Blend)(Aph)	236	446.64	89	0.18	1550.3	93	0.02	262.01	91	0.28	2.85	82	0.12
Beta M704 (Aph)	255	368.09	74	0	1594.4	95	0.13	258.07	90	0.22	3.26	94	0.61
Beta M705 (Rzm-Aph)	242	455.02	91	0.25	1758.9	105	0.08	266.76	93	0.38	3.41	98	0.89
Beta M706 (Rzm-Aph)	232	485.97	97	0.71	1859.5	111	0	288.17	100	1	3.22	93	0.54
Beta M724 (Rzm)	279	522.36	104	0.58	1564.2	94	0.04	258.96	90	0.23	2.84	82	0.12
Beta M725 (Rzm)	256	652.35	130	0	1589.7	95	0.11	328.25	114	0.1	3.19	92	0.49
Beta M811 (Rzm-Aph)	274	421.56	84	0.05	1602.5	96	0.18	234.76	81	0.03	3.25	94	0.59
Beta M812 (Rzm-Aph)	247	514.43	103	0.73	1730.2	104	0.23	303.98	105	0.51	4.08	118	0.12
Beta M813 (Rzm-Aph)	264	427.26	85	0.07	1674.8	100	0.93	243.6	85	0.07	2.61	75	0.03
Beta M814 (Aph)	234	320.09	64	0	1610.3	96	0.23	291.03	101	0.91	2.92	84	0.17
Beta M815 (Aph)	219	359.46	72	0	1525.4	91	0	242	84	0.06	3.14	91	0.41
Beta M816 (Aph)	268	444.65	89	0.16	1425.8	85	0	320.01	111	0.19	3.39	98	0.86
Croplan CL 103	251	552.61	110	0.19	1565.5	94	0.04	299.37	104	0.64	3.44	99	0.96
Croplan CL 104	231	461.25	92	0.32	1658.8	99	0.82	280.88	97	0.76	2.95	85	0.2
Crystal 222 (Aph)	220	419.94	84	0.05	1669.7	100	0.99	340.56	118	0.03	3.3	95	0.68
Crystal 309 (check #2)	244	493.39	99	0.86	1910.7	114	0	273.41	95	0.54	4.71	136	0
Crystal 555 (Aph)	267	346.09	69	0	1630.1	98	0.42	341.82	119	0.03	5.95	172	0
Crystal 9708	258	539.63	108	0.33	1721.2	103	0.31	292.86	102	0.85	3.38	98	0.83
Crystal 9711	277	570.52	114	0.08	1669.9	100	1	257.46	89	0.21	2.82	81	0.1
Crystal 9817	229	620.76	124	0	1637.2	98	0.51	260.94	91	0.26	2.65	77	0.04
Crystal 9832	239	511.48	102	0.78	1655	99	0.76	306.7	106	0.44	3.38	98	0.83
Crystal 9835 (Aph)	252	488.16	98	0.75	1660.5	99	0.85	320.08	111	0.19	3.59	104	0.75
Crystal 9837	217	581.55	116	0.04	1783.9	107	0.03	299.37	104	0.64	2.92	84	0.17
Crystal 9845 (Aph)	276	463.07	93	0.35	1777.4	106	0.03	314.69	109	0.27	3.98	115	0.19
Crystal 9849	253	503.08	100	0.95	1601.7	96	0.17	301.97	105	0.57	3.75	108	0.46
Crystal 9855 (Aph)	227	544.9	109	0.27	1722	103	0.3	320.2	111	0.19	3.8	110	0.4
Crystal 9877	248	626.85	125	0	1764.1	106	0.06	265.93	92	0.36	2.54	73	0.02
Filler-3	269	443.80	89	0.16	1706.2	102	0.47	278.14	97	0.68	4.95	143	0
HM 1643	237	497.32	99	0.93	1452	87	0	324.36	113	0.14	4.31	125	0.03
HM 7066	223	471.46	94	0.46	1564.1	94	0.04	345.13	120	0.02	3.21	93	0.52
HM 7073 (Rzm)	270	509.23	102	0.83	1740	104	0.17	285.65	99	0.92	3.27	94	0.62
HM 7078 (Rzm)	263	638.51	128	0	1961.7	117	0	300.17	104	0.62	3.46	100	1
HM 7080	238	515.77	103	0.7	1626.8	97	0.39	281.2	98	0.77	3.31	96	0.7
HM 7082	230	390.80	78	0.01	1663.3	100	0.89	318.8	111	0.21	3.29	95	0.66
HM 7083 (Rzm)	259	624.47	125	0	1833.5	110	0	292.17	101	0.87	3.66	106	0.62
HM Hector (check #3)	218	516.91	103	0.68	1620.6	97	0.32	308.77	107	0.4	4.29	124	0.04
HM RH5	262	384.76	77	0	1546.5	93	0.02	225.44	78	0.01	3.35	97	0.77
Holly 97HX706	216	526.84	105	0.51	1654.7	99	0.76	322.16	112	0.16	3.07	89	0.32
Holly 97HX712	265	543.82	109	0.28	1559.3	93	0.03	282.56	98	0.82	3.67	106	0.59
Holly 97HX713	272	589.32	118	0.03	1621.5	97	0.33	285.65	99	0.92	3.35	97	0.78
Holly 98APH03 (Aph)	245	513.37	103	0.75	1774.4	106	0.04	319.79	111	0.19	3.35	97	0.78
Holly 98HX806	228	447.73	89	0.19	1554.8	93	0.02	283.78	98	0.86	3.94	114	0.23
Holly 98HX825	250	581.27	116	0.05	1610.2	96	0.23	275.15	95	0.59	2.64	76	0.04
Holly 98HX826	225	602.83	120	0.01	1537.6	92	0.01	289.46	100	0.98	3.77	109	0.44
Holly 98HX828	260	690.52	138	0	1630.8	98	0.43	276.01	96	0.62	3.54	102	0.84
Holly 98HX829	243	361.45	72	0	1719.9	103	0.32	259.05	90	0.23	3.56	103	0.81
Holly Rival (Rzm)	226	525.66	105	0.53	1976.1	118	0	304.87	106	0.49	3.03	87	0.27
Maribo 9363 (check #4)	275	601.53	120	0.01	1767.3	106	0.06	270.41	94	0.48	3.48	100	0.97
Maribo 9757	278	614.64	123	0.01	1699.3	102	0.56	273.55	95	0.55	3.79	110	0.4
Maribo 9767	261	666.2	133	0	1700.8	102	0.54	303.71	105	0.52	3.17	91	0.45
Seedex SX1012	224	400.4	80	0.01	1700.2	102	0.55	260.6	90	0.26	3.62	105	0.69
Seedex SX1015	266	569.18	114	0.09	1599.3	96	0.16	313.27	109	0.3	3.43	99	0.94
Seedex SX1016	249	514.73	103	0.72	1636.2	98	0.6	303	105	0.54	3.45	100	0.97
Van der Have H46109	257	352.13	70	0	1674	100	0.94	244.31	85	0.07	3.94	114	0.23
Van der Have H46109rr (Aph-Rzm)	273	384.68	77	0	1619.5	97	0.31	265.49	92	0.35	4.17	120	0.08
Van der Have H46140	233	371.93	74	0	1699.9	102	0.55	258.81	90	0.23	3.72	108	0.51
Van der Have H68339	246	538.02	107	0.35	1671.1	100	0.99	325.21	113	0.13	2.98	86	0.23
Van der Have H68108 (Aph)	271	475.19	95	0.52	1901.4	114	0	310.77	108	0.35	3.4	98	0.88
Van der Have H68151 (Aph)	235	495.94	99	0.91	1642.5	98	0.58	274.42	95	0.57	3.17	91	0.45
Van der Have H68152rr (Aph-Rzm)	240	628.74	126	0	1809.4	108	0.01	280.84	97	0.76	2.92	84	0.17
Van der Have H68153 (Aph)	241	619.8	124	0	1806.3	108	0.01	272.74	95	0.52	3.38	98	0.84

	NA (ppm)		K (ppm)		Am. N. (ppm)		Tare (%)	
Check Mean	500.6		1670.2		288.15		3.46	
Coeff. of Var. (%)	23.04		7.89		18.88		29.64	
F Value	5.16 **		5.07 **		1.29 ns		2.09 **	
Mean LSD (0.05)	112.58	22	141.45	8	68.59	24	1.12	32
Mean LSD (0.01)	149.66	30	188.02	11	91.18	32	1.49	43

Table 15. Combined Semi Commercial

1998 SOUTHERN MINNESOTA COMBINED SEMI COMMERCIAL CODED TEST
AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER

ENTRY	CODE	Bolters % Mean	Bolters % %	Bolters % P-Val	Vigor Mean	Vigor %	Vigor P-Val
Beta 5216 (Aph)	222	0			1.44	81	0.09
Beta 6904 (check #1)	254	0			1.83	104	0.7
Beta M701 (Aph)	221	0			1.83	104	0.72
Beta M703 (Blend)(Aph)	236	0			2.08	118	0.09
Beta M704 (Aph)	255	0			2.76	157	0
Beta M705 (Rzm-Aph)	242	0			2	114	0.2
Beta M706 (Rzm-Aph)	232	0			1.94	110	0.34
Beta M724 (Rzm)	279	0			1.51	86	0.19
Beta M725 (Rzm)	256	0			1.07	61	0
Beta M811 (Rzm-Aph)	274	0			2.02	115	0.17
Beta M812 (Rzm-Aph)	247	0			1.65	94	0.57
Beta M813 (Rzm-Aph)	264	0			1.99	113	0.23
Beta M814 (Aph)	234	0			1.93	110	0.37
Beta M815 (Aph)	219	0			2.51	143	0
Beta M816 (Aph)	208	0			1.68	95	0.67
Croplan CL 103	251	0			1.91	109	0.42
Croplan CL 104	231	0			2.09	118	0.09
Crystal 222 (Aph)	220	0			1.82	103	0.75
Crystal 309 (check #2)	244	0			1.15	65	0
Crystal 555 (Aph)	267	0			1.66	94	0.57
Crystal 9708	258	0.14			1.85	105	0.64
Crystal 9711	277	0			2.53	143	0
Crystal 9817	229	0			1.58	90	0.33
Crystal 9832	239	0			1.95	111	0.32
Crystal 9835 (Aph)	252	0			2.18	124	0.03
Crystal 9837	217	0			1.91	109	0.42
Crystal 9845 (Aph)	276	0			1.9	108	0.45
Crystal 9849	253	0			2	113	0.21
Crystal 9855 (Aph)	227	0			1.52	86	0.19
Crystal 9877	248	0			1.4	79	0.06
Filler-3	269	0			1.54	88	0.25
HM 1843	237	0			1.09	62	0
HM 7066	223	0			2.18	124	0.03
HM 7073 (Rzm)	270	0			2.25	127	0.01
HM 7076 (Rzm)	263	0			1.41	80	0.07
HM 7080	238	0			1.57	89	0.3
HM 7082	230	0			1.09	62	0
HM 7083 (Rzm)	259	0			2.33	132	0
HM Hector (check #3)	218	0			2.09	119	0.08
HM RH5	262	0			2.48	141	0
Holly 97HX708	216	0			1.57	89	0.31
Holly 97HX712	265	0.14			1.49	85	0.15
Holly 97HX713	272	0			1.42	80	0.07
Holly 98APH03 (Aph)	245	0.14			1.61	91	0.42
Holly 98HX806	228	0			1.3	74	0.02
Holly 98HX825	250	0			1.25	71	0.01
Holly 98HX826	225	0			1.39	79	0.05
Holly 98HX828	260	0			1.42	80	0.07
Holly 98HX829	243	0			2.08	118	0.09
Holly Rival (Rzm)	226	0.14			1.69	96	0.69
Maribo 9363 (check #4)	275	0			1.44	82	0.09
Maribo 9757	278	0			1.73	98	0.88
Maribo 9767	261	0			1.41	80	0.06
Seedex SX1012	224	0			1.59	90	0.37
Seedex SX1015	266	0			1.91	108	0.43
Seedex SX1016	249	0			1.09	62	0
Van der Have H46108	257	0			1.74	99	0.92
Van der Have H46109rr (Aph-Rzm)	273	0			1.99	113	0.23
Van der Have H46140	233	0			1.91	109	0.42
Van der Have H66339	246	0			1.67	95	0.63
Van der Have H68108 (Aph)	271	0			1.66	94	0.6
Van der Have H68151 (Aph)	235	0			1.66	94	0.56
Van der Have H68152rr (Aph-Rzm)	240	0			2.1	119	0.07
Van der Have H68153 (Aph)	241	0			1.91	109	0.42

	Bolters %	Vigor Mean	Vigor %	Vigor P-Val
Check Mean		1.76		
Coeff. of Var. (%)		29.48		
F Value		3.93 **		
Mean LSD (0.05)		0.53	30	
Mean LSD (0.01)		0.71	40	

INSECTICIDE AND METHYLATED OIL INFLUENCE ON MICRO RATE EFFICACY

OBJECTIVE: Evaluate the effect of Lorsban and Asana insecticides on micro rates efficacy with various methylated oils.

EXPERIMENTAL PROCEDURE

Sugarbeets were planted on April 17, 1998. Experimental design was RCBD with four replications. Treatments were applied with a bicycle spray at 40 psi and 8.5 gal/acre. Applications were made when sugarbeets were cotyledon and 4 leaf. Sugarbeets were evaluated for injury and weed control was also evaluated.

RESULTS

Injury to sugarbeets was insignificant regardless of time of application. There was significant differences between treatments for giant foxtail and lambsquarter control. However, the effect of methylated oil or insecticide was not consistent. There was not one specific insecticide or methylated oil that consistently gave greater weed control when mixed with micro rates. The effect of the various methylated oils or insecticides on precipitation of micro rate components is unclear. Further evaluation of products needs to be reviewed.

Table 1. Insecticide and methylated oil influence on micro rate efficacy and crop injury

Treatment	Insecticide	Sugarbeet % Injury		Giant Foxtail % Control	Lambsquarter % Control
		Cotyledon	4 leaf		
Micro rate+Methyl. oil 1	None	0	0	65	86
Micro rate+Methyl. oil 2	None	0	0	60	90
Micro rate+Methyl. oil 3	None	0	0	67	83
Micro rate+Methyl. oil 1	Lorsban	0	0	55	80
Micro rate+Methyl. oil 2	Lorsban	0	0	65	83
Micro rate+Methyl. oil 3	Lorsban	0	0	60	88
Micro rate+Methyl. oil 1	Asana	0	0	60	85
Micro rate+Methyl. oil 2	Asana	0	0	66	88
Micro rate+Methyl. oil 3	Asana	0	0	70	92
LSD (0.05)		NS	NS	7	5

Micro rate = .5 pt. Betanex + 1/8 oz. Upbeet + 1.25 oz. Stinger
Methyl. oil 1 = Generic methylated oil
Methyl. oil 2 = Silicone based methylated oil
Methyl. oil 3 = Highly refined methylated oil

MICRO RATE EFFICACY AS INFLUENCED BY SPRAY INTERVAL

OBJECTIVE: To evaluate weed control and sugarbeet injury as influenced by time between sprays.

EXPERIMENTAL PROCEDURE

Sugarbeets were planted on April 17, 1998. Treatments were initiated at the cotyledon stage of sugarbeets. Treatments were applied with a bicycle sprayer with 8001 nozzles at 3 mph with 8.5 gal/acre. All treatments were sprayed with micro rate mixture as follows:

.5 pt.	Betanex
1/8 oz.	Upbeet
1.25 oz.	Stinger
1 pt.	Methylated seed oil

Spraying was conducted in four treatments. The treatments were applied at 7, 10, 14 and 18 days between sprays. These four spray intervals were evaluated for lambsquarter control and sugarbeet injury with above mentioned micro rate mixtures.

RESULTS

Sugarbeet injury (table 1) was insignificant regardless of spray interval. Lambsquarter control was significantly higher at 7 and 10 days between sprays compared to 14 and 18 days between sprays. Furthermore, the spray mixture was more effective at 14 days between sprayings compared to 18 days between sprayings.

Table 1. Micro rate lambsquarter control and sugarbeet injury as influenced by time between sprays.

Day Interval	Sugarbeet % Injury	Lambsquarter % Control
7	0	90
10	0	92
14	0	80
18	0	70
LSD (0.05)	NS	8

POSTEMERGENCE HERBICIDES IN SUGARBEETS APPLIED IN BAND AND BROADCAST AT VARIOUS PRESSURE

OBJECTIVE: Evaluate postemergence herbicides applied in band and broadcast at 40 and 100 psi.

EXPERIMENTAL PROCEDURE

Sugarbeets were planted on April 17, 1998. Experimental design was RCBD with four replications. Treatments were applied with a high pressure sprayer. Treatments were applied at cotyledon, two leaf and four leaf sugarbeets. Sugarbeets were evaluated for injury and weed control was also evaluated.

RESULTS

Sugarbeet injury was significantly increased with only one treatment, Betanex at 100 psi in a band. Lambsquarter control was generally higher with micro rates compared to Betanex treatments. Lambsquarter tended to be greater with Betanex when psi was 100 compared to 40. Micro rates gave similar control regardless of psi. Lambsquarter control was not consistently effected by band or broadcast application.

Table 1.

Treatments	Pressure	Sugarbeet % Injury	Lambsquarter % Control
Broadcast Betanex*	40	0	65
Broadcast Betanex*	100	3	80
Band Betanex*	40	0	70
Band Betanex*	100	7	75
Broadcast Micro Rate**	40	0	85
Broadcast Micro Rate**	100	0	88
Band Micro Rate**	40	0	90
Band Micro Rate**	100	3	85
LSD (0.05)		3	8

Micro-rates of sugarbeet herbicides plus additives, Maynard, 1998. (Dexter) 'Hilleshog Viking' sugarbeet was seeded April 23. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 6, May 13 and May 20. Sugarbeet injury and wild proso millet, common lambsquarters and redroot pigweed control were evaluated June 18.

Date	May 6	May 13	May 20
Time of Day	3:00 PM	1:45 PM	11:00 AM
Sugarbeet Stage	cotyledon	2 leaf	4 leaf
Wild Proso Millet	0.25 inches tall	0.25 to 1 inch tall	2.5 inches tall
Common Lambsquarters	cotyledon	cotyledon – 1 inch tall	cotyledon – 2 inches tall
Redroot Pigweed	cotyledon	cotyledon – 1 inch tall	cotyledon – 2 inches tall

Treatment*	Rate	Wipm cntl	Colq cntl	Rrpw cntl	Sgbt inj
	lb/A	%	%	%	%
Desmedipham	0.25	41	84	74	0
Desmedipham+Triflusulfuron	0.25+0.0156	74	95	95	0
Desm+Tfsu+Clopyralid	0.25+0.0156+0.09	78	99	97	0
Desm+Tfsu+Clopyralid	0.16+0.008+0.06	69	98	97	1
Desm+Tfsu+MethOil	0.08+0.004+1.5%	74	88	88	0
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	60	82	80	0
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.03+3%	73	96	84	1
Desm+Tfsu+Clpy+NH4+MethOil	0.08+0.004+0.03+0.02%+1.5%	40	73	80	0
Desm+Tfsu+Clpy+Quad 7	0.08+0.004+0.03+1%	75	94	91	0
Desm+Tfsu+Clpy+Quad 7+MethOil	0.08+0.004+0.03+1%+1.5%	50	80	83	0
Desm+Tfsu+Clpy+Quad 7	0.08+0.004+0.03+2%	65	88	87	0
Desm+Tfsu+Clpy+NH4+Quad 7	0.08+0.004+0.03+0.02%+1%	40	90	95	0
Desm+Tfsu+Clpy+Clet+MethOil	0.08+0.004+0.03+0.03+1.5%	86	92	95	0
Desm+Tfsu+Clpy+Clet+NH4+MOil	.08+.004+.03+.03+.02%+1.5%	90	95	93	0
Desm+Tfsu+Clpy+Clet+Quad 7	0.08+0.004+0.03+0.03+1%	66	85	76	0
Desm&Phen+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	76	96	88	0
Desm&Phen&Etho+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	61	92	93	0
Desm+Tfsu+Clpy+Diflufen+MOil	0.08+0.004+0.03+0.05+1.5%	72	95	84	76
Desm+Tfsu+Clpy+Qufp+MethOil	0.08+0.004+0.03+0.028+1.5%	86	93	85	0
EXP MEAN		67	90	87	4
C.V. %		29	13	14	190
LSD 5%		27	NS	NS	11
LSD 1%		36	NS	NS	15
# OF REPS		4	4	4	4

*MethOil=methylated seed oil from Terra; Quad 7=basic blend adjuvant from AGSCO; NH_4=household ammonia(2% concentration) at 1 gallon/100 gallon water.

Summary

Only desmedipham + triflusulfuron + clopyralid + diflufenzopyr + MethOil gave significant sugarbeet injury. Weed control was similar with all treatments.

Micro-rates of sugarbeet herbicides plus additives, Clara City, 1998. (Dexter) Sugarbeet was seeded April 25. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots

Date	May 6	May 13	May 20
Time of Day	1:15 PM	12:00 PM	1:00 PM
Sugarbeet Stage	cotyledon	2 to 3 leaf	4 to 6 leaf
Common Lambsquarters	cotyledon - 1 inch tall	cotyledon – 2 inch tall	cotyledon – 3 inch tall

May 6, May 13 and May 20. Sugarbeet injury and common lambsquarters control were evaluated June 19.

Treatment*	Rate	Colq cntl	Sgbt inj
	lb/A	%	%
Desmedipham	0.25	87	0
Desmedipham+Triflusulfuron	0.25+0.0156	92	0
Desm+Tfsu+Clopyralid	0.25+0.0156+0.09	97	0
Desm+Tfsu+Clopyralid	0.16+0.008+0.06	96	0
Desm+Tfsu+MethOil	0.08+0.004+1.5%	83	0
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	87	0
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.03+3%	93	0
Desm+Tfsu+Clpy+NH4+MethOil	0.08+0.004+0.03+0.02%+1.5%	86	0
Desm+Tfsu+Clpy+Quad 7	0.08+0.004+0.03+1%	84	0
Desm+Tfsu+Clpy+Quad7+MethOil	0.08+0.004+0.03+1%+1.5%	89	0
Desm+Tfsu+Clpy+Quad 7	0.08+0.004+0.03+2%	79	0
Desm+Tfsu+Clpy+NH4+Quad 7	0.08+0.004+0.03+0.02%+1%	65	0
Desm+Tfsu+Clpy+Clet+MethOil	0.08+0.004+0.03+0.03+1.5%	95	0
Desm+Tfsu+Clpy+Clet+NH4+Moil	0.08+.004+.03+.03+.02%+1.5%	88	0
Desm+Tfsu+Clpy+Clet+Quad 7	0.08+0.004+0.03+0.03+1%	72	0
Desm&Phen+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	92	0
Desm&Phen&Etho+Tfsu+Clpy+MethOil	0.08+0.004+0.03+1.5%	90	0
Desm+Tfsu+Clpy+Diflufenzopyr+Moil	0.08+0.004+0.03+0.05+1.5%	98	94
Desm+Tfsu+Clpy+Qufp+MethOil	0.08+0.004+0.03+0.028+1.5%	81	0
EXP MEAN		87	5
C.V. %		13	12
LSD 5%		17	1
LSD 1%		NS	1
# OF REPS		4	4

*MethOil=methylated seed oil from Terra; Quad 7=basic blend adjuvant from AGSCO; NH_4=household ammonia(2% concentration) at 1 gallon/100 gallon water.

Summary

Only desmedipham + triflusulfuron + clopyralid + diflufenzopyr + MethOil gave sugarbeet injury. Desmedipham + triflusulfuron + clopyralid + NH_4 + Quad 7 gave less control of common lambsquarters than other treatments.

THE EFFECT OF SOIL pH ON SUGARBEET YIELD AND HERBICIDE DEGRADATION

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INTRODUCTION

Pursuit and Raptor are selective imidazolinone herbicides that are used to control grass and broadleaf weed species in soybean and other leguminous crops. One of the most important processes affecting the fate of herbicides in the field is sorption, which is the binding of the herbicide to the soil particle. Sorption controls the availability of the herbicide to the target plant, availability to soil microorganisms which degrade the herbicide and the movement of the herbicides through the soil profile. Sorption is affected by a number of soil properties and by the nature of the herbicide. One of the most important factors affecting the field persistence (carryover) of Pursuit and Raptor is soil pH. In soils with lower pH levels, sorption of these herbicides can also be influenced by soil OC content (Oliveira et al., 1997). A study by Loux and Reese (1992) suggested that Pursuit carryover increased as soil pH decreased depending on soil type. Soils that contained a high organic carbon content and a higher clay content were found to have greater Pursuit carryover than soils with lower organic carbon and clay (Goetz et al. 1989, Loux et al. 1988).

Carryover of Pursuit may result in injury to non-target plants in years following herbicide application. Pursuit carryover limits the choices of rotational crops. Sugarbeet is the most susceptible crop to Pursuit and 0.54 ppb of Pursuit in soil will cause injury. Turnip is injured by 1.03 ppb and rapeseed by 3.30 ppb. Grain sorghum is less sensitive at 5.68 ppb, but sorghum has been injured by Pursuit carryover (Onofri, 1996).

The objectives of this research were to determine the influence of Pursuit and Raptor on sugarbeet yield; to determine if increasing soil pH with spent lime would decrease Pursuit and Raptor persistence; and to determine the effectiveness of spent lime for increasing soil pH.

MATERIALS AND METHODS

Field Experiment - 1996: Two field locations in Southern MN were selected with soil pH of 5.1 to 6.0. The organic carbon content of the two fields ranged from 2.1 to 2.3%. Soils were limed at 3.4 and 11.4 ton/A with spent calcium carbonate from the nearby Southern Minnesota Beet Sugar Cooperative processing plant at Renville, MN. The 3.4 and 11.4 ton/A of spent lime was equivalent to 3 and 10 ton/A of virgin lime. Field one was seeded in 22-inch rows with "Pioneer 9137" soybean. Field two was seeded in 22-inch rows with "Land O Lake 0946" soybean. Pursuit at 0.06 lb/A was applied to soybean in both fields at the 3 to 4 trifoliate leaf stage. A randomized complete block design with four replicates was used. Field plot size was 25x55 feet, with the middle 20x50 feet treated. Soils samples 6-inches deep were collected from limed and unlimed plots at three times during the growing saeson; immediately after herbicide application and at 9 and 18 weeks after application. Five samples were taken from each plot and combined, large particles of foreign matter were removed and soil was screened using a 20 mesh "micrometer 850" sieve. Soil samples were frozen at 4° C for soil pH and HPLC analysis.

Field Experiment-1997: Field one was seeded with "Viking" sugarbeet in 22-inch rows. Sugarbeet was hand harvested from one row 10 ft in length. The sugarbeet root yield was determined using the following equation; *ton/A net = clean wgt lbs/ % of A /2000*. Sugarbeet was analyzed for % sugar, sodium content, potassium content and amino nitrogen content. Extractable sucrose content was calculated from this analysis using the equations below:

*Purity index = ((3.5 * Na ppm) + (2.5 * K ppm) + 9.5 *AmN ppm))/ % sucrose*

*Sugar loss lb/A= (Purity index * (% sugar/100) * ton/A net * 1.5)/10,000*

*Extractable sucrose lb/A= ((ton/A net * (% sugar/100)) - sugar loss) * 2000*

Field Experiment-1998: Field two was seeded with "American Crystal 309"sugarbeet in 22-inch rows. Yield data was obtained by hand harvesting two rows 10 ft in length. The sugarbeet root yield was determined using the equation previously presented and sugarbeet was analyzed for % sucrose. Extractable sucrose content was calculated using the equations previously presented.

Soil Analyses: Pursuit and Raptor was measured in two sub samples from each plot sample. Pursuit and Raptor residues were extracted by shaking 25 g of soil with 100 ml of 0.5 N sodium hydroxide for 1 hr. Samples were centrifuged for 15 min at 5000 rpm and 80 ml of the supernatant was decanted. The pH of the supernatant was adjusted to 1.7 with 6N HCL, and 5 g of celite was added, the contents were stirred and filtered through a 12.5 cm glass fiber filter. The extract was then applied to a MegaBond-Elut C18-0H cartridge which had been prepared with 5 ml of methanol and 5mL of Milli-Q water. The C18-0H cartridge was eluted, using 40 ml of 50% methanol water, onto a Megabond-Elut SCX cartridge which had been prepared with 5 ml of hexane, 5 ml of methanol and 5 ml of Milli-Q water. The SCX column was eluted using 30 ml of saturated potassium chloride in methanol into a round bottom flask. One ml of Milli-Q water was added to the flask. The sample was evaporated to near dryness and re-dissolved in 10 ml of pH 2.0 water. The sample was transferred to a separatory funnel to which 25 ml of methylene chloride was added. The sample was shaken for 1 min. The bottom layer was then drawn off and this procedure was repeated twice. One ml of Milli-Q water was added and the sample was evaporated to near dryness and then re-evaporated with 20 ml of methanol. The sample was re-dissolved in 5 ml of Milli-Q water. Pursuit and Raptor concentration was determined using high performance liquid chromatography (Hewlett Packard 1050) equipped with a UV detector at a wavelength of 254 nm. Liquid chromatography separation was performed on a C8 reversed-phase column with a mobile phase of acetonitrile:water:formic acid (32:66:2) at a flow rate of 1.00 ml/min. Sample injection volume was 200 uL.

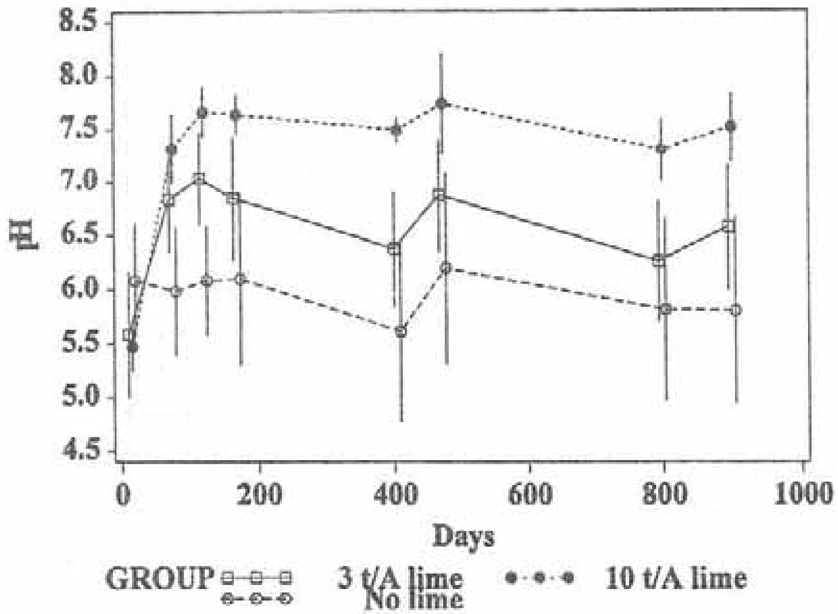
A linear calibration curve based on peak area was generated using known Pursuit and Raptor concentrations ranging from 0.05 μg/ml to 1 μg/ml. The stock solution for both chemicals consisted of analytical grade herbicide (chemical purity > 99%) dissolved in one ml of acetone and diluted with milli-Q water. The concentration of Pursuit and Raptor in extracts from soil samples was determined by entering peak area values into a regression equation describing the calibration curve.

Greenhouse: Pre-germinated Pursuit-resistant and susceptible canola were seeded at 10 lb/A into soil samples taken from limed and unlimed plots. Soil from three sampling times was used, immediately after herbicide application, and after 9 and 18 weeks. Canola growth was measured over a three week period.

RESULTS AND DISCUSSION

Soil pH increase with time in plots that were limed. Figure 1 illustrates the change in pH over the course of the experiment at Field two. Unlimed field plot soil pH did not significantly change over the course of the experiment. The soil pH generally increased by one pH unit in the field plots limed at 3 ton/A. At the 10 ton/A rate, field plot soil pH rose approximately two pH units. The pH was relatively stable over three growing seasons. Pursuit and Raptor had no influence on soil pH.

Figure 1. The effect of spent lime (mean + or - 1 s.d.) on soil pH at Field 2.



Both locations were limed and herbicides were applied in 1996. Field one was planted to sugarbeet the following year in 1997, while Field two was seeded to wheat. Field one Raptor treated plots and plots not treated with herbicide (control plots) produced greater sugarbeet root yield, extractable sucrose and percent sucrose where lime was used to increase soil pH (Table 1). Control plots that were limed at 3 ton/A produced root yield 8.4 ton/A higher than unlimed control plots. The control plots limed at 10 ton/A produced root yield 7.1 ton/A higher than unlimed control plots. The control plots limed at 3 ton/A produced extractable sucrose 2600 lb/A higher than unlimed control plots. The control plots limed at 10 ton/A produced 2400 lb/A more extractable sucrose than unlimed control plots. The sucrose percentage increased ~0.7-0.8% in the control plots limed at 3 and 10 ton/A compared to the untreated control plots.

Field one plots that were limed and treated with Raptor produced greater sugarbeet root yield, extractable sucrose and percent sucrose than unlimed plots treated with Raptor (Table 1). However, damage from the herbicide was still apparent one year after application of Raptor since Raptor treated plots yielded loss than the equivalent limed and unlimed control plots. Plots limed at 3 ton/A and treated with Raptor produced sugarbeet root yield 3.6 ton/A higher than unlimed plots treated with Raptor. Plots that were limed at10 ton/A and treated with Raptor produced sugarbeet root yield 7.2 ton/A greater than unlimed plots treated with Raptor. Extractable sucrose yield was greater in limed plots with higher soil pH as compared to unlimed plots.. Extractable sucrose yield was1200 lb/A higher in field plots that were limed at 3 ton/A and treated with Raptor, than in plots that were unlimed and treated with Raptor. The Raptor treated plots limed at 10 ton/A produced 2100 lb/A more extractable sucrose than Raptor treated plots that were unlimed and treated with Raptor. Sucrose content was greater in limed than in unlimed plots treated with Raptor. Plots treated with Pursuit in1996 had zero yield in 1997.

Table 1. Field one: Effect of Pursuit, Raptor and lime on soil pH, % sucrose, root yield and extractable sucrose in 1997.

Herbicide	1996 lime treatment	Soil pH	Sucrose	Root Yield	Extractable Sucrose
			%	ton/A	lb/A
None (control)	Unlimed	5.7	13.9	14.3	3500
	3 ton/A	6.8	14.6	22.7	6100
	10 ton/A	7.7	14.7	21.4	5900
Pursuit	Unlimed	5.7	0	0	0
	3 ton/A	6.8	0	0	0
	10 ton/A	7.7	0	0	0
Raptor	Unlimed	5.7	13.4	12.9	3100
	3 ton/A	6.8	14.1	16.5	4300
	10 ton/A	7.7	14.3	20.1	5200
LSD (0.1)			0.6	1.8	900

Field two was planted to sugarbeet in 1998. Pursuit treated plots and plots not treated with herbicide had greater sugarbeet root yield and extractable sucrose where lime was used to increase soil pH (Table 2). In contrast plots treated with Raptor, showed no significant differences in root yield and extractable sucrose where lime was used to increase soil pH. Percent sucrose did not significantly increase for control plots treated with lime. Plots limed at 3 and 10 ton/A and treated with Pursuit and Raptor had a sucrose percentage similar to unlimed treated plots.. Control plots limed at 3 ton/A did not produce significantly higher root yield or extractable sucrose than unlimed control plots.

Control plots limed at 10 ton/A produced 7.9 ton/A greater root yield and 2492 lb/A greater extractable sucrose than unlimed control plots. Plots limed at 10 ton/A and treated with Pursuit produced 17.6 ton/A sugarbeet root yield and 5994 lb/A more extractable sucrose than unlimed plots treated with Pursuit. Pursuit treated plots limed at 3 ton/A produced 13.3 ton/A sugarbeet root yield and 4638 lb/A more extractable sucrose than unlimed plots treated with Pursuit. Limed control plots yielded more extractable sucrose than unlimed Pursuit treated or Raptor treated plots in all comparisons, but the differences were not significant due to high variability in the experiment.

Table 2. Field two: Effect of Pursuit, Raptor and lime on soil pH, % sucrose, root yield and extractable sucrose in 1998.

Herbicide	1996 lime Treatment	Soil pH	Sucrose	Root Yield	Extractable Sucrose
			%	ton/A	lb/A
none (control)	Unlimed	5.8	18.0	21.4	7096
	3 ton/A	6.6	18.5	23.1	7904
	10 ton/A	7.5	17.8	29.3	9588
Pursuit	Unlimed	5.8	16.1	7.7	2276
	3 ton/A	6.6	17.9	21.0	6914
	10 ton/A	7.5	17.8	25.3	8270
Raptor	Unlimed	5.8	18.0	22.8	7540
	3 ton/A	6.6	18.0	23.0	7687
	10 ton/A	7.5	17.6	25.1	8036
LSD (0.1)			0.9	4.9	1809

Greenhouse studies were conducted to determine the effect of Pursuit and Raptor on susceptible and Pursuit resistant canola in limed and unlimed soils (Table 3). Canola height reduction from Pursuit and Raptor was less in the limed soil than in the unlimed soil. Pursuit and Raptor caused greater height reduction to the Pursuit susceptible canola variety than to the Pursuit resistant canola variety.

Table 3. Pursuit, Raptor and lime effects on canola in the greenhouse

		Canola Height	
Herbicide	Treatment	Resistant canola	Susceptible canola
		cm	cm
Pursuit	Unlimed	5.3	0.3
	3 ton/A	6.1	2.9
	10 ton/A	6.5	2.8
Raptor	Unlimed	4.9	0.7
	3 ton/A	6.4	3.3
	10 ton/A	6.3	3.8
LSD (0.05)		0.8	0.9

Soil samples were taken from both Field one and Field two in1996. The samples taken immediately after application of the herbicides, and after 9 and 18 weeks during the growing season. Soil samples were analyzed by high performance liquid chromatography (Table 4). At the end of the 3 month growing season, 80% of Pursuit and Raptor had degraded. Soil pH had no effect on the rate of degradation of either herbicide.

Table 4. Pursuit and Raptor soil residual

Treatment	Herbicide
	PPB
Unlimed Pursuit	37.8
3 ton/A Pursuit	46.0
10 ton/A Pursuit	43.1
Unlimed Raptor	53.4
3 ton/A Raptor	52.0
10 ton/A Raptor	48.4
LSD (0.05)	11.3

Soil pH increased in the field plots to which lime had been applied. At the end of the three month growing season ~20% of Pursuit and Raptor were still present in the soil. The persistence of the herbicides was independent of soil pH. In contrast soil pH influenced the bioavailability of the herbicide remaining in the soil at 3 months. This was indicated by the greater sugarbeet root yield, sucrose percentage and extractable sucrose produced from the limed herbicide treated plots compared to the unlimed herbicide treated plots. Field one in 1997 produced higher percent sucrose, sugarbeet root yield and extractable sucrose in limed control plots and limed plots treated with Raptor as compared to unlimed control plots and unlimed plots treated with Raptor. The plots treated with Pursuit produced zero yield regardless of lime treatment. Field two in1998 produced greater sugarbeet root yield and extractable sucrose in 10 ton/A limed control plots and 10 ton/A limed Pursuit treated plots as compared to unlimed control plots and unlimed plots treated with Pursuit. Limed and unlimed control plots and limed and unlimed Raptor treated plots had similar root yield and extractable sucrose. Percent sucrose was not significantly different in the limed and unlimed control plots and the limed and unlimed plots treated with Pursuit or Raptor.

The results of these experiments suggest that raising soil pH with lime in soils with a low pH will increase the sugarbeet yield potential of the soils even in the absence of herbicide residue. Raising soil pH with lime also reduced sugarbeet injury from carryover of Pursuit and Raptor. Raising pH with lime did not totally prevent sugarbeet injury from Pursuit and Raptor carryover.

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CERCOSPORA LEAFSPOT CONTROL IN EASTERN NORTH DAKOTA AND MINNESOTA IN 1998

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Cercospora leafspot, caused by the fungus ***Cercospora beticola***, is the most serious disease of sugarbeet in the production area of Minnesota and North Dakota. This disease may cause reductions in tonnage, sucrose, and profitability and increase impurities. Losses as high as 30 percent in recoverable sucrose are fairly common under móderate disease conditions. Roots of affected plants do not store in the pile as well as roots of healthy plants. Limited tolerance to the triphenyl tin hydroxide (TPTH) fungicides was identified in the southern Red River Valley and Southern Minnesota (So. Mn) in 1994. This tolerance has increased in incidence and severity in the Red River Valley and southern Minnesota. Benzimidazole resistance is present in all production areas of Minnesota and North Dakota.

OBJECTIVES:

The research objectives of these trials were to evaluate the efficacy of new or existing fungicides for control of cercospora leafspot. These fungicides were applied alone, in tank mixes or alternated at various application intervals not only to evaluate control, but also to evaluate management strategies against buildup of tolerance or resistance to the fungicides. All 1998 test sites had known TPTH tolerance and benzimidazole resistance.

PROCEDURES:

Two test sites were established in So. Mn with single sites at Breckenridge and Crookston, Minnesota. The cultural practice and application dates for each location are given in **Table 1**. At all locations, plots were six rows wide and 30 or 35 feet long. The middle four rows received the fungicide applications. The middle two rows of each plot were harvested for yield and quality determinations. The Crookston and Breckenridge analysis was completed at the East Grand Forks American Crystal quality lab. So. Mn site samples were analyzed for quality at the Southern Minnesota Beet Sugar Cooperative lab at Renville, Minnesota. Each treatment was replicated four or six times. All treatments containing Dithane had CS-7 spreader sticker used at the recommended rate. Leafspot severity was rated on the KWS scale of 1 to 9. One is no disease, a 3 rating is at early stages of economic loss level, and a 9 rating has only new leaf growth living and severe economic loss.

All sites were planted in April, 1998, as opposed to similar trials in 1997, where planting was delayed due to wet soil conditions. The onset of disease was earlier at the two So. Mn locations and Crookston in 1998. All sites had rapid buildup of cercospora in the latter part of July and August which continued into September for the So. Mn and Crookston locations. Below normal precipitation at the Breckenridge site slowed the spread of cercospora in late August and into September.

The number of fungicide treatments varied by location, (So. Mn - 31, Breckenridge - 36, Crookston - 37). No treatments with the fungicide Topsin M were applied at the So. Mn locations because of the high level of benzimidazole resistance known to exist at these sites. The number of applications also varied. The number of applications for the 14, 10/10 and 7/10 day splits at Crookston were 5, 7 and 8 respectively and for Breckenridge 4, 6 and 7. The number of applications for the 14, 14/10 and 10/10 day splits at the So. Mn locations were 6, 7 and 8 respectively.

RESULTS AND DISCUSSION:

The effect of the various fungicides or fungicide combinations for cercospora leafspot control for the test sites are shown in **Tables 2, 3, 4 and 5**. PLEASE NOTE. a number of the treatments shown for all sites with the registered fungicides exceeded the amounts registered for a given season (i.e. only 15 oz/A of Super Tin 80 WP is allowed per season). A section 18 was granted for the fungicide Quadris for 1998 only. Registration status of all experimental fungicides for the 1999 season is unknown at this time.

Crookston:

The degree of damage from cercospora leaf spot is clearly evident at the Crookston site **(Table 2)**. The best fungicide treatment of the registered compounds (Topsin M (app 2) /Super Tin (app 1,3,4) increased recoverable sucrose, root yield and sucrose content by 3142 lb/A, 43 lb/T, 6.4 T/A and 2.2% respectively. These increases translate to an increase of $491 in gross return/A using the ACSC 1998 sugarbeet payment schedule. The check treatment had only regrowth canopy and a KWS cercospora leafspot rating of 8.3 at harvest.

All fungicide treatments with the exception of Pro-Tex increased recoverable sucrose/A. The level of increase varied significantly among treatments, however. All resistance management strategies using the registered fungicides performed well, especially those with one application of Topsin M in the application scheme. This may well relate to a lower level of resistance to the benzimidazole fungicides at Crookston.

Three experimental fungicides or fungicide combinations (Eminent, Eminent + Echo 720, BASF.50000F and BASF.50001F) gave excellent cercospora control. Compared to what was observed in 1997 at Crookston, the fungicide Quadris performed well below expectations. Bravo alone, while significantly better than the check in cercospora control and recoverable sucrose/A, was not equal in performance to the above listed experimentals.

Breckenridge:

The resistance management strategies using the registered fungicides, with the exception of Penncozeb (app 1,3,4,5,6)/ Topsin M (app 2) treatment performed poorly at the Breckenridge site in contrast to the performance at Crookston. Higher levels of benzimidazole resistance and tolerance to the TPTH and mancozeb compounds were found at this test site. Sucrose percent and recoverable sucrose/T were not significant across treatments.

The experimental fungicides BASF 490, BASF.50001F, Stratego and fungicide combinations with Eminent gave excellent cercospora control and recoverable sucrose/A.. Quadris performed similar to that observed at this site in 1997.

Southern Minnesota:

The two So. Mn sites had cercospora leafspot development beginning in late June and continuing through September. These sites had very high levels of benzimidazole resistance and TPTH tolerance. The loss in recoverable sucrose, % sucrose and root yield from cercospora, between the check treatment and the best fungicide treatment at both sites were the largest recorded in Minnesota or North Dakota cercospora control trials. All fungicide treatments increased yield and quality when compared to the check.

Blomkest Site:

Recoverable sucrose ranged from 2713 lb/A on the check treatment to a high of 9513 lb/A for the experimental fungicide Eminent + Echo 720, at the 26.0 oz rate of Eminent. The difference in % sucrose and root yield was 5.6% and 16.2T/A respectively.

The experimental fungicide Eminent in combination with Echo 720 or alternating with Super Tin significantly out performed the Eminent + Bac J treatment. Other experimentals that performed equal to the best registered treatment (Super Tin {app 1-3}/ Manzate 200 DF {app 4-8}) were: Stratego, BASF.50000F, BASF.50001F and Quadris/Super Tin alternating. All other registered and experimental treatments had significantly poorer performance relative to recoverable sucrose/A.

Lueschen Site:

The experimental fungicide or fungicide combinations that had significantly higher recoverable sucrose than the best registered fungicide treatment (Super Tin {app 1-3} / Manzate 200 {app 4-8}) were: all Eminent combinations, Eminent alternating with Super Tin, Stratego, CGA-279202, BASF.50000F, BASF.50001F and Quadris alternating with Super Tin. All other experimentals and registered treatments had significantly higher KWS cercospora leafspot ratings at harvest.

Combined Site Data:

The combined cercospora leafspot control data from the Crookston and Breckenridge sites with similar registered and experimental fungicide treatments is shown in **Table 6**. The best experimental fungicide from the two combined sites would have increased the gross sugarbeet payment by $373/A using the 1998 ACSC payment schedule. The best current registered treatment would have increased the payment by $330/A

The combined data from all sites with similar treatments is shown in **Table 7**. Using the same payment system above, the best experimental treatment would have increased gross return by $580/A and the
best registered by $390/A.

SUMMARY AND CONCLUSIONS

A. Registered Fungicides

1. The 3.75 oz/A Super Tin rate should only be used in the northern end of the sugarbeet growing area of Minnesota and North Dakota. For maximum cercospora leafspot control, a 10-day application interval is recommended.

2. The 5.0 oz/A Super Tin rate should be used in areas of high TPTH tolerance (Moorhead Factory, MinDak and So. Mn) with an application interval of 10 days.

3. Cercospora control with a single benzimidazole (Topsin M) fungicide application in combination with or alternating with a protectant fungicide was superior at the Crookston site as compared to the Breckenridge site. No benzimidazole fungicides should be used in So. Mn and only one application in combination with a protectant fungicide used in the northern end of the sugarbeet growing region.

4. Data from So. Mn and Breckenridge suggest increased tolerance to the mancozeb fungicide may be developing. See Wieland article in this publication..

5. The resistance management strategies (alternating and combining fungicide treatments) worked best at the Crookston site.

B. Experimental Fungicides

1. A number of experimental fungicides consistently out performed or equaled the best currently registered fungicides or fungicide combinations for cercospora control. These experimentals would include BASF.50000F, BASF.50001F, Stratego, Eminent and Eminent combinations. Research on other experimentals used in combination with registered or other experimentals also show promise.

C. Other

1. The addition of an extra 30 lb/A of N above the recommended level did not improve cercospora control with the registered fungicides. For the most part, recoverable sucrose/A was reduced due to lower sucrose content.

2. Cercospora leafspot continued to develop into September and October in both 1997 and 1998.

3. The level of cercospora inoculum for 1999 will be greater than in 1998.

4. Playing "catch up" due to late first application of fungicides, stretching application intervals or reducing fungicide rates does not pay (reason for big inoculum potential for 1999).

5. The level of resistance to the benzimidazole fungicides and tolerance to the TPTH and mancozeb fungicides continues to increase.

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Table 1. Cultural Practices and Application Date Information For Each Research Site in 1998.

	Breckenridge	So. MN.	Crookston
Planting Date	April 22	April 26	April 27
Previous Crop	Wheat	Corn	Small Grains
Variety	HM Valley	VDH 66140	HM Valley
Weed Control	Betamix – micro	Benanex – micro	Betamix – micro
	Betanex – micro	Upbeet – micro	Betanex – micro
	Upbeet – micro	Stinger – micro	Upbeet – micro
	Stinger – micro	Oil – micro	Stinger – micro
	Poast – micro	Assure II	Select – micro
	Oil –micro	Hand Labor	Oil – micro
	Hand Labor	Cultivation	Ammonia
	Cultivation		Hand Labor
			Cultivation
Insecticide	Counter	None	Counter
Plant Pop. at Thinning	35,0000 plant/A	35,0000 plant/A	35,0000 plant/A
Spray Dates	**Breckenridge**	**So. MN.**	**Crookston**
1st	July 21	July 1	July 13
2nd	July 28	July 10	July 20
3rd	July 31	July 14	July 23
4th	August 4	July 21	July 27
5th	August 7	July 24	July 30
6th	August10	July 28	August 3
7th	August 14	August 1	August 6
8th	August 17	August 7	August 10
9th	August 20	August 8	August 12
10th	August 25	August 11	August 17
11th	August 27	August 17	August 20
12th	September 1	August 18	August 24
13th	September 3	August 21	August 27
14th	September 8	August 25	August 31
15th	September 10	August 28	September 11
16th		August 31	
17th		September 1	
18th		September 8	
19th		September 10	
Spray Volume (gpa)	20.5	20.0	20.0
Spray Pressure (psi)	110	120	100
Rain and/or wet conditions may have occasionally kept application intervals from being exactly correct.			
Harvest Date	September 24	October 20	September 28

Table 2. Cercospora leafspot control at Crookston in 1998 with registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	CLS* 9/27	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
BASF 0.50000F	No	14		0.15 a. i.	3.8	10264	341	30.1	18.6	1.6
BASF 0.50000F	No	14		0.20 a.i.	3.3	10065	344	29.3	18.7	1.5
Topsin M(app 2) / Super Tin (app 1,3,4)	Yes	14 / 14		0.5 lb / 3.75 oz	3.5	9960	333	29.9	18.4	1.7
Eminent + Echo 720	No	14	Tank Mix	26.0oz + 1.5pt	3.1	9929	340	29.2	18.5	1.5
Eminent + Echo 720	No	14	Tank Mix	13oz + 1.5pt	3.4	9871	338	29.3	18.4	1.6
Eminent + Echo 720	No	14	Tank Mix	19.5oz + 1.5pt	3.5	9810	329	29.8	18.1	1.6
Topsin M(app2)/Super Tin(app3,5)/Penncozeb(app1,4,6)	Yes	10 / 10 / 7		0.5 lb / 3.75 oz / 2.0 lb	3.5	9804	343	28.6	18.6	1.4
BASF 0.50001F	No	14		0.15 a.i.	3.4	9783	332	29.6	18.2	1.6
Eminent	No	14		13 oz	3.6	9761	328	29.8	18.0	1.6
Penncozeb (app1,3,4,5,6) / Topsin M (app 2)	Yes	7 / 10		2.0 lb / 0.5 lb	3.6	9716	341	28.6	18.7	1.7
BASF 490	No	14		0.20 a.i.	5.6	9698	323	30.1	17.7	1.6
Super Tin (app 1-3) / Manzate 200 (app 4-6)	Yes	10 / 10		5 oz / 2 lb	4.3	9692	340	28.6	18.5	1.5
Penncozeb(app2,5)/Super Tin(app1,4,6)/Topsin M(app3)	Yes	7 / 10 / 10		2.0 lb / 3.75 oz / 0.5 lb	3.5	9542	331	28.9	18.1	1.6
Super Tin (app 1-6)	No**	10		3.75 oz	4.6	9529	326	29.2	17.9	1.6
Super Tin + Tactic	No**	10	Tank Mix	3.75oz + 1pt	4.1	9423	326	28.9	17.8	1.5
Eminent + Bac J	No	14	Tank Mix	13 oz	4.4	9394	323	29.1	17.7	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	5.3	9348	321	29.1	17.6	1.5
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	4.0	9339	352	26.6	19.1	1.5
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz +.12%vv / 3.75 oz	3.8	9330	329	28.4	18.0	1.5
Super Tin + Manzate 200 (app 1-5)	No**	14	Tank Mix	5 oz + 2 lb	4.1	9317	330	28.3	18.1	1.6
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	5.3	9189	314	29.3	17.3	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	5.0	9121	324	28.2	17.9	1.7
Super Tin(app 1,3,5) / Penncozeb (app 2,4,6)	Yes	10 / 7	Alternate	5 oz / 2.0 lb	4.7	9103	332	27.6	18.3	1.7
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz +.12%vv / 0.2308 lb	3.9	9070	320	28.4	17.6	1.6
CGA-279202	No	10		1.8 oz	4.1	9068	331	27.5	18.0	1.5
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	5.1	9030	326	27.8	17.9	1.6
Super Tin(app 1,2,3) / Dithane (app 4,5,6)	Yes	14 / 10	30 lb/A N	5 oz / 2 lb	4.0	9015	317	28.5	17.4	1.6
Quadris	No	14		0.3077 lb	5.8	8992	332	27.2	18.1	1.5
Bravo Weather Stik	No	14		1.5 pt	5.5	8902	322	27.7	17.7	1.6
Bravo Weather Stik Zn	No	14		1.5 pt	6.2	8902	323	27.6	17.8	1.7
Quadris	No***	14		0.2308 lb	5.9	8767	331	26.6	18.1	1.6
Terrinal Cu	No	14		3.38 pt	4.8	8559	334	25.7	18.2	1.5
Quadris	No	14		0.1538 lb	6.4	8490	317	26.8	17.5	1.6
Super Tin + Early Harvest	No**	14	Tank Mix	5 oz + 1.5 oz	4.5	8412	314	26.9	17.3	1.6
Tilt	No	10		4 fl oz	5.6	8069	325	24.9	17.8	1.6
Pro-tex (app 1-5)	No**	14		1.6 qt	8.1	7195	309	23.3	17.1	1.7
Check					8.3	6818	290	23.5	16.2	1.7
				C.V. %	10.4	6.81	5.10	6.36	4.18	10.1
				LSD 0.5 %	0.68	877	23.4	2.5	1.05	NS

* KWS Scale 1-9 (least - most)
** Rates above seasonal registration
*** Section 18 for 1998 only

Table 3. Cercospora leafspot control at Breckenridge in 1998 with registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	CLS* 8/21	CLS* 9/10	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
Eminent + Bac J	No	14	Tank Mix	13 oz	2.1	3.3	9901	358	27.7	19.6	1.8
Eminent + Echo 720	No	14	Tank Mix	26.0oz + 1.5pt	15	2.8	9534	357	26.7	19.5	1.7
BASF 490	No	14		0.20 a.i.	2.8	3.8	9345	343	27.3	19.0	1.8
Eminent + Echo 720	No	14	Tank Mix	13oz + 1.5pt	2.1	3.3	9201	347	26.5	19.2	1.9
BASF 0.50001F	No	14		0.15 a.i.	2.2	3.3	9200	358	25.7	19.6	1.7
Penncozeb (app 1,3,4,5,6) / Topsin M (app 2)	Yes	7 / 10		2.0 lb / 0.5 lb	2.3	3.6	9127	351	26.0	19.1	1.6
Terrinal Cu	No	14		3.38 pt	3.8	4.8	9107	347	26.2	19.0	1.7
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	3.2	4.2	9096	357	25.5	19.4	1.6
Super Tin (app1,3,5) / Dithane (app2,4)	Yes	14 / 10	30 lb/A N	5 oz / 2 lb	3.3	4.7	9081	347	26.1	19.1	1.7
BASF 0.50000F	No	14		0.15 a.i.	3.1	4.2	9079	352	25.9	19.3	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	4.2	5.3	8986	356	25.3	19.4	1.6
Eminent + Echo 720	No	14	Tank Mix	19.5oz + 1.5pt	1.5	2.7	8949	364	24.6	19.8	1.6
CGA-279202	No	10		1.8 oz	3.3	4.9	8935	349	25.6	19.1	1.6
Super Tin + Manzate 200	No**	14	Tank Mix	5 oz + 2 lb	3.9	4.7	8910	347	25.8	19.0	1.6
Super Tin (app 1-6)	No**	10		3.75 oz	3.8	4.9	8910	344	26.0	18.9	1.7
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	3.7	4.9	8766	341	25.8	18.7	1.6
Bravo Weather Stik	No	14		1.5 pt	3.7	5.1	8759	353	24.9	19.3	1.7
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz +.12%vv / 3.75 oz	3.9	5.0	8735	351	24.9	19.2	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	4.0	5.1	8731	348	25.1	19.1	1.7
Super Tin + Tactic	No**	10	Tank Mix	3.75oz + 1pt	3.8	5.3	8704	349	25.0	19.0	1.6
Quadris	No***	14		0.2308 lb	3.7	5.0	8679	337	25.9	18.6	1.8
Quadris	No	14		0.3077 lb	3.7	4.8	8665	352	24.6	19.3	1.7
Tilt	No	10		4 fl oz	3.5	4.6	8631	343	25.2	18.8	1.6
Super Tin (app1,3,5) / Penncozeb (app2,4,6)	Yes	10 / 7	Alternate	5 oz / 2.0 lb	3.8	4.7	8605	342	25.2	18.8	1.8
Super Tin + Early Harvest	No	14	Tank Mix	5 oz + 1.5 oz	3.6	4.9	8585	347	24.8	19.1	1.7
BASF 0.50000F	No	14		0.20 a.i.	2.5	3.7	8572	345	24.9	19.1	1.8
Super Tin (app1-3) / Manzate 200 (app4-6)	Yes	10 / 10		5 oz / 2 lb	4.1	5.5	8538	342	25.0	18.8	1.7
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz +.12%vv / 0.2308 lb	3.5	4.6	8507	340	25.0	18.8	1.8
Quadris	No	14		0.1538 lb	3.7	5.0	8494	341	25.1	18.8	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	3.8	5.1	8464	345	24.6	19.0	1.7
Topsin M (app 2) / Super Tin (app 1,3,4)	Yes	14 / 14		0.5 lb / 3.75 oz	4.1	5.4	8448	343	24.7	18.7	1.6
Pro-tex	No**	14		1.6 qt	3.9	5.2	8416	349	24.2	19.2	1.7
Bravo Weather Stik Zn	No	14		1.5 pt	3.5	4.8	8372	345	24.3	19.0	1.7
Topsin M (app 2) / Super Tin (app 3,5) / Penncozeb (app 1,4,6)	Yes	10 / 10 / 7		0.5 lb / 3.75 oz / 2.0 lb	3.4	4.9	8123	336	24.2	18.6	1.8
Check					5.4	7.4	7966	342	23.3	18.8	1.7
Penncozeb (app2,5) / Super Tin (app1,4,6) / Topsin M (app 3)	Yes	7 / 10 / 10		2.0 lb / 3.75 oz / 0.5 lb	3.7	4.9	7646	350	21.9	19.2	1.7
				C.V. %	11.2	13.9	7.0	4.8	7.1	4.4	12.7
				LSD 0.5 %	0.4	0.7	702	NS	2.1	NS	NS

* KWS Scale 1-9 (least – most)

** Rates above seasonal registration

*** Section 18 for 1998 only

Table 4. Cercospora leafspot control at Southern Minnesota Bloomkest Site in 1998 with registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	CLS* 8/15	CLS* 10/15	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
Eminent + Echo 720	No	14	Tank Mix	26.0oz + 1.5pt	1.5	2.2	9513	310	30.7	17.2	1.7
Eminent / Super Tin	No	14 / 10	Alternate	19.5 oz / 3.75 oz	1.3	2.5	9073	307	29.6	17.2	1.9
Eminent + Echo 720	No	14	Tank Mix	19.5oz + 1.5pt	1.7	2.2	8652	307	28.2	17.1	1.8
Eminent + Echo 720	No	14	Tank Mix	13oz + 1.5pt	1.5	2.7	8296	283	29.3	16.1	1.9
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	2.0	3.0	8070	281	28.7	15.8	1.8
Super Tin (appl-3) / Manzate 200 (app4-8)	Yes	10 / 10		5 oz / 2 lb	3.7	5.8	7644	277	27.6	15.7	1.8
BASF 0.50000F	No	14		0.20 a.i.	1.8	2.8	7538	286	26.4	16.1	1.8
BASF 0.50001F	No	14		0.15 a.i.	2.3	3.3	7350	278	26.4	15.7	1.8
BASF 0.50000F	No	14		0.15 a. i.	3.2	4.2	7327	270	27.1	15.3	1.8
Quadris / Super Tin	No	14 / 10	Alternate	0.1538 lb / 3.75 oz	2.0	3.2	7326	283	25.9	16.0	1.9
Eminent + Bac J	No	14	Tank Mix	13 oz	1.8	3.8	6862	275	25.0	15.6	1.9
CGA-279202	No	10		1.8 oz	2.8	4.3	6478	276	23.5	15.7	1.9
Tilt	No	10		4 fl oz	5.8	6.7	6165	242	25.5	13.8	1.7
BASF 490	No	14		0.20 a.i.	4.0	4.7	5929	261	22.8	15.0	2.0
Super Tin + Manzate 200	No**	14	Tank Mix	5 oz + 2 lb	5.5	6.2	5907	234	25.3	13.6	1.9
Quadris	No	14		0.3077 lb	6.0	4.8	5824	240	24.3	13.8	1.8
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz .12%vv / 3.75 oz	5.3	5.7	5615	243	23.1	13.9	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	5.2	5.5	5586	251	22.4	14.3	1.8
Bravo Weather Stik	No	14		1.5 pt	5.7	5.0	5484	253	21.7	14.4	1.8
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	4.8	5.2	5482	235	23.4	13.6	1.8
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	5.0	5.3	5396	239	22.6	13.9	2.0
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz.12%vv/0.2308 lb	5.5	5.5	5369	238	22.5	13.8	1.9
Bravo Weather Stik Zn	No	14		1.5 pt	5.0	6.0	5246	237	22.1	13.8	2.0
Quadris	No***	14		0.2308 lb	5.8	4.8	5208	229	22.6	13.4	2.0
Super Tin (app1-4) / Manzate 200 (app5-8)	Yes	10 / 10		3.75 oz / 2 lb	5.2	6.0	5105	226	22.6	13.1	1.8
Pro-tex	No**	14		1.6 qt	5.7	6.0	4904	231	21.2	13.3	1.8
Super Tin + Tactic	No**	10	Tank Mix	3.75oz + 1pt	4.5	5.3	4846	232	20.9	13.5	1.8
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	5.3	4.2	4805	222	21.7	13.0	1.9
Quadris	No	14		0.1538 lb	5.7	5.5	4621	233	19.8	13.6	2.0
Super Tin (app 1-3) / Dithane (app 4-7)	Yes	14 / 10	30 lb N	5 oz / 2 lb	5.7	5.7	4615	213	21.7	12.6	1.9
Check					7.5	7.3	2713	188	14.5	11.6	2.2
				C.V. %	16.3	25.1	8.81	4.8	7.61	3.45	12.4
				LSD 0.5 %	0.77	1.34	626	13.9	2.1	0.57	NS

* KWS Scale 1-9 (least – most)
** Rates above seasonal registration
*** Section 18 for 1998 only

Table 5. Cercospora leafspot control at Southern Minnesota Lueschen Site in 1998 with registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	CLS * 8/15	CLS* 10/15	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
Eminent + Echo 720	No	14	Tank Mix	19.5oz + 1.5pt	1.2	1.2	7219	236	30.1	16.5	1.7
Eminent + Echo 720	No	14	Tank Mix	13oz + 1.5pt	1.2	1.3	6947	242	28.6	16.7	1.6
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	3.3	3.5	6925	250	27.7	16.0	1.5
Eminent + Echo 720	No	14	Tank Mix	26.0oz + 1.5pt	1.0	1.0	6890	230	30.0	16.1	1.6
Eminent / Super Tin	No	14 / 10	Alternate	19.5 oz / 3.75 oz	1.8	1.2	6881	234	29.4	16.6	1.6
CGA-279202	No	10		1.8 oz	3.5	3.8	6555	233	28.2	15.4	1.7
Eminent + Bac J	No	14	Tank Mix	13 oz	1.3	1.7	6432	233	27.6	16.3	1.6
BASF 0.50000F	No	14		0.20 a.i.	1.8	2.2	6372	234	27.3	15.8	1.7
BASF 0.50001F	No	14		0.15 a.i.	2.5	2.7	6176	240	25.7	16.2	1.5
Quadris / Super Tin	No	14 / 10	Alternate	.1538 lb / 3.75 oz	2.5	3.2	6008	224	26.8	16.0	1.5
BASF 0.50000F	No	14		0.15 a. i.	3.5	3.8	5865	225	26.2	15.0	1.8
BASF 490	No	14		0.20 a.i.	3.5	3.8	5722	225	25.4	15.8	1.7
Super Tin (app 1-3) / Manzate 200 (app4-8)	Yes	10 / 10		5 oz / 2 lb	3.1	4.3	5295	218	24.4	15.1	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	5.2	5.5	5251	226	23.3	14.9	1.5
Quadris	No	14		0.3077 lb	5.8	6.3	5227	232	22.6	15.0	1.4
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	4.8	5.0	5199	222	23.4	14.8	1.7
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz .12%vv/ 0.2308 lb	5.5	6.0	5130	218	23.6	14.6	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	5.5	5.8	5048	225	22.5	14.8	1.6
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz .12%vv / 3.75 oz	5.5	5.8	5019	229	21.9	15.1	1.6
Bravo Weather Stik	No	14		1.5 pt	5.7	6.5	5001	226	22.2	14.9	1.6
Quadris	No***	14		0.2308 lb	6.3	6.8	4964	228	21.8	14.9	1.6
Super Tin + Manzate 200	No**	14	Tank Mix	5 oz + 2 lb	4.7	5.5	4917	222	22.1	14.6	1.5
Quadris	No	14		0.1538 lb	5.7	6.2	4898	223	22.0	14.9	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	5.7	6.0	4867	216	22.5	14.4	1.6
Tilt	No	10		4 fl oz	6.5	6.8	4823	216	22.3	14.4	1.6
Super Tin (app1-4) / Manzate 200 (app5-8)	Yes	10 / 10		3.75 oz / 2 lb	5.7	5.5	4751	227	20.9	14.8	1.4
Super Tin (app1-3) / Dithane (app 4-7)	Yes	14 / 10	30 lb N	5 oz / 2 lb	6.5	6.8	4618	226	20.5	14.9	1.6
Super Tin + Tactic	No**	10	Tank Mix	3.75oz + 1pt	5.2	5.5	4603	225	20.5	14.9	1.7
Bravo Weather Stik Zn	No	14		1.5 pt	4.3	5.7	4601	221	20.7	14.6	1.6
Pro-tex	No**	14		1.6 qt	5.3	6.8	4568	214	21.4	14.4	1.7
Check					7.8	8.0	3104	216	14.4	12.4	1.6
				C.V. %	17.9	16.1	9.06	7.66	5.57	2.9	15.1
				LSD 0.5 %	0.87	0.86	566	NS	1.5	0.49	NS

* KWS Scale 1-9 (least – most)
** Rates above seasonal registration
*** Section 18 for 1998 only

Table 6. Combined Cercospora leafspot control data from Breckenridge and Crookston in 1998 with similar registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	CLS*	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
Eminent + Echo 720	No	14	Tank Mix	26.0 oz + 1.5 pt	3.0	9731	348	28.0	19.0	1.6
BASF 0.50000F	No	14		0.15 a.i.	4.0	9672	346	28.0	18.9	1.6
Eminent + Bac J	No	14	Tank Mix	13 oz	3.7	9647	340	28.4	18.7	1.7
Eminent + Echo 720	No	14	Tank Mix	13 oz + 1.5 pt	3.3	9536	342	27.9	18.8	1.7
BASF 490	No	14		0.20 a.i.	4.5	9522	333	28.7	18.3	1.7
BASF 0.50001F	No	14		0.15 a.i.	3.3	9491	345	27.6	18.9	1.7
Penncozeb (app1,3,4,5,6) / Topsin M (app 2)	Yes	7 / 10		2.0 lb / 0.5 lb	3.6	9421	346	27.3	18.9	1.6
Eminent + Echo 720	No	14	Tank Mix	19.5 oz + 1.5 pt	3.0	9380	346	27.2	18.9	1.6
BASF 0.50000F	No	14		0.20 a.i.	3.5	9319	344	27.1	18.9	1.6
Super Tin	No**	10		3.75 oz	4.8	9220	335	27.6	18.4	1.6
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	4.1	9217	354	26.0	19.3	1.5
Topsin M (app 2) / Super Tin (app 1,3,4)	Yes	14 / 14		0.5 lb / 3.75 oz	4.7	9204	338	27.3	18.6	1.7
Super Tin (app 1-3) / Manzate 200 (app 4-6)	Yes	10 / 10		5 oz / 2 lb	5.0	9115	341	26.8	18.6	1.6
Super Tin + Manzate 200	No**	14	Tank Mix	5 oz + 2 lb	4.6	9114	339	27.0	18.5	1.6
Super Tin + Tactic	No**	10	Tank Mix	3.75oz + 1pt	4.7	9064	338	27.0	18.4	1.7
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz +.12%vv / 3.75 oz	4.5	9032	340	26.6	18.6	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	5.3	9008	341	26.5	18.6	1.6
CGA-279202	No	10		1.8 oz	4.3	9002	340	26.6	18.6	1.6
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	5.1	8978	327	27.5	18.0	1.6
Topsin M (app2) / Super Tin (app3,5) / Penncozeb (app1,4,6)	Yes	10 / 10 / 7		0.5 lb / 3.75 oz / 2.0 lb	4.4	8964	339	26.4	18.6	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	5.1	8926	336	26.7	18.5	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	5.2	8906	333	26.9	18.3	1.6
Super Tin (app 1,3,5) / Penncozeb (app 2,4,6)	Yes	10 / 7	Alternate	5 oz / 2.0 lb	4.7	8854	337	26.4	18.6	1.7
Terrinal Cu	No	14		3.38 pt	4.8	8833	341	25.9	18.6	1.6
Bravo Weather Stik	No	14		1.5 pt	5.3	8830	337	26.3	18.5	1.6
Quadris	No	14		0.3077 lb	5.2	8829	342	25.9	18.7	1.6
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz +.12%vv / 0.2308lb	4.3	8789	330	26.7	18.2	1.7
Quadris	No***	14		0.2308 lb	5.4	8723	334	26.2	18.4	1.7
Bravo Weather Stik Zn	No	14		1.5 pt	5.4	8637	334	26.0	18.4	1.7
Penncozeb (app 2,5) / Super Tin (app1,4,6) / Topsin M (app 3)	Yes	7 / 10 / 10		2.0 lb / 3.75 oz / 0.5 lb	4.4	8594	340	25.4	18.7	1.6
Super Tin + Early Harvest	No**	14	Tank Mix	5 oz + 1.5 oz	4.8	8498	331	25.8	18.2	1.7
Quadris	No	14		0.1538 lb	5.6	8492	329	26.0	18.1	1.7
Tilt	No	10		4 fl oz	5.0	8350	334	25.1	18.3	1.6
Pro-tex	No**	14		1.6 qt	6.3	7805	329	23.7	18.1	1.7
Check					7.8	7392	316	23.4	17.5	1.7

* KWS Scale 1-9 (least – most)

** Rates above seasonal registration

*** Section 18 for 1998 only

Table 7. Combined Cercospora leafspot control data from All Sites in 1998 with similar registered and experimental fungicides.

Treatment	Label	App. Int. days	Comments	Rate (Acre)	Rec. Sucrose (lb/A)	Rec. Sucrose (lb/T)	Root Yield (ton/A)	Sucrose (%)	LTM (%)
Eminent + Echo 720	No	14	Tank Mix	26.0oz + 1.5pt	8966	309	29.2	17.8	1.6
Eminent + Echo 720	No	14	Tank Mix	19.5oz + 1.5pt	8658	309	28.3	17.9	1.7
Eminent + Echo 720	No	14	Tank Mix	13oz + 1.5pt	8579	302	28.4	17.6	1.7
Stratego (Tilt + CGA-279202)	No	10	Tank Mix	7 fl oz	8357	310	27.1	17.6	1.6
Eminent + Bac J	No	14	Tank Mix	13 oz	8147	297	27.3	17.3	1.7
BASF 0.50000F	No	14		0.20 a.i.	8137	302	27.0	17.4	1.7
BASF 0.50000F	No	14		0.15 a. i.	8134	297	27.3	17.0	1.7
BASF 0.50001F	No	14		0.15 a.i.	8127	302	26.8	17.4	1.7
Super Tin (app 1-3) / Manzate 200	Yes	10 / 10		5 oz / 2 lb	7792	294	26.4	17.0	1.7
CGA-279202	No	10		1.8 oz	7759	297	26.2	17.0	1.7
BASF 490	No	14		0.20 a.i.	7674	288	26.4	16.9	1.8
Super Tin + Manzate 200	No**	14	Tank Mix	5 oz + 2 lb	7263	283	25.4	16.3	1.7
Quadris	No	14		0.3077 lb	7177	289	24.7	16.6	1.6
Govern + Latron / Super Tin	No	10 / 10	Alternate	2.7oz +.12%vv / 3.75 oz	7175	288	24.6	16.5	1.6
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.2308 lb + 1.5 pt	7146	283	25.0	16.4	1.7
Bravo Weather Stik / Quadris	No	14 / 14	Alternate	1.5 pt / 0.2308 lb	7138	279	25.3	16.2	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.1538 lb / 1.5 pt	7066	283	24.6	16.3	1.7
Bravo Weather Stik	No	14		1.5 pt	7037	288	24.1	16.6	1.6
Govern + Latron / Quadris	No	10 / 10	Alternate	2.7oz .12%vv/ 0.2308lb	7019	279	24.9	16.2	1.7
Quadris / Bravo Weather Stik	No	14 / 14	Alternate	0.3077 lb / 1.5 pt	6967	282	24.3	16.3	1.7
Tilt	No	10		4 fl oz	6922	281	24.5	16.2	1.6
Quadris	No***	14		0.2308 lb	6904	281	24.2	16.3	1.7
Bravo Weather Stik Zn	No	14		1.5 pt	6780	282	23.7	16.3	1.7
Quadris	No	14		0.1538 lb	6626	279	23.4	16.2	1.7
Pro-tex	No**	14		1.6 qt	6271	276	22.5	16.0	1.7
Check					5150	259	18.9	14.8	1.8

** Rates above seasonal registration

*** Section 18 for 1998 only

CERCOSPORA LEAF SPOT CONTROL AS INFLUENCED BY HARVEST DATE

OBJECTIVE: To evaluate fungicide control of cercospora leaf spot and sugarbeet yield and quality with sugarbeets harvested early (mid September) and late (mid October).

EXPERIMENTAL PROCEDURE

Sugarbeet variety VDH 66140 was planted on April 26, 1998. Experimental units were established 11 ft. wide and 30 ft. long in a RCBD arrangement. Sugarbeets were maintained using normal production practices except when fungicide spraying was initiated. Fungicide spray was initiated early Manzate treatments ten days prior to initiation of treatments on all experimental units. Each treatment was duplicated for early and late harvest. Early Manzate was applied on one of the duplicates for each harvest date. The applications were made with a high pressure sprayer at 5 mph, 120 psi and 20 gallons per acre. The spray dates were as follows:

RESULTS

Cercospora leaf spot control (Table 1) was not enhanced by the application of early Manzate. Fungicide Eminent alternated with Supertin and Quadris alternated with Supertin controlled cercospora leaf spot equally. The two spray mixtures previously mentioned gave significantly better cercospora leaf spot control than Supertin alternated with Manzate.

Sucrose percent and recoverable sucrose per ton was similar for all treatments and harvest dates, except Supertin alternated with Manzate at the early harvest date (Table 1). Loss to molasses was not different statistically for all treatments. Tons per acre was either significantly higher or tended to be significantly higher without early Manzate compared to with early Manzate.

Recoverable sucrose per acre was higher with Eminent or Quadris alternated with Supertin compared to Supertin alternated with Manzate. Treatments without Manzate produced significantly less recoverable sucrose per acre than the same treatment within the same harvest date.

Sugarbeets increased in yield and quality significantly greater when applied with Eminent alternated with Supertin than when applied with Supertin alternated with Manzate when comparing early harvest to late harvest dates. This indicates that the greater control of cercospora leaf spot by Eminent carried over into yield and quality determination. The situation in 1998 was that very little increase in yield and quality was obtained. However, these data indicate that with more effective products, an increase would have been able to be obtained in 1998.

Fungicides for Cercospora Leaf Spot Control, Yield and Quality Factors
Harvested at 2 Intervals

Fungicide	Harvest* Code	Early** Manzate	(Days) Int	Rate	S%	LTM	TPA	RST	RSA	CLS RATING
Supertin	1	YES	10	3.75 oz.	13.46	1.82	10.58	233	2463	6
Manzate			10	2 lb						
Supertin	2	NO	10	3.75 oz.	15.51	1.81	12.24	254	3048	6
Manzate			10	2 lb						
Supertin	1	YES	10	3.75 oz	15.11	1.74	16.80	267	4492	6
Manzate			10	2 lb						
Supertin	2	NO	10	3.75 oz	15.45	1.73	18.13	27	4975	6.25
Manzate			10	2 lb						
Eminent	1	YES	14	19.5 oz.	14.02	1.77	19.10	245	4679	3
Supertin			10	3.75 oz						
Eminent	2	NO	14	19.5 oz.	13.94	1.81	21.51	243	5218	2.5
Supertin			10	3.75 oz.						
Eminent	1	YES	14	19.5 oz.	17.14	1.77	28.50	307	8760	2.25
Supertin			10	3.75 oz.						
Eminent	2	NO	14	19.5 oz.	17.32	1.64	29.80	314	9345	2.5
Supertin			10	3.75 oz.						
Quadris	2	YES	14	6 oz	16.57	1.79	26.60	295	7852	3.5
Supertin			10	3.75 oz.						
Quadris	2	NO	14	6 oz.	16.66	1.69	29.64	300	8904	3.25
Supertin			10	3.75 oz.						
1 Check					**11.56**	**1.77**	**4.24**	**204**	**2723**	7.5
2 Check					**12.00**	**1.71**	**13.36**	**196**	**830**	8
LSD (0.05)					**1.38**	**0.33**	**2.81**	**13**	**449**	1.45

*** 1 = Early Harvest - September 18**
*** 2 = Late Harvest - October 20**
**** Manzate applied 10 days prior to First applicaton**

CHEMICAL CONTROL OF SEEDLING DISEASE

OBJECTIVE: To evaluate chemicals influence on sugarbeet seedling diseases and sugar production.

EXPERIMENTAL PROCEDURE

Hilleshog Viking was planted at 4 inch spacing. Tachigaren was applied to seed for Tachigaren treatments. Apron and Thiram was applied to all seed as (check) standard treatment. Fungicides tested were Quadris, Ridomil, Folicur and fumigant Vapam.

Sugarbeet seed was planted on May 22 and May 26 at experiments 3498 (Renville) and 3898 (Buffalo Lake). Experiment design was a randomized complete block design. Experimental units were 11 ft. wide (6 rows wide) and 30 ft. long. All data was collected from the middle two rows on the following dates:

	Renville	Buffalo Lake
First stand count	06/12/98	06/15/98
Second stand count	07/15/98	07/15/98
Harvest	09/18/98	09/24/98

Sub samples from sugarbeets harvested were analyzed for quality.

Soil was indexed by Jason Bratnex at the University of Minnesota and Northwest Experiment Station at Crookston, Minnesota. The results of these tests were that the Renville site had high incidence of Aphanomyces and Rhizoctonia and the Buffalo Lake site had low incidence of Aphanomyces.

SUMMARY

Stand counts at both locations were non-significant among treatment except at Renville at the second stand count. The second stand count at Renville showed the untreated was the only treatment that was significantly different from the other treatments. Thus, at all locations and time of stand counts, the chemical treatments were statistically the same.

Sugarbeet yield, however, was significantly effected by treatments. This indicates that although sugarbeet stand did not appear to be effected, there was an effect on sugarbeet yield and quality.

The Renville location had both aphanomyces and Rhizoctonia. This probably is why Quadris treated sugarbeets at the Renville location were among the top three treatments for recoverable sugar per acre when applied at .2308 fl. oz./1,000 row ft., regardless of application time. Vapam applied at 9 gallons/acre gave significantly higher recoverable sugar per acre than all other treatments except Quadris at .2308 fl. oz./1,000 row ft. ppi and post 4 leaf and Quadris at .1154 fl. oz./1,000 row ft. applied ppi. Quadris has shown in the past research to be effective on both Aphanomyces and Rhizoctonia.

The Buffalo Lake location had a low index of Aphanomyces. Tachigaren was the only treatment at Buffalo Lake that gave significantly higher recoverable sugar per acre in comparison to the untreated check. The ability of treatments to enhance sugar production in conditions of low disease pressure indicates the effectiveness of such products even under low disease pressure.

The conclusion to these two trials is that in a situation where Rhizoctonia is present then Vapam at 9 gallons per acre or Quadris should be used and Tachigaren should be used when Aphanomyces is present. This indicates further research should be conducted to consider combining products either in the row or as a seed treatment as a broad spectrum control of Aphanomyces and Rhizoctonia.

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT RENVILLE, MN
EXPERMENT #: 3498

YIELD AND QUALITY

TREATMENT	APPLICATION TIMING	RATE	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	3804	92.39	259	97.96	14.69	94.24	14.28	98.66	1.33	106.12
Quadris	PPI	.2308 fl oz/1000rowft	4618	112.18	270	102.08	17.11	109.80	14.73	101.75	1.23	98.34
Quadris	POST 4LF	.1154 fl oz/1000rowft	4034	97.98	249	94.12	16.21	104.03	13.66	94.38	1.22	97.15
Quadris	POST 4LF	.2308 fl oz/1000rowft	4383	105.98	258	97.47	16.93	108.65	14.15	97.78	1.27	101.03
Ridomil	PPI	1 fl oz/1000rowft	3780	91.81	265	100.33	14.25	91.43	14.49	100.13	1.23	97.98
Folicur	PPI	.4089 fl oz/1000rowft	3998	97.09	257	97.38	15.53	99.63	14.23	98.32	1.36	108.16
Folicur	POST 4 LF	.4089 fl oz/1000rowft	3965	96.31	276	104.55	14.35	92.04	15.01	103.73	1.19	95.05
Tachigaren	WITH SEED	45 g/100kg seed	3989	96.89	269	101.81	14.82	95.09	14.74	101.82	1.28	101.89
Vapam	PPI	6 gal/acre	3806	92.45	267	100.91	14.27	91.56	14.63	101.08	1.29	102.89
Vapam	PPI	9 gal/acre	4501	109.33	268	101.35	16.80	107.79	14.62	101.01	1.22	97.51
Untreated	----------	----------	3364	81.71	247	93.30	13.64	87.52	13.56	93.69	1.23	97.83
		MEAN	4117	100	264	100	15.59	100	14.47	100	1.25	100
		C.V %	11		6		8.58		7.016		11.16	
		LSD (0.05)	510		25		1.87		1.17		0.16	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT BUFFALO LAKE, MN
EXPERMENT #: 3898

YIELD AND QUALITY

TREATMENT	APPLICATION TIMING	RATE	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	3298	95.47	241	99.18	13.66	96.26	13.58	99.35	1.49	100.80
Quadris	PPI	.2308 fl oz/1000rowft	3409	98.60	254	104.17	13.43	94.66	14.12	103.46	1.44	97.62
Quadris	POST 4LF	.1154 fl oz/1000rowft	3384	97.98	234	96.00	14.48	102.06	13.21	96.81	1.53	103.51
Quadris	POST 4LF	.2308 fl oz/1000rowft	3651	105.72	243	99.89	15.02	105.83	13.66	100.09	1.50	101.68
Ridomil	PPI	1 fl oz/1000rowft	2976	86.17	247	101.64	12.03	84.78	13.81	101.18	1.44	97.42
Folicur	PPI	.4089 fl oz/1000rowft	3449	99.85	236	97.04	14.60	102.89	13.32	97.61	1.51	102.29
Folicur	POST 4 LF	.4089 fl oz/1000rowft	3835	111.04	251	103.05	15.29	107.75	14.00	102.58	1.46	98.70
Tachigaren	WITH SEED	45 g/100kg seed	3902	112.98	245	100.62	15.93	112.27	13.71	100.45	1.46	99.04
Vapam	PPI	6 gal/acre	3230	93.52	241	98.82	13.43	94.64	13.49	98.86	1.47	99.24
Vapam	PPI	9 gal/acre	3839	111.16	245	100.75	15.66	110.34	13.72	100.53	1.46	98.70
Untreated	----------	----------	3022	87.50	241	98.85	12.56	88.51	13.52	99.05	1.49	101.00
		MEAN	3454	100	243	100	14.19	100	13.65	100	1.48	100
		C.V %	14.06		16.5		10.60		21.8		20.53	
		LSD (0.05)	858		NS		1.33		NS		NS	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT RENVILLE, MN
EXPERMENT #: 3498

YIELD AND QUALITY

TREATMENT	APPLICATION TIMING	RATE	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	3804	92.39	259	97.98	14.69	94.24	14.28	98.68	1.33	106.12
Quadris	PPI	.2308 fl oz/1000rowft	4618	112.16	270	102.08	17.11	109.80	14.73	101.75	1.23	98.34
Quadris	POST 4LF	.1154 fl oz/1000rowft	4034	97.98	249	94.12	16.21	104.03	13.66	94.38	1.22	97.15
Quadris	POST 4LF	.2308 fl oz/1000rowft	4363	105.98	258	97.47	16.93	108.65	14.15	97.78	1.27	101.03
Ridomil	PPI	1 fl oz/1000rowft	3780	91.81	265	100.33	14.25	91.43	14.49	100.13	1.23	97.98
Folicur	PPI	.4089 fl oz/1000rowft	3998	97.09	257	97.38	15.53	99.63	14.23	98.32	1.36	108.16
Folicur	POST 4 LF	.4089 fl oz/1000rowft	3965	96.31	276	104.55	14.35	92.04	15.01	103.73	1.19	95.05
Tachigaren	WITH SEED	45 g/100kg seed	3989	96.89	269	101.81	14.82	95.09	14.74	101.82	1.28	101.89
Vapam	PPI	6 gal/acre	3806	92.45	267	100.91	14.27	91.55	14.63	101.08	1.29	102.89
Vapam	PPI	9 gal/acre	4501	109.33	268	101.35	16.80	107.79	14.62	101.01	1.22	97.51
Untreated	----------	----------	3364	81.71	247	93.30	13.64	87.52	13.56	93.69	1.23	97.83
		MEAN	4117	100	264	100	15.59	100	14.47	100	1.25	100
		C.V %	11		6		3.88		7.016		11.18	
		LSD (0.05)	510		25		1.57		1.17		0.16	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT BUFFALO LAKE, MN
EXPERMENT #: 3898

YIELD AND QUALITY

TREATMENT	APPLICATION TIMING	RATE	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	3298	95.47	241	99.18	13.66	96.28	13.56	99.35	1.49	100.80
Quadris	PPI	.2308 fl oz/1000rowft	3406	98.60	254	104.17	13.43	94.66	14.12	103.46	1.44	97.62
Quadris	POST 4LF	.1154 fl oz/1000rowft	3384	97.98	234	96.00	14.48	102.08	13.21	96.81	1.53	103.51
Quadris	POST 4LF	.2308 fl oz/1000rowft	3651	105.72	243	99.89	15.02	105.83	13.66	100.09	1.50	101.68
Ridomil	PPI	1 fl oz/1000rowft	2976	86.17	247	101.64	12.03	84.78	13.81	101.18	1.44	97.42
Folicur	PPI	.4089 fl oz/1000rowft	3449	99.85	236	97.04	14.60	102.89	13.32	97.61	1.51	102.29
Folicur	POST 4 LF	.4089 fl oz/1000rowft	3835	111.04	251	103.05	15.29	107.75	14.00	102.58	1.46	98.70
Tachigaren	WITH SEED	45 g/100kg seed	3902	112.98	245	100.62	15.93	112.27	13.71	100.46	1.46	99.04
Vapam	PPI	6 gal/acre	3230	93.52	241	98.82	13.43	94.64	13.49	98.86	1.47	99.24
Vapam	PPI	9 gal/acre	3839	111.16	245	100.75	15.66	110.34	13.72	100.53	1.46	98.70
Untreated	----------	----------	3022	87.50	241	98.85	12.56	88.51	13.52	99.08	1.49	101.00
		MEAN	3453.82	100	243.40	100	14.19	100	13.66	100	1.48	100
		C.V %	15.06		15.5		10.69		21.6		20.63	
		LSD (0.05)	856		23.72		1.326		1.12		0.21	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT RENVILLE, MN
EXPERMENT #: 3498

STAND COUNTS

TREATMENT	APPLICATION TIMING	RATE	FIRST STAND COUNT	FIRST STND CNT (%) of mean	SECOND STAND COUNT	SECOND STND CNT (%) of mean	COMBINED STAND COUNT	COMBINED STND CNT (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	65	102.39	44	95.40	55	99.45
Quadris	PPI	.2308 fl oz/1000rowft	64	100.81	46	99.74	55	100.36
Quadris	POST 4LF	.1154 fl oz/1000rowft	53	83.49	45	97.57	49	89.41
Quadris	POST 4LF	.2308 fl oz/1000rowft	70	110.00	48	104.07	59	107.51
Ridomil	PPI	1 fl oz/1000rowft	70	110.52	48	104.07	59	107.81
Folicur	PPI	.4089 fl oz/1000rowft	68	106.85	49	106.24	58	106.59
Folicur	POST 4 LF	.4089 fl oz/1000rowft	60	94.51	48	104.07	54	98.54
Tachigaren	WITH SEED	45 g/100kg seed	61	95.62	48	104.07	54	99.29
Vapam	PPI	6 gal/acre	67	105.27	49	106.24	58	105.68
Vapam	PPI	9 gal/acre	61	96.61	46	99.74	54	97.93
Untreated	------------	------------	60	93.73	36	78.78	48	87.44
		MEAN	63	100	46	100	55	100
		C.V %	23		22		19	
		LSD (0.05)	17		9		11	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT BUFFALO LAKE, MN
EXPERMENT #: 3898

STAND COUNT

TREATMENT	APPLICATION TIMING	RATE	FIRST STAND COUNT	FIRST STND CNT (%) of mean	SECOND STAND COUNT	SECOND STND CNT (%) of mean	COMBINED STAND COUNT	COMBINED STND CNT (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	44	96.84	38	97.15	41	96.98
Quadris	PPI	.2308 fl oz/1000rowft	44	97.58	38	95.87	41	96.79
Quadris	POST 4LF	.1154 fl oz/1000rowft	48	102.02	43	108.18	44	104.88
Quadris	POST 4LF	.2308 fl oz/1000rowft	50	111.26	43	110.30	47	110.81
Ridomil	PPI	1 fl oz/1000rowft	41	90.56	41	103.93	41	96.78
Folicur	PPI	.4089 fl oz/1000rowft	43	95.73	38	97.57	41	96.59
Folicur	POST 4 LF	.4089 fl oz/1000rowft	50	109.78	40	102.24	45	106.27
Tachigaren	WITH SEED	45 g/100kg seed	40	89.08	36	90.36	38	89.68
Vapam	PPI	6 gal/acre	47	104.60	40	102.24	44	103.50
Vapam	PPI	9 gal/acre	50	111.26	41	103.51	45	107.65
Untreated	------------	------------	41	91.30	35	88.66	38	90.07
		MEAN	45	100	39	100	42	100
		C.V %	23		24		22	
		LSD (0.05)	12		11		11	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT RENVILLE, MN
EXPERMENT #: 3498

STAND COUNTS

TREATMENT	APPLICATION TIMING	RATE	FIRST STAND COUNT	FIRST STND CNT (%) of mean	SECOND STAND COUNT	SECOND STND CNT (%) of mean	COMBINED STAND COUNT	COMBINED STND CNT (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	65	102.39	44	95.40	55	99.45
Quadris	PPI	.2308 fl oz/1000rowft	64	100.81	46	99.74	55	100.36
Quadris	POST 4LF	.1154 fl oz/1000rowft	53	83.49	45	97.57	49	89.41
Quadris	POST 4LF	.2308 fl oz/1000rowft	70	110.00	48	104.07	59	107.51
Ridomil	PPI	1 fl oz/1000rowft	70	110.52	48	104.07	59	107.81
Folicur	PPI	.4089 fl oz/1000rowft	68	106.85	49	106.24	58	106.59
Folicur	POST 4 LF	.4089 fl oz/1000rowft	60	94.51	48	104.07	54	98.54
Tachigaren	WITH SEED	45 g/100kg seed	61	95.82	48	104.07	54	99.29
Vapam	PPI	6 gal/acre	67	105.27	49	106.24	58	105.68
Vapam	PPI	9 gal/acre	61	96.61	46	99.74	54	97.93
Untreated	------------	------------	60	93.73	36	78.78	48	87.44
		MEAN	63	100	46	100	55	100
		C.V %	23		22		19	
		LSD (0.05)	NS		9		NS	

CHEMICAL CONTROL OF ROOT DISEASES IN SUGAR BEETS AT BUFFALO LAKE, MN
EXPERMENT #: 3898

STAND COUNT

TREATMENT	APPLICATION TIMING	RATE	FIRST STAND COUNT	FIRST STND CNT (%) of mean	SECOND STAND COUNT	SECOND STND CNT (%) of mean	COMBINED STAND COUNT	COMBINED STND CNT (%) of mean
Quadris	PPI	.1154 fl oz/1000rowft	44	96.84	38	97.15	41	96.98
Quadris	PPI	.2308 fl oz/1000rowft	44	97.58	38	95.87	41	96.79
Quadris	POST 4LF	.1154 fl oz/1000rowft	46	102.02	43	108.18	44	104.88
Quadris	POST 4LF	.2308 fl oz/1000rowft	50	111.26	43	110.30	47	110.81
Ridomil	PPI	1 fl oz/1000rowft	41	90.56	41	103.93	41	96.78
Folicur	PPI	.4089 fl oz/1000rowft	43	95.73	38	97.57	41	96.59
Folicur	POST 4 LF	.4089 fl oz/1000rowft	50	109.78	40	102.24	45	106.27
Tachigaren	WITH SEED	45 g/100kg seed	40	89.08	36	90.36	38	89.68
Vapam	PPI	6 gal/acre	47	104.60	40	102.24	44	103.50
Vapam	PPI	9 gal/acre	50	111.26	41	103.51	45	107.65
Untreated	------------	------------	41	91.30	35	88.66	38	90.07
		MEAN	45	100	39	100	42	100
		C.V %	23		24		22	
		LSD (0.05)	NS		NS		NS	

RHIZOMANIA RESISTANT VARIETIES EVALUATED FOR SUGAR PRODUCTION

OBJECTIVE: Evaluate Rhizomania resistant varieties for yield and quality in presence and absence of Rhizomania.

EXPERIMENTAL PROCEDURE

Trials were planted in three locations in 1998. Varieties were replicated six times in a randomized complete block design. Trials were planted on April 20 and 21. Varieties planted are as follows:

Varieties:

Holly 97C101-02
Holly 97C101-05
Holly 97C101-07
Holly 97C202-06
Holly 97C203-06
Holly 97C204-06
Holly 97C35-06
Holly 97C35-06
Holly Rival
Holly S 1660 RT
Holly S 1850 RTCT
Holly S 1862 CTRT
Beta M811
Beta M812
Beta M813
Beta M841
Beta M842
Beta M843
Beta M844
Beta M845
Beta M846
Beta M847
Beta M848
Beta M849
Beta M850
VDH 46109 RR
VDH 68152 RR
Hilleshog HM 7073
Hilleshog HM 7076
Hilleshog HM 7083
Seedex 98 SX SM-1
Seedex 98 SX SM-2
Seedex 98 SX SM-3
Seedex 98 SX SM-4
Seedex 98 SX SM-5
Seedex 98 SX SM-6
ACH Crystal 9876RZ
ACH Crystal 9700053
ACH Maribo 9372
Beta 6904

Beta 6904 was used as a check. Varieties were coded and sent to Beta Seed at Shakopee, MN for testing in Aphanomyces and cercospora leaf spot nurseries (Table 4).

Trials were harvested on September 22, 23, 25 and 26. The sugarbeets were harvested with a two row harvester and were analyzed for yield and quality.

Locations were soil sampled to determine presence or absence of Rhizomania. Two locations were considered disease free and data was combined (Table 1).

Table 2 shows data from a location that tested positive for Rhizomania and also had Aphanomyces. The last location (Table 3) tested positive for Rhizomania alone. The various disease presence at each location caused a change in rankings of the varieties. The data indicates the high potential of the genetics available for various conditions.

Table 1. RHIZOMANIA VARIETY SCREENING PERFORMANCE SUMMARY, DISEASE FREE
EXPERMENT #: COMBINED 198 AND 398

ranking	VARIETIES	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
1	BETA M812	8538	130	247	102	34.66	129	13.95	103	1.62	107
2	HOLLY S 1850 RTCT	8053	123	267	111	30.16	112	14.75	109	1.39	92
3	HOLLY RIVAL	7852	120	264	109	29.67	110	14.56	107	1.38	92
4	HOLLY 97C101-07	7795	119	258	107	30.02	112	14.34	106	1.41	94
5	BETA M846	7774	119	252	105	30.59	114	14.03	104	1.42	94
6	BETA M813	7703	118	242	100	31.79	118	13.63	101	1.54	103
7	BETA M811	7671	117	253	105	30.20	112	14.14	104	1.47	98
8	HOLLY 97C35-06	7459	114	251	104	29.65	110	14.08	104	1.53	102
9	HOLLY 97C204-08	7394	113	249	103	29.60	110	14.03	104	1.60	106
10	HOLLY 97C35-06	7385	113	266	110	27.77	103	14.65	108	1.37	91
11	BETA M843	7269	111	263	109	27.53	102	14.60	108	1.43	95
12	HOLLY S 1660 RT	7165	109	258	107	27.67	103	14.37	106	1.46	97
13	BETA M841	7054	108	256	106	27.36	102	14.34	106	1.51	101
14	BETA M848	7049	108	239	99	29.33	109	13.52	100	1.54	102
15	HILLESHOG HM 7073	7048	108	250	104	28.08	104	13.94	103	1.47	97
16	HOLLY 97C101-05	6893	105	255	106	27.14	101	14.39	106	1.65	110
17	HOLLY 97C203-06	6756	103	243	101	27.62	103	13.71	101	1.54	102
18	BETA M850	6751	103	234	97	28.57	106	13.25	98	1.54	102
19	HOLLY S 1862 CTRT	6675	102	251	104	26.33	98	14.06	104	1.49	99
20	ACH CRYSTAL 9700053	6654	102	247	102	26.70	99	13.87	102	1.53	101
21	HOLLY 97C101-02	6455	98	242	100	26.64	99	13.66	101	1.55	103
22	BETA M842	6324	96	250	104	25.09	93	14.01	103	1.51	100
23	HOLLY 97C202-02	6293	96	247	103	25.14	93	13.90	103	1.53	102
24	BETA 6904	6250	95	224	93	27.46	102	12.74	94	1.53	102
25	BETA M849	6205	95	239	99	25.70	96	13.44	99	1.51	100
26	SEEDEX 96SX SM-5	6161	94	224	93	27.09	101	12.77	94	1.57	104
27	BETA M845	5943	91	231	96	25.44	95	13.01	96	1.47	98
28	SEEDEX 96SX SM-2	5940	91	227	94	25.87	96	12.79	94	1.46	97
29	BETA M847	5908	90	224	93	26.08	97	12.75	94	1.56	103
30	HILLESHOG HM 7076	5875	90	228	95	25.47	95	12.98	96	1.58	105
31	SEEDEX 96SX SM-3	5856	89	220	91	26.30	98	12.60	93	1.60	106
32	VDH 46109 RR	5816	89	236	98	24.38	91	13.30	98	1.51	100
33	SEEDEX 96SX SM-1	5804	89	231	96	24.76	92	13.07	96	1.51	100
34	ACH CRYSTAL 9676RZ	5698	87	230	96	24.39	91	12.92	95	1.41	93
35	BETA M844	5621	86	227	94	24.37	91	12.84	95	1.50	100
36	ACH	5599	85	225	93	24.46	91	12.84	95	1.60	106
37	SEEDEX 96SX SM-6	5509	84	222	92	24.50	91	12.63	93	1.55	103
38	VDH 68152 RR	5385	82	226	94	23.46	87	12.76	94	1.44	96
39	HILLESHOG HM 7083	5318	81	213	89	24.49	91	12.19	90	1.53	102
40	SEEDEX 96SX SM-4	5231	80	231	96	22.04	82	13.06	97	1.54	102
	MEAN	6554	100	241	100	26.90	100	13.55	100	1.51	100
	C.V %	14.93		12.88		8.91		6.93		10.35	
	LSD (0.05)	759		16.61		2.80		0.75		0.13	

Table 2. RHIZOMANIA VARIETY SCREENING PERFORMANCE SUMMARY, RHIZOMANIA AND APHANOMYCES POSITIVE
EXPERMENT #: 298

ranking	VARIETIES	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
1	BETA M844	5562	155	227	102	24.48	152	13.16	102	1.80	100
2	VDH 68152 RR	5273	147	237	107	22.23	138	13.54	105	1.68	93
3	BETA M841	5035	140	239	108	21.05	131	13.66	106	1.70	94
4	VDH 46109 RR	4901	136	250	113	19.59	122	14.17	110	1.66	92
5	BETA M812	4771	133	228	103	20.89	130	13.27	103	1.86	103
6	BETA M848	4520	126	224	101	20.15	125	13.19	102	1.97	110
7	BETA M811	4342	121	246	111	17.62	110	14.03	109	1.70	95
8	BETA M849	4301	120	236	106	18.20	113	13.44	104	1.62	90
9	BETA M846	4246	118	243	109	17.51	109	14.01	109	1.89	105
10	HOLLY 97C35-06	3940	110	220	99	17.89	111	12.96	100	1.94	108
11	BETA M842	3940	110	226	102	17.44	108	12.99	101	1.70	94
12	SEEDEX 98SX SM-6	3927	109	221	99	17.78	111	13.09	101	2.04	113
13	SEEDEX 98SX SM-5	3857	107	225	101	17.17	107	12.90	100	1.67	93
14	BETA M843	3837	107	221	100	17.35	108	12.88	100	1.83	101
15	ACH	3807	106	232	104	16.44	102	13.53	105	1.95	108
16	BETA M813	3734	104	237	107	15.75	98	13.51	105	1.66	92
17	BETA M847	3557	99	239	108	14.88	93	13.57	105	1.62	90
18	HILLESHOG HM 7083	3546	99	221	100	16.01	100	12.95	100	1.88	104
19	HOLLY S 1862 CTRT	3481	97	225	101	15.45	96	13.09	101	1.82	101
20	BETA M845	3412	95	213	96	16.06	100	12.41	96	1.78	99
21	HOLLY 97C35-06	3407	95	202	91	16.83	105	12.06	93	1.94	108
22	HILLESHOG HM 7076	3323	93	221	100	15.02	93	13.02	101	1.96	109
23	SEEDEX 98SX SM-4	3321	92	215	97	15.41	96	12.68	98	1.90	106
24	HOLLY 97C101-07	3294	92	215	97	15.30	95	12.72	99	1.96	109
25	SEEDEX 98SX SM-3	3288	92	221	100	14.86	92	12.64	98	1.58	88
26	BETA M850	3263	91	220	99	14.86	92	12.69	98	1.71	95
27	HOLLY 97C101-05	3247	90	215	97	15.09	94	12.76	99	2.00	111
28	HOLLY 97C202-06	3235	90	202	91	16.00	100	12.04	93	1.92	107
29	HOLLY RIVAL	3197	89	222	100	14.41	90	13.03	101	1.94	108
30	HILLESHOG HM 7073	3180	89	237	107	13.43	84	13.72	106	1.89	105
31	HOLLY S 1850 RTCT	3047	85	217	98	14.04	87	12.68	98	1.83	102
32	HOLLY S 1660 RT	2979	83	216	97	13.76	86	12.39	96	1.57	87
33	HOLLY 97C101-02	2978	83	208	94	14.31	89	12.39	96	1.99	110
34	SEEDEX 98SX SM-2	2854	79	208	94	13.69	85	11.96	93	1.54	85
35	HOLLY 97C204-06	2843	79	210	95	13.52	84	12.36	96	1.85	103
36	ACH CRYSTAL 9676RZ	2814	78	222	100	12.70	79	12.99	101	1.91	106
37	SEEDEX 98SX SM-1	2697	75	217	98	12.43	77	12.35	96	1.50	83
38	ACH CRYSTAL 9700053	2478	69	212	96	11.67	73	12.44	96	1.82	101
39	HOLLY 97C203-06	2395	67	196	88	12.25	76	11.59	90	1.81	101
40	BETA 6904	1855	52	194	87	9.56	59	11.33	88	1.63	91
	MEAN	3592	100	222	100	16.08	100	12.91	100	1.80	100
	C.V %	10.78		7.19		7.70		5.65		8.40	
	LSD (0.05)	441		18		1.40		0.83		0.17	

Table 3. RHIZOMANIA VARIETY SCREENING PERFORMANCE SUMMARY, NOBLE LOCATION
EXPERMENT #: 498

ranking	VARIETIES	REC. SUC. PER ACRE (LBS)	REC. SUC. PER ACRE (%) of mean	REC. SUC. PER TON (LBS)	REC. SUC. PER TON (%) of mean	TONS PER ACRE (TONS)	TONS PER ACRE (%) of mean	SUCROSE (%)	SUCROSE (%) of mean	LOSS TO MOLASSES (%)	LOSS TO MOLASSES (%) of mean
1	BETA M811	7884	148	281	116	28.10	128	15.29	114	1.27	89
2	HOLLY S 1862 CTRT	7670	144	260	108	29.48	134	14.43	107	1.42	100
3	HOLLY 97C101-07	7086	133	258	107	27.49	125	14.40	107	1.52	107
4	BETA M846	7074	133	261	108	27.10	123	14.50	108	1.45	102
5	BETA M842	6759	127	257	107	26.33	120	14.17	105	1.33	94
6	HOLLY S 1680 RT	6666	125	228	95	29.23	133	12.76	95	1.35	95
7	VDH 68152 RR	6469	121	239	99	27.05	123	13.38	99	1.40	99
8	BETA M848	6344	119	224	93	28.29	129	12.80	95	1.59	112
9	BETA M841	6325	119	263	109	24.08	110	14.41	107	1.28	90
10	HOLLY 97C101-05	6252	117	235	97	26.64	121	13.34	99	1.61	113
11	BETA M845	6216	117	245	101	25.42	116	13.57	101	1.34	94
12	HILLESHOG HM 7076	6124	115	237	98	25.86	118	13.38	99	1.55	109
13	HOLLY 97C35-08	6116	115	250	104	24.50	111	13.95	104	1.46	103
14	HOLLY 97C35-06	6044	113	237	98	25.46	116	13.29	99	1.42	100
15	HOLLY S 1850 RTCT	6006	113	251	104	23.94	109	13.98	104	1.44	101
16	BETA M813	5873	110	272	113	21.58	98	14.80	110	1.19	84
17	BETA M843	5853	110	243	101	24.07	110	13.61	101	1.46	103
18	BETA M847	5831	109	247	103	23.57	107	13.67	102	1.30	92
19	HOLLY RIVAL	5803	109	247	102	23.50	107	13.82	103	1.47	104
20	HILLESHOG HM 7073	5688	107	263	109	21.63	98	14.52	108	1.37	96
21	BETA M844	5612	105	256	106	21.90	100	14.21	105	1.40	98
22	ACH	5512	103	249	103	22.16	101	13.98	104	1.55	109
23	HILLESHOG HM 7083	5508	103	247	102	22.34	102	13.77	102	1.44	102
24	VDH 46109 RR	5474	103	250	104	21.89	100	13.93	103	1.43	101
25	HOLLY 97C101-02	5333	100	259	107	20.61	94	14.42	107	1.48	104
26	BETA M849	5268	99	235	97	22.45	102	13.06	97	1.32	93
27	ACH CRYSTAL 9676RZ	5133	96	271	112	18.96	86	14.66	109	1.13	79
28	HOLLY 97C204-06	4807	90	222	92	21.64	98	12.59	93	1.48	105
29	SEEDEX 98SX SM-4	4773	90	214	89	22.30	101	12.16	90	1.48	103
30	BETA M812	4730	89	242	101	19.54	89	13.56	101	1.46	103
31	HOLLY 97C202-02	4566	86	232	96	19.64	89	13.17	98	1.55	109
32	SEEDEX 98SX SM-6	4542	85	234	97	19.44	88	13.25	98	1.57	110
33	SEEDEX 98SX SM-5	4539	85	219	91	20.71	94	12.38	92	1.42	100
34	BETA M850	4277	80	243	101	17.59	80	13.44	100	1.28	90
35	HOLLY 97C203-06	4004	75	229	95	17.48	80	13.01	97	1.56	110
36	ACH CRYSTAL 9700053	3177	60	230	95	13.83	63	12.96	96	1.47	104
37	BETA 6904	2860	54	238	99	12.00	55	13.22	98	1.31	92
38	SEEDEX 98SX SM-3	2841	53	216	90	13.14	60	12.14	90	1.33	94
39	SEEDEX 98SX SM-1	2553	48	213	89	11.97	54	11.98	89	1.29	91
40	SEEDEX 98SX SM-2	2205	41	183	76	12.08	55	10.62	79	1.49	105
	MEAN	5331	100	241	100	21.97	100	13.47	100	1.42	100
	C.V %	12.96		10.15		10.61		8.8		10.34	
	LSD (0.05)	808		28		2.42		1.32		0.17	

Table 4. 1998 SMBSC RESEARCH-CODED CERCOSPORA AND APANOMYCES

ranking		04-Aug	10-Aug	18-Aug	25-Aug		ADJ TO ACH 5.5 EQUIV.	APHANOMYCES RATING R1** ACTUAL	%CHECK
		CERCOSPORA READINGS							
1	SEEDEX 98SX SM-3	1.9	2.8	4.0	4.5	3.3	3.8	2.0	74
2	HOLLY 97C101-02	2.7	3.0	3.9	5.2	3.7	4.1	3.2	119
3	HOLLY 97C101-05	2.5	3.0	4.1	5.3	3.7	4.1	3.6	133
4	HOLLY 97C101-07	2.2	3.3	4.1	5.1	3.7	4.1	3.1	115
5	BETA M850	2.0	3.2	4.5	5.1	3.7	4.1	2.3	85
6	HOLLY 97C35-08	2.1	3.2	4.6	5.5	3.9	4.2	3.3	122
7	BETA M846	2.4	3.0	4.8	5.3	3.9	4.2	2.7	100
8	BETA M848	2.2	3.2	4.3	5.5	3.8	4.2	1.2	44
9	SEEDEX 98SX SM-1	2.3	3.0	4.5	5.4	3.8	4.2	1.6	59
10	HOLLY 97C203-06	2.4	3.1	4.3	5.7	3.9	4.3	3.9	144
11	HILLESHOG HM 7073	2.1	3.0	4.8	5.7	3.9	4.3	2.6	96
12	SEEDEX 98SX SM-5	2.5	2.8	5.0	5.5	4.0	4.3	2.3	85
13	SEEDEX 98SX SM-6	2.5	3.0	4.5	5.6	3.9	4.3	1.8	67
14	VDH 46109 RR	2.0	3.0	4.8	6.3	4.0	4.4	2.0	74
15	VDH 68152 RR	2.4	3.0	5.0	5.9	4.1	4.4	1.8	67
16	ACH CRYSTAL 9876RZ	2.2	3.3	4.5	6.0	4.0	4.4	2.6	96
17	ACH CRYSTAL 9700053	2.1	3.3	4.6	5.8	4.0	4.4	2.3	85
18	HOLLY 97C202-02	2.1	3.1	4.6	6.5	4.1	4.5	2.8	104
19	HOLLY 97C35-06	2.3	3.2	5.2	5.8	4.1	4.5	2.9	107
20	HOLLY S 1862 CTRT	2.2	3.0	4.6	6.6	4.1	4.5	2.4	89
21	BETA M811	2.4	3.2	4.8	5.8	4.1	4.5	1.9	70
22	BETA M849	2.8	2.9	4.8	5.9	4.1	4.5	2.3	85
23	ACH	2.5	3.3	4.6	6.0	4.1	4.5	2.5	93
24	HILLESHOG HM 7083	2.7	3.3	5.0	6.1	4.3	4.6	3.2	119
25	BETA 6904	2.4	3.4	5.1	6.0	4.2	4.6	1.5	56
26	HOLLY RIVAL	2.7	3.5	4.6	6.3	4.3	4.7	3.9	144
27	BETA M847	2.5	3.3	4.8	6.3	4.2	4.7	1.9	70
28	SEEDEX 98SX SM-2	2.5	3.2	4.8	6.7	4.3	4.7	1.9	70
29	SEEDEX 98SX SM-4	2.5	3.3	5.0	6.4	4.3	4.7	1.7	63
30	HOLLY 97C204-08	2.6	3.2	5.2	6.4	4.4	4.9	3.0	111
31	BETA M812	2.8	3.0	5.0	7.1	4.5	5.0	2.2	81
32	HOLLY S 1850 RTCT	2.7	4.0	5.0	6.9	4.7	5.1	2.7	100
33	BETA M843	2.7	3.8	5.4	6.9	4.7	5.2	2.1	78
34	HILLESHOG HM 7076	2.2	3.6	5.6	7.6	4.8	5.2	1.7	63
35	BETA M813	3.0	3.5	5.2	7.6	4.8	5.3	1.9	70
36	BETA M842	2.8	3.7	5.6	7.5	4.9	5.4	1.9	70
37	BETA M845	2.8	3.5	5.0	8.5	5.0	5.4	3.2	119
38	BETA M841	2.8	3.8	5.4	8.0	5.0	5.5	2.1	78
39	BETA M844	2.6	3.7	5.5	8.4	5.1	5.5	1.4	52
40	HOLLY S 1660 RT	3.0	3.8	5.9	7.7	5.1	5.6	2.3	85
	MICHIGAN TOLERANT	2.0	3.0	4.0	4.3	3.3	3.6	2.0	74
	RRV SUSCEPTIBLE	2.6	3.5	5.0	6.6	4.4	4.9	3.4	126
	CANADIAN SUSCEPTIBLE	3.0	3.8	5.5	8.0	5.1	5.6	3.8	141
	USDA RESISTANT	1.8	1.9	2.9	2.9	2.4	2.6	1.6	59
	CHECK MEAN	2.4	3.1	4.3	5.5	3.8		2.7	100
	LSD (0.05)	0.5	0.5	0.6	0.8	0.6		0.7	26
	GRAND MEAN	2.4	3.2	4.7	5.9	4.1		2.3	85

CHEMICAL CONTROL OF RHIZOMANIA

OBJECTIVE: To evaluate chemical (Vapam and Tachigaren) control of Rhizomania and that influence on sugarbeet yield and quality.

EXPERIMENTAL PROCEDURE

Vapam was applied at 15 and 30 gallons per acre with and without Tachigaren treated seed. The rate of Tachigaren was 75 g/100 kg of seed. Vapam was incorporated immediately with a 5 ft. roto tiller at a depth of 4 inches.

The experimental design was a randomized complete block design. Experimental units were 11 ft. (6 rows) wide and 30 ft. long.

Sugarbeet seed Beta 6904 was planted on April 20 and 21 at experiment 498B and 298B, respectively. The middle two rows of the six rows experimental units were harvested on September 23 and 25 for experiments 498B and 298B, respectively. Sugarbeets were analyzed for yield and quality. Experiment 298B was north of Bird Island and experiment 498B was north of Maynard.

The data from the two sites are presented separately since site 498B (Table 1) had only Rhizomania and site 298B (Table 2) had Aphanomyces and Rhizomania. However, the conclusion for both sites are similar in that Vapam and Tachigaren did not control Rhizomania in comparison to check. The site with both Aphanomyces and Rhizomania gave a greater influence with the chemicals, although Vapam was lower when applied alone in comparison to the Vapam plus Tachigaren.

Chemical control of Rhizomania , experiment 298B

Treatment	Tons/ Acre	Sucrose Percent	Loss to Mollasses	Sucrose /Ton	Sucrose /Acre
Check	8.36	12.96	1.62	227	1896
Vapam 15 gal	8.42	12.41	1.52	218	1834
Vapam 30 gal	9.47	12.5	1.6	218	2064
Vapam 15 gal + Tach 75g	11.12	12.91	1.56	227	2524
Vapam 30 gal + Tach 75g	11.54	13.41	1.65	235	2714
Tachigaren 75 g	11.74	13.2	1.59	232	2726
Mean	**10.11**	**12.90**	**1.59**	**226**	**2293**
LSD (.05)	**0.53**	**0.84**	**0.12**	**17**	**405**
CV%	**14.26**	**5.55**	**6.62**	**6**	**17**

Chemical control of Rhizomania , experiment 498B

Treatment	Tons/ Acre	Sucrose Percent	Loss to Mollasses	Sucrose /Ton	Sucrose /Acre
Check	12.54	13.18	1.37	236	2962
Vapam 15 gal	12.45	13.41	1.41	240	2988
Vapam 30 gal	11.54	13.61	1.38	245	2823
Vapam 15 gal + Tach 75g	12.22	13.4	1.51	238	2906
Vapam 30 gal + Tach 75g	11.98	13.84	1.33	250	2997
Tachigaren 75 g	12.94	13.27	1.38	238	3077
Mean	**12.28**	**13.45**	**1.40**	**241**	**2959**
LSD (.05)	**0.53**	**0.84**	**0.12**	**17**	**405**
CV%	**14.26**	**5.55**	**6.62**	**6**	**17**

AGRONOMIC AND ECONOMIC EVALUATION OF GRID CELL SIZES NEEDED FOR NITROGEN RECOMMENDATIONS FOR SUGAR BEET IN SOUTHERN MINNESOTA

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Site-specific fertilizer application is becoming more common on sugar beet. Variable-rate application is based on grid sampling, with a grid of about 400 ft. X 400 ft. Each sample usually consists of 3-8 subsample cores. Economic returns have been achieved using this grid to direct a fertilizer application. However, the choice of grid size to use was determined based on the cost of sampling without a very good data base of the underlying nutrient variability in southern Minnesota fields. This project has been developed to determine the variability of soil nitrogen both within the field and within grid cells and measure changes in soil nitrogen within a field following a crop of sugar beet.

Objective:

Determine the agronomic and economic aspects of using different grid cells sizes for sampling for soil nitrate-N on site specific N recommendations for sugar beet production in Southern Minnesota.

Materials and Methods:

To achieve the stated objective, soil samples were collected Novermber 4-5, 1997 from a 14 acre research area (600 ft. X 900 ft.) in a producer's field near Raymond, Minnesota. The previous crop was corn. Soil samples were collected to a depth of four feet on a 60 ft X 60 ft grid pattern. Additional soil samples were taken around the perimeter of the research site to assist in making N recommendations maps for the larger grid cell sizes. Four nitrogen application maps were developed from the analysis for nitrate-N. These maps were based on 60 ft X 60 ft (0.08 acre), 180 ft X 180 ft (0.75 acre), 300 ft X 300 ft (2 acres), and 420 ft X 420 ft (4 acres) grid sampling patterns. The recommended N application rate was based on the following equation:

$$\text{Nrec} = 150 - (\text{soil nitrate in 0 to 2 ft.} + ((0.80 * (\text{soil nitrate in 2 to 4 ft} - 30))$$

If the soil nitrate 0 to 2 ft plus fertilizer was less than 80 lb/acre then fertilizer was added to bring the recommendation to 80 lb N/acre. The four variable nitrogen rate patterns were applied November 14, 1997 in 60 ft. wide strips and compared to a uniform rate of N applied across the field. This uniform rate will be based on the average nitrate-N value for the field. These five field length strips were replicated two times, Figure 1.

The field was space-planted at a 5.2 inch spacing between seeds by the producer. The variety used was Hilleshog Resist and treated with tachigren fungicide. Before harvest, September 29, 1998, a sample of ten beets was taken from the center of each of the 150-60 ft. X 60 ft. grid cells. Quality measurements were done at the Southern Minnesota Beet Sugar Cooperative tare lab in Renville, Minnesota. Sugar beet root yield was measured, October 1, 1998, in each strip with a beet lifter fitted with an on-the-go yield sensor.

Addition measurements taken include elevation and satellite images.

On October 8, 1998, soil samples were collected to a depth of four feet on a 60 ft. X 60 ft. grid to measure residual nitrate-N. The results from this soil sampling were not available at the time this report was written.

Results:

This project was established in late 1996. Two locations have been used in this study. The results from the first location were reported last year. This report will focus on the results from the second location. Figure 2. shows the nitrogen spread map developed from samples taken November 4-5, 1997 for nitrate-N. The differences between the maps become less as the grid cell size decreases. The 60 X 60 ft. grid map has the most variability. The range in N recommendations was from 0 to 144 lb N/a, Table 1. The maps for 180 X 180 ft., 300 X 300 ft., and 420 X 420 ft. grid cell sizes look somewhat different (Figure 2.) but the application amounts had a small range. The application maps indicate the ranges were 30 lb N/a for the 180 X 180 ft. grid cell map and 10 lb N/a for the 300 X 300 ft. and 420 X 420 ft. grid cell size maps. This indicates that to measure the full differences in the residual nitrate-N found in this field, then a very small grid cell size would have been needed. Economically, the use of this small of grid cell size is not practical and thus when using the larger grid cell sizes there is not a very large difference in the amount of N recommended. The elevation map, figure 1, and soil survey (not shown) for this field would indicate a substantial amount of variability in this field. The elevation change is up to 15 feet between the lowest and highest point in the field.

Table 1. Descriptive statistics for N fertilizer recommendations for several grid cell sizes.

Grid cell size	Number of values	Mean	Minimum	Maximum	Standard deviation
feet X feet	n	---------- pounds N per acre ----------			
60 X 60	150	128	0	144	17
180 X 180	15	128	114	137	7
300 X 300	6	128	125	131	3
420 X 420	2	129	129	130	1

At the time of this report, root yield data has not been processed for the on-the-go equipped beet lifter. The quality data, Table 2, shows differences within the field of 4.6 % in sugar concentration and 99 lb recoverable sugar per ton. With the current payment system this translates into $18 per ton. These differences were similar to last years. The distribution of these differences in sugar concentration, recoverable sugar per ton, loss to molasses, root amino-N, root K, and root Na are shown in figures 3 and 4. The treatments were applied in 60 foot strips oriented North and South. The differences in quality do not visually indicate any relationship to the treatments applied. The statistical analyses and means for the treatments in Table 3 show no differences for the quality parameters between the grid cell sizes used for making the nitrogen application maps.

Table 2. Descriptive statistics for sugar concentration, recoverable sugar per ton, root K, Root Na, Root amino-N, and loss to molasses for the study area near Raymond, Minnesota, 1998.

	Sugar concentration	Recoverable sugar	Root K	Root Na	Root amino-N	Loss to molasses
	%	lb/ton	------------ ppm ------------			%
Mean	15.8	298	1675	212	201	0.93
Minimum	13.5	248	1342	124	94	0.72
Maximum	18.1	347	2470	563	402	1.37
Standard Deviation	0.9	18	160	57	57	0.11
Coefficient of variation (%)	5.6	6.0	9.6	27.1	28.3	11.7

Table 3. Treatment means and statistics for sugar concentration, recoverable sugar per ton, root K, root Na, root amino-N, and loss to molasses for nitrogen grid cell study near Raymond, Minnesota, 1998.

	Sugar concentration		Root K	Root Na	Root amino-N	Loss to molasses
Treatment	%	lb/ton	-------------- ppm ------------			%

Constant	15.9	299	1725	212	192	0.93
60 X 60 ft	15.8	297	1708	207	202	0.94
180 X 180 ft	15.9	299	1681	206	201	0.93
300 X 300 ft	15.7	296	1656	226	199	0.93
420 X 420 ft	15.8	299	1604	208	207	0.91
$LSD_{0.05}$	0.94	20	239	54	11	0.11
Statistical analysis						
Trt	0.98	0.98	0.68	0.84	0.12	0.96
CV %	2.1	2.4	5.1	9.2	2.0	4.3

Again similar to last years results, this information does not agree with information from the Red River Valley. The Red River Valley research indicates an increased economic return occurs from using variable rate nitrogen application. Why are these results different? The dynamics of nitrogen in the Southern Minnesota soil could be considerable different. Possible factors for this difference include soil moisture, drainage , crop rotations, and amounts of organic matter. These factors may have effected the nitrogen availability across the landscape and equalize the differences between the constant rate and grid cell sampling treatments.

General Conclusions:

In both years of this study, there have been no differences in quality caused by using soil samples from different grid cell sizes to formulate application maps. This can also be said for root yield in 1997 and from visual observations of root yields at harvest in 1998. The application maps formulated from soil nitrate-N data obtained from grid cell sizes greater than 60 X 60 ft. are going to be very similar. When applying nitrogen fertilizer to sugar beet in Southern Minnesota at the recommended 150 lb N/a, variable rate application of nitrogen based on maps produced from the use of grid cell soil sampling does not cause root yield and quality to be any different than the use of a constant rate application.

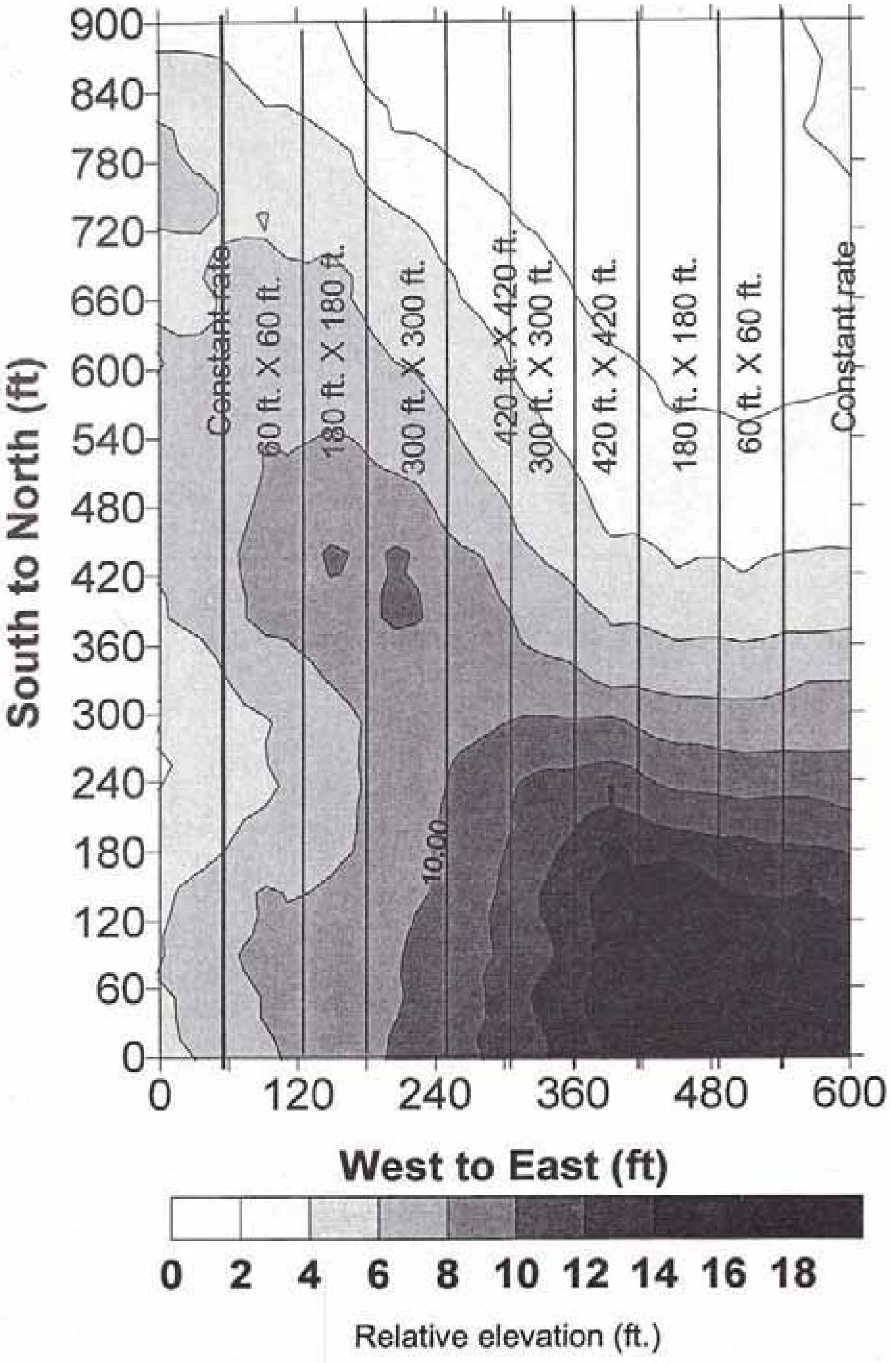

Figure 1. Plot layout and elevation map for 1998 grid cell size study.

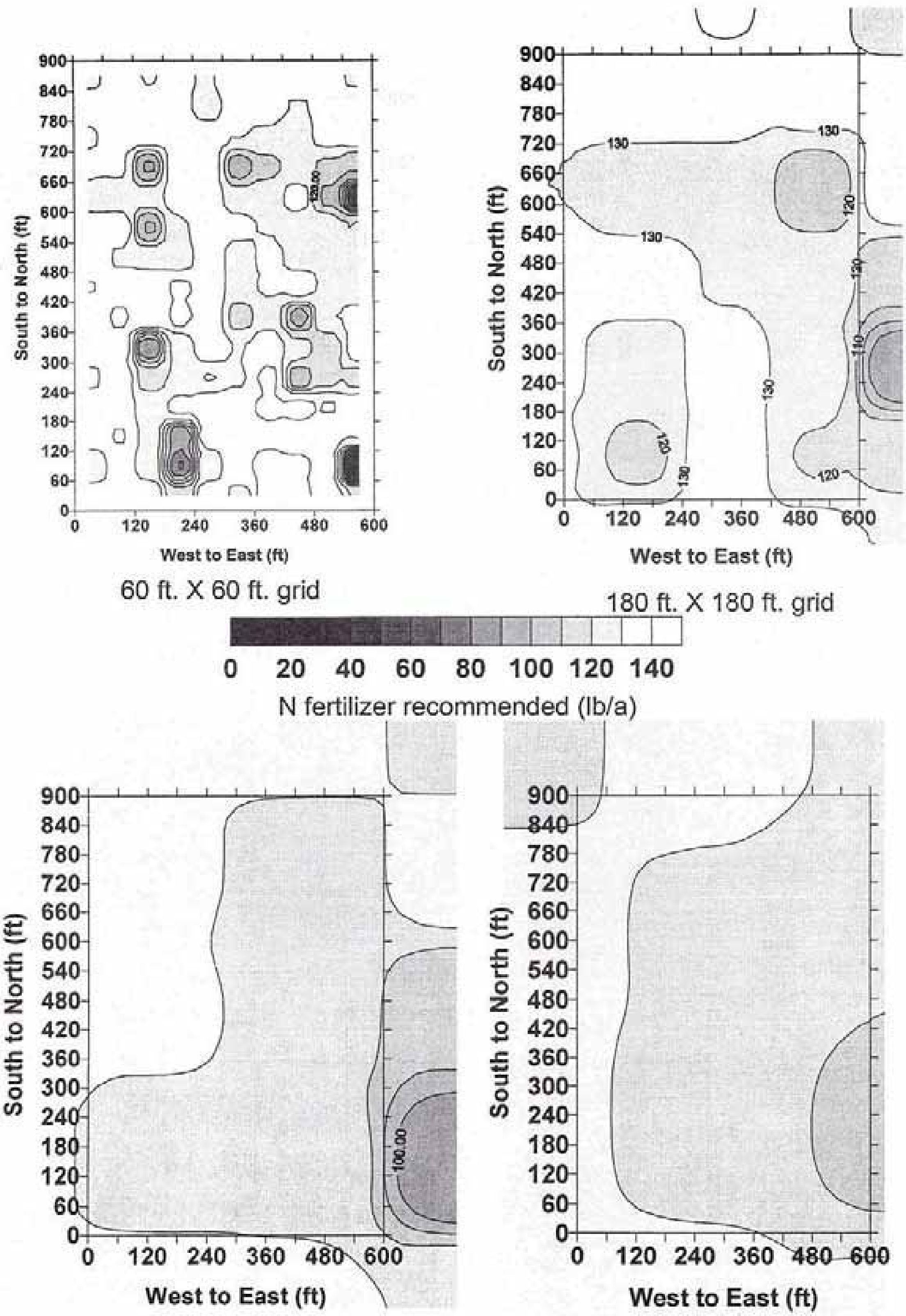

Figure 2. Nitrogen spread maps based soil samples taken on 60, 180, 300, and 420 ft. grid cells.

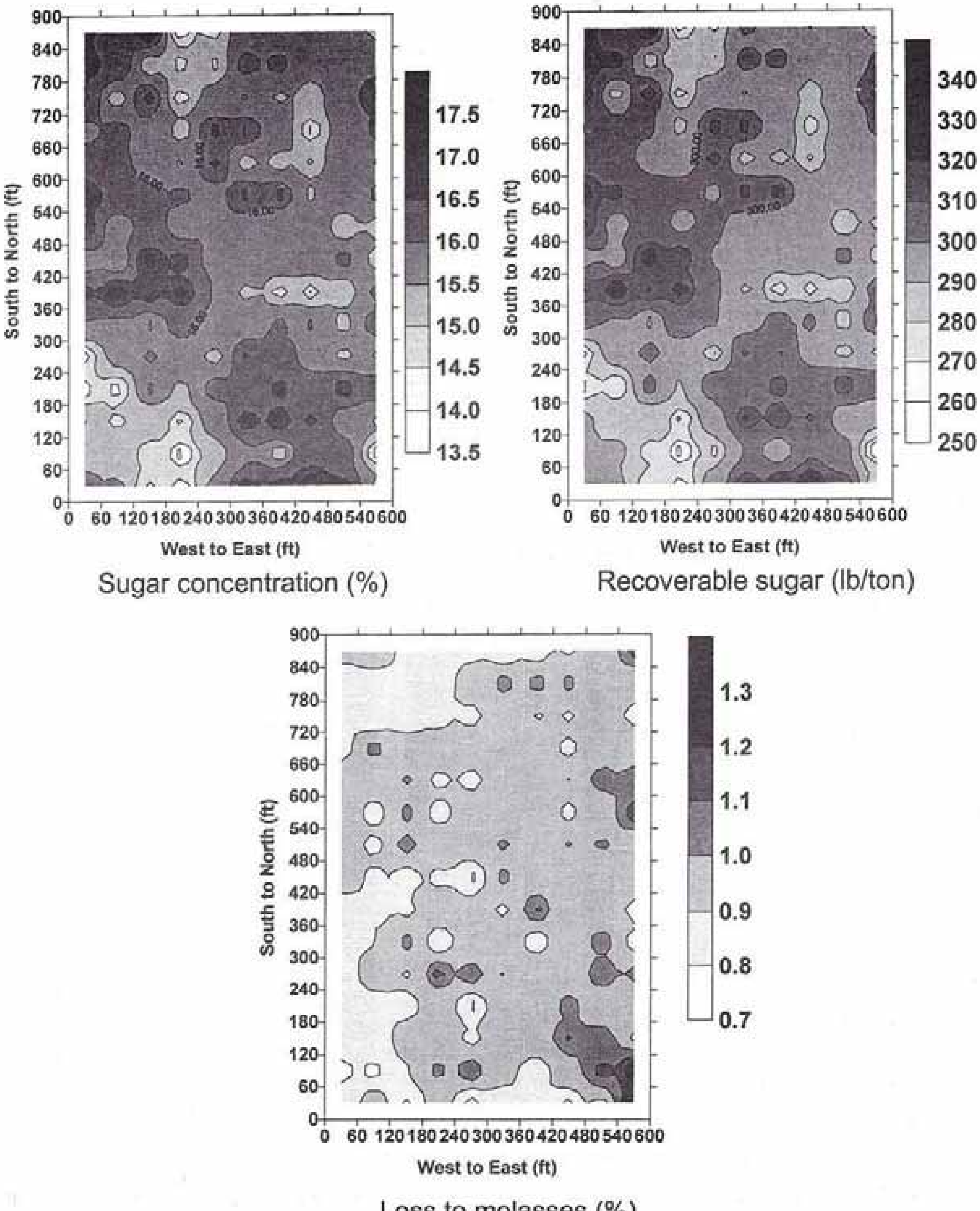

Figure 3. Sugar concentration, recoverable sugar per ton, and loss to molasses for grid cell size site 1998.

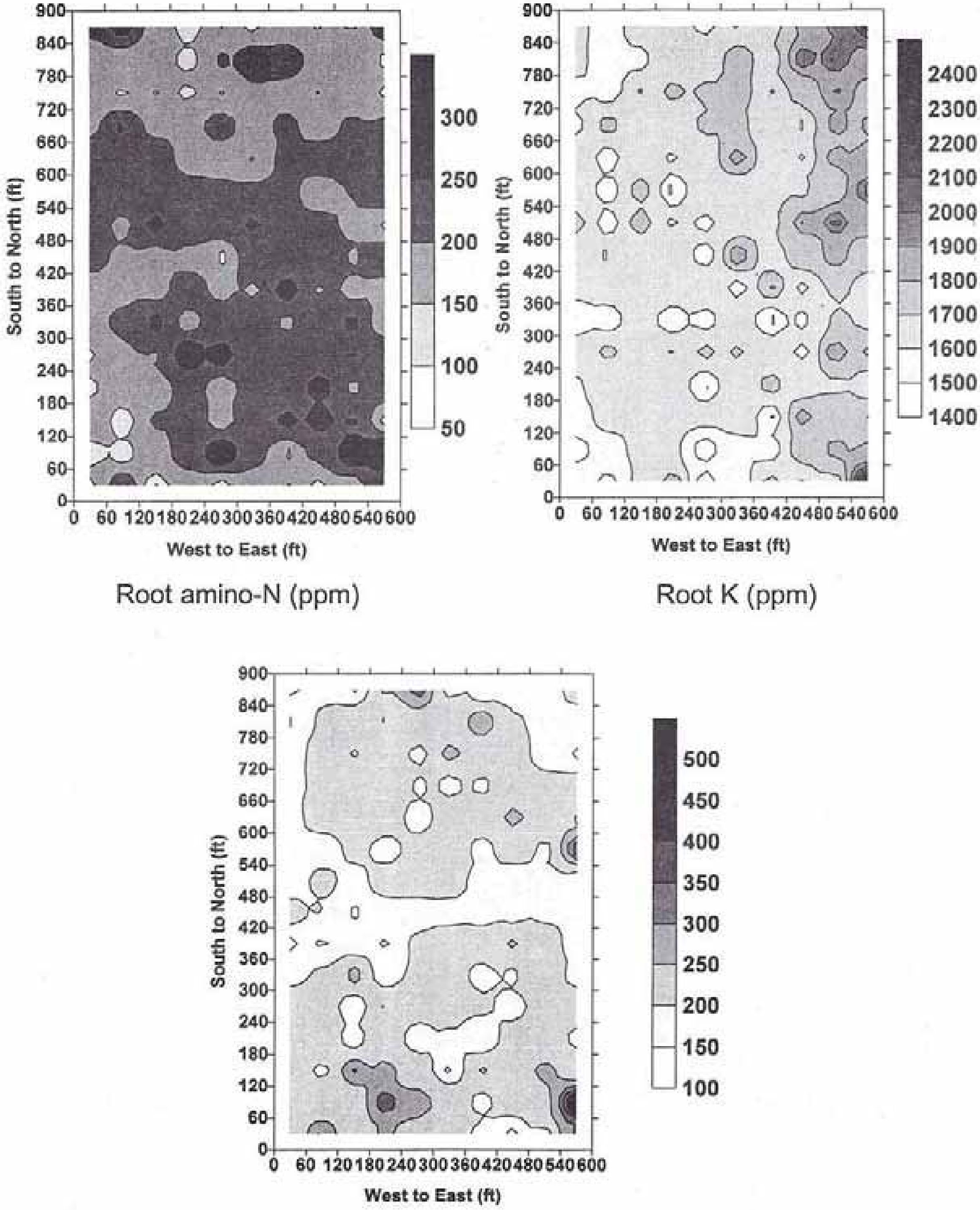

Figure 4. Root amino-N, root K, and root Na for grid cell size site 1998.

NITRATE SOIL TEST ADJUSTMENT FOR SUGAR BEET GROWN IN HUMID AREAS OF MINNESOTA

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Concerns have been raised about the accuracy of the nitrate-N soil test in prediction of N needs in the Southern Beet Sugar Cooperative growing area. This sugar beet production area is located in a more humid area of Minnesota than the Red River Valley production areas. The extra precipitation changes the soil moisture dynamics and thus increases the chances of N losses to denitrification and also possibly an increase in the contribution of N from soil organic matter. Other logistical problems exist because of the more humid situation. Soil samples from the 2 to 4 foot depths are difficult to collect. Soil can be too wet to stay in the sampling tube when brought to the soil surface or too wet to get a recognizable and representative sample. This work is investigating the importance of deep nitrate soil sampling at different times in the production year in the prediction of the optimum N fertilizer rate for optimum root yield and quality.

Nitrogen management is paramount for optimum sugar production. Nitrogen sources for sugar beet include fertilizer N and organic matter. Factors that influence nitrogen availability are temperature, precipitation, and soil drainage. Of the factors mentioned, the rate of nitrogen fertilizer applied is the easiest input to management. This has been done through the use of a nitrate soil test.

The effect of previous crop on sugar beet yield and quality can be seen in cooperative statistics. There are many different crops in the Southern Minnesota Beet Sugar Cooperative growing area that have been used as previous crop. Little is known about the effect of previous crop on nitrogen fertilizer recommendations for sugar beet grown in this area. One observation has been that a fall nitrate-N soil test when the previous crop is soybean is not very useful because the soybean plant utilizes all the nitrate-N in the soil. The nitrogen in soybean residue mineralizes much quicker than other crops such as corn. This would make a case for the use of a spring or in-season soil test for prediction of N fertilizer needs. Environmental demands may require that no fall N fertilizer application may be made. This leads to the need to know the effect of spring applications of N verses fall application on sugar beet yield and quality.

Objectives:

1. Improve the ability to predict more accurately the nitrogen fertilizer needs for optimum sugar beet yield and quality in humid areas of Minnesota following several different crops.

2. Determine the effect of fall verses spring nitrogen fertilizer applications on sugar beet yield and quality.

Materials and Methods:

To achieve the objectives, a multi-year/multi-site study is being conducted. In the fall of 1998, four sites were established in the Southern Minnesota Beet Sugar Cooperative production area. Two of the sites were in the eastern area (near Bird Island, MN) and two in the western end (near DeGraff, MN). Preceding crops were corn and sweet corn at the eastern sites and corn and soybean at the western sites (Table 1)..

Each site will have a factorial set of treatments replicated four times. The factors include five nitrogen rates (0, 40, 80, 120, and 160 pounds nitrogen per acre) applied as ammonium nitrate and two applications times (fall and preplant). The growers planted the plots. Sugar beet top samples were taken one or two days before root harvest.

These were weighed, subsampled, dried, and analyzed for total nitrogen content. The harvest was done by a plot-sized lifter. Root samples for quality analyses were obtained at harvest and analyzed by the Southern Minnesota Beet Sugar Cooperative Quality Lab.

Soil samples to a depth of four feet in increments of 0-6 inches, 6-12 inches, 1-2 foot, 2-3 foot, and 3-4 foot were taken from the 0 nitrogen rate plots in fall 1997 preceding sugar beet production, in the spring at preplanting, and the first week of June during the production year (1998). Following sugar beet harvest, soil samples to a depth of four feet in one-foot increments were taken to document residual nitrate-N in each treatment.

Results and Discussion:

Root yields were very good at all locations in 1998. The use of nitrogen fertilizer increased root yield 6, 10, and 10 tons per acre at site 1, 3, and 4, respectively. Site 2 was lost to diseases. The yield response to N application was affected by the time of application at all locations. The statistical analyses for 1998 are provided in Table 2.

SITE 1: At site 1, maximum root yield from the fall application was achieved at 120 lb N/A while it took only 80 N/A with a spring application (Figure 1). The fall application caused the greatest yields compared to yields from a spring application.

Sucrose concentration, loss to molasses recoverable sucrose per ton, root Amino-N, root K, and root Na were not affected by the nitrogen rate or application treatments.

Recoverable sucrose per acre was only significantly affected by the rate of nitrogen applied. Recoverable sucrose per acre was increased 1500 lb/A with 80 lb N/acre.

SITE 3: Root yields were increased more by the spring nitrogen application when compared to the yields from P loss treated in the fall (Figure 2). The maximum root yield for spring application came at the 80 lb N/A rate while the maximum root yield for fall applications occurred at 120 lb N/A.

Sucrose concentration, loss in molasses, recoverable sucrose per ton, root K and root Na were not significantly affected by any treatments.

Recoverable sucrose per acre was increased with the application of nitrogen. This increase was 3000 lb/A with 80 lb N/A. No time of application effect occurred. The root amino-N concentration was greater for spring applications and N rates of 120 and 160 lb N/A. This effect is not reflected in the recoverable sucrose per acre but does indicate that the spring N application at site had more nitrogen available because of possible N losses in the fall application to influence an important quality constituent and could lead to management problems.

SITE 4: As with the other two sites, root yield at site 4 was increased with N application (Figure 3). The time application affected the root yield with the greater yields from spring application. The maximum yields occurred at 80 lb N/acre for sugar beets with N applied in both fall and spring. Unlike the other two sites, sucrose concentration was significantly decreased by the application of nitrogen fertilizer. On the average, this decrease was 0.75 %. At the 160 lb N/A rate, the spring application caused a greater reduction than the fall application. The maximum recoverable sucrose per acre occurred at 40 lb N/A. Sugar beet treated with spring application at the 40 lb N/A had the greater recoverable sucrose per acre.

Loss to molasses was increased by nitrogen use and the spring application had larger losses compared to the fall applications. The root amino-N concentration was affected similar to loss of molasses. Root Na was increased by nitrogen application while root K was not.

Soil Nitrate-N

Soil nitrate-N was measured October 27, 1997, April 16-17, 1998 and May 28-29, 1998 (Table 3). The initial fall values were low and would indicate a need of 134 lb N/A applied at site 1, 124 lb N/A at site 3, and 113 lb N/A at site 4. The maximum recoverable sucrose per acre at site 1 and site 3 occurred with an application of 80 lb N/A. At site 4, the maximum recoverable sucrose per acre occurred at approximately 40 lb N/A. This difference in optimum N rate is reflecting to larger amount nitrate-N available on April 17, 1998 for site 4 compared to site 1 and site 3. This difference in earlier nitrate-N availability is caused by the previous crop (sweet corn verses field corn). More information about previous crop is needed to understand how much this difference will be from year to year.

Nitrogen is an important nutrient for optimum sugar beet production. Management of N is important because of its possible negative effect on recoverable sucrose. These three locations responded differently to nitrogen application rates and time. Some insights from this first year's data are:

1. Nitrogen increases root yield and recoverable sucrose per acre.

2. There is evidence that in 1998 some of the nitrogen that was fall applied was lost. This evidence is from 1) instances where root yields and recoverable sucrose per acre was increased more by spring applications or that the spring application require loss N to achieve the maximum yields, and 2) cases where the spring application negatively affected impurities more than a fall nitrogen applications.

Table 1. Characteristics of sites in 1998.

Site	Previous Crop	Fall 1997 Nitrate-N (lb/A)		
		0 - 2'	2 - 4'	0 - 4'
1	field corn	16	12	28
3	field corn	26	18	44
4	sweet corn	37	25	62

Table 2. Statistics for root yield sucrose concentration, recoverable sucrose per acre, recoverable per ton, loss to molasses, root amino-N, root K, and root N for 1998 sugar beet N adjustment trials.

	Yield			Sucrose			Recoverable Sucrose per acre			Recoverable Sucrose per ton		
Site	1	3	4	1	3	4	1	3	4	1	3	4
Rep	NS	NS	NS	+	+	+	NS	NS	NS	NS	NS	+
Time	+	**	**	NS	NS	*	+	NS	++	NS	+	**
Rate	***	***	***	+	NS	*	***	***	***	NS	NS	**
T x R	**	**	*	NS	NS	++	NS	NS	NS	+	+	++
C.V.(%)	7.1	3.7	5.5	2.9	2.7	2.1	8.6	5.1	6.2	3.6	3.0	2.4

	Loss to Molasses			Root Amino-N			Root K			Root NA		
	1	3	4	1	3	4	1	3	4	1	3	4
Rep	*	NS	NS	+	++	**	NS	NS	*	NS	*	**
Time	++	**	***	NS	**	***	*	NS	NS	NS	*	*
Rate	NS	***	***	NS	***	***	NS	NS	NS	NS	*	*
T x R	+	*	+	NS	**	*	NS	NS	NS	NS	++	NS
C.V.(%)	8.8	7.2	4.2	26.1	16.9	7.5	9.8	3.9	4.4	20.2	19.2	16.0

+ = 0.20
++ = 0.10
* = 0.05
** = 0.01
*** = 0.001
NS = non-significant

Table 3. Soil Nitrate-N at each sampling date in 1998.

	Fall	Preplant April 16-17	Presiddress May 28-29
	soil nitrate-N (lb/A)		
Site 1			
0 - 2'	16	27	39
2 - 4'	12	17	20
0 - 4'	28	44	59
Site 3			
0 - 2'	26	45	37
2 - 4'	18	33	22
0 - 4'	44	78	59
Site 4			
0 - 2'	37	70	56
2 - 4'	25	44	32
0 - 4'	62	114	88

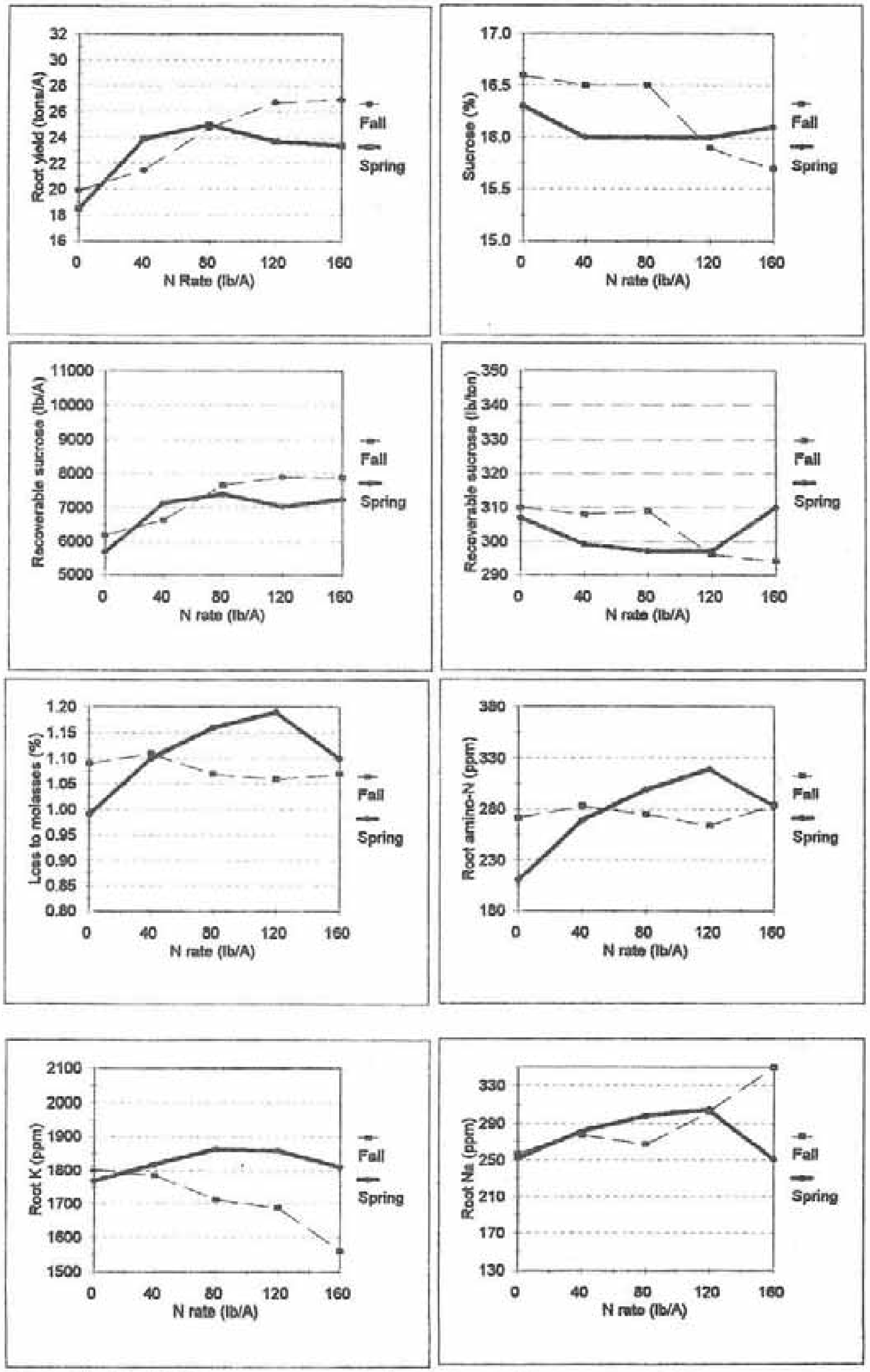

Figure 1. Root yield, sucrose concentration, recoverable sucrose per acre, recoverable sucrose per ton, loss to molasses, root amino-n, root K, and root Na for site 1 1998.

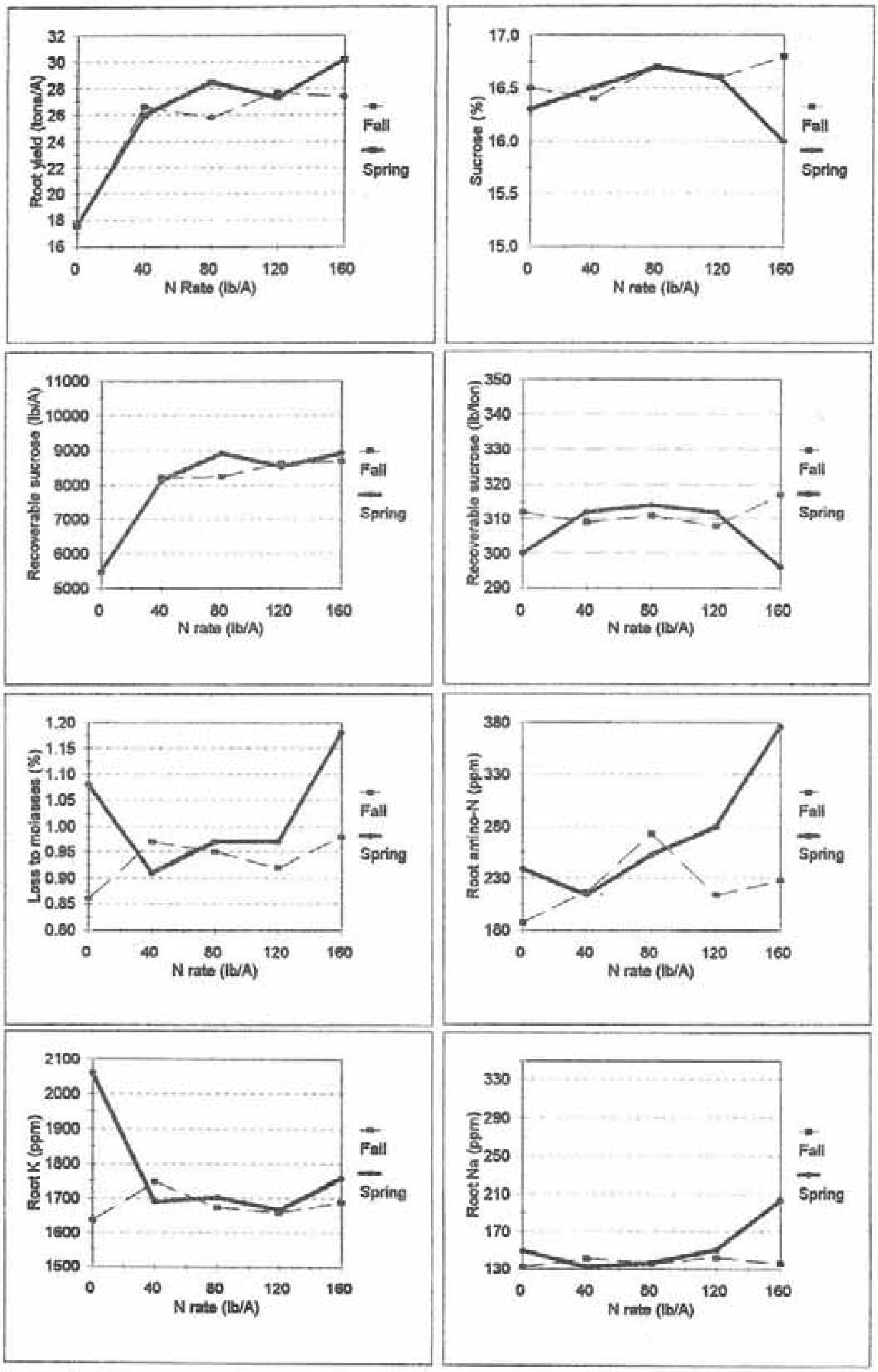

Figure 2. Root yield, sucrose concentration, recoverable sucrose per acre, recoverable sucrose per ton, loss to molasses, root amino-n, root K, and root Na for site 3 1998.

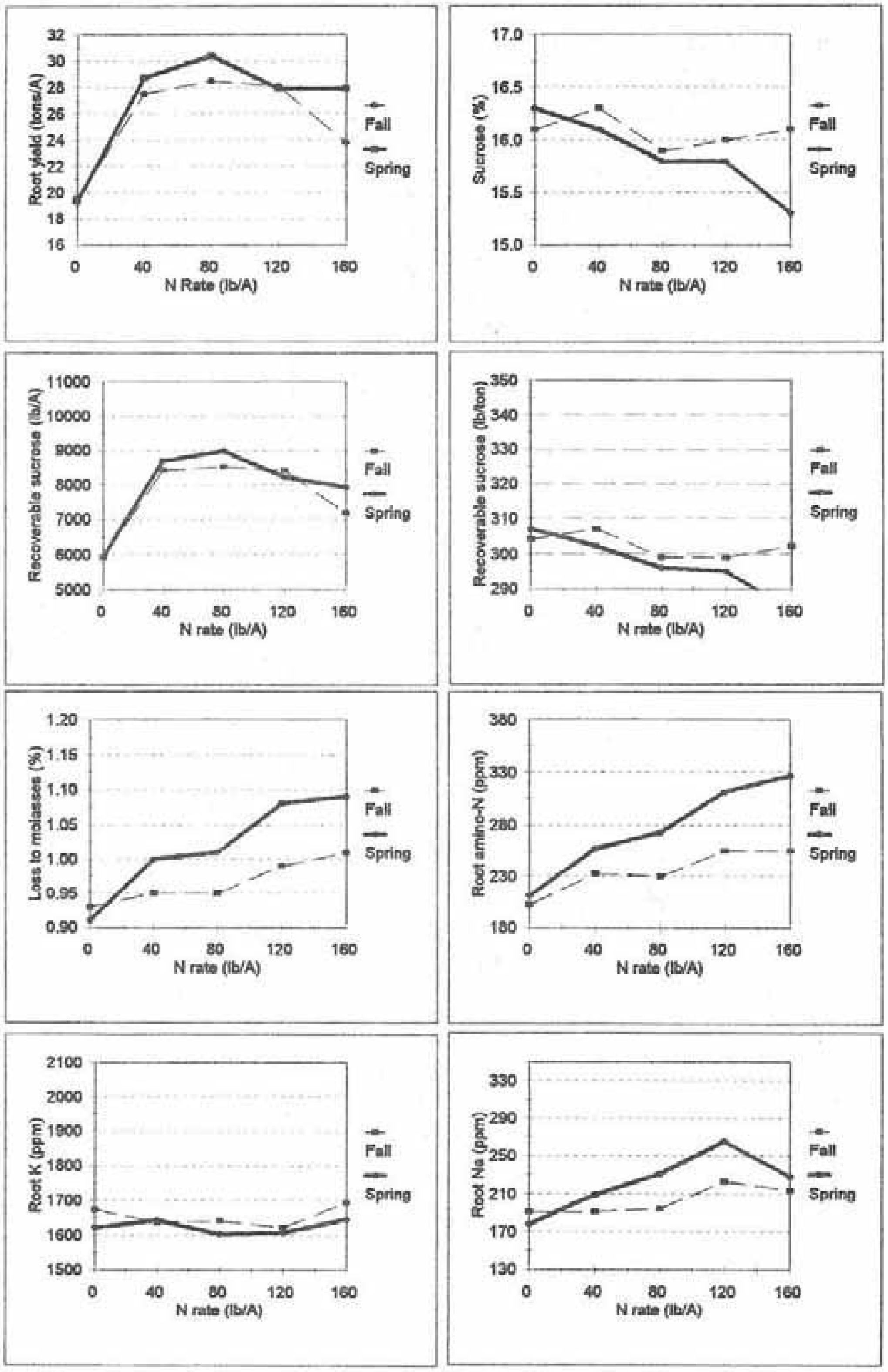

Figure 3. Root yield, sucrose concentration, recoverable sucrose per acre, recoverable sucrose per ton, loss to molasses, root amino-n, root K, and root Na for site 4 1998.