2010 Research Report

SMBSC

2/21/2011
Southern Minnesota Beet Sugar Company
SMBSC

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<u>Seed Furnished by:</u>
Betaseed, Inc.
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Germains Technology Group
Hilleshog
Holly Hybrids
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Seedex
SES/Vander Have

<u>Services Provided by:</u>
Agvise
Bird Island Soil Service
Cargill Aghorizons
Centrol Crop Consulting
Clara City Farmers Coop Oil
Coop Country Farmers Elevator
Harvest Land Coop
Minnesota Energy
Prinsburg Farmers Coop

Failure to acknowledge any form of assistance whether cooperative or technical is purely unintentional.

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SMBSC Official Variety Trial Procedures

Four Official Variety Trial Locations were planted in 2010. These trials were located near Murdock, Renville, Lake Lillian, and Hector. Trials are planted with a modified 12 row John Deere 7300 planter. Plots are four rows wide by forty foot long. Emergence counts are taken approximately 28 days after planting, and alleys are cut perpendicular to the rows. After the emergence counts are taken, plots are thinned to a uniform spacing of approximately 190 sugarbeets per 100 foot of row, and all doubles are removed. Quadris was banded over the row after thinning to suppress rhizoctonia root and crown rot.

Weed control was accomplished by applying Roundup WeatherMax and additional herbicides if needed. All spraying operations are conducted by a tractor sprayer driving down the alleys so no wheel tracks can affect yield within the plots. All spraying operations were conducted by SMBSC Research Staff. Five Cercospora leafspot fungicide applications were made on all four plots.

In early September, approximately 2.5 feet was tilled under on each end of the plot to eliminate the nitrogen border effect that develops on the outside of the plots near the tilled alleys. Row lengths are taken on each harvest row to calculate yield at harvest. All plots are defoliated using a 4-row defoliator. The center two rows of each plot are harvested using a 2-row research harvester. All beets harvested from the center two rows are weighed on a scale on the harvester and a sample of beets is taken for quality analysis.

Varieties were entered into various disease nurseries to evaluate the disease tolerance of the varieties. Cercospora leafspot nurseries were conducted near Renville and at a Betaseed location near Rosemount. Aphanomyces Root Rot nurseries were conducted at Betaseed's facility in Shakopee and in a Syngenta Aphanomyces Nursery near Glyndon, MN. Rhizoctonia tolerance was tested at a location near Clara City as well as selected entries submitted to the BSDF rhizoctonia nursery near Ft. Collins, CO.

All this data is summarized and merged with the 2009 and 2008 data to evaluate the varieties for approval. SMBSC Seed Policy sets out guidelines for minimum performance standards of the varieties. Varieties that meet all the approval criteria are approved for planting the next year's SMBSC sugarbeet crop.

2010 SMBSC Official Variety Trials Specifications

Trial Location	Cooperator	Entry Designation	Previous Crop	Total Nitrogen	Starter Fertilizer	Planting Date	Stand Counts	Disease	Harvest Date
Hector	G.E. Johnson Inc	Official Trial	Sweet Corn	125	No	4/20/10		moderate Aph, light rhizoc	10/4/10
				Replanted	No	5/17/10	6/9/10	light rhizomania	
Lake Lillian	Schmoll Bros.	Official Trial	Sweet Corn	140	No	4/21/10	5/21/10	moderate to severe rhizomania light rhizoctonia	10/7/10
Renville	C&P Haen	Official Trial	Field Corn	105	Yes	4/27/10	5/26/10	moderate Rhizomania, light rhizoc	10/11/10
Murdock	Petersen Farms	Official Trial	Field Corn	105	Yes	4/28/10	5/27/10	very little disease	9/24/10

All trials were sprayed with RoundUp twice for weed control, except Hector which was sprayed three times.
Quadris was applied to all trials after thinning for rhizoctonia suppression.
Five CLS fungicide applications were applied to all trial locations.

2010 Disease Nursery Trial Specifications

Disease	Cooperator	Location	Ratings Performed By	Use of Ratings in 2010 Variety Approval
Cercospora	Betaseed	Rosemount	Betaseed	50 % of 2010 CLS Rating
Cercospora	SMBSC Randy Frieborg	Renville	SMBSC Research	50% of 2010 CLS Rating
Aphanomyces	Betaseed	Shakopee	Betaseed, Jason Brantner, Mark Bloomquist	50% of 2010 Aphanomyces Rating
Aphanomyces	Hilleshog	Glyndon	SMBSC Research	50% of 2010 Aphanomyces Rating
Rhizoctonia	USDA/ARS/BSDF Lee Panella	Ft. Collins, CO	USDA/ARS	Specialty Approval Status
Rhizcotonia	SMBSC Bob Condon	Clara City	SMBSC Research	Abandoned Site

SMBSC APPROVED VARIETIES – 2011

*Roundup Ready® Sugarbeets are not currently approved for distribution or planting in 2011. Roundup Ready® data shown for information only.

FULLY APPROVED VARIETIES

Beta 95RR03
Beta 97RR37
Beta 98RR08
Crystal RR265
Crystal RR805
Crystal RR850
Hilleshog 4017RR
Hilleshog 4096RR
SV 36835RR

RHIZOCTONIA SPECIALTY APPROVED VARIETIES

Hilleshog 9093RR (Rhizoctonia)
Hilleshog 4063RR (Rhizoctonia)

RHIZOCTONIA SPECIALTY TEST MARKET

(limited to 5% of total seed request)

Beta 99RR53 (Rhizoctonia)

TEST MARKET VARIETIES

Beta 99RR64

CONVENTIONAL VARIETIES – Approved for planting in 2011.

Beta 4811
Beta 1591
Beta 1322
Beta 4708R
Hilleshog 3035
Hilleshog 3036
Hilleshog 2467
Hilleshog 3031
Hilleshog 2411
Hilleshog 2480
Holly 255
Holly 710
SV 46177

Table 1. Comparison of 2011 Full Approved Varieties to Specialty Approved Varieties Based on 3 Year Data (2008-2010)

Entry	RST+ RSA	*Rec/T (lbs)* 3 yr avg	% of mean	*Rec/A (lbs)* 3 yr avg	% of mean	*Yield (T/A)* 3 yr avg	% of mean	*Sugar %* 3 yr avg	% of mean	*Cercospora Leaf Spot* 3 yr avg	% of mean	*Emerg-ence (%)* 3 yr avg	% of mean	*Aphano-myces* 3 yr avg	% of mean	*Purity (%)* 3 yr avg	% of mean	*Revenue/ * Ton* % of mean	*Revenue/ * Acre* % of mean
2011APPROVED VARIETIES																			
Beta 95RR03	196.57	260.57	97.21	8585.45	99.36	32.98	102.18	15.44	97.72	4.66	98.20	61.45	91.28	4.33	96.62	90.93	99.68	95.00	97.08
Beta 97RR37	200.70	266.66	99.48	8746.05	101.22	32.65	101.13	15.79	99.97	4.90	103.33	70.10	104.13	4.38	97.83	90.95	99.70	99.27	100.41
Beta 98RR08	205.63	274.54	102.43	8917.88	103.20	32.50	100.69	16.06	101.68	4.25	89.65	67.67	100.52	4.32	96.43	91.61	100.43	104.16	104.89
Crystal RR265	202.83	268.55	100.19	8869.36	102.64	32.91	101.95	15.86	100.40	4.44	93.67	63.68	94.59	4.32	96.42	91.07	99.83	100.36	102.33
Crystal RR805	199.57	269.16	100.42	8567.75	99.15	32.09	99.42	15.80	100.04	4.87	102.77	68.90	102.35	4.58	102.36	91.45	100.25	100.65	100.08
Crystal RR850	200.84	269.77	100.65	8657.38	100.19	32.07	99.34	15.88	100.50	5.17	109.06	68.99	102.48	4.38	97.71	91.27	100.05	101.05	100.39
Hilleshog 4017RR	199.02	270.59	100.95	8474.30	98.07	31.53	97.68	15.98	101.15	5.28	111.42	69.29	102.92	4.80	107.15	91.07	99.84	101.80	99.45
Hilleshog 4096RR	196.71	266.67	99.49	8401.27	97.23	31.50	97.58	15.79	99.93	3.97	83.80	66.27	98.44	4.85	108.30	90.96	99.71	99.22	96.83
SV 36835RR	198.13	265.86	99.19	8549.69	98.94	32.29	100.03	15.58	98.60	5.13	108.11	69.54	103.30	4.35	97.18	91.68	100.51	98.50	98.54
		268.04	100.00	8641.02	100.00	32.28	100.00	15.80	100.00	4.74	100.00	67.32	100.00	4.48	100.00	91.22	100.00	100.00	100.00
Specialty Approved Varieties with Three Years of Data																			
Hilleshog 4063RR	198.33	262.80	98.04	8665.70	100.29	33.18	102.79	15.57	98.56	4.37	92.26	73.17	108.69	4.35	97.21	90.88	99.62	96.45	99.15
Hilleshog 9093RR	199.39	263.24	98.21	8742.72	101.18	33.35	103.32	15.59	98.71	4.41	92.92	71.48	106.18	4.14	92.48	91.03	99.79	97.10	100.33

* Revenue per Ton and Revenue per Acre figures were produced using the SMBSC payment formula for the 2009 crop.

Table 2. Comparison of 2011 Full Approval Varieties to Test Market and Specialty Approved Varieties Based on 2 Year Data, 2009 - 2010

Entry		RST+ RSA	*Rec/T (lbs)* 2 yr avg	*Rec/T (lbs)* % of mean	*Rec/A (lbs)* 2 yr avg	*Rec/A (lbs)* % of mean	*Yield (T/A)* 2 yr avg	*Yield (T/A)* % of mean	*Sugar %* 2 yr avg	*Sugar %* % of mean	*Cercospora Leaf Spot* 2 yr avg	*Cercospora Leaf Spot* % of mean	*Emergence (%)* 2 yr avg	*Emergence (%)* % of mean	*Aphanomyces* 2 yr avg	*Aphanomyces* % of mean	*Purity (%)* 2 yr avg	*Purity (%)* % of mean	*Revenue/ Ton** % of mean	*Revenue/ Acre** % of mean
2011 APPROVED VARIETIES																				
Beta 95RR03		197.43	260.69	97.36	9003.86	100.07	34.47	102.69	15.38	97.77	4.65	97.11	64.68	93.29	4.31	101.45	91.25	99.75	95.24	97.82
Beta 97RR37		201.76	267.85	100.04	9152.56	101.72	33.97	101.22	15.76	100.19	5.07	105.94	69.63	100.43	4.40	103.53	91.46	99.97	100.29	101.53
Beta 98RR08		206.29	275.47	102.88	9304.52	103.41	33.76	100.58	16.07	102.13	4.11	85.87	70.14	101.16	4.20	98.77	91.84	100.39	104.92	105.54
Crystal RR265		203.17	268.22	100.17	9267.45	103.00	34.26	102.08	15.81	100.51	4.60	96.09	66.27	95.59	4.22	99.23	91.25	99.75	100.38	102.49
Crystal RR805		198.90	269.02	100.47	8856.27	98.43	33.12	98.67	15.73	100.00	4.78	99.89	69.45	100.17	4.17	98.14	91.76	100.30	100.69	99.37
Crystal RR850		201.56	267.62	99.95	9142.46	101.61	34.03	101.40	15.75	100.10	5.33	111.30	71.17	102.66	3.98	93.64	91.31	99.81	99.76	101.16
Hilleshog 4017RR		198.74	270.69	101.09	8785.28	97.64	32.62	97.18	15.92	101.21	5.50	114.80	72.52	104.60	4.34	102.21	91.41	99.92	102.09	99.23
Hilleshog 4096RR		195.82	266.56	99.55	8661.10	96.26	32.40	96.54	15.75	100.10	4.00	83.60	69.01	99.53	4.53	106.74	91.17	99.65	99.39	95.97
SV 36835RR		196.32	263.69	98.48	8803.32	97.84	33.44	99.63	15.42	98.00	5.05	105.40	71.11	102.56	4.09	96.30	91.90	100.46	97.23	96.88
			267.76	100.00	8997.42	100.00	33.56	100.00	15.73	100.00	4.79	100.00	69.33	100.00	4.25	100.00	91.48	100.00	100.00	100.00
TEST MARKET VARIETIES WITH 2 YEARS OF DATA (% OF MEAN IS OF APPROVED MEAN)																				
Beta 99RR64		207.71	271.92	101.56	9550.98	106.15	34.98	104.21	15.95	101.37	4.77	99.70	72.34	104.34	4.85	114.11	91.57	100.09	102.79	107.14
2011 SPECIALTY APPROVED VARIETIES (% OF MEAN IS OF APPROVED MEAN)																				
Beta 99RR53	Spec	206.99	259.35	96.86	9909.05	110.13	38.23	113.90	15.24	96.85	5.01	104.62	74.10	106.88	4.56	107.29	91.62	100.15	94.38	107.52
Hilleshog 4063RR	Spec	198.06	262.78	98.14	8990.02	99.92	34.46	102.67	15.53	98.70	4.43	92.54	75.14	108.38	3.97	93.49	91.10	99.58	96.61	99.20
Hilleshog 9093RR	Spec	197.26	263.07	98.25	8908.29	99.01	34.01	101.32	15.55	98.86	4.48	93.52	74.67	107.70	3.80	89.50	91.26	99.75	97.29	98.59

* Revenue per Ton and Revenue per Acre figures were produced using the SMBSC payment forumla for the 2009 crop.

Table 3. Comparison of 2011 Full Approved Varieties to Test Market and Specialty Approved Varieties Based on 1 Year Data, 2010

Entry	Specialty	RST+ RSA	*Rec/T (lbs)* 1 yr avg	*Rec/T (lbs)* % of mean	*Rec/A (lbs)* 1 yr avg	*Rec/A (lbs)* % of mean	*Yield (T/A)* 1 yr avg	*Yield (T/A)* % of mean	*Sugar %* 1 yr avg	*Sugar %* % of mean	*Cercospora Leaf Spot* 1 yr avg	*Cercospora Leaf Spot* % of mean	*Emerg-ence (%)* 1 yr avg	*Emerg-ence (%)* % of mean	*Aphano-myces* 1 yr avg	*Aphano-myces* % of mean	*Purity (%)* 1 yr avg	*Purity (%)* % of mean	*Revenue/ Ton* % of mean	*Revenue/ Acre* % of mean
Beta 95RR03		196.80	265.00	98.31	8580.04	98.49	32.36	100.39	15.63	98.69	4.79	97.67	63.96	93.13	4.60	104.65	91.29	99.86	97.23	97.68
Beta 97RR37		206.33	268.00	99.42	9312.79	106.90	34.68	107.59	15.71	99.19	5.58	113.79	64.38	93.74	4.58	104.21	91.77	100.39	99.35	106.96
Beta 98RR08		202.99	277.00	102.76	8731.26	100.23	31.48	97.66	16.15	101.97	4.20	85.62	66.86	97.35	4.21	95.75	91.69	100.30	104.38	102.01
Crystal RR265		205.69	272.00	100.91	9128.08	104.78	33.11	102.72	16.03	101.21	4.29	87.40	67.98	98.96	4.20	95.66	91.16	99.72	101.63	104.47
Crystal RR805		198.33	276.00	102.39	8357.59	95.94	30.41	94.34	16.10	101.66	4.98	101.56	68.41	99.61	4.29	97.79	91.81	100.43	104.09	98.27
Crystal RR850		206.08	265.00	98.31	9388.55	107.77	35.24	109.33	15.64	98.75	5.77	117.62	68.33	99.49	3.80	86.52	91.00	99.54	96.64	105.72
Hilleshog 4017RR		197.02	273.00	101.28	8340.64	95.74	30.50	94.62	16.08	101.53	5.46	111.20	72.79	105.99	4.37	99.60	91.33	99.90	102.65	97.20
Hilleshog 4096RR		192.32	265.00	98.31	8189.18	94.01	30.68	95.18	15.70	99.13	3.99	81.26	73.47	106.96	4.86	110.62	90.95	99.49	97.22	92.60
SV 36835RR		194.44	265.00	98.31	8374.67	96.13	31.64	98.16	15.50	97.87	5.10	103.88	71.92	104.72	4.62	105.20	91.76	100.37	96.82	95.10
			269.56	100.00	8711.42	100.00	32.23	100.00	15.84	100.00	4.91	100.00	68.68	100.00	4.39	100.00	91.42	100.00	100.00	100.00

TEST MARKET VARIETIES WITH 1 YEAR DATA (% OF MEAN IS OF APPROVED MEAN)

Beta 99RR64		209.09	275.00	102.02	9327.07	107.07	33.75	104.71	16.17	102.10	5.59	113.97	74.63	108.67	5.36	122.01	91.28	99.85	103.59	108.54

2010 SPECIALTY APPROVED VARIETIES (% OF MEAN IS OF APPROVED MEAN)

Beta 99RR53	RCZ	206.11	256.00	94.97	9681.42	111.13	37.59	116.62	15.11	95.40	5.55	113.09	73.87	107.56	4.82	109.73	91.33	99.90	91.17	106.40
Hilleshog 4063RR	APH & RZC	196.16	263.00	97.57	8588.51	98.59	32.78	101.70	15.59	98.44	3.93	80.17	76.25	111.03	4.13	94.08	90.81	99.34	95.58	97.27
Hilleshog 9093RR	APH & RZC	195.35	265.00	98.31	8453.49	97.04	32.17	99.80	15.70	99.13	4.26	86.71	75.43	109.83	4.08	92.82	91.13	99.69	97.66	97.54

2010 SMBSC Strip Trial Results

Northern Area

Agriculturist:	Jim Radermacher	Plant date:	4/15/2010
Location:	Belgrade - Early Harvest	Harvest date:	9/20/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*	Visual - Foliar Rhizoctonia Rating (A-F)
Beta 98RR08	38.38	16.1	91.59	10,549.55	125.82%	B-
Crystal RR805	30.23	16.09	91.26	8,265.79	98.19%	C
Crystal RR875	33.92	14.38	90.41	8,132.35	86.42%	B-
Hilleshog 4017RR	30.01	15.84	90.55	7,989.73	92.99%	C+
Hilleshog 4063RR	35.6	15.52	90.68	9,292.43	106.45%	A-
Hilleshog 4096RR	30.38	15.53	90.72	7,939.85	91.05%	A-
Hilleshog 9093RR	34.85	15.46	90.6	9,048.97	103.21%	A-
SV 835RR	33.93	14.99	91.11	8,587.96	95.87%	B-
Average	**33.41**	**15.49**	**90.87**	**8725.83**		

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results

Northern Area

Agriculturist:	Jim Radermacher	Plant date:	4/15/2010
Location:	Belgrade - Late harvest	Harvest date:	10/19/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	35.32	18.58	91.95	11,347.50	112.36%
Crystal RR805	34.72	18.32	90.55	10,777.10	104.56%
Crystal RR875	31.83	17.08	90.85	9,216.62	85.51%
Hilleshog 4017RR	31.42	18.6	90.75	9,937.89	97.51%
Hilleshog 4063RR	35.09	17.65	90.62	10,483.80	99.31%
Hilleshog 4096RR	32.53	17.98	90.36	9,873.25	94.47%
Hilleshog 9093RR	37.79	17.61	90.31	11,213.27	105.75%
SV 835RR	36.48	17.44	90.87	10,735.76	100.53%
Average	**34.40**	**17.91**	**90.78**	**10,448.15**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results

Northern Area

Agriculturist: Lonny Buss — Plant date: 4/12/2010

Location: **Appleton** — Harvest date: 9/20/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*	Visual - Foliar Rhizoctonia Rating (A-F)
Beta 98RR08	34.62	15.09	89.98	8,682.45	95.85%	C-
Crystal RR805	30.43	15.92	91.11	8,210.09	96.24%	D
Crystal RR875	37.34	14.64	89.94	9,062.52	97.11%	B
Hilleshog 4017RR	35.28	15.31	89.72	8,950.65	99.80%	C-
Hilleshog 4063RR	37.61	15.09	89.55	9,372.47	102.88%	A
Hilleshog 4096RR	32.69	15.52	90.48	8,508.37	96.93%	B
Hilleshog 9093RR	34.35	15.61	90.5	8,998.01	103.05%	B+
SV 835RR	36.82	15.31	91.13	9,533.64	108.14%	B-
Average	**34.89**	**15.31**	**90.30**	**8914.78**		

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results *Test Market*

Agriculturist: Jim Radermacher Plant date: 4/21/2010

Location: Raymond Harvest date: 10/22/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	24.9	18.9	91.97	8,146.73	104.96%
Crystal RR805	21.4	18.3	91.23	6,699.35	84.14%
Crystal RR850	24.2	18.45	92.2	7,744.08	98.53%
Hilleshog 4017RR	20.6	19.27	91.56	6,839.62	88.84%
Hilleshog 4096RR	25	19.06	92.31	8,290.32	107.61%
SV 36835RR	27.9	18.78	91.78	9,043.85	115.92%
Average	**24.00**	**18.79**	**91.84**	**7,793.99**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results *Test Market*

Agriculturist: Mike Schjenken Plant date: 4/14/2010

Location: Renville Harvest date: 9/13/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	33.04	16.33	92.09	9,282.58	115.21%
Crystal RR805RR	28.83	16.03	92.24	7,958.59	97.52%
Crystal RR850RR	32.78	15.87	91.76	8,894.88	107.60%
Hilleshog 4017RR	27.48	16.18	91.85	7,620.46	93.69%
Hilleshog 4096RR	28.26	15.68	91.73	7,567.99	90.62%
SV 36835RR	31.09	15.28	91.92	8,121.85	95.35%
Average	**30.25**	**15.90**	**91.93**	**8,241.06**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results *Test Market*

Agriculturist: Les Plumley Plant date: 4/15/2010

Location: Bird Island early harvest Harvest date: 8/26/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	28.21	14.6	91.33	6,946.16	114.61%
Crystal RR805	26.06	13.78	92.37	6,135.57	96.54%
Crystal RR850	30.89	14.11	90.95	7,313.99	115.73%
Hilleshog 4017RR	27.96	13.25	91.23	6,214.06	92.02%
Hilleshog 4096RR	25.98	13.3	91.84	5,846.66	87.78%
SV 36835RR	28.13	13.23	91.62	6,275.74	93.32%
Average	27.87	13.71	91.56	6,455.36	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results *Test Market*

Agriculturist: Les Plumley Plant date: 4/15/2010

Location: Bird Island - Late Harvest Harvest date: 10/13/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	34.12	17.56	92.98	10,376.36	110.93%
Crystal RR805	27.95	17.23	94.11	8,533.81	91.46%
Crystal RR850	36.76	17.68	93.14	11,389.38	123.17%
Hilleshog 4017RR	31.19	16.65	93.04	9,058.89	93.98%
Hilleshog 4096RR	29.98	16.18	93.79	8,350.51	87.26%
SV 36835RR	33.33	15.92	93.31	9,264.75	93.20%
Average	32.22	16.87	93.40	9,495.62	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results

Test Market

Agriculturist: Lonny Buss   Plant date: 4/21/2010

Location: **Montevideo**   Harvest date: 10/3/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 98RR08	27.21	16.66	91.77	7,773.91	103.11%
Crystal RR805	25	16.33	91.66	6,982.45	91.14%
Crystal RR850	29.78	16.27	92	8,323.95	108.71%
Hilleshog 4017RR	23.98	16.63	93.28	6,977.88	93.73%
Hilleshog 4096RR	27.54	15.82	92.34	7,506.15	96.22%
SV 36835RR	29.13	16.15	92.89	8,175.96	107.09%
Average	**27.11**	**16.31**	**92.32**	**7,623.38**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results

Rhizoctonia Specialty

Agriculturist: Pete Caspers — Plant date: 4/16/2010

Location: **Hector** — Harvest date: 9/30/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 99RR33	23.7	14.82	91.13	5,928.01	83.00%
Crystal RR875	24.2	13.97	91.01	5,674.10	74.76%
Hilleshog 4063RR	27.1	16.74	92.64	7,874.07	123.80%
Hilleshog 9093RR	29	16	91.36	7,893.56	118.44%
Average	**26.00**	**15.38**	**91.54**	**6,842.44**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results

Rhizoctonia Specialty

Agriculturist: Greg Johnson — Plant date: 4/12/2010

Location: **Olivia** — Harvest date: 9/13/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 99RR33	34.36	13.97	89.51	7,882.50	94.77%
Crystal RR875	34.62	14.02	89.32	7,949.82	95.68%
Hilleshog 4063RR	33.29	14.89	89.04	8,116.48	103.62%
Hilleshog 9093RR	32.98	14.99	89.66	8,174.17	105.93%
Average	**33.81**	**14.47**	**89.38**	**8,030.74**	

*Revenue calculated using the 2009 crop revenue calculator

2010 SMBSC Strip Trial Results *Rhizoctonia Specialty*

Agriculturist:	Paul Wallert	Plant date:	4/12/2010
Location:	Murdock	Harvest date:	9/20/2010

Variety	Tons Per Acre	Sugar %	Purity %	ESA lbs/acre	% of Mean Revenue $/acre*
Beta 99RR33	36.32	13.86	92.11	8,582.19	84.84%
Crystal RR875	36.18	13.9	92.03	8,558	84.69%
Hilleshog 4063RR	41.95	14.96	91.44	10,644.40	112.36%
Hilleshog 9093RR	39.52	15.74	91.86	10,652.51	118.11%
Average	**38.49**	**14.62**	**91.86**	**9,609.28**	

*Revenue calculated using the 2009 crop revenue calculator

Seed Priming Trials at SMBSC during the 2009 and 2010 Season

Mark Bloomquist – SMBSC Production Agronomist
Gary Lindahl – SMBSC Research Technician

Seed priming is a process applied to seeds that initiates the germination process of the seed, and then stops the germination process at a point that does not harm the seed. This process is marketed by a few suppliers in the sugarbeet market. By going through this process, it is possible to speed the emergence of the seed, and decrease the amount of time needed for a sugarbeet stand to emerge.

Objectives:

In the Michigan growing area, and in the northern Red River Valley of Minnesota and North Dakota, results from seed priming trials looked favorable for the use of primed seed. Priming treatments are being applied to a majority of the acreage in the Michigan growing area and priming usage is increasing in the Red River Valley. During the 2009 and 2010 growing season, SMBSC conducted trials to test seed priming in our growing area.

Materials and Methods:

The trials were set up as a split-plot design. This allowed the primed version of the variety to be planted next to the unprimed version of the same variety. The varieties were then randomized throughout the plot with six replications. All trial locations were planted at 5.1 inch seed spacing. No thinning operations were performed at any of the locations. Stand counts were taken as the sugarbeets emerged with a final stand count taken at approximately 28 days after planting. Plots were 4 rows wide by approximately 30 feet long. The center two rows were harvested with a two-row sugarbeet harvester. Samples were taken from each plot for quality analysis. In 2009, there were three locations planted. These locations had four varieties with and without the X-beet priming treatment and two varieties with and without the UltiPro priming treatment. One of these locations was abandoned in 2009, and the other two locations were harvested. In 2010, four locations were planted and harvested. The 2010 trials had five varieties with and without the X-beet treatment and two varieties with and without the UltiPro treatment.

Results and Discussion:

Below are the results of each trial location harvested in 2009 and 2010. These results will include sugarbeets per 100 foot of row at the various dates after planting. Yield and quality data as well as revenue per acre differences are also included. Statistical analysis was performed and the results are shown under each data table. In general, the primed seed emerged faster than the non-primed. These differences in stand decreased over time and in many but not all cases, the final stand counts at 28 days after planting were statistically similar.

Yield and revenue results are also shown in the tables. Revenue differences are shown as +/- dollars in comparison with the non-primed entry. In most cases, the yields and revenues are statistically similar. SV6 was in the 2010 trials, and the SV6 with Xbeet treatment was consistently lower in stand and yield at all locations. This seed was prepared as a small lot and GTG believes there was an issue with Tachigaren application or other film coating issue on this seed that affected its performance.

2010 Renville Priming Trial Analysis

Table 1

Entry Name	Entry	Sugar	Purity	TonsPerAcre	ESA	Difference in Revenue/Acre	Beets per 100 foot of row 13 DAP 10-May	17 DAP 14-May	21 DAY 18-May	27 DAP 24-May
SV 6	1	16.13	92.69	33.36	9326.81		18	59	142	145
SV 6 + Xbeet	2	16.42	92.2	31.91	9037.69	-$35.47	43	75	122	115
SV 8	3	17.25	92.69	29.60	8881.81		23	71	146	144
SV 8 + Xbeet	4	17.28	93.06	31.16	9409.19	$102.92	84	114	169	172
SV 13	5	16.43	92.58	33.44	9429.33		20	59	147	151
SV 13 + Xbeet	6	16.15	92.49	33.52	9360.17	-$50.57	89	125	172	173
Syngenta 1	7	17.38	92.12	27.23	8186.31		31	73	153	158
Syngenta 1 + Xbeet	8	16.95	91.64	27.56	8002.16	-$66.72	91	114	162	165
Syngenta 3	9	16.49	92.31	31.70	9020.57		39	82	151	153
Syngenta 3 + Xbeet	10	16.44	92.11	31.50	8913.40	-$24.79	79	111	155	153
Beta 1	11	17.04	92.14	31.45	9240.03		17	62	154	150
Beta 1 + UltiPro	12	17.16	92.38	31.14	9248.69	$13.58	70	107	152	155
Crystal 1	13	17.11	92.42	26.74	7950.13		65	110	168	165
Crystal 1 + UltiGem	14	17.24	92.4	26.13	7796.20	-$18.07	71	111	151	145
lsd (.05)*		N/S	N/S	N/S	N/S	N/S	19.29	23.92	15.74	18.11
CV%		2.1	0.67	4.82	4.79	5.56	31.17	22.46	8.77	10.09
Pr>F		0.199	0.538	0.339	0.336	0.306	0.0003	0.0114	0.0007	0.0004
Reps		6	6	6	6	6	6	6	6	6

* lsd is valid to compare two subplot treatments within the same whole plot.
ex. Primed vs nonprimed in Variety A

Planted 4/27/10
Harvested 10/12/10

2010 Hector Priming Analysis

Table 2

Entry Name	Entry	Sugar	Purity	TonsPerAcre	ESA	Difference in Rev / Acre	Beets per 100 foot of row 7 DAP 24-May	10 DAP 27-May	16 DAP 2-Jun	24 DAP 10-Jun
SV 6	1	14.44	90.16	27.26	6539.21		76	138	155	153
SV 6 + Xbeet	2	14.46	89.73	20.36	4849.58	-$262.06	49	60	65	70
SV 8	3	15.10	90.10	26.60	6686.11		65	121	148	149
SV 8 + Xbeet	4	15.31	90.21	26.87	6862.08	$43.37	127	140	163	165
SV 13	5	14.44	90.01	26.40	6318.67		44	115	139	143
SV 13 + Xbeet	6	14.77	90.48	27.94	6892.64	$117.61	91	145	160	159
Syngenta 1	7	15.25	89.53	21.31	5364.98		81	129	151	154
Syngenta 1 + Xbeet	8	15.43	89.93	21.77	5583.52	$49.32	135	157	168	169
Syngenta 3	9	14.79	89.92	24.92	6106.81		75	114	155	153
Syngenta 3 + Xbeet	10	14.83	90.06	26.39	6503.22	$66.55	119	129	163	161
Beta 1	11	14.77	89.88	27.22	6650.83		47	101	135	130
Beta 1 + UltiPro	12	14.82	90.09	27.67	6805.84	$30.28	86	123	155	150
Crystal 1	13	15.40	90.49	26.17	6749.94		71	121	153	153
Crystal 1 + UltiGem	14	15.47	89.75	24.90	6397.06	-$60.42	83	116	142	138
lsd (.05)*		N/S	0.54	2.18	568.40	99.80	20.4	24.7	22.0	23.1
CV%		1.85	0.512	7.31	7.69	8.60	21.2	17.3	12.8	13.5
Pr>F		0.805	0.027	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Reps		6	6	6	6	6	6	6	6	6

* lsd is valid to compare two subplot treatments within the same whole plot.
ex. Primed vs nonprimed in Variety A

Planted 4/20/10
Replanted 5/17/10
Harvested 10/3/10

2010 Lake Lillian Priming Trial Analysis

Table 3

							Beets per 100 foot of row					
						Difference in	9 DAP	11 DAP	14 DAP	17 DAP	22 DAP	28 DAP
	Entry	Sugar	Purity	TonsPerAcre	ESA	Rev / Acre	**30-Apr**	**2-May**	**5-May**	**8-May**	**13-May**	**19-May**
SV 6	1	14.77	92.01	38.78	9790.02		2	53	147	160	170	176
SV 6 + Xbeet	2	15.18	91.70	33.86	8759.28	-$135.12	21	47	86	100	119	127
SV 8	3	15.72	92.22	33.31	9008.64		3	66	157	163	185	191
SV 8 + Xbeet	4	15.66	92.20	34.45	9274.82	$39.17	45	136	171	176	184	185
SV 13	5	15.30	91.89	36.71	9593.63		1	34	125	146	173	179
SV 13 + Xbeet	6	15.28	92.01	38.20	10000.69	$69.02	32	101	149	168	184	191
Syngenta 1	7	16.45	91.24	30.67	8575.19		5	64	151	162	175	187
Syngenta 1 + Xbeet	8	16.22	91.16	30.44	8391.77	-$46.78	57	133	172	177	183	185
Syngenta 3	9	15.68	91.23	35.49	9434.02		3	57	137	152	174	179
Syngenta 3 + Xbeet	10	15.73	91.28	36.15	9651.32	$41.72	39	102	145	159	165	168
Beta 1	11	15.98	91.61	34.23	9335.92		3	47	134	149	170	179
Beta 1 + UltiPro	12	15.75	91.19	34.10	9092.98	-$68.05	55	119	157	166	179	174
Crystal 1	13	15.93	91.93	31.87	8691.91		25	94	146	168	181	179
Crystal 1 + UltiGem	14	15.95	91.76	30.84	8424.05	-$43.57	48	116	160	166	180	180
lsd (.05)*		N/S	N/S	2.39	610.43	N/S	14.6	16.8	20.6	19.8	17.95	14.2
CV%		1.89	0.41	5.96	5.70	6.01	50.05	17.2	12.09	10.7	8.88	6.88
Pr>F		0.189	0.590	0.010	0.034	0.108	0.0225	<.0001	<.0001	<.0001	0.0003	<.0001
Reps		6	6	6.00	6.00	6.00	6	6	6	6	6	6

* lsd is valid to compare two subplot treatments within the same whole plot.
ex. Primed vs nonprimed in Variety A

Planted 4/21/10
Harvested 10/8/10

2010 Murdock Priming Trial Analysis

Table 4

							Beets per 100 foot of row			
						Difference in	14 DAP	17 DAP	20 DAP	28 DAP
	Entry	Sugar	Purity	TonsPerAcre	ESA	Rev./Acre	**12-May**	**15-May**	**18-May**	**26-May**
SV6	1	15.35	90.66	30.74	7931.58		4	61	127	141
SV6+Xbeet	2	15.62	90.34	27.44	7165.86	-$112.72	16	59	103	121
SV8	3	15.51	90.58	32.84	8535.00		9	54	132	146
SV8 + Xbeet	4	15.56	90.37	34.49	8976.04	$73.90	46	128	157	167
SV13	5	15.20	90.11	32.49	8223.13		3	70	133	143
SV13+Xbeet	6	14.96	90.28	35.18	8767.86	$68.10	39	136	173	178
Syngenta1	7	15.51	89.89	30.43	7828.10		13	95	151	163
Syn 1 + Xbeet	8	15.67	90.14	30.61	7964.90	$45.06	58	138	167	175
Syngenta 3	9	15.43	90.96	29.25	7618.17		18	113	153	168
Syn 3 + Xbeet	10	15.57	90.65	29.22	7641.59	$8.05	46	116	151	161
Beta1	11	15.14	90.02	29.89	7522.20		8	81	145	153
Beta1 + UltiPro	12	15.19	90.64	31.41	8006.54	$91.40	51	128	151	160
Crystal 1	13	16.26	91.01	31.43	8646.75		32	113	159	163
Cry 1 + UltiGem	14	16.20	90.69	31.94	8719.55	$3.90	43	115	142	147
lsd (.05)*		N/S	N/S	2.00	449.72	80.48	15.29	20.9	19.94	17.64
CV%		2.03	0.66	5.47	4.73	5.18	47.23	14.21	7.61	7.22
Pr>F		0.560	0.345	0.005	0.003	0.017	0.0111	<.0001	<.0001	<.0001
Reps		6	6	6.00	6.00	6.00	6	6	6	6

* lsd is valid to compare two subplot treatments within the same whole plot.
ex. Primed vs nonprimed in Variety A

Planted 4/28/10
Harvested 10/1/10

Table 5

2009 Priming Analysis - Renville

EXPT	Entry	Sugar	Purity	TonsPerAcre	ESA	Difference in Rev / Acre	Beets per 100 foot of row 11 DAP	13 DAP	15 DAP	18 DAP	33 DAP
SV 1	1	15.02	92.06	34.80	8948.47		2	76	117	145	138
SV 1 + Xbeet	2	14.74	92.28	34.69	8855.02	$41.01	26	115	134	152	142
SV 2	3	14.47	92.25	42.31	10468.31		1	66	101	142	157
SV 2 + Xbeet	4	14.37	91.48	41.52	10089.84	-$78.78	19	127	144	155	151
Hill 1	5	15.13	90.88	33.74	8709.91		3	67	120	157	153
Hill 1 + Xbeet	6	15.21	90.75	34.61	8888.78	$40.78	18	143	158	166	154
Hill 2	7	14.59	91.51	35.38	8750.90		1	97	140	171	154
Hill 2 + Xbeet	8	14.69	91.06	39.28	9723.79	$140.82	26	151	177	181	170
Beta 1	9	14.90	91.06	38.65	9707.26		3	42	91	135	148
Beta 1 + UltiPro	10	14.39	91.44	38.84	9533.36	-$76.24	3	63	107	158	156
ACH 1	11	14.97	91.15	36.19	9150.89		1	47	78	119	135
ACH 1 + UltiGem	12	14.72	91.05	33.51	8321.36	-$142.24	2	88	116	145	144
lsd (.05)*		n/s	n/s	n/s	n/s	N/S	11.24	20.85	n/s	n/s	n/s
CV		2.69	0.68	6.86	7.30	8.65	109.80	19.61	13.87	10.17	13.17
Pr>F		0.41	0.261	0.081	0.06	0.07	0.0055	0.0140	0.25	0.59	0.8220
Reps		6	6	6	6	6	6	6	6	6	6

*lsd is valid to compare two subplot treatments within the same whole plot.
Ex. Primed vs. nonprimed in Variety A.

Planted 4/24/2009
Harvested 9/30/2009

Table 6

2009 Priming Analysis - Murdock

EXPT	Entry	Sugar	Purity	TonsPerAcre	ESA	Difference in Rev / Acre	Beets per 100 foot of row 9 DAP	11 DAP	14 DAP	16 DAP	29 DAP
SV 1	1	15.75	92.32	32.77	8862.01		47	118	149	147	152
SV 1 + Xbeet	2	15.81	91.93	33.06	8956.72	$15.45	74	133	152	153	156
SV 2	3	15.55	91.57	36.19	9557.90		27	106	153	160	166
SV 2 + Xbeet	4	15.75	91.75	35.28	9462.87	$1.78	81	142	162	169	169
Hill 1	5	16.04	91.12	31.48	8544.19		27	96	149	161	164
Hill 1 + Xbeet	6	16.58	91.42	32.02	9042.19	$124.86	51	121	152	162	164
Hill 2	7	15.80	91.17	30.96	8292.63		63	149	173	174	178
Hill 2 + Xbeet	8	15.92	91.71	30.94	8415.39	$34.55	111	162	171	169	171
Beta 1	9	16.34	91.23	35.62	9906.88		12	74	138	158	171
Beta 1 + UltiPro	10	16.36	91.28	36.75	10230.07	$52.47	31	86	157	162	166
ACH 1	11	16.03	90.89	35.75	9678.11		34	115	153	157	157
ACH 1 + UltiGem	12	16.15	91.10	36.13	9893.56	$46.93	37	116	144	153	153
lsd (.05)*		N/S	N/S	N/S	N/S	N/S	13.94	N/S	N/S	N/S	N/S
CV		2.65	0.6	3.53	5.24	7.30	23.83	12.31	9.7	8.76	7.67
Pr>F		0.704	0.456	0.458	0.751	0.775	0.0001	0.1007	0.3104	0.7632	0.854
Reps		6	6	6	6	6	6	6	6	6	6

*lsd is valid to compare two subplot treatments within the same whole plot.
Ex. Primed vs. nonprimed in Variety A.

Planted 5/4/2009
Harvested 9/22/2009

Zone Nitrogen Management using Organic Matter

Fertility zones in a given field can be identified using satellite imagery. A study has been implemented at Southern Minnesota Beet Sugar Cooperative (SMBSC) to test the viability of adjusting fertility within those zones and if it is beneficial to sugar beet yield, quality and revenue. The test also compares zone management to current sugar beet fertility practices in the SMBSC growing area. The test zones are defined as management zones created using a model that uses bare soil imagery and elevation to estimate changes in soil characteristics. A patent on the model has been applied for and is pending. A GIS software program uses the model to generate a map of a field showing the calculated areas. Each zone is given a number to identify the areas. Generally, clay or lower organic matter soils will be assigned a lower number whereas darker or higher organic matter soils will be assigned a higher number. Grid testing is defined as dividing a field into 4.4 acre blocks and managing each block individually. Conventional is defined as soil sampling a field attempting to sample as many types of soils as possible, averaging all samples and using the soil sample result to adjust fertility across the whole field based on current recommendations.

Methods and Materials:
In 2010 there were 7 fields in the study. Each field was soil sampled to a depth of 4 feet and nitrogen (N) was adjusted based on the average organic matter within each zone. The criterion for total adjusted N is shown in Table 1.

Table 1.

OM	Adjusted N
< 3%	120
3.1 - 4%	110
4.1 - 5%	100
5.1 - 7%	90
> 7%	70

In each field two 140 foot wide test strips were installed. There were one of each, conventional and grid. The blocks within the grid strips were 440 feet in length. At harvest 2 adjacent 10 foot beet samples were collected from multiple points within each zone and test strips. The sugar beet samples tested in the zone were collected adjacent to the grid and conventional strips. This was done to reduce the natural variability in soils. There were 406 individual samples collected from the 7 fields. Each sample was weighed and analyzed for quality at the SMBSC Tare Lab.

Results and Discussion:
All data from six of the seven fields were combined. Accurate fertilizer application data was not available for one field and it was not used.

Tables 2, 3 and 4 show the statistics for zones, grid and conventional, respectively. Average sample results for each zone are shown. Statistical analysis for variance (Pr > F) among variables measured was conducted at the alpha 0.05 level of confidence. The Pr > F uses a statistical value to explain the difference in variables measured within the zones. A value of 0.00 – 0.05 means the difference in the variables measured across the zones are highly significant. A value of 0.05 – 0.10 means the difference in the variables measured are moderately significant. A value of 0.10 and greater means the differences in variables measured are not significantly different.

The LSD shows what/if any samples are different from the others. Any number in the below tables that is statistically different is in bold type. Net Revenue is the gross beet payment minus the fertilizer, sampling, mapping and application costs. Each nitrogen management technique is presented separately in tables 2, 3 and 4 in order to show the influence of the soil change within the nitrogen management technique. The data is weighted to reflect the acres in each zone.

In Table 2 (zone comparisons), sugar, nitrate, extractable sucrose per ton (EST) and revenue show differences that are highly significant when compared across zones. Purity, tons, extractable sucrose per acre (ESA) and net revenue are moderately significantly different. In Table 3(grid comparisons), purity, tons, nitrate, ESA, revenue and net revenue show differences when compared across zones. Sugar and EST are moderately different. In Table 4 (conventional comparisons), only purity is different across zones.

When fertilizer is applied conventionally there are large changes in yield and sugar within a field. Optimizing the efficiencies of fertility management and soil types are not realized. Fertilizer is added to high organic matter areas where soil test nitrogen (N) is most likely excessive and detrimental to sugarbeet quality. Too little is added where soil test N is low not taking full advantage of the crops potential. Grid technology is a vast improvement over conventional, however each 4.4 acre block may contain considerable changes in residual N.

Zone technology being tested at SMBSC has shown to be beneficial. Variations in organic matter and residual nitrogen are taken into account and adjustments are made for each area. Averaging data over the soil changes (zones) within each nitrogen management technique (Table 5) shows that there is a slight advantage of Zone management compared to grid and conventional. Significant changes are not as pronounced when each zone is managed to its potential. Overall increase in beet quality is the greatest advantage. An increase in tons has not been realized.

Table 2.						Zone				
Zone #	Om	Residual N	Sugar	PURITY	Tons	Nitrate	Extsucton	Extsucacre	Revenue	Net
3	5.0	44	15.9	91.8	29.5	7	273	8,120	$ 978.26	$ 924.63
4	4.5	50	15.1	92.2	24.3	6	259	6,343	$ 731.17	$ 690.07
5	6.0	62	15.6	92.5	24.3	8	270	6,533	$ 773.55	$ 733.92
6	12.9	326	**14.6**	**89.5**	28.6	**62**	**240**	6,848	$ 726.46	$ 705.76
	Mean	**121**	***15.4***	***91.9***	***26.0***	***15***	***264***	***6862***	***$ 799.65***	***$ 760.14***
	Pr > F		**0.003**	0.053	0.077	**0.003**	**0.010**	0.055	**0.031**	0.057
	LSD		1.04	1.95	NS	24	24	NS	NS	NS

Table 3.						Grid				
Zone #	Om	Residual N	Sugar	PURITY	Tons	Nitrate	Extsucton	Extsucacre	Revenue	Net
3	4.9	26	15.4	91.3	27.2	6	261	7,215	$ 843.97	$ 799.37
4	4.4	46	15.4	92.4	26.7	7	265	7,083	$ 829.11	$ 787.69
5	5.2	46	15.4	91.9	24.3	5	264	6,440	$ 751.23	$ 707.58
6	16.3	74	14.7	**89.5**	28.7	57	242	6,946	$ 745.80	$ 718.99
	Mean	**48**	***15.4***	***91.5***	***25.9***	***13***	***262***	***6,787***	***$ 785.84***	***$ 745.72***
	Pr > F		0.075	**0.031**	**0.003**	**0.003**	0.077	**0.004**	**0.006**	**0.006**
	LSD		NS	1.3	NS	NS	NS	NS	NS	NS

Table 4.						Conventional				
Zone #	Om	Residual N	Sugar	PURITY	Tons	Nitrate	Extsucton	Extsucacre	Revenue	Net
3	5.3	64	15.3	90.6	29.5	8	257	7,626	$ 870.40	$ 856.64
4	5.1	75	15.1	91.6	23.9	7	256	6,155	$ 701.48	$ 689.56
5	6.3	98	15.5	91.9	23.8	7	265	6,285	$ 732.88	$ 705.28
6	17.8	191	14.8	90.5	27.9	27	248	6,857	$ 746.94	$ 727.22
	Mean	**107**	***15.3***	***91.4***	***26.0***	***11***	***260***	***6765***	***$ 776.48***	***$ 754.80***
	Pr > F		**0.006**	0.304	**0.014**	**0.0001**	**0.008**	**0.006**	**0.003**	**0.003**
	LSD		NS	NS	NS	NS	NS	NS	NS	NS

Table 5: Average quality, tons and revenue for the three tests. The most desirable numbers are in bold type.

	Sugar	Purity	Tons	Nitrate	EST	ESA	Revenue	Net Revenue
Zone	**15.4**	**91.9**	**26.0**	15	**264**	**6862**	**$ 799.65**	**$ 760.14**
Grid	**15.4**	91.5	25.9	13	262	6787	$ 785.84	$ 745.72
Conventional	15.3	91.4	**26.0**	**11**	260	6765	$ 776.48	$ 754.80

Fertilizer, mapping and application costs trend higher for zone and grid sampling versus conventional. The higher costs are offset by increased beet quality and nutrient management that will benefit future crops.

Table 6: Average fertilizer cost per acre by test

	Res N	Urea_cost	DAP_cost	Potash cost	Fertilizer cost
Zone	40	$ 18.95	$ 28.09		$ 28.78
Grid	38	$ 25.42	$ 21.48	$ 17.83	$ 30.92
Conventional	44	$ 17.76		$ 14.00	$ 16.76

Summary

In 2010, tests showed there was an advantage using zone nitrogen application to both sugar beet quality and revenue. Research will continue indeterminately to improve zone identification and to fine-tune fertilizer recommendations within each zone. Additional testing will include planting and harvest population and its effect on yield and quality within the zones.

Literature Cited

Fertility Zones Generated Using Satellite Imagery to Predict Organic Matter. SMBSC 2009 Research Report. P.28

SMBSC In-furrow Application of Pop-up Fertilizer Products for Enhancement of Sugarbeet Growth

SMBSC growers have adopted the practice of applying pop-up products for enhancement of sugar beet production. This being the case many retailers have available to the growers a number of pop-up type products. SMBSC research has researched a number of these products and it is impossible to test all the products available. SMBSC research has reviewed the data available from various sources pertaining to the pop-up products. The products tested in the following article are the products that were considered to be of interest to SMBSC.

Methods

Testing was initiated in 2010 in which sugarbeets were planted at two locations to test the influence of pop-up fertilizer products on sugarbeet production. The locations were at Bird Island and Maynard, MN. Statistical analysis of the data for homogeneity of combinability determined that the data could not be combined across environments and locations.

Table 1 shows the site specifics for 2010 at the Bird Island and Maynard locations. Table 2 shows the soil test information for each location. N1 is 0-6 inch, N2 is 6-24 inch and N3 is the 24-48 inch depth. Table’s 3 and 4 show the sugarbeet production data for each site. Significant data is presented in bold type. Plots were 11 feet (6 rows) wide and 35 feet long. Pop-up (starter) fertilizers were applied at planting time with a 6 row planter. Sugarbeet samples were collected from rows 3 and 4 of a 6 row plot. Sugarbeets at both locations were harvested with a 2 row research harvester. The whole length of the plot was harvested. One sub-sample was collected from each plot. The weights were collected and weighed on the harvester for yield calculation and the subsample was analyzed in the SMBSC quality lab.

Table 1. Site Specifics for Locations in 2010.

	Location	
Task	**Bird Island, 2010**	**Maynard, 2010**
Sugarbeet-Varity	SV735RR	4017 RR
Planting-date	4/29/2010	4/27/2010
Harvest	10/2/2010	10/19/2010

Combind Starter type Comparison
Table 2. Soil Test 0-48", 2010

Location	pH	OM	N1 lb	N2 lb	N3 lb	Total N	P-O ppm	K ppm
Bird Island	7.6	5.3	58	62	12	132	20	198
Maynard	7.9	5.2	60	59	23	121	16	226

1028 Bird Island Starter type Comparison
Table 3. In-furrow Starter Fertilizer Influence on Sugarbeet Production, 2010

Trt No.	Starter Product	Rate Per Acre	Stand Count	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext.Suc Per Acre	Revenue % of Means
1	None	0	134	21.1	16.19	90.54	272	5738	95.25
2	10-34-0	3 gal	175	**22.9**	15.79	91.28	268	6131	100.47
3	Riser	2.5 gal	188	**24.1**	16.23	91.24	276	**6654**	**111.57**
4	LI 6340	4 pt	180	**24.0**	15.82	90.30	265	6357	103.04
5	Riser + Radiate	2.5 gal + 2 oz.	209	**26.3**	16.17	91.18	275	**7213**	**120.55**
6	LI 6336	2.5 gal	118	20.6	15.76	90.77	266	5484	89.12
7	LI 6340	2 pt	218	20.7	16.38	91.37	279	5849	100.18
8	Radiate	2 oz.	159	18.8	15.80	90.02	263	4957	80.07
9	Agzyme	12.8 oz.	195	20.0	16.26	92.19	280	5621	95.50
10	Agzyme	19.2 oz.	166	**22.6**	16.04	90.44	269	6083	100.14
11	Trifix	1 pt.	145	21.4	16.05	90.86	271	5806	95.92
12	Trifix	1 qt.	206	21.4	16.27	90.78	275	5881	98.37
13	Soygreen	1 lb.	146	**23.6**	16.21	91.56	277	**6531**	**109.82**
		CV	**28**	**8.6**	**3.17**	**1.12**	**4**	**11**	**14.02**
		LSD (.05)	**68**	**2.7**	**NS**	**NS**	**NS**	**964**	**20.11**

Conclusions – Bird Island location

1. Stand count, tons per acre, extractable sugar per acre and revenue percent of mean showed statistical differences among treatment tested. All other variables measured responded similarly to starter type products tested.
2. Starter products that positively influenced stand did not necessarily relate directly to sugar beet yield and revenue.
3. Riser plus Radiate showed the highest revenue percent of mean and was statistically higher than all other products than Riser alone and Soygreen.
4. Combining Radiate and Riser tended to increase revenue percent of mean by approximately 9% over Riser alone and 40% over Radiate alone.

1029 Maynard Starter type Comparison

Table 4. In-furrow Starter Fertilizer Influence on Sugarbeet Production, 2010

Trt No.	**Starter Product**	**Rate Per Acre**	Stand Count	Tons	% Sugar	Purtiy	Ext.Suc Per Ton	Ext. Suc Per Acre	Revenue % of Means
1	None	0	147	20.1	17.07	**91.78**	293	5902	87.69
2	10-34-0	3 gal	153	21.8	16.60	91.16	282	6183	89.66
3	Riser	2.5 gal	133	22.1	16.33	89.94	273	6024	84.56
4	Radiate	2 oz.	150	20.7	16.86	**92.13**	291	6028	89.00
5	Riser + Radiate	2.5 gal + 2 oz.	172	**24.9**	16.65	91.66	285	**7137**	104.13
6	LI 6336	2.5 gal	138	**26.2**	16.69	91.23	284	**7435**	107.87
7	LI 6340	2 pt	165	22.0	16.50	**93.10**	288	6340	92.91
8	LI 6340	4 pt	170	**26.2**	16.73	90.84	283	**7407**	107.23
9	Agzyme	12.8 oz.	178	**26.5**	16.12	90.81	272	**7219**	101.30
10	Agzyme	19.2 oz.	172	**26.5**	16.87	**92.69**	293	**7763**	**115.27**
11	Trifix	1 pt.	193	**23.8**	16.27	91.56	278	6605	94.02
12	Trifix	1 qt.	193	**26.0**	17.03	91.60	292	**7593**	**112.42**
13	Soygreen	1 lb.	155	**26.5**	16.80	**92.51**	291	**7705**	**113.94**
		CV%	**11**	**6.3**	**6.15**	**1.12**	**7**	**10**	**14.59**
		LSD (.05)	**31**	**2.6**	**NS**	**1.73**	**NS**	**1168**	**24.58**

Conclusions – Maynard Location

1. Stand count, tons per acre, purity, extractable sugar per acre and revenue percent of mean showed statistical differences among treatment tested. All other variables measured responded similarly to starter type products tested.
2. Stand count was influenced by starter type treatment, however the stand count differences did not directly relate to sugar beet production or revenue percent of mean.
3. The three treatments that tended to give the highest revenue percent of mean were Agzyme at 19.2 oz. per acre, Trifix at 1 qt. per acre and Soygreen.
4. Combining Radiate and Riser significantly increased revenue percent of mean compared to Riser or Radiate applied alone.

General conclusion

1. The conclusions discussed here consider both locations which statistically can not be done. However, these general conclusions are included in this discussion as an overall observation of the data.

2. Soygreen at the 1 lb. rate was significant at both locations. In other SMBSC research trials Soygreen at the 1 lb. rate was also advantageous.

3. Performance of Riser and Radiate combined was consistent between the two locations in that the combination was better than the products applied alone and the combination of Riser and Radiate was among the treatments that gave higher revenue percent of mean at both locations.
4. Soygreen gave one of the highest revenue percent of mean at both locations.
5. This data indicates the need to search for products that may enhance sugar beet production and revenue compared to the standard starter type products.
6. However, you need to keep in mind this data is one year and more testing needs to be conducted to make concrete conclusions.

SMBSC In-furrow Application of Pop-up Fertilizers for Enhancement of Sugarbeet Growth

Pop-up fertilizer testing by SMBSC Research has shown there is a benefit to using 10-34-0 starter fertilizer to enhance sugarbeet production. A test was developed in 2008 to test various pop-up products and determine if any of the tested products alone or in combination with 10-34-0 would further increase production.

Methods

Sugarbeets were planted at three locations in 2008, two locations in 2009 and two locations in 2010 to test the influence of pop-up fertilizer and amendment products on sugarbeet production. The locations were at Bird Island, Wood Lake and Clara City, MN in 2008, Clara City and Hector, MN in 2009 and Bird Island and Maynard, MN in 2010. Table 1 shows the combined data for 2008 and 2009. Table 2 and 3 show the specifics of activities conducted at each site in 2010. Table 4 shows the combined data for 2010. Table 5 shows the site specifics for all years. Plots were 11 feet (6 rows) wide and 35 feet long. Pop-up fertilizers and amendments were applied at planting time with a 6 row planter. In 2008 and 2009 planting issues with product mixtures settling in the tank caused some products not to perform to its full potential. The research planter is not capable of agitating products. Changes in planting protocol were made in 2010 to deter this from happening. Products tested were added to the tank immediately prior to planting and drained immediately after planting. In 2008 and 2009 five of the research trials were harvested with a 1 row research harvester. Two quality sub samples were collected from each plot and analyzed for quality and weighed for yield calculation. Each sample was collected from 10 feet of row. Harvest data was collected from rows 3 or 4 of a 6 row plot. In 2009 the Hector site and both of the sites in 2010 were harvested with a 2 row research harvester and the whole plot length was harvested. One sub-sample was collected from each plot and analyzed for quality. Statistical analysis of the data for homogeneity of combinability determined that the data could be combined across locations within years. The years 2008 and 2009 could be combined. 2010 could not be combined with 2008 and/or 2009.

Materials

Popup fertilizer used in this experiment was 10-34-0. Soygreen® is a dry water soluble powder 6% Iron ORTHO-ORTHO EDDHA Chelate. Redline™ contains many nutrients that are necessary for plant growth as well as the same technology that is used in Soygreen®. A three gallon application of redline provides 1 lb., of Soygreen. EB Mix® is a product containing a blend of nitrogen, sulfur, boron, iron, manganese and zinc. JumpStart® contains the naturally occurring fungus *Penicillium bilaii*, which naturally forms Carboxillic acid and helps increase the amount of phosphate readily available to plants by releasing bound phosphate from the soil. MAN-GRO DF is a highly concentrated water soluble manganese powder designed for foliar application. It is designed to combat Glyphosate induced Manganese Deficiency that has been known to occur in glyphosate resistant plants. Boron was applied using Tetra-Bor 10. The product contains 10% boron as well as some macro-nutrients.

Combined 2 year Data 2008-2009

Table 1. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means

Trt	Product	Rate	Timing	Tons	Sugar	Purity	Ext. Suc Per Ton	Ext.Suc Per Acre	% Revenue
1	Soygreen	1 lbs.	at planting in furrow	**31.8**	16.4	91.6	280	**8869**	106.8
2	Broadcast P	45 lbs	at planting incorporated	30.1	16.4	91.6	280	8400	101.1
3	Soygreen	2 lbs.	at planting in furrow	29.9	16.2	91.6	277	8242	98.2
4	Pop-up (10-34-0)	3 gal	at planting in furrow	**30.4**	16.0	91.5	273	8231	96.8
5	Untreated	N/A	N/A	30.0	16.2	91.7	277	8281	98.9
6	Nutriplant(4-15-12)	4 oz	at planting in furrow	29.8	16.3	91.7	278	8259	99.0
7	Jump Start	seed treated	at planting	30.1	16.2	91.5	275	8260	98.2
8	ManGro DF	2 lbs	at planting in furrow	**30.2**	16.2	91.6	277	8306	99.0
9	ManGro DF	3 lbs	at planting in furrow	**30.7**	16.3	91.7	278	**8541**	102.5
10	Boron	1.81 gal	at planting in furrow	**30.5**	16.2	91.7	277	8334	99.5
			CV	**7.6**	**3.5**	**1.1**	**4**	**9**	**10.8**
			LSD (.05)	**1.6**	**NS**	**NS**	**NS**	**467**	**NS**

1020 Maynard Starter Product Plus Additives

Table 2. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means, 2010

Trt No.	Product	Rate/Acre	Timing	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% of Revenue
1	Soygreen	1 lbs.	at planting in furrow	20.9	16.24	90.38	273	5689	93.17
2	Broadcast P	45 lbs	at planting incorporated	19.5	16.28	90.94	276	5380	88.99
3	10-34-0	3 gal	at planting in furrow	20.6	16.54	90.12	277	5712	94.81
4	Soygreen + 10-34-0	1 lbs. + 3 gal.	at planting in furrow	21.4	16.31	90.89	276	5897	97.58
5	Untreated	N/A	N/A	18.1	16.29	90.03	272	4929	80.64
6	Redline	2 gal	at planting in furrow	22.5	16.66	**91.39**	284	6416	**109.10**
7	Redline	3 gal	at planting in furrow	23.2	16.59	**91.31**	283	**6560**	**110.68**
8	EB Mix	1 qt	at planting in furrow	22.0	16.51	**92.59**	286	6276	**106.79**
9	EB Mix + 10-34-0	1 qt. + 3 gal.	at planting in furrow	**26.1**	16.28	**91.28**	277	**7198**	**119.24**
10	ManGro DF	3 lbs	at planting in furrow	**26.5**	16.12	90.72	272	**7194**	**117.67**
11	Boron	1.81 gal	at planting in furrow	20.8	16.54	90.89	280	5836	97.74
12	Untreated	N/A	N/A	17.4	16.61	**91.40**	283	4936	83.59
			CV	**6.8**	**3.08**	**1.22**	**4**	**8**	**100.00**
			LSD (0.05)	**2.1**	**NS**	**1.59**	**NS**	**709**	**15.47**

1021 Bird Island Starter Products

Table 3. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means, 2010

Trt No.	Product	Rate/Acre	Timing	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Soygreen	1 lbs.	at planting in furrow	21.0	15.99	90.71	270	5656	99.92
2	Broadcast P	45 lbs	at planting incorporated	19.5	16.16	90.56	272	5313	94.48
3	10-34-0	3 gal	at planting in furrow	19.5	15.90	91.01	269	5362	94.58
4	Soygreen + 10-34-0	1 lb. + 3 gal.	at planting in furrow	**23.1**	15.93	90.53	268	**6169**	**108.22**
5	Untreated	N/A	N/A	18.2	16.30	91.03	276	5033	90.81
6	Redline	2 gal	at planting in furrow	**22.9**	15.91	90.18	266	**6077**	**106.05**
7	Redline	3 gal	at planting in furrow	**23.7**	15.77	90.86	266	**6295**	**109.87**
8	EB Mix	1 qt	at planting in furrow	**22.2**	15.91	90.68	268	**5950**	**104.49**
9	EB Mix + 10-34-0	1 qt. + 3 gal.	at planting in furrow	**22.1**	15.86	90.26	265	**5851**	**101.93**
10	ManGro DF	3 lbs	at planting in furrow	**22.2**	15.90	90.47	267	**5931**	**103.96**
11	Boron	1.81 gal	at planting in furrow	19.7	16.06	91.14	272	5375	95.73
12	Untreated	N/A	N/A	19.7	15.83	90.01	264	5188	89.97
			CV	7.0	2.30	1.00	3	7	8.82
			LSD (.05)	2.1	NS	NS	NS	611	12.70

Combined Data for 2010

Table 4. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means, 2010

Trt No.	Product	Rate/Acre	Timing	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Soygreen	1 lbs.	at planting in furrow	20.9	16.11	90.54	271	5673	96.54
2	Broadcast P	45 lbs	at planting incorporated	19.5	16.22	90.75	274	5347	91.74
3	10-34-0	3 gal	at planting in furrow	20.1	16.22	90.56	273	5537	94.70
4	Soygreen+10-34-0	1 lb.+ 3 gal.	at planting in furrow	22.2	16.12	90.71	272	6033	**102.90**
5	Untreated	N/A	N/A	18.2	16.30	90.53	274	4981	85.73
6	Redline	2 gal	at planting in furrow	**22.7**	16.28	90.78	275	**6246**	**107.57**
7	Redline	3 gal	at planting in furrow	23.4	16.18	91.08	274	**6428**	**110.27**
8	EB Mix	1 qt	at planting in furrow	22.1	16.21	**91.64**	277	**6113**	**105.64**
9	EB Mix + 10-34-0	1 qt. + 3 gal.	at planting in furrow	24.1	16.07	90.77	271	**6525**	**110.58**
10	ManGro DF	3 lbs	at planting in furrow	**24.3**	16.01	90.59	270	**6563**	**110.81**
11	Boron	1.81 gal	at planting in furrow	20.3	16.30	91.02	276	5606	96.74
12	Untreated	N/A	N/A	18.5	16.22	90.70	274	5062	86.78
			CV	**8.6**	**2.63**	**1.12**	**4**	**9**	**9.79**
			LSD (.05)	**1.6**	**NS**	**1.08**	**NS**	**518**	**11.03**

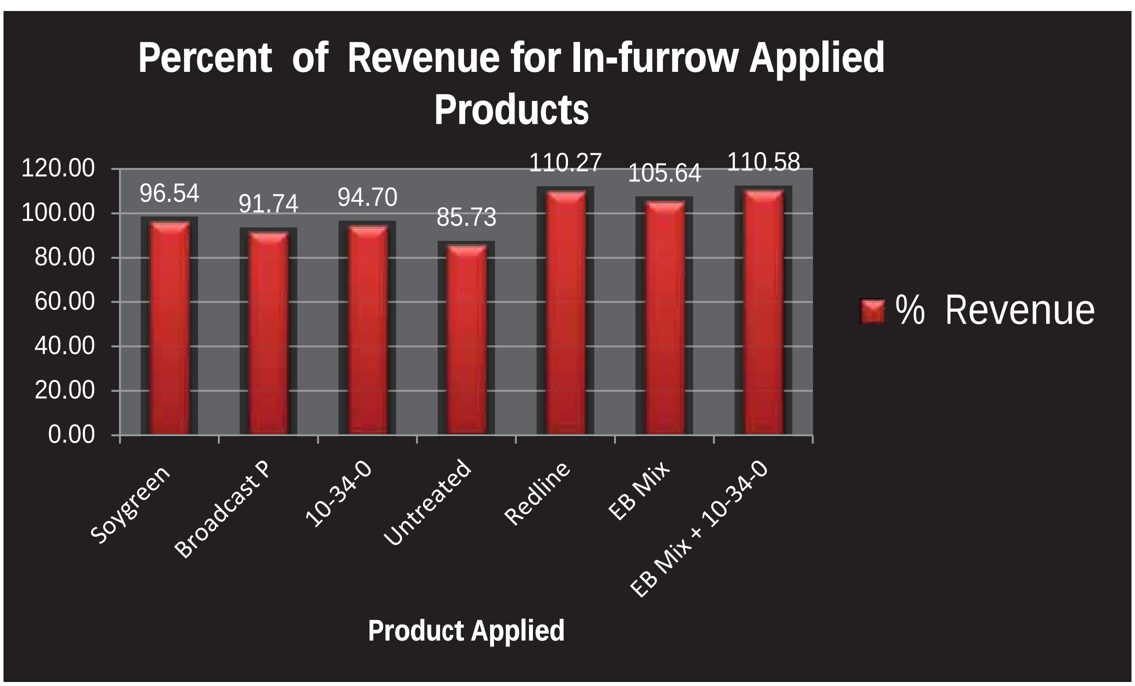

Table 5. Site Specifics for Pop-up Fertilizers, 2008-2010

Task	Location						
	2008			2009		2010	
	Wood Lake	Clara City	Clara City	Clara City	Hector	Maynard	Bird Island
Sugarbeet variety	95RR03	4017 RR	SM RR01	RR 201	RR 201	SV835RR	H255
Planting date	5/5/2008	5/9/2008	5/20/2008	4/24/2009	4/28/2009	4/27/2010	4/29/2010
Fertility							
Nitrogen	77	75	76	75	52	99	121
Phosphorus	7.9	8.0	8.0	8.0	7.9	7.7	7.5
Potassium	165	244	205	244	164	180	181
OM.	4.3	5.2	5.0	5.2	5.5		5.5
Fertilizer Applied							
Nitrogen	30 lbs.	30 lbs.	30 lbs.	35 lbs.	30 lbs.	30 lbs.	0 lbs.
Phosphorus							
Potassium							
Harvest	10/3/2008	10/12/2008	9/26/2008	10/24/2009	10/21/2009	10/19/2010	10/2/2010

Results and Discussion

1. This discussion concentrates on data from 2008 and 2009 combined across locations and years (table 1) and the data from 2010 combined across locations (table 4).

2. Significant data is presented in bold type. Data deemed significant is any number in a given column that is greater than the highest number in that column minus the LSD.

3. In 2008 and 2009 the treatments were non-significant from many of the variables measured except for tons per acre and extractable sugar per acre.

4. Soygreen applied at1 lb. per acre influenced of tons per acre in 2008 and 2009 showed to tend higher or was significantly greater than all other treatments. The increase in tons per acre resulted in similar effect on extractable sugar per acre.

5. Revenue expressed as a percent of the mean showed a tendency to be higher with Soygreen applied at 1 lb., per acre.

6. Mangro applied at 3 lbs. per acre tended to increase revenue percent of mean more than Mangro applied at 2 lbs. acre. This research lead to only using Soygreen at 1 lb. and Mangro at 3 lbs. per acre as treatment in the 2010 research trials.

7. Due to other experiments conducted in 2009, mixtures of Soygreen and popup (10-34-0) fertilizer (includes Redline) were tested in 2010 and gave results showing a tendency or an actual increase in tons per acre, purity, extractable sugar per acre and percent revenue of the mean.

8. EB-mix also showed an increase in the factors mentioned in bullet number 7 as well as a tendency for an additional increase when mixed with popup fertilizer.

9. Mangro applied at 3 lbs. per acre showed a similar influence on the factors mention in bullet 7 as Redline and EBmix with popup fertilizer.

Nutrient Efficiency and Plant Health Products Impact on Sugarbeet Growth

There are numerous products being marketed as a health enhancement or having the ability to make micro and macro nutrients more available to the plant. A test was generated in 2009 to test the assertions of these products.

Methods:

Sugarbeets were planted to test products for sugarbeet production. There were 2 locations in 2009 located at Clara City and Lake Lillian, MN. In 2010 there were 2 locations at Maynard and Bird Island, MN. The data will be presented combined across locations by year. Statistical analysis of the data was conducted for homogeneity of combinability and it was determined that the data could be combined across locations within years. Some treatments were not replicated from 2009 to 2010; therefore treatments could not be combined across years. Table 1 shows the harvest data for all sites in 2009. Table 2 and 3 shows data by location in 2010. Table 4 shows combined harvest data from 2010. Plots were 11 ft. (6 rows) wide and 50 feet long. Sugarbeets were planted with a 6 row planter. All in-furrow products were placed in the furrow on the seed. Post emergence products were applied as noted. Harvest data was collected from rows 3 and 4 of a 6 row plot. The research trial was harvested with a 1 row research harvester at Lake Lillian in 2009. Two quality sub samples were collected from each plot and analyzed for quality and weighed for yield calculation. Each sample was collected from 10 feet of row. Research trials were harvested with a 2 row research harvester at Clara City in 2009, Maynard and Bird Island in 2010. The whole plot length was harvested. One quality sub-sample was collected from each plot and analyzed for quality. Plots were not thinned as the sugarbeet stands did not warrant thinning. For this test liquid starter fertilizer (10-34-0) was used for treatments labeled as Popup.

Materials

Popup fertilizer used in this experiment was 10-34-0. Soygreen® is a dry water soluble powder 6% Iron ORTHO-ORTHO EDDHA Chelate. Redline™ contains many nutrients that are necessary for plant growth as well as the same technology that is used in Soygreen®. A three gallon application of Redline provides 1 lb., of Soygreen. JumpStart® contains the naturally occurring fungus *Penicillium bilaii*, which naturally forms Carboxillic acid and helps increase the amount of phosphate readily available to plants by releasing bound phosphate from the soil. Carbon Boost-S is a zinc based product from FBSciences. Kreb-Start-F is a phosphate and potash based product from FBSciences. Lucros-F is a boron based product from FBSciences. Ambrosia-F is a multi-nutrient product from FBSciences. For treatments with PCC, factory precipitated lime was used. North American Fertilizer (NAF) is a co-product of burning turkey litter to generate electricity at Fibrominn in Benson, MN.

Table 1. Treatment Descriptions of Products and their Influence on Sugarbeet Yield and Quality Combined over 2 sites, 2009.

Trt No.	**Product**	**Rate**	**As Applied**	Stand	Tons	% Sugar	Purity	EST	ESA	Revenue - % of Mean
1	Soygreen	1 lb.	at planting in furrow	146	36.4	16.0	91.2	271	9720	94.9
2	Soygreen+Popup	1 lb. + 3 gal.	at planting in furrow	168	**39.4**	16.2	**91.8**	277	**10796**	**107.7**
3	Redline	2 gal.	at planting in furrow	144	**38.1**	16.0	91.5	273	**10285**	**101.3**
4	Redline	3 gal	at planting in furrow	142	37.2	16.1	91.3	274	**10051**	99.1
5	Untreated	N/A	N/A	160	34.0	16.0	91.4	272	9114	89.4
6	Popup	3 gal	at planting in furrow	142	37.4	16.1	90.9	273	**10060**	98.9
7	Jump Start	seed treated	at planting in furrow	134	35.3	16.2	91.7	277	9697	97.1
8	Jump Start + Popup	seed treated + 3 gal.	at planting in furrow	144	36.1	15.9	91.4	270	9683	95.0
9	Jump Start + Soygreen	seed treated + 1 lb.	at planting in furrow	154	**39.1**	16.2	**91.9**	278	**10727**	**107.1**
10	Carbon Boost+Popup	8 oz + 3gal	at planting in furrow	134	34.9	16.1	91.5	274	9506	94.4
11	Carbon Boost+Popup	8 oz + 3gal	at planting in furrow	138	**38.0**	16.2	91.2	275	**10344**	**102.7**
	Kreb-Start F	64 oz	4-6 WAE							
12	Carbon Boost+Popup	8 oz + 3gal	at planting in furrow	158	**39.0**	16.1	**91.8**	275	**10613**	**105.3**
	Kreb-Start F	64 oz	4-6 WAE							
	Ambrosia F	64 oz	14-21 DAC							
13	Carbon Boost+Popup	8 oz + 3gal	at planting in furrow	156	**40.4**	16.2	91.1	275	**11003**	**109.2**
	Ambrosia F	64 oz	14-21 DAC							
14	PCC	4 ton	Preplant application	144	37.3	16.1	91.1	274	**10160**	**100.8**
15	Jump Start	seed treated	at planting in furrow	150	37.4	15.9	91.6	272	**10060**	98.9
	PCC	4 ton								
16	NAF	750 lb.	Preplant incorporated	154	36.4	16.1	91.6	274	9923	98.5
17	Jump Start + NAF	seed treated + 750 lb	at planting in furrow	130	37.6	16.0	**91.9**	275	**10213**	**101.2**
			C.V. %	15.58	8.29	3.87	1	4.7	9.23	11.79
			LSD (0.05)	NS	2.8	NS	0.8	NS	825	5.70

1023 Maynard

Table 2.Treatment Description and Revenue. 2010

Trt No.	Product	Rate/acre	Notes	Stand Ct. AVG	Tons	Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	Revenue- % of Mean
1	Popup + AGM 08005	3 gal + 5 oz.	at planting in furrow	144	18.2	16.3	90.5	274	4988	90.0
2	Popup + Ultra-Che MN	3 gal + 32 oz.	at planting in furrow	183	20.5	16.1	90.0	269	5519	98.1
3	Untreated			174	15.0	16.2	90.1	271	4055	72.5
4	Untreated			180	13.2	**16.5**	**92.1**	**285**	3786	70.7
5	Untreated			198	13.7	16.3	89.5	270	3709	66.2
6	Popup	3 gal	at planting in furrow	184	19.5	16.1	90.8	272	5295	94.9
7	CP-20	seed	seed treated	190	20.5	16.5	90.7	278	5697	104.0
8	Carbon Boost	6 oz.	at planting in furrow	176	20.4	16.1	90.0	268	5484	97.4
9	Popup +Carbon Boost	3 gal + 6 oz	at planting in furrow	188	20.8	16.3	90.3	273	5670	102.0
10	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	191	20.6	16.1	89.9	267	5509	97.4
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
11	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	190	21.7	16.2	89.8	270	5870	104.8
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
	Lucros	16 oz.	Apply w/last Fungicide							
12	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	184	21.9	16.3	90.2	272	5969	**107.1**
	Lucros	16 oz.	Apply w/last Fungicide							
13	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	180	**24.7**	16.3	90.6	274	**6771**	**122.4**
	Lucros	16 oz.	Apply w/last Fungicide							
	Lucros	16 oz.	Apply 14 days after last application							
14	Popup	3 gal	at planting in furrow	191	**25.6**	15.9	90.8	268	**6827**	**120.6**
	Lucros	16 oz.	Apply w/last Fungicide							
15	Popup	3 gal	at planting in furrow	176	22.9	16.5	**91.8**	282	**6431**	**118.4**
	Lucros	16 oz.	application							
	Lucros	16 oz.	prior to harvest)							
16	Popup	3 gal	at planting in furrow	178	21.8	16.1	90.7	271	5897	105.3
	Jumpstart	1X rate	seed treatment							
17	Popup	3 gal	at planting in furrow	204	21.0	16.4	91.3	279	5872	**107.6**
	Jumpstart	2X rate	seed treatment							
18	Popup	3 gal	at planting in furrow	148	**23.6**	16.4	91.0	278	**6568**	**120.0**
	Jumpstart	3X rate	seed treatment							
			CV	11.5	8.7	2.60	1.64	4	4	11.4
			LSD	2.9	2.5	0.60	2.11	17	749	16.2

1024 Bird Island
Table 3. Treatment Description and Revenue, 2010

Trt No	Product	Rate/acre	Notes	Stand Ct. Avg	Tons per acre	Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	Revenue % of Means
1	Popup + AGM 08005	3 gal + 5 oz.	at planting in furrow	148	**19.7**	16.6	90.6	280	5535	99.3
2	Popup + Ultra-Che MN	3 gal + 32 oz.	at planting in furrow	144	17.3	**16.8**	**92.9**	**293**	5106	95.1
3	Untreated			140	16.9	**16.8**	91.2	286	4844	88.3
4	Untreated			143	16.9	16.5	90.6	279	4705	84.0
5	Untreated			156	16.4	16.4	90.0	273	4477	78.7
6	Popup	3 gal	at planting in furrow	146	**21.9**	16.7	90.9	283	**6215**	**112.4**
7	CP-20	2 oz./100 lbs. seed	seed treated	131	19.5	16.1	90.6	271	5308	92.8
8	Carbon Boost	6 oz.	at planting in furrow	179	**22.3**	**16.9**	90.9	286	**6370**	**116.1**
9	Popup +Carbon Boost	3 gal + 6 oz	at planting in furrow	156	17.4	16.4	90.9	278	4834	86.0
10	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	168	18.1	16.4	90.6	277	5035	89.7
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
11	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	170	**20.2**	**16.9**	90.2	283	5739	**103.9**
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
	Lucros	16 oz.	Apply w/last Fungicide							
12	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	139	**20.4**	**16.9**	90.8	286	**5835**	**106.3**
	Lucros	16 oz.	Apply w/last Fungicide							
13	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	131	**21.3**	**16.9**	90.9	286	**6105**	**111.3**
	Lucros	16 oz.	Apply w/last Fungicide							
	Lucros	16 oz.	Apply 14 days after last application							
14	Popup	3 gal	at planting in furrow	125	**24.1**	16.6	90.8	281	**6764**	**121.4**
	Lucros	16 oz.	Apply w/last Fungicide							
15	Popup	3 gal	at planting in furrow	164	**20.7**	16.4	90.7	277	5714	**101.4**
	Lucros	16 oz.	Apply 14 days after last application							
	Lucros	16 oz.	(approximately 6 wks prior to harvest)							
16	Popup	3 gal	at planting in furrow	138	19.2	16.5	90.8	280	5366	95.9
	Jumpstart	1X rate	seed treatment							
17	Popup	3 gal	at planting in furrow	136	18.9	16.5	91.3	280	5306	95.2
	Jumpstart	2X rate	seed treatment							
18	Popup	3 gal	at planting in furrow	145	**22.1**	**17.0**	91.1	289	**6367**	**116.6**
	Jumpstart	3X rate	seed treatment							
			CVT	29.6	11.6	3.1	1.5	5	13	14.8
			LSD	NS	3.2	0.7	2.0	20	1006	21.0

Table 4. Treatment descriptions for 2010 Products combined over 2 sites.
2010 Combined Data

Trt No	Product	Rate/acre	Notes	Stand	Tons	Sugar	Purity	EST	ESA	Revenue - % of Mean
1	Popup + AGM 08005	3 gal + 5 oz.	at planting in furrow	146	19.0	16.4	90.6	277	5261	94.7
2	Popup + Ultra-Che MN	3 gal + 32 oz.	at planting in furrow	163	18.9	16.5	91.4	281	5313	96.6
3	Untreated			157	15.9	16.5	90.7	278	4450	80.4
4	Untreated			161	15.1	16.5	91.3	282	4246	77.3
5	Untreated			177	15.1	16.3	89.7	272	4093	72.4
6	Popup	3 gal	at planting in furrow	165	20.7	16.4	90.8	278	5755	103.7
7	CP-20	seed	seed treated	161	20.0	16.3	90.6	275	5503	98.4
8	Carbon Boost	6 oz.	at planting in furrow	178	21.3	16.5	90.4	277	5927	**106.7**
9	Popup +Carbon Boost	3 gal + 6 oz	at planting in furrow	172	19.1	16.3	90.6	275	5252	94.0
10	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	179	19.4	16.3	90.2	272	5272	93.5
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
11	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	**180**	21.0	16.5	90.0	277	5805	104.3
	Carbon Boost	8 oz.	Foliar @ 2 nd RU appl.							
	Lucros	16 oz.	Apply w/last Fungicide							
12	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	161	21.2	16.6	90.5	279	5902	**106.7**
	Lucros	16 oz.	Apply w/last Fungicide							
13	Popup + Carbon Boost	3 gal + 6 oz	at planting in furrow	156	**23.0**	16.6	90.8	280	**6438**	**116.8**
	Lucros	16 oz.	Apply w/last Fungicide							
	Lucros	16 oz.	Apply 14 days after last application							
14	Popup	3 gal	at planting in furrow	158	**24.8**	16.3	90.8	275	**6796**	**121.0**
	Lucros	16 oz.	Apply w/last Fungicide							
15	Popup	3 gal	at planting in furrow	170	21.8	16.4	91.3	280	6072	**109.9**
	Lucros	16 oz.	application							
	Lucros	16 oz.	(approximately 6 wks prior to harvest)							
16	Popup	3 gal	at planting in furrow	158	20.5	16.3	90.8	276	5632	100.6
	Jumpstart	1X rate	seed treatment							
17	Popup	3 gal	at planting in furrow	170	20.0	16.4	91.3	280	5589	101.4
	Jumpstart	2X rate	seed treatment							
18	Popup	3 gal	at planting in furrow	146	**22.9**	16.7	91.0	283	**6468**	**118.3**
	Jumpstart	3X rate	seed treatment							
			CV	25.8	13.8	3.3	1.5	5	14	14.7
			LSD (.05)	3.0	1.9	NS	NS	NS	624	14.0

Results and Discussion

2009 discussion (Table 1)

1. Comparisons will be made by considering the statistical significance comparing the treatment giving the highest value for the variable being discussed.
2. Stand count, percent sugar and extractable sugar per ton (EST) were not influenced by the treatments tested.
3. Tons per acre were significantly influenced by treatments 2, 3, 9, 11, 12 and 13. Treatment 2 and 3 are similar treatments in that Redline has a popup fraction of the mix along with Soygreen that when applied at 3 gal gives 1 lb. of Soygreen. Treatments 11, 12 and 13 are using Carbon Boost as the base and adding Kreb-start F and Ambrosia alone or in combination.

Treatment 9 includes Jumpstart which is a similar product to Carbon Boost in principal relative to the concept of the active component in the soil.

4. The treatment listed in bullet point number 3 all show to be among the highest in revenue expressed as a percent of mean.
5. Of the products tested, where revenue was increased, the data indicates that the main influence was tons. However, among the treatments giving the higher revenues, significant increase in purity was apparent.

2010 Discussion (Table 4)

6. Comparisons will be made by considering the statistical significance comparing the treatment giving the highest value for the variable being discussed.
7. Sugar percent, purity and extractable sugar per ton were not influenced by the treatments tested. This indicated the treatments tested did not have any influence on sugar beet quality.
8. Tons per acre were higher for treatments 13, 14, and 18. The higher tons per acre related directly to revenue per acre expressed as revenue percent of mean.

Nitrogen in a Sweet Corn and Sugar Beet Rotation-2010

In the Southern Minnesota sugar beet growing area, sugar beets are grown following sweet corn on approximately 11% of the contracted acres. There has been discussion in the growing area as to what is the correct amount of nitrogen needed to maximize sweet corn yield and sugarbeets in the rotation.

Methods:
Plots were 11 ft. (6 rows) wide and 50 feet long. Soil tests were collected and nitrogen was applied in the fall of 2008. Sweet corn and sugar beets were planted with a 6 row planter. Sweet Corn was planted at three intervals during the growing season in 2009. The early corn was planted on 5/8/09 at a target population of 37,100. The mid-season corn was planted on 5/28/09 at a target population of 25,500. The late season corn was planted on 6/11/09 at a target population of 25,500. Sugar beets were planted in 2010. Nitrogen was not applied between the sweet corn and sugar beet crop. Harvest data was collected from the middle two rows of a 6 row plot. Plots were not thinned as the sugar beet stands did not warrant thinning. Research trials were harvested at Lake Lillian with a 1 row research harvester. Two quality sub-samples were collected from each plot and analyzed for quality and weighed for yield calculation. Each sample was collected from 10 feet of row.

Results and Discussion:
The rate of nitrogen (N) will be discussed as total nitrogen. The total nitrogen is the soil test or residual nitrogen to the 4 foot depth plus applied nitrogen. Table 1 shows the order of significance for sugar beet and sweet corn yield. The significance decreases as the letters progress. Same letters across varying N levels indicate there is no significant difference between those levels.

Table 1.

Nitrogen	28	59	90	113	146	184
stand	b	***b***	b	**a**	b	**bc**
beet_Tons	b	***b***	ab	**a**	b	**ab**
Sugar	a	***a***	a	**a**	a	**a**
PURITY	a	***a***	a	**a**	a	**a**
EST	a	***a***	a	**a**	a	**a**
ESA	b	***b***	ab	**a**	b	**ab**
beet_rev	b	***b***	ab	**a**	ab	**ab**
corn_TONS	c	***ab***	ab	**a**	a	**bc**
corn_Rev	c	***ab***	ab	**ab**	a	**bc**

Sweet corn yield was maximized when N levels were between 59 and 146 lbs. When N increased above and below optimum levels, sweet corn tons and revenue decreased. Sugar beet yield was maximized between 90 and 184 lb. Sugar beet quality was not affected by N levels. Therefore, maximum sweet corn yield in year 1 and sugarbeet yield and quality in year 2 can be maximized when 4 ft. nitrogen prior to sweet corn is adjusted to between 90 and 146 lbs. N.

Table 2 shows yield and quality for the different N levels. Averages are in bold type. Revenues are shown as a percent of the mean for all tests.

Table 2.

Timing	Total N	Beet_stand	Beet_Tons	Sugar	Purity	EST	ESA	Beet_revenue %	Corn_tons/acre	Corn_Rev %
Early	40	122	32.8	13.6	90.2	225	7343	96.05	4.5	61.63
Mid	18	144	23.8	14.1	91.9	240	5703	80.54	6.8	72.42
Late	25	168	30.8	14.3	90.7	239	7365	103.93	4.9	75.36
	28	**144**	**29.1**	**14.0**	**90.9**	**235**	**6804**	**93.51**	**5.4**	**69.80**
Early	56	154	32.2	14.3	91.4	242	7816	111.91	5.8	80.15
Mid	74	155	26.9	14.3	91.1	240	6474	92.01	9.1	97.89
Late	47	129	24.2	14.1	90.5	235	5643	77.33	7.1	110.61
	59	**146**	**27.8**	**14.2**	**91.0**	**239**	**6644**	**93.75**	**7.4**	**96.22**
Early	81	169	32.9	14.1	90.7	235	7654	104.75	4.8	66.79
Mid	112	149	33.0	14.2	90.8	238	7833	109.65	9.4	100.28
Late	77	171	32.4	14.2	90.8	238	7723	108.51	10.2	157.86
	90	**163**	**32.8**	**14.2**	**90.8**	**237**	**7737**	**107.64**	**8.1**	**108.31**
Early	109	205	36.6	13.9	90.9	234	8601	119.23	6.8	94.53
Mid	110	176	33.0	14.2	91.2	238	7845	109.89	10.2	109.83
Late	119	224	35.8	14.3	91.0	240	8585	121.52	9.2	142.88
	113	**202**	**35.1**	**14.1**	**91.0**	**238**	**8344**	**116.88**	**8.8**	**115.75**
Early	139	145	28.5	13.7	90.6	228	6450	85.61	7.1	97.61
Late	146	143	28.6	14.3	90.9	241	6963	99.92	10.5	163.62
Mid	154	178	30.7	14.5	91.3	246	7577	110.30	9.1	97.10
	146	**155**	**29.3**	**14.2**	**90.9**	**238**	**6997**	**98.61**	**8.9**	**119.44**
Early	168	158	25.4	14.3	91.5	242	6222	89.92	4.3	59.60
Mid	213	166	33.5	14.2	91.0	239	8038	113.76	7.5	80.04
Late	172	163	28.6	14.5	90.6	243	6960	100.00	9.1	141.72
	184	**162**	**29.2**	**14.3**	**91.0**	**241**	**7073**	**101.23**	**7.0**	**93.79**

Table 3 shows the yield and quality for corn and sugar beets by sweet corn planting timing. Averages are in bold type. Revenues are shown as a percent of the mean for all tests.

Table 3.

Timing	Total N	Beet_stand	Beet_Tons	Sugar	Purity	EST	ESA	Beet_revenue %	Corn_tons/acre	Corn_Rev %
Early	40	122	32.8	13.6	90.2	225	7343	96.05	4.5	61.63
Early	56	154	32.2	14.3	91.4	242	7816	111.91	5.8	80.15
Early	81	169	32.9	14.1	90.7	235	7654	104.75	4.8	66.79
Early	109	205	36.6	13.9	90.9	234	8601	119.23	6.8	94.53
Early	139	145	28.5	13.7	90.6	228	6450	85.61	7.1	97.61
Early	168	158	25.4	14.3	91.5	242	6222	89.92	4.3	59.60
	99	**159**	**31.4**	**14.0**	**90.9**	**234**	**7348**	**101.24**	**5.5**	**76.72**
Mid	18	144	23.8	14.1	91.9	240	5703	80.54	6.8	72.42
Mid	74	155	26.9	14.3	91.1	240	6474	92.01	9.1	97.89
Mid	112	149	33.0	14.2	90.8	238	7833	109.65	9.4	100.28
Mid	110	176	33.0	14.2	91.2	238	7845	109.89	10.2	109.83
Mid	154	178	30.7	14.5	91.3	246	7577	110.30	9.1	97.10
Mid	213	166	33.5	14.2	91.0	239	8038	113.76	7.5	80.04
	113	**161**	**30.2**	**14.2**	**91.2**	**240**	**7245**	**102.69**	**8.7**	**92.93**
Late	25	168	30.8	14.3	90.7	239	7365	103.93	4.9	75.36
Late	47	129	24.2	14.1	90.5	235	5643	77.33	7.1	110.61
Late	77	171	32.4	14.2	90.8	238	7723	108.51	10.2	157.86
Late	119	224	35.8	14.3	91.0	240	8585	121.52	9.2	142.88
Late	146	143	28.6	14.3	90.9	241	6963	99.92	10.5	163.62
Late	172	163	28.6	14.5	90.6	243	6960	100.00	9.1	141.72
	98	**166**	**30.1**	**14.3**	**90.8**	**239**	**7207**	**101.87**	**8.5**	**132.01**

In this test the late planted corn yielded higher than the mid and early plantings. Favorable rain fell at the time the corn was filling and seasonable temperatures favored kernel fill. Sugar beet yield and quality was not affected by the sweet corn planting dates.

One year of data is presented. Management decisions should not be made based on one year of data. The test has been replicated in 2010 and will be continued in 2011.

SMBSC Potassium by Nitrogen Rate for Enhancement of Sugar Beet Growth-2010

Nitrogen management is a complex issue in the production of sugarbeets. For many years the enigma of applying the optimum nitrogen rate for yield and quality has been a dynamic production issue in sugarbeets. Some basic soils information leads to the theory that a nutrient availability to the plant within the soil can be dependent on a balance of the molecules charge at plants root. Nitrogen as Nitrate (NO_3^-) and potassium ($K^{+)}$ may influence plant root uptake of either nutrient. We have also seen potassium levels decline recently in some areas and considering the principals of Liebig's Law of the minimum which states that yield is proportional to the amount of the most limiting nutrient, whichever nutrient it may be. In the past we have also been concerned about potassium's influence on impurities in sugar beets. Considering these implications of potassium influence on sugar beet production in southern Minnesota, it is fitting for us to consider the management of potassium on the production of sugar beets.

Methods:

Sugarbeets were planted at three locations in 2010 to test if potassium influenced nitrogen uptake by sugarbeets. In 2010 the tests were conducted in Elrosa, Redwood Falls and Maynard, MN. The data will be presented combined over the three locations. Statistical analysis of the data was conducted for homogeneity of combinability and determined that the data could not be combined across locations.

Table 1 shows the specifics of activities conducted at all sites. Plots were 11 ft. (6 rows) wide and 50 ft. long. Nitrogen was applied as urea (46-0-0) and potassium was applied as potash (0-0-60). Harvest data was collected from the middle two rows of a 6 row plot. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested at Elrosa with a 1 row research harvester and at Maynard and Redwood Falls with a 2 row research harvester. With the 1 row harvester two quality sub-samples were collected from each plot and analyzed for quality and weighed for yield calculation in the SMBSC quality lab. Each sample was collected from 10 feet of row. With the two row harvester the weights were collected and weighed on the harvester for yield calculation and a subsample was analyzed in the SMBSC quality lab.

Results and Discussion:

The rate of potassium (K) will be discussed as total K. The total K is the soil test K to the 6 inch depth plus applied K. The rate of nitrogen (N) will be discussed as total N. The total N is the soil test or residual nitrogen to the 4 foot depth plus applied N. Data presented is tons (per acre); sugar (percent), purity, extractable sugar per ton, extractable sugar per acre and percent of revenue mean.

Table 1. Site Specifics for Potassium by Nitrogen Uptake in Sugarbeets,2010

Task	Elrosa	Redwood Falls	Maynard
	Location		
Sugarbeet-Varity	Hill. 4017	SV835RR	SV835RR
Planting-date	4/31/10	4/27/2010	4/27/2010
Fertility			
Nitrogen	62	25	111
Phosphorus	7	7	8
Potassium	127	139	8
OM.	4.1	2.6	6.2
Harvest	9/13/2010	10/15/2010	10/19/2010

1073 Elrosa Potassium by Nitrogen the Affect of Nitrogen on Sugarbeet Production, 2010

Trt No.	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Tons per Acre	% Sugar	Purity
1	0	0	62	127	**33.2**	14.8	90.7
2	0	30	62	157	30.6	14.8	90.6
3	0	60	62	187	**35.0**	14.8	90.6
4	0	90	62	217	31.1	14.5	90.9
5	0	300	62	427	32.3	14.9	91.0
6	0	500	62	627	31.3	14.9	90.7
7	40	0	102	127	**33.1**	14.7	90.4
8	40	30	102	157	31.8	14.7	90.6
9	40	60	102	187	31.2	14.6	90.3
10	40	90	102	217	32.0	14.7	90.6
11	40	300	102	427	32.0	**15.2**	91.2
12	40	500	102	627	30.7	15.0	90.7
13	80	0	142	127	**33.3**	14.8	90.8
14	80	30	142	157	30.9	**15.2**	91.1
15	80	60	142	187	31.4	15.0	91.3
16	80	90	142	217	30.2	14.6	90.6
17	80	300	142	427	29.3	**15.1**	91.1
18	80	500	142	627	**33.7**	14.7	90.4
19	120	0	182	127	30.8	14.8	90.1
20	120	30	182	157	**33.8**	14.8	90.8
21	120	60	182	187	27.8	15.0	90.9
22	120	90	182	217	33.7	15.0	90.6
23	120	300	182	427	32.7	14.5	90.3
24	120	500	182	627	32.0	15.0	91.2
		CV			**13.7**	**3.4**	**1.5**
		LSD (.05)			**5.0**	**0.6**	**NS**

1073 Elrosa Potassium by Nitrogen
Affect of Nitrogen on Sugar Production in Sugarbeets,2010

Trt No.	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Ext. Suc.per ton	Ext. Suc.per acre	% Revenue
1	0	0	62	127	249	8221	85.5
2	0	30	62	157	247	7558	91.2
3	0	60	62	187	248	8689	105.4
4	0	90	62	217	245	7696	99.7
5	0	300	62	427	250	8074	101.7
6	0	500	62	627	249	7828	97.4
7	40	0	102	127	246	8160	102.0
8	40	30	102	157	247	7854	96.7
9	40	60	102	187	243	7567	95.5
10	40	90	102	217	246	7881	95.6
11	40	300	102	427	257	8235	106.0
12	40	500	102	627	251	7707	104.5
13	80	0	142	127	249	8299	104.2
14	80	30	142	157	256	7939	101.2
15	80	60	142	187	254	7942	103.4
16	80	90	142	217	245	7340	100.5
17	80	300	142	427	255	7464	95.1
18	80	500	142	627	245	8354	101.0
19	120	0	182	127	247	7568	97.2
20	120	30	182	157	248	8411	103.9
21	120	60	182	187	252	6975	101.0
22	120	90	182	217	252	8466	105.1
23	120	300	182	427	241	7917	106.1
24	120	500	182	627	254	8085	100.0
		CV			**5**	**14**	**16.33**
		LSD (.05)			**15**	**1305**	**16.39**

1074 Redwood Falls Potassium by Nitrogen the Affect of Nitrogen on Sugarbeet Production, 2010

Trt. No	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Tons per Acre	% Sugar	Purity
1	0	0	25	139	29	17.63	90.85
2	0	30	25	169	28	18.10	91.16
3	0	60	25	199	31	17.77	91.14
4	0	90	25	229	28	18.12	91.61
5	0	300	25	439	29	18.29	91.41
6	0	500	25	639	29	18.21	91.95
7	40	0	65	139	29	17.46	90.79
8	40	30	65	169	28	18.07	91.27
9	40	60	65	199	29	18.24	92.25
10	40	90	65	229	28	18.11	91.92
11	40	300	65	439	29	18.32	91.94
12	40	500	65	639	31	18.28	92.05
13	80	0	105	139	27	18.56	95.05
14	80	30	105	169	28	17.72	91.22
15	80	60	105	199	30	17.88	91.95
16	80	90	105	229	29	17.27	90.51
17	80	300	105	439	27	18.00	90.48
18	80	500	105	639	28	18.07	92.22
19	120	0	145	139	27	17.47	90.92
20	120	30	145	169	29	17.13	91.42
21	120	60	145	199	30	17.76	90.66
22	120	90	145	229	28	17.74	91.75
23	120	300	145	439	27	17.78	91.15
24	120	500	145	639	26	17.83	90.39

		CV			**9.9**	**2.54**	**1.13**
		LSD (.05)			**4.0**	**0.6399**	**1.45**

1074 Redwood Falls Potassium by Nitrogen
Table 3b. Potassium Influence on the Affect of Nitrogen on Sugar Production in

Trt. No	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	0	0	25	139	299	8694	98.32
2	0	30	25	169	309	8587	99.25
3	0	60	25	199	303	9249	105.53
4	0	90	25	229	311	8826	102.54
5	0	300	25	439	314	9105	106.26
6	0	500	25	639	314	9024	105.50
7	40	0	65	139	296	8604	96.56
8	40	30	65	169	309	8595	99.35
9	40	60	65	199	316	9185	107.79
10	40	90	65	229	313	8707	101.39
11	40	300	65	439	317	9054	106.30
12	40	500	65	639	316	9837	115.42
13	80	0	105	139	334	9087	110.25
14	80	30	105	169	302	8484	96.65
15	80	60	105	199	309	9381	108.31
16	80	90	105	229	292	8311	92.23
17	80	300	105	439	304	8316	95.12
18	80	500	105	639	313	8658	100.93
19	120	0	145	139	297	8009	90.03
20	120	30	145	169	293	8401	93.54
21	120	60	145	199	301	9027	102.46
22	120	90	145	229	305	8622	98.80
23	120	300	145	439	303	8178	93.35
24	120	500	145	639	301	7883	89.51
		CV			**4**	**11**	**12.37**
		LSD (.05)			**16**	**1361**	**17.45**

1075 Maynard Potassium by Nitrogen the Affect of Nitrogen on Sugarbeet Production, 2010

Trt No.	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Tons per Acre	%Sugar	Purity
1	0	0	111	177	19.7	16.5	92.3
2	0	30	111	207	22.1	16.6	92.2
3	0	60	111	237	21.4	16.4	92.0
4	0	90	111	267	21.1	16.4	91.9
5	0	300	111	477	21.2	16.6	92.2
6	0	500	111	677	22.4	16.4	91.7
7	40	0	151	177	22.4	16.0	90.9
8	40	30	151	207	23.4	16.6	92.3
9	40	60	151	237	25.3	16.5	91.5
10	40	90	151	267	26.2	16.5	91.7
11	40	300	151	477	25.8	16.3	91.4
12	40	500	151	677	25.5	16.6	91.0
13	80	0	191	177	25.7	16.2	91.6
14	80	30	191	207	25.7	16.4	91.4
15	80	60	191	237	25.2	15.8	90.7
16	80	90	191	267	26.0	16.2	91.4
17	80	300	191	477	26.7	16.0	90.3
18	80	500	191	677	26.4	16.9	91.4
19	120	0	231	177	27.0	16.3	91.4
20	120	30	231	207	27.0	16.2	91.5
21	120	60	231	237	25.9	16.6	91.4
22	120	90	231	267	28.0	16.6	92.5
23	120	300	231	477	27.5	15.4	86.3
24	120	500	231	677	27.2	16.1	91.3

CV	**6.0**	**4.1**	**2.9**
LSD (.05)	**1.7**	**0.8**	**3.1**

1075 Maynard Potassium by Nitrogen
Affect of Nitrogen on Sugar Production in Sugarbeets,2010

Trt No.	Urea rate per plot	Potassium rate per plot	Total N (Applied+Soil Test)	Total K	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	0	0	111	177	285	5585	81.7
2	0	30	111	207	287	6341	93.6
3	0	60	111	237	281	6036	87.8
4	0	90	111	267	282	5953	86.7
5	0	300	111	477	286	6058	89.0
6	0	500	111	677	281	6296	91.3
7	40	0	151	177	271	6081	85.7
8	40	30	151	207	287	6740	99.5
9	40	60	151	237	281	7117	103.2
10	40	90	151	267	282	7418	108.2
11	40	300	151	477	278	7144	102.4
12	40	500	151	677	282	7190	104.5
13	80	0	191	177	277	7128	102.4
14	80	30	191	207	280	7185	103.9
15	80	60	191	237	265	6670	92.1
16	80	90	191	267	276	7157	102.2
17	80	300	191	477	269	7192	100.8
18	80	500	191	677	288	7578	110.1
19	120	0	231	177	277	7479	108.7
20	120	30	231	207	276	7482	107.3
21	120	60	231	237	283	7327	106.8
22	120	90	231	267	287	8056	118.1
23	120	300	231	477	242	6647	106.4
24	120	500	231	677	275	7482	106.7
		CV			8	10	16.20
		LSD (.05)			24	817	21.10

Table 5. ANOVA Analysis of Probability of Significance for measured Variables.

	P>F
Tons	0.0004
Sugar	0.0231
Purity	0.5337
Nitrate	0.4028
Ext.Suc	0.0219
Ext.Suc Ton	0.0283
Ext.Suc Acre	0.0024
% Revenue	0.0004

*** Pr > F = .05**
**** Greater than .05 = NS**

Table 6. Stepwise regression showing how treatments affect sugarbeet yield and quality and the accumulative R^2 explaining the change in a variable.

		K rate	N rate	Total N	Total K	Sdct
Tons	R2	0.817		0.872	0.226	
	Pr > F	0.0002		0.0002	0.1004	
Sugar	R2	0.991	0.960	0.941	0.972	0.916
	Pr > F	0.7653	0.0716	0.0648	0.0964	<.0001
Purity	R2	0.510				
	Pr > F	0.0061				
Nitrate	R2	0.552			0.959	0.288
	Pr > F	0.0354			<.0001	0.0587
Extsuc	R2		0.957	0.925		0.901
	Pr > F		0.0298	0.1081		<.0001
Extsucton	R2		0.957	0.924		0.901
	Pr > F		0.0277	0.1098		<.0001
Extsucacre	R2					
	Pr > F					
Revenue	R2	0.816			0.694	0.574
	Pr > F	0.0371			0.0754	0.0027

1. Sugar beet production at all locations was more consistently influenced by nitrogen than any other production input.
2. The total potassium influence on sugarbeet production was more consistent at Elrosa than at Redwood Falls or Maynard.
3. The Elrosa data indicates that optimum potassium levels tend to increase as total nitrogen levels increase.
4. At Redwood Falls potassium positively influenced sugar beet production to a greater extent at lower total nitrogen level. At the higher total nitrogen level the influence of potassium was less consistent.
5. At Maynard the influence of the higher nitrogen rates was probably due to the high level of moisture received at that location.
6. Step wise analysis (table 6) shows that sugar beet production was primarily influenced by stand and secondarily influenced by total N and tertiary influenced by total potassium.
7. Step wise analysis shows as potassium increased brie nitrate also increased adding weight to the theory that potassium may influence nitrogen uptake by sugarbeets.
8. This is the first year of a multiple year study. Management decisions should not be made using one year of information.

Turkey Litter Effects on Sugar beet Production

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Livestock operations, mainly poultry and swine, are increasing in size and impact in the Southern Minnesota sugar beet growing area. Many sugar beet producers own or have interest in these operations; thus have manure available to use on their fields. Manure research data concludes that manure has a positive effect on crop production from its effects on soil nutrient availability and soil physical properties. A concern has been raised about the effect of late season nitrogen mineralized from the manure on sugar beet quality. Grower observations indicate better growth in fields that have had manure applied. With the large amount of manure available, the question has changed from whether to use manure but when in the sugar beet crop rotation should manure be applied to minimize quality concerns and realize benefits? Turkey manure has a considerable amount of litter in it, thus slowing initial release of poultry manure-N. The implication of the manure-N release is critical, especially to sugar beet growers. Therefore, recommendations need to be evaluated with sugar beets. This research project has been designed to: 1) determine when in a three-year rotation, should turkey litter be applied and 2) determine nitrogen fertilizer equivalent of turkey litter applied two and three years in advance of sugar beet production.

Materials and Methods

To meet the objectives of this experiment, the first of three sites was established near Raymond, Minnesota in the fall of 2006. A second site was established in the fall of 2007 near Olivia, Minnesota and a third site was established near Bird Island in 2009. The Bird Island site was lost because of an errant manure application by the cooperator. A fourth site was established near Clara City, MN in the fall of 2009.

The Raymond site was cropped to soybean in 2007. Turkey manure was applied fall 2006 and soybean grain yields were harvested by a plot combines and soil samples taken in the fall of 2007. The treatments for the second year were applied to the first site near Raymond in the fall of 2007 with corn grown in 2008. The corn was harvested, soil samples taken, and the third year treatments were applied late fall 2008 and sugar beet was grown in 2009.

The second site near Olivia, Minnesota had the first manure treatment applied in the fall of 2007 with soybean grown in 2008. The soybeans were harvested with a research combine, soil samples taken, and the second year's treatments were applied fall 2008. Corn was grown in 2009 and hand harvested for grain yield fall 2009. After corn harvest, soil samples were taken and the third year treatments were applied and sugar beet was grown in 2010.

The fourth site near Clara City, Minnesota was cropped to dry edible beans in 2010 by request of the grower. The dry beans were hand harvested in the fall of 2010 and the turkey litter treatments of 3 and 6 tons were applied after harvest.

At each site of this study there were five replications of the treatments listed in Table 1. Turkey litter treatments of 3 and 6 tons per acres were applied 2 and 3 years ahead of sugar beet production in the three year rotation of soybean (dry bean)/corn/sugar beet. This rotation is the most common rotation in the Southern Minnesota Sugar Cooperative growing area. Treatment 5 is the check treatment for the whole experiment while treatments 8 and 15 are checks for different parts of the rotation. Treatments 6 through 14 are the N fertilizer rates plus the two turkey litter rate applied the fall before the sugar beet production year. During the corn production year, 120 lb N per acre will be applied for treatments 6 through 14. This is the current U of MN N guideline for corn following soybean. In the soybean production year, grain yield was measured with a research combine. Soil samples were taken in fall to a depth of 4 feet and analyzed for nitrate-N while soil samples to a 6 inch depth were analyzed for phosphorous, potassium, organic matter, and pH. The year 2 manure and fertilizer treatments were applied in the late fall. Corn grain was hand harvested in the fall. Similar to year 1 soil samples were taken. The year 3 treatments were applied late fall of year 2. Root yield and quality were determined in the fall. In each of the production years, optimum production practices for pests control and nutrient management besides nitrogen were used.

Table 1. Treatment List

Treatment Number	Year 1 (soybean/dry bean)	Year 2 (corn)	Year 3 (sugar beet)
1	3 ton litter	0 N	0 N
2	6 ton litter	0 N	0 N
3	0 N	3 ton litter	0 N
4	0 N	6 ton litter	0 N
5	0 N	0N	0 N
6	0 N	120 N	3 ton litter
7	0 N	120 N	6 ton litter
8	0 N	120 N	0 N
9	0 N	120 N	30 N
10	0 N	120 N	60 N
11	0 N	120 N	90 N
12	0 N	120 N	120 N
13	0 N	120 N	150 N
14	0 N	120 N	180 N
15	0 N	0 N	90 N

Table 2. Timeline for crops at each of three locations.

2007-08	2008-09	2009-10	2010-2011	2011-2012	2012-2013
Location 1 - soybean	Location 1 - corn	Location 1 – sugar beet			
	Location 2 - soybean	Location 2 - corn	Location 2 – sugar beet		
		Location 3 - Abandoned	Location 4 – dry edible bean	Location 4 - corn	Location 4 – sugar beet

Results and Discussion

Raymond Site:

Soybean grain yields where significantly increased by the application of manure in 2007 at the Raymond site, Table 3. This increase was small. There were no differences in grain yield between 3 and 6 tons of turkey litter application.

Table 3. Soybean grain yields as affected by the application of 3 and 6 tons of turkey litter in fall 2006 at Raymond, Minnesota in 2007.

Treatment	Soybean grain yield (bushels per acre)
Zero (check)	50.0
3 tons turkey litter	51.8
6 tons turkey litter	53.5
Statistics	P>F
Zero vs. turkey litter application	0.005
Manure (3 vs. 6 tons turkey litter)	NS
C.V. (%)	5.3

Soil samples were taken in the fall before each year of the rotation. The soil nitrate-N, soil test P, and soil test K were similar in the fall of 2006 before the study started at this site, Table 4. The application of 3 and 6 tons of turkey litter, fall 2006, increased the soil residual nitrate-N and soil test P in the sample taken fall 2007, Table 4. The application of turkey litter at 6 tons per acre two and three years before sugar beet production increased soil nitrate-N.

Table 4. Soil test results fall 2006, fall 2007, and fall 2008 at Raymond, Minnesota.

	Nitrate-N 0-4 ft. (lb/A)			Olsen-P (ppm)			Soil test K (ppm)		
Treatment	Fall 06	Fall 07	Fall 08	Fall 06	Fall 07	Fall 08	Fall 06	Fall 07	Fall 08
3 tons turkey litter fall 06	24	98	37	35	38	34	206	178	136
6 tons turkey litter fall 06	22	172	71	34	45	41	196	187	146
3 tons turkey litter fall 07			29			28			135
6 tons turkey litter fall 07			79			43			169
120 lb N/A fall 07			40			35			143
Check	23	44	26	27	29	31	165	157	141

Corn grain yields in 2008 were measured at the Raymond site, Table 5. The only significant difference in corn grain yield was between the check, with no N fertilizer or turkey litter applied and the corn grain yield from the rest of the treated plots. There were no differences between yields from the 120 pounds N per acre as urea fertilizer and the turkey litter treatments from applied either Fall 2006 of Fall 2007, Table 4. In the Fall of 2008, soil nitrate-N was increase over the check in plots that were treated with 6 tons of turkey litter fall 2006 or fall 2007. The 3 tons of turkey applied in fall 2006 or fall 2007 had similar soil nitrate-N values as the check.

Table 5. Corn grain yields as affected by the application of 120 pounds N per acre, 3 and 6 tons of turkey litter in fall 2006, and 3 and 6 tons of turkey litter in fall 2007 at Raymond, Minnesota in 2008.

Treatment	Corn grain yield (bushels per acre)
Zero N (check)	102
120 pounds N per acre applied fall 2007	150
3 tons turkey litter applied fall 2006	130
6 tons turkey litter applied fall 2006	146
3 tons turkey litter applied fall 2007	150
6 tons turkey litter applied fall 2007	144
Statistics	P > F
Check vs. rest	0.0001
120 lb N per acre vs. turkey litter	NS
2006 vs. 2007 turkey litter	NS
2006 3 ton vs. 6 ton turkey litter	NS
2007 3 ton vs. 6 ton turkey litter	NS

Sugar beets were planted in 2009 with N rate treatments and 3 and 6 turkey litter applications made fall 2008. The root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue for the turkey litter treatments are reported in Table 6 while the statistical analysis is reported in Table 7. Root yield was increased with the use of litter application. The increase was greatest with the Fall 2008 litter application. This application was confounded with an application of 120 pounds of fertilizer N per acre. The sugar beet root yield greater with 6 tons litter per acre applied compared to the 3 tons per acre when the litter was applied fall 2007. Sugar beet quality, as measured by the extractable sucrose per ton of processed sugar beet was not affected by the manure treatments. Because of the lack of response in sugar beet quality, extractable sucrose per acre and revenue was affected by the litter treatments the same as root yield was.

Table 6. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of turkey litter since 2006 at Raymond, MN in 2009.

Treatments			Root yield	Extractable sucrose		Revenue
Fall 06	Fall 07	Fall 08	ton/A	lb/ton	lb/A	$/A
Check	Check	Check	23.1	248	5721	629
3 ton turkey litter			27.3	241	6574	701
6 ton turkey litter			27.6	250	6994	786
	3 ton turkey litter		25.1	247	6207	680
	6 ton turkey litter		33.9	253	8527	949
	120 lb N/A	3 ton turkey litter	35.1	252	8816	982
	120 lb N/A	6 ton turkey litter	39.3	258	10102	1149

Table 7. Statistical analysis for sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue at Raymond, MN in 2009.

		Extractable sucrose		
Contrast	Root yield	lb/ton	lb/A	Revenue
	P>F			
Check vs. rest	0.0007	NS	0.0005	0.0008
Turkey litter fall 06 and 07 vs. 08	0.0001	0.12	0.0001	0.0001
Turkey litter fall 06 vs. fall 07	NS	NS	NS	NS
Turkey litter 06, 3 vs. 6 tons	NS	0.17	NS	NS
Turkey litter 07, 3 vs. 6	0.002	NS	0.002	0.003
Turkey litter 08, 3 vs. 6	NS	NS	0.20	0.17
N rate fertilizer	0.02	NS	0.04	0.08

To compare litter treatments with fertilizer, a nitrogen rate study was conducted within the litter treatments, Table 8. There was a significant response to nitrogen application at the Raymond, MN site in 2009 for root yield, extractable sucrose per acre, and revenue. Sugar beet quality was not affect by N fertilizer application. The optimum nitrogen rate was 90 pounds per acre. The residual nitrate-N in the surface 4 feet was 40 pounds per acre. With both soil nitrate-N and fertilizer N, this would make the optimum of 130 pounds per acre. The optimum fertilizer application was similar statistically to the best litter application for revenue. This information would suggest that the time of turkey litter application in the sugar beet rotation was important at this location. Remember that this observation is based on one location in one year!

Table 8. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of nitrogen fertilizer fall 2008 at Raymond, MN in 2009.

Fall 07	Fall 08	Root yield	Extractable sucrose		Revenue
lb nitrogen/A		ton/A	lb/ton	lb/A	$/A
120	0	27.0	254	6884	776
120	30	25.7	254	6553	740
120	60	33.2	254	8448	950
120	90	35.1	255	8985	1017
120	120	30.5	259	7871	899
120	150	33.4	255	8484	955
120	180	31.3	248	7754	850

Olivia Site:

A second site was established south of Olivia fall of 2007. Soybean was planted and harvested in 2008. The soybean grain yields were not affected by the 3 and 6 tons turkey litter application in the fall of 2007, Table 9.

Table 9. Soybean grain yields as affected by the application of 3 and 6 tons of turkey litter in fall 2007 at Olivia, Minnesota in 2008.

Treatment	Soybean grain yield (bushels per acre)
Zero (check)	49.8
3 tons turkey litter	50.1
6 tons turkey litter	50.7
Statistics	P>F
Zero vs. turkey litter application	NS
Manure (3 vs. 6 tons turkey litter)	NS
C.V. (%)	6.0

Soil samples were taken each fall before each crop in the rotation, Table 10. The average amount of nitrate-N in 4 feet at the beginning of this study at this site was 100 pounds per acre. The phosphorus was near 50 ppm Olsen and soil test was 170 ppm. The application of turkey litter at 6 tons per acre caused a greater soil nitrate amount in the fall of 2008. The soil test phosphorus was increased while soil test K was not affected by the fall 2007 manure applications. The study area was fertilized in the fall of 2008 with 80 pounds phosphate per acre as 0-46-0 and 60 pounds potash per acre as 0-0-60. This application resulted in the increase in soil test P and soil test K between the falls of 2008 and 2009. The increases caused the fall soil test P and K to be similar among the different treatments.

Table 10. Soil test results fall 2007, fall 2008, and fall 2009 at Olivia, Minnesota.

	Nitrate-N 0-4 ft. (lb/A)			Olsen-P (ppm)			Soil test K (ppm)		
Treatment	Fall 07	Fall 08	Fall 09	Fall 07	Fall 08	Fall 09	Fall 07	Fall 08	Fall 09
3 tons turkey litter fall 07		48	27	48	70	96	164	174	287
6 tons turkey litter fall 07	118	101	20	56	68	82	177	186	231
3 tons turkey litter fall 08			24			79			255
6 tons turkey litter fall 08			26			68			265
120 lb N/A fall 08			20			91			281
Check	80	47	22			83			268

Corn was grown in 2009 with treatments added of 120 pounds N per acre and 3 and 6 tons turkey litter applied fall 2008. Corn grain yields from 2009 are reported in Table 11. There was a significant increase in grain yield over no nitrogen from the application of turkey litter and nitrogen fertilizer in 2009. The 120 pounds of N per acre as urea and the 6 tons of turkey litter per acre applied fall 2008 had the greatest grain yields of 218 bushels per acre. Statistically, there was no difference in grain yield between the 2007 and 2008 turkey litter applications. Each year, the 6 ton per acre application produced greater grain yields than the 3 ton per acre application. This site will be planted to sugar beet in 2010.

Table 11. Corn grain yields as affected by the application of 120 pounds N per acre, 3 and 6 tons of turkey litter in fall 2007, and 3 and 6 tons of turkey litter in fall 2008 at Olivia, Minnesota in 2009.

Treatment	Corn grain yield (bushels per acre)
Zero N (check)	149
120 pounds N per acre applied fall 2008	218
3 tons turkey litter applied fall 2007	180
6 tons turkey litter applied fall 2007	208
3 tons turkey litter applied fall 2008	185
6 tons turkey litter applied fall 2008	218
Statistics	P > F
Check vs. rest	0.0001
120 lb N per acre vs. turkey litter	0.0013
2007 vs. 2008 turkey litter	NS
2007 3 ton vs. 6 ton turkey litter	0.05
2008 3 ton vs. 6 ton turkey litter	0.03

Sugar beets were planted in 2010 with N rate treatments and 3 and 6 turkey litter applications made fall 2009. The root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue for the turkey litter treatments are reported in Table 12. while the statistical analysis is reported in Table 13. Root yield was increased with the use of litter application. The increase was greatest with the Fall 2009 litter application. This application was confounded with an application of 120 pounds of fertilizer N per acre. The increase in root yield with 120 pounds of N fertilizer N per acre was 24 tons per acre. This suggests that the manure application in fall 2009 did increase root yield more than the applications in previous years. Sugar beet quality, as measured by the extractable sucrose per ton of processed sugar beet was decreased by the manure treatments compared to sugar beet grown in plots with no nitrogen fertilizer application during the three years of the rotation. There were no differences in extractable sucrose by the different manure treatments. The extractable sucrose and revenue per acre were affected by the treatments, similarly. The increase in root yield over the check resulted in an increase in both extractable sucrose per acre and revenue per acre from manure applications. The fall 2009 manure application (either rate) increased root yield over the other manure treatments and thus increased the extractable sucrose per acre and revenue per acre more than the other manure treatments. The best return per acre was from the manure applied directly before the sugar beet production year at this location.

Table 12. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of turkey litter since 2007 at Olivia, MN in 2010.

Treatments			Root yield	Extractable sucrose		Revenue
Fall 07	Fall 08	Fall 09	ton/A	lb/ton	lb/A	$/A
Check	Check	Check	20.3	308	6208	813
3 ton turkey litter			25.7	279	7193	879
6 ton turkey litter			27.2	277	7532	913
	3 ton turkey litter		27.1	275	7480	903
	6 ton turkey litter		28.3	271	7695	918
	120 lb N/A	3 ton turkey litter	37.3	280	10466	1282
	120 lb N/A	6 ton turkey litter	35.0	274	9615	1158

Table 13. Statistical analysis for sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue at Olivia, MN in 2010.

		Extractable sucrose		
Contrast	Root yield	lb/ton	lb/A	Revenue
	P>F			
Check vs. rest	0.0001	0.0001	0.0004	0.06
Turkey litter fall 07 and 08 vs. 09	0.0001	0.59	0.0001	0.0001
Turkey litter fall 07 vs. fall 08	0.21	0.15	0.49	0.74
Turkey litter 07, 3 vs. 6 tons	0.32	0.65	0.48	0.60
Turkey litter 08, 3 vs. 6	0.37	0.38	0.63	0.81
Turkey litter 09, 3 vs. 6	0.12	0.21	0.08	0.07
N rate fertilizer	0.0004	0.003	0.06	0.21

The use of fertilizer applied in fall 2009 increased root yield and extractable sucrose per acre, Table 14. Revenue per acre was not affect by the N application. The decrease in extractable sucrose per ton was more pronounced for fertilizer application rates when compared to the litter treatments.

Table 14. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of nitrogen fertilizer fall 2009 at Olivia, MN in 2010.

Fall 08	Fall 09	Root yield	Extractable sucrose		Revenue
lb nitrogen/A		ton/A	lb/ton	lb/A	$/A
120	0	24.0	274	6582	792
120	30	23.6	282	6581	802
120	60	27.6	282	7631	938
120	90	24.3	275	6652	799
120	120	28.5	266	7556	884
120	150	27.1	257	6972	792
120	180	27.7	265	7348	859

Clara City site:

The Clara City site was established with the application of the 3 and 6 tons of turkey litter in the fall of 2009. The plot area was planted to dry edible bean in 2010. This is different than the other sites. The dry edible bean was hand harvested. The use of turkey significantly increased bean yields in 2010, Table 15. The increase was approximately 600 lb per acre. There was no difference in bean yield from the different turkey litter rates.

Table 15. Dry edible bean yields as affected by the application of 3 and 6 tons of turkey litter in fall 2009 at Clara City, Minnesota in 2010.

Treatment	Dry edible bean yield (lbs per acre)
Zero (check)	1902
3 tons turkey litter	2465
6 tons turkey litter	2575
Statistics	P>F
Zero vs. turkey litter application	0.03
Manure (3 vs. 6 tons turkey litter)	0.69
C.V. (%)	18.0

Summary:

After two sites worth of information, if a grower must apply turkey litter in the sugar beet production system, it should be applied in the fall before sugar beet production. This conclusion is not what the current recommendation is. This study has one more site to complete. This will occur at the end of the 2012 growing season.

SMBSC Popup Fertilizers Influence on Nitrogen Efficiency for Enhancement of Sugar Beet Growth-2010

Sugarbeets were planted at eight locations in 2008, 2009 and 2010 to test nitrogen use efficiency (NUE) for sugarbeet production as influenced by popup fertilizer. Popup fertilizer is the term used in this report to describe the generic term of starter fertilizer. Popup fertilizer in this report is fertilizer 10-34-0 applied in furrow on the sugarbeet seed. In 2008 the tests were conducted in Olivia, Clara City and Gluek, MN. In 2009 there was one location at Clara City, MN and two at Hector, MN. In 2010 there were two locations at Redwood Falls, MN and Maynard, MN. The data will be presented combined over the eight locations. Statistical analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across environments or locations.

Methods:
Table 1 shows the specifics of activities conducted at all sites. Tables 2 – 9 show the summary for each location. Table 10 summarizes the three years combined. Plots were 11 ft. (6 rows) wide and 50 feet long. Phosphorus fertilizer source 10-34-0 was used as a popup fertilizer. Popup fertilizer 10-34-0 was applied in furrow on seed at 3 gal per acre. Popup was combined with water 50/50 and the mix was applied at a rate of 6 gal per acre. Treatments included were with and without popup fertilizer and therefore nitrogen rates were applied with and without popup fertilizer. Sugarbeets were planted with a 6 row planter. Harvest data was collected from the middle two rows of a 6 row plot. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested at Clara City, Olivia and Gluek with a 1 row research harvester and at Maynard, Redwood Falls and both Hector sites with a 2 row research harvester. With the 1 row harvester two quality sub-samples were collected from each plot and analyzed for quality and weighed for yield calculation. Each sample was collected from 10 feet of row. With the two row harvester the weights were collected and weighed on the harvester for yield calculation and a subsample was analyzed in the SMBSC quality lab.

Results and Discussion:
Table 1 shows the specifics of activities conducted at all sites. Tables 2 – 9 show the summary for each location. Table 10 summarizes the three years combined. Table 11 shows the optimum total N for yield and quality. The rate of nitrogen will discussed as total nitrogen. The total nitrogen is the soil test or residual nitrogen to the 4 foot depth plus applied nitrogen. Data presented is tons per acre, percent sugar, extractable sugar per ton, extractable sugar per acre and percent of revenue mean for each location. The following conclusions are a summary of Table 10 and 11.

Table 10 summary

1. Starter can significantly increase sugar beet yield, quality and revenue.
2. Tons per acre, Extractable sucrose per ton, Extractable sucrose per acre and Revenue per acre (presented as revenue percent of mean) were statistically significantly influenced by total Nitrogen.
3. Total Nitrogen of 101 lbs. per acre gave the highest Tons per acre, Extractable sucrose per ton and Revenue per acre with or without starter fertilizer applied.
4. As a result the data shows that whether starter is or is not applied the 4 ft. nitrogen should be adjusted to the current recommendation of 100 lbs.

Table 11 summary

1. The optimum total N was about 90 lbs. for all variables measured except average revenue.

2. Average revenue was expressed as percent of the mean. The optimum total N without and with starter was 122 and 111 lbs.
3. This data concludes that the current recommendation of 100 lbs. total N is with in the range of optimum total N for sugar beet production in Southern Minnesota.

TABLE 1. Site Specifics for Starter by N rate.

	Locations								
Task	**Gluek**	**Clara City**	**Olivia**	**Clara City**	**Hector**	**Hector**	**Maynard**	**Redwood Falls**	All Sites Avg
Year	**2008**	**2008**	**2008**	**2009**	**2009**	**2009**	**2010**	**2010**	
Sugarbeet-Varity	B95RR03	4017RR	H9027RR	RR201	RR201	RR201	RR805	SV835RR	
Planting-date	5/15/2008	5/9/2008	5/20/2008	4/24/2009	4/28/2009	4/23/2009	4/22/2010	4/27/2010	
Nitrogen	89	106	89	97	49	51	53	53	73
Phosphorus	8	8	8	8	8	7	7	7	8
Potassium	153	401	190	165	145	151	166	166	192
OM.	5.0	5.6	5.3	6.0	5.0	5.0	5.0	5.0	5.2
Harvest	10/10/2008	10/12/2008	10/4/2008	10/24/2009	10/21/2009	10/21/2009	10/19/2010	10/15/2010	

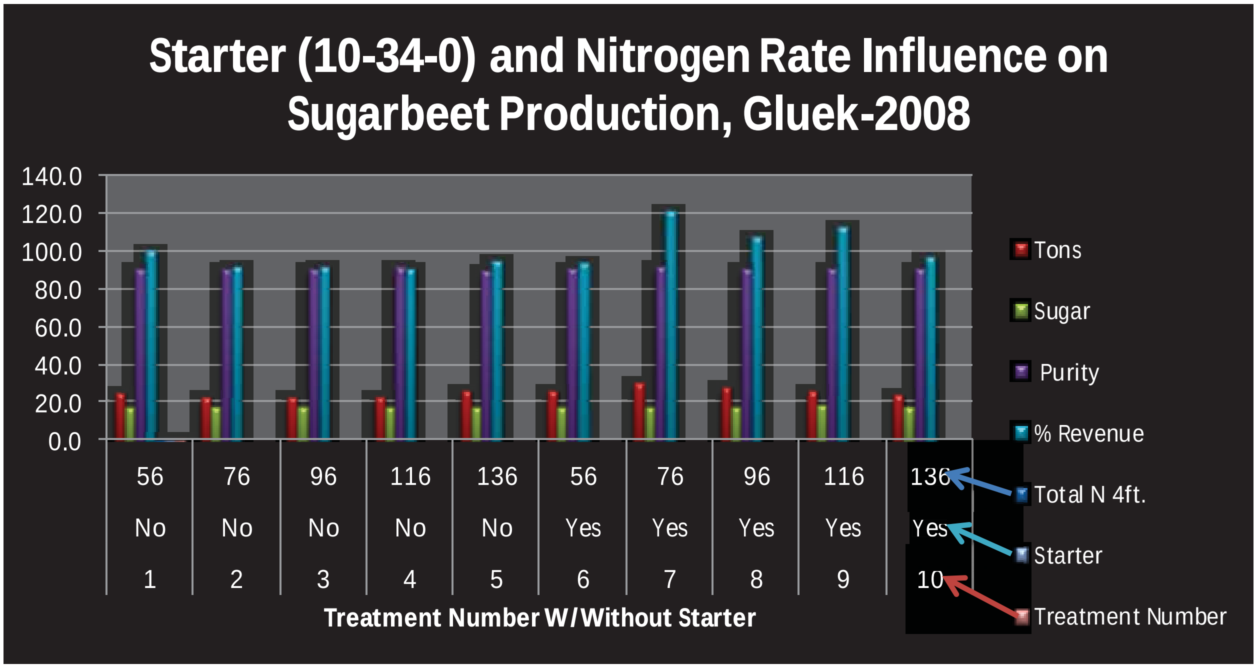
0870 Gluek Starter by N Rate
Table 2a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	56	24.6	17.4	90.5
2	No	20	76	22.8	18.2	90.8
3	No	40	96	22.8	18.1	91.0
4	No	60	116	23.1	17.9	91.3
5	No	80	136	25.9	17.7	89.5
6	Yes	0	56	25.7	17.4	90.5
7	Yes	20	76	30.7	18.0	91.4
8	Yes	40	96	27.9	17.9	90.6
9	Yes	60	116	25.8	19.2	90.9
10	Yes	80	136	24.4	18.2	90.6
		CV		15.1	5.3	1.0
		LSD(.05)		3.9	1.0	0.9

0870 Gluek Starter by N Rate
Table 2b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	56	294	7241	100.2
2	No	20	76	309	7061	91.3
3	No	40	96	308	7061	91.4
4	No	60	116	306	7035	90.2
5	No	80	136	295	7612	95.0
6	Yes	0	56	293	7512	93.4
7	Yes	20	76	308	9409	121.0
8	Yes	40	96	304	8458	108.0
9	Yes	60	116	328	8432	112.9
10	Yes	80	136	308	7497	96.6
		CV		6	14	15.5
		LSD(.05)		18	1127	15.7

TABLE 2 A&B



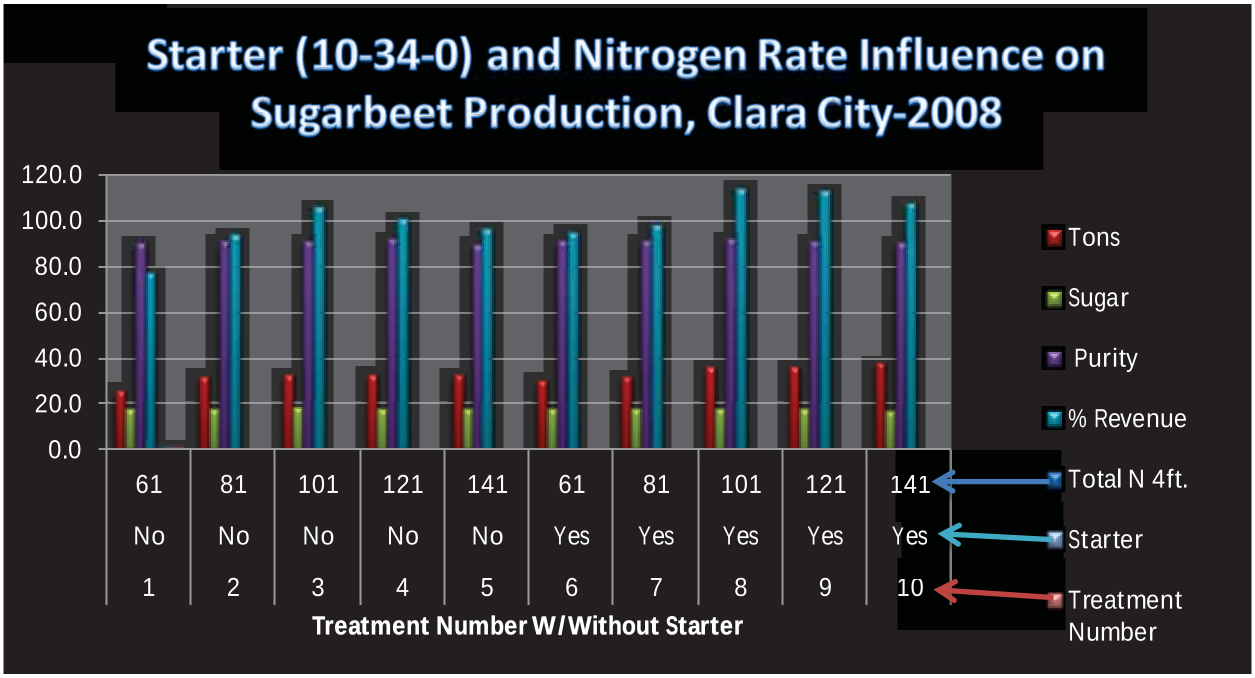
0871 Clara City Starter by N Rate
Table 3a.Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	61	25.9	17.5	90.1
2	No	20	81	31.9	17.4	90.6
3	No	40	101	32.6	18.1	91.2
4	No	60	121	32.8	17.6	91.4
5	No	80	141	32.3	17.7	89.6
6	Yes	0	61	30.2	17.9	90.9
7	Yes	20	81	31.9	17.6	91.3
8	Yes	40	101	35.5	17.9	91.5
9	Yes	60	121	36.1	17.8	90.7
10	Yes	80	141	37.8	17.1	90.1
		CV		**7.4**	**4.3**	**1.0**
		LSD(.05)		**3.3**	**0.8**	**0.9**

0871 Clara City Starter by N Rate
Table 3b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	61	294	7604	76.9
2	No	20	81	294	9319	93.8
3	No	40	101	310	10083	105.6
4	No	60	121	302	9813	100.5
5	No	80	141	294	9498	96.1
6	Yes	0	61	304	9170	94.8
7	Yes	20	81	300	9575	98.3
8	Yes	40	101	307	10927	114.0
9	Yes	60	121	302	10896	112.4
10	Yes	80	141	286	10831	107.5
		CV		**5**	**9**	**10.5**
		LSD(.05)		**16**	**928**	**10.7**

TABLE 3 A&B



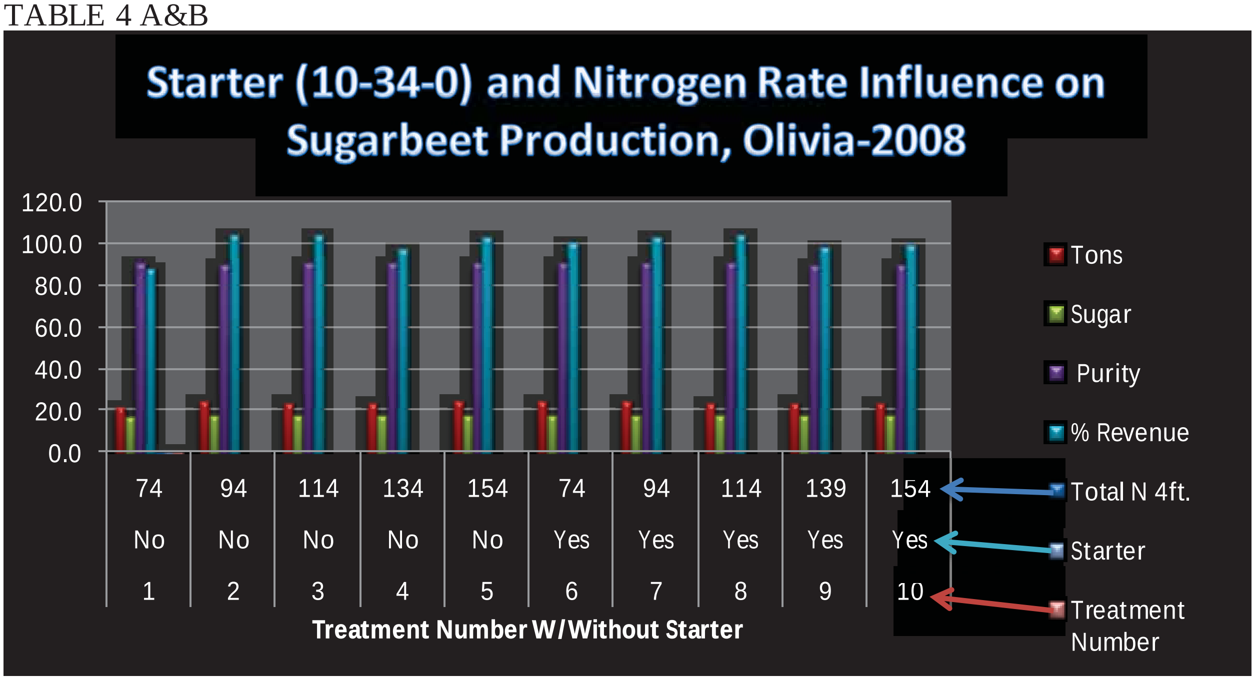
0872 Olivia Starter by N Rate
Table4a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Tons	Sugar	Purity
1	No	0	74	22.1	17.21	90.30
2	No	20	94	24.9	17.86	90.00
3	No	40	114	24.1	18.00	90.60
4	No	60	134	23.6	17.60	90.40
5	No	80	154	24.8	17.70	90.40
6	Yes	0	74	24.2	17.60	90.40
7	Yes	20	94	24.4	17.70	90.90
8	Yes	40	114	23.7	18.20	90.50
9	Yes	60	139	24.1	17.60	89.90
10	Yes	80	154	23.7	17.90	89.90
		CV%		10.1	2.59	0.65
		LSD(0.05)		2.5	0.46	0.59

0872 Olivia Starter by N Rate
Table4b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2008

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	74	290	6842	87.25
2	No	20	94	300	8170	104.32
3	No	40	114	305	6861	103.89
4	No	60	134	297	6830	97.26
5	No	80	154	299	7206	103.25
6	Yes	0	74	297	6273	99.74
7	Yes	20	94	301	7187	102.83
8	Yes	40	114	308	7316	103.92
9	Yes	60	139	295	6632	98.09
10	Yes	80	154	300	6226	99.44
		CV%		3	11	11.75
		LSD(0.05)		8	794	11.93

TABLE 4 A&B



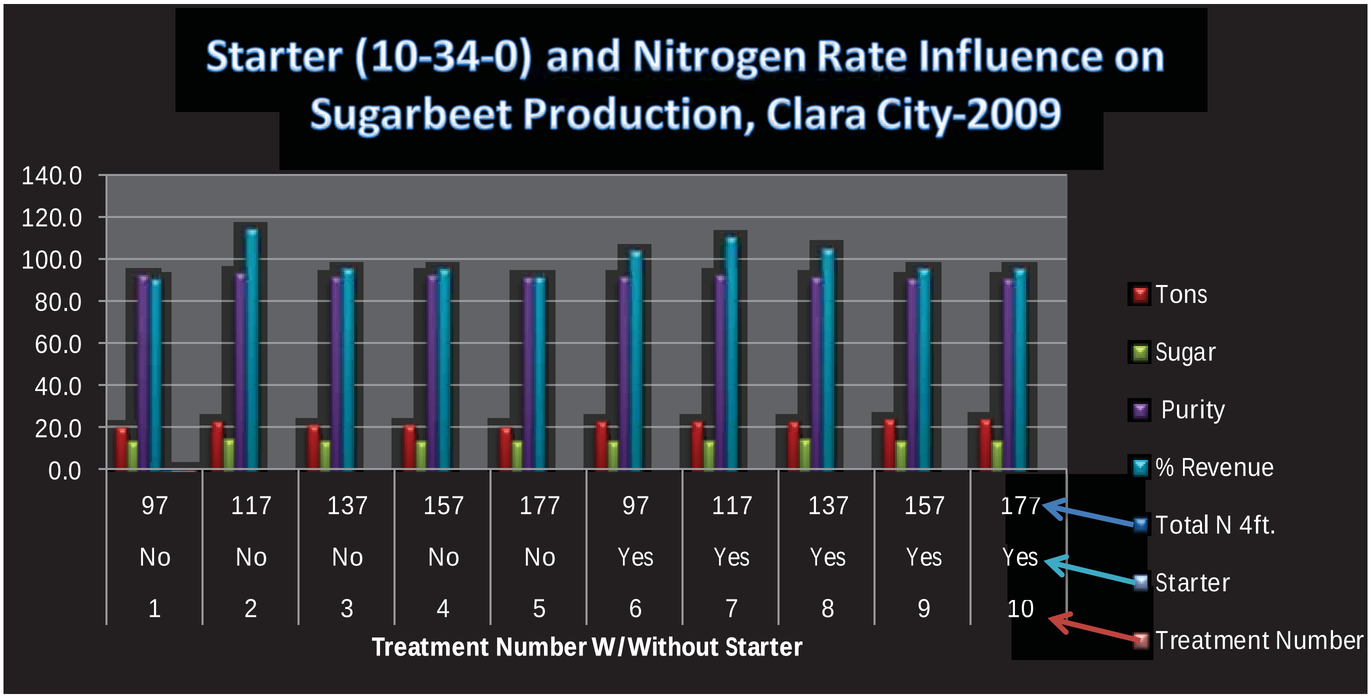
0971 Clara City Starter by N Rate
Table 5a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	97	20.5	14.20	92.56
2	No	20	117	23.4	14.78	93.38
3	No	40	137	21.7	14.31	92.09
4	No	60	157	21.7	14.11	93.01
5	No	80	177	21.1	14.21	91.90
6	Yes	0	97	23.8	14.20	91.95
7	Yes	20	117	23.8	14.47	92.91
8	Yes	40	137	23.2	14.51	91.88
9	Yes	60	157	24.2	13.74	91.10
10	Yes	80	177	24.2	13.74	91.10
		CV		**7.3**	**4.31**	**1.59**
		LSD(.05)		**1.6**	**0.63**	**1.49**

0971 Clara City Starter by N Rate
Table 5b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	97	244	4991	90.54
2	No	20	117	257	6005	114.68
3	No	40	137	244	5282	95.89
4	No	60	157	243	5283	95.93
5	No	80	177	241	5089	91.57
6	Yes	0	97	242	5766	103.81
7	Yes	20	117	250	5955	110.87
8	Yes	40	137	247	5738	105.56
9	Yes	60	157	231	5586	95.49
10	Yes	80	177	232	5584	95.66
		CV		**5**	**9**	**12.67**
		LSD(.05)		**13**	**482**	**12.86**

TABLE 5 A&B



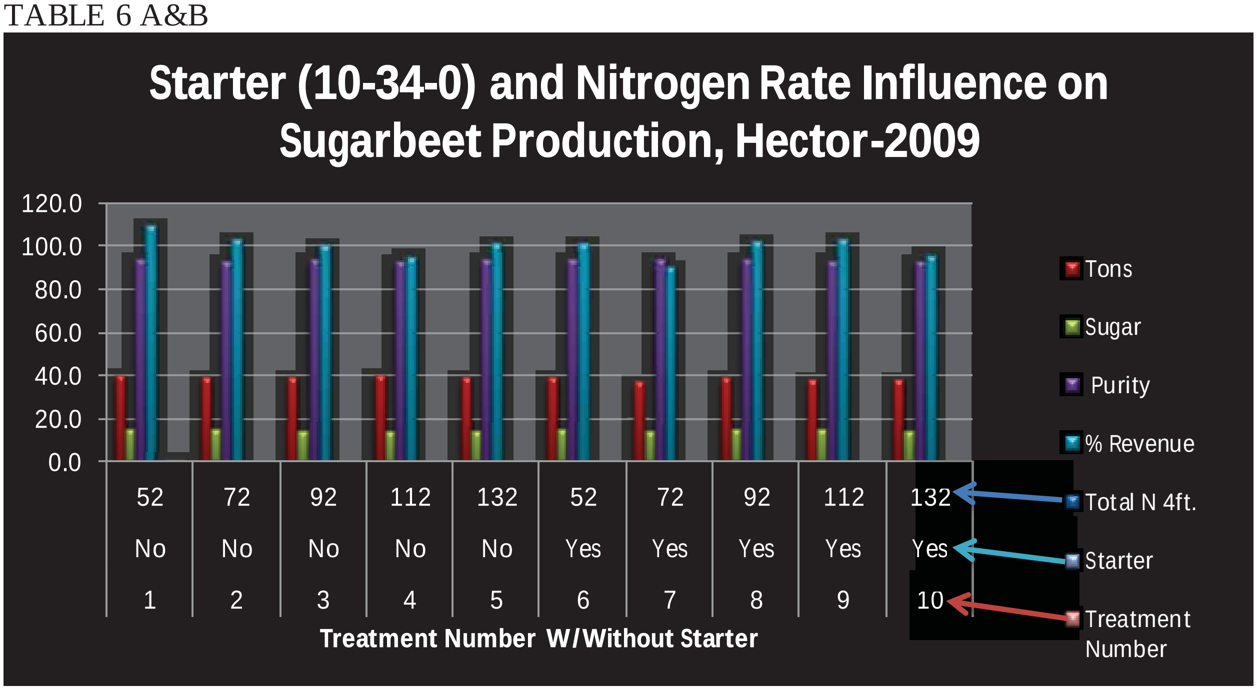
0972 Hector Starter by N Rate
Table 6a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	52	39.8	14.87	93.74
2	No	20	72	39.3	14.67	92.93
3	No	40	92	39.4	14.44	93.62
4	No	60	112	40.0	13.96	92.89
5	No	80	132	39.2	14.40	93.96
6	Yes	0	52	39.0	14.48	93.74
7	Yes	20	72	36.9	14.12	93.48
8	Yes	40	92	38.8	14.60	93.66
9	Yes	60	112	37.9	14.88	93.25
10	Yes	80	132	38.0	14.44	92.95
		CV		**4.5**	**4.33**	**1.87**
		LSD(.05)		**1.8**	**0.63**	**1.77**

0972 Hector Starter by N Rate
Table 6b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	52	260	10359	109.15
2	No	20	72	254	9981	102.79
3	No	40	92	252	9870	100.58
4	No	60	112	240	9739	95.11
5	No	80	132	252	9854	100.68
6	Yes	0	52	253	9836	100.69
7	Yes	20	72	245	9043	90.10
8	Yes	40	92	255	9884	102.13
9	Yes	60	112	259	9804	102.80
10	Yes	80	132	249	9468	95.96
		CV		**6**	**7**	**12.03**
		LSD(.05)		**15**	**678**	**12.21**

TABLE 6 A&B



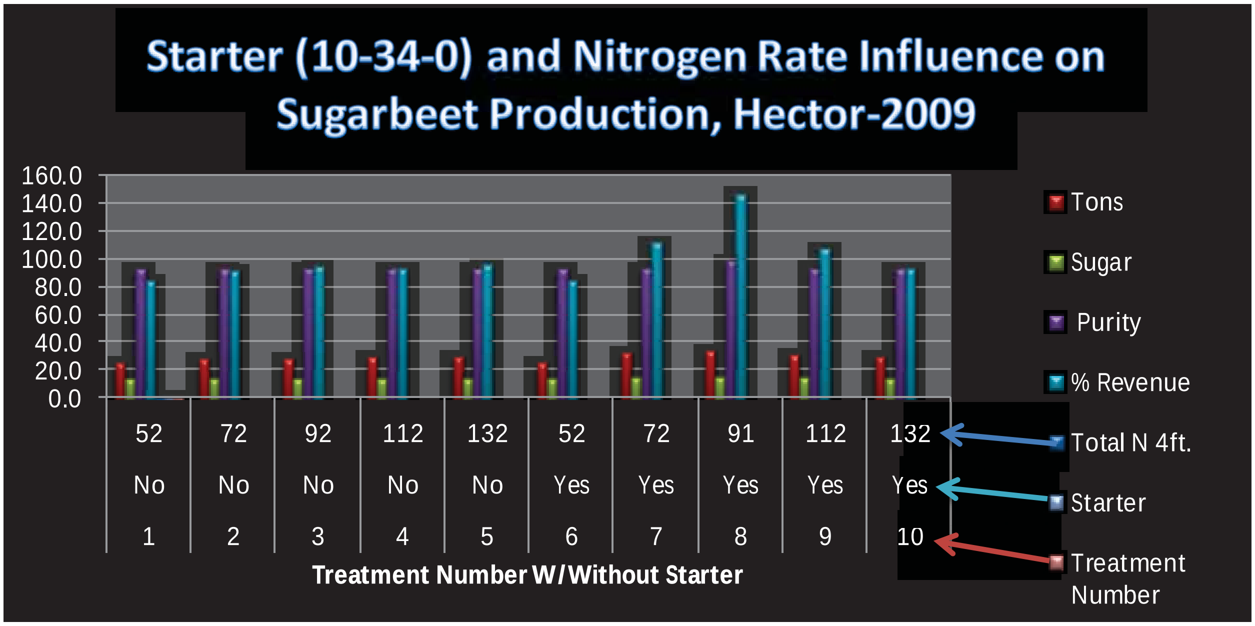
0973 Hector Starter by N Rate
Table 7a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	52	25.5	14.62	93.40
2	No	20	72	28.1	14.47	93.18
3	No	40	92	28.0	14.71	93.31
4	No	60	112	29.7	14.31	92.66
5	No	80	132	29.4	14.52	93.07
6	Yes	0	52	25.8	14.58	92.96
7	Yes	20	72	32.3	14.91	93.24
8	Yes	40	91	33.5	15.84	98.49
9	Yes	60	112	31.4	14.80	93.60
10	Yes	80	132	29.5	14.41	92.47
		CV		**8.4**	**3.64**	**1.32**
		LSD (.05)		**2.2**	**0.48**	**1.11**

0973 Hector Starter by N Rate
Table 7b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2009

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	52	254	6490	84.80
2	No	20	72	251	7044	90.86
3	No	40	92	256	7149	93.85
4	No	60	112	246	7303	92.43
5	No	80	132	251	7394	95.54
6	Yes	0	52	252	6510	84.26
7	Yes	20	72	259	8368	111.12
8	Yes	40	91	294	9924	146.75
9	Yes	60	112	258	8113	107.53
10	Yes	80	132	247	7305	92.87
		CV		**5**	**11**	**14.69**
		LSD (.05)		**12**	**740**	**13.31**

TABLE 7 A&B



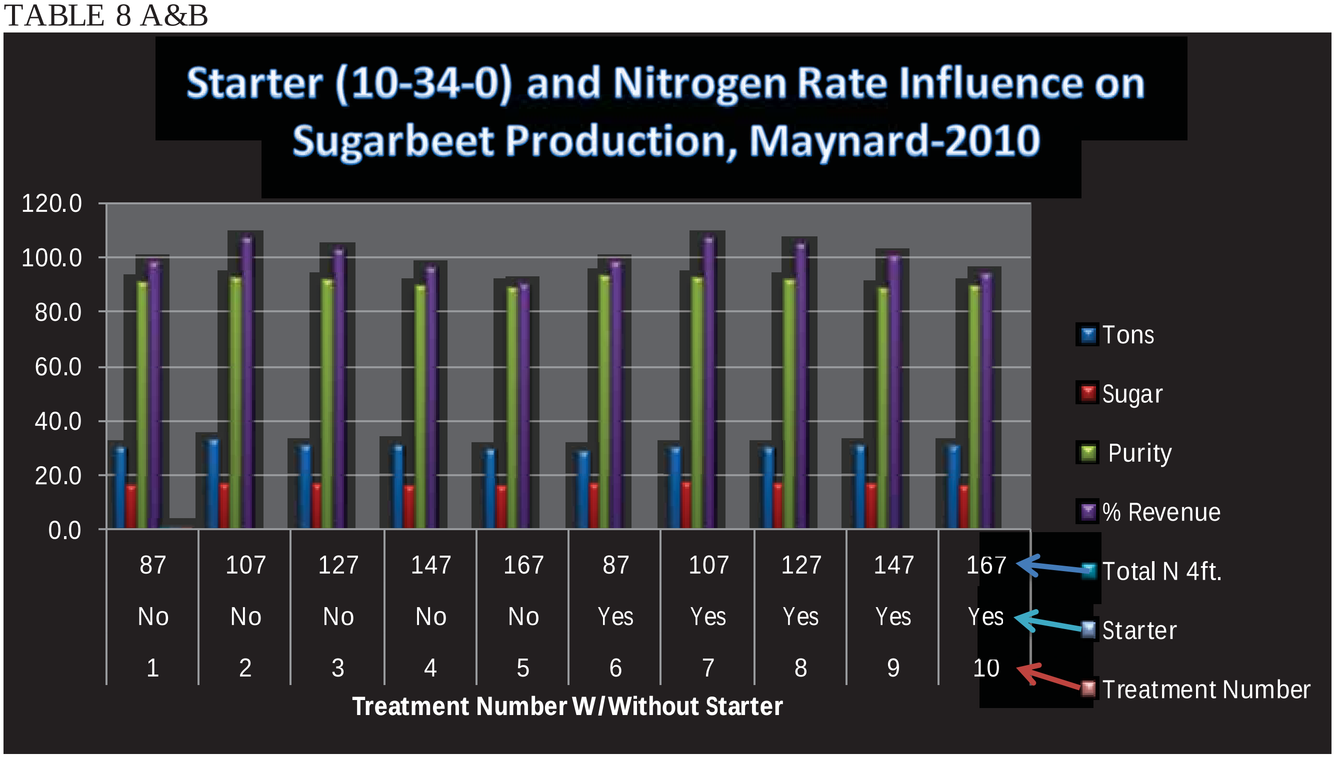
1071 Maynard Starter by N Rate
Table 8a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2010

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	87	30.3	16.45	91.20
2	No	20	107	33.0	16.52	92.40
3	No	40	127	30.9	16.54	91.72
4	No	60	147	31.1	16.07	89.55
5	No	80	167	29.2	16.11	89.12
6	Yes	0	87	28.9	16.90	93.06
7	Yes	20	107	30.2	17.27	92.62
8	Yes	40	127	29.8	16.90	91.38
9	Yes	60	147	30.5	16.59	88.80
10	Yes	80	167	30.5	16.36	89.64
		CV		**86.0**	**2.16**	**1.30**
		LSD(.05)		**2.0**	**0.36**	**1.20**

1071 Maynard Starter by N Rate
Table 8b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2010

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	87	280	8469	98.28
2	No	20	107	280	9241	107.36
3	No	40	127	283	8748	102.50
4	No	60	147	273	8482	96.40
5	No	80	167	272	7946	90.09
6	Yes	0	87	287	8306	98.39
7	Yes	20	107	295	8900	107.39
8	Yes	40	127	293	8736	105.02
9	Yes	60	147	282	8599	100.48
10	Yes	80	167	272	8295	94.09
		CV		3	12	12.68
		LSD(.05)		8	1081	12.87

TABLE 8 A&B



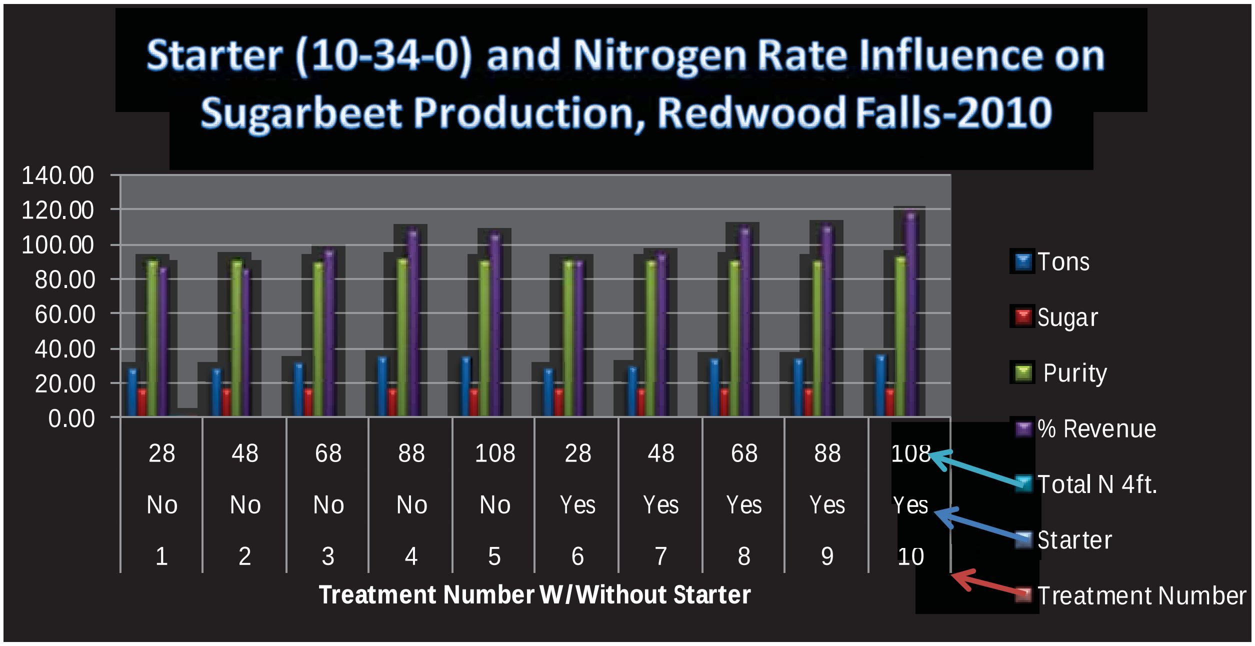
1070 Redwood Falls Starter by N Rate
Table 9a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2010

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	28	27.87	16.44	90.61
2	No	20	48	27.88	16.31	90.70
3	No	40	68	31.54	16.43	89.48
4	No	60	88	34.27	16.34	91.01
5	No	80	108	34.62	16.31	89.99
6	Yes	0	28	28.16	16.74	90.23
7	Yes	20	48	29.43	16.64	90.30
8	Yes	40	68	33.45	16.70	90.73
9	Yes	60	88	34.02	16.75	90.30
10	Yes	80	108	35.53	16.64	92.14
		CV		**3.9**	**2.70**	**1.46**
		LSD(.05)		**1.0**	**0.36**	**1.08**

1070 Redwood Falls Starter by N Rate
Table 9b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production, 2010

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	28	277	7721	87.15
2	No	20	48	275	7671	86.10
3	No	40	68	272	8585	95.51
4	No	60	88	277	9485	106.97
5	No	80	108	272	9426	104.89
6	Yes	0	28	281	7913	90.33
7	Yes	20	48	279	8224	93.46
8	Yes	40	68	282	9441	108.13
9	Yes	60	88	281	9573	109.41
10	Yes	80	108	287	10185	118.06
		CV		4	6	8.13
		LSD(.05)		9	405	6.65

TABLE 9 A&B

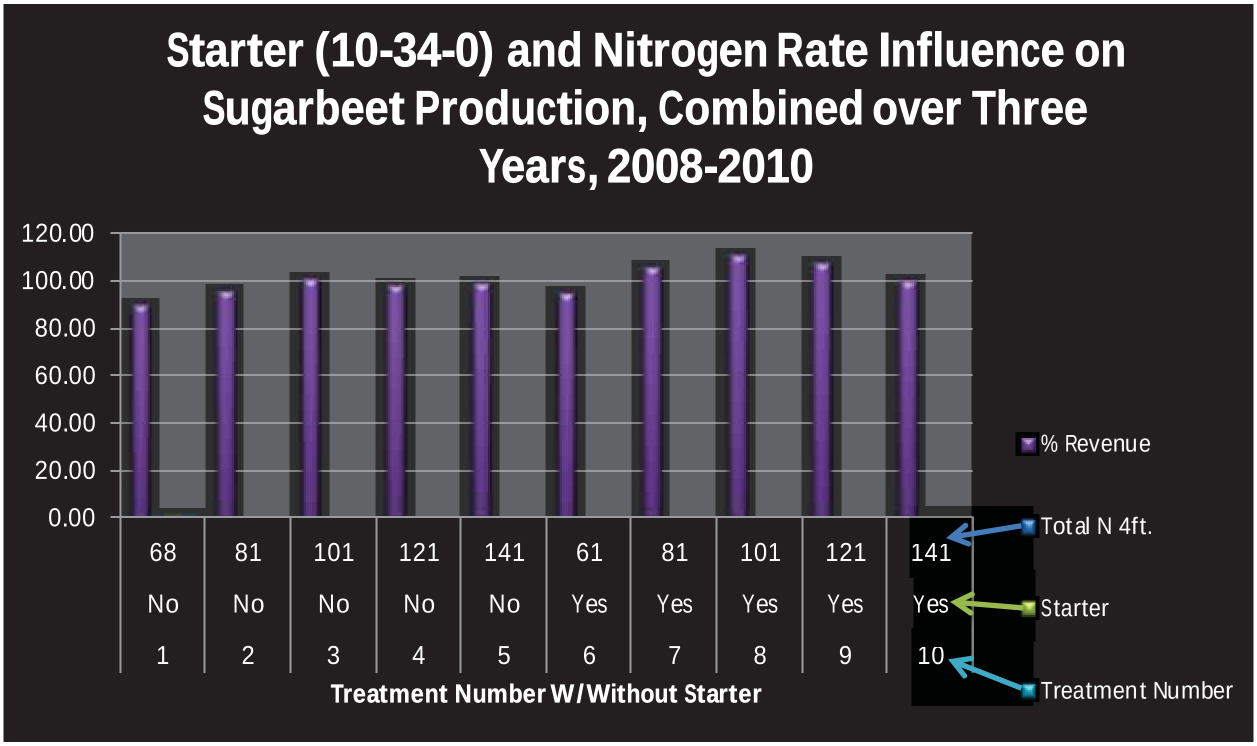


Combined Three Years
Table 10a. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production

Trt No.	Starter	N Rate	Total N Rate	Tons	% Sugar	Purity
1	No	0	68	23.3	16.07	91.61
2	No	20	81	24.9	16.09	91.52
3	No	40	101	26.0	16.34	91.64
4	No	60	121	26.2	15.99	91.81
5	No	80	141	27.0	15.99	91.17
6	Yes	0	61	24.9	16.19	91.40
7	Yes	20	81	27.1	16.29	91.72
8	Yes	40	101	28.0	16.45	92.10
9	Yes	60	121	27.6	16.40	91.47
10	Yes	80	141	27.4	16.00	91.00
		CV		**7.5**	**3.49**	**1.34**
		LSD(.05)		**2.1**	**NS**	**NS**

Combined Three Years
Table 10b. Starter (10-34-0) and Nitrogen Rate Influence on Sugarbeet Production

Trt No.	Starter	N Rate	Total N Rate	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	No	0	68	274	7252	89.24
2	No	20	81	274	7756	95.24
3	No	40	101	279	8043	100.87
4	No	60	121	273	8038	98.22
5	No	80	141	271	8099	98.50
6	Yes	0	61	275	7708	94.98
7	Yes	20	81	278	8436	105.65
8	Yes	40	101	283	8775	111.02
9	Yes	60	121	279	8585	107.01
10	Yes	80	141	271	8265	100.06
		CV		**4.4**	**8.2**	**10.83**
		LSD(.05)		**6**	**307**	**2.07**



Response Table

Table 11 Sugarbeet Production Response Curve Data as Influenced by Total N (Soil N Plus Applied N) and Presence of Starter

Total N averaged in 20lb increments				
	No starter		With starter	
Dependent variable	**Total N optimum**	**Recom. total N range**	**Total N optimum**	**Recom. total N range**
Sugar	87	84-98	87	70-91
Purity	146	133-147	98	70-91
Nitrate	94	70-91	75	126-140
ES	92	70-91	90	70-84
EST	92	70-91	90	70-84
ESA	96	70-91	89	70-84
Revenue	96	70-91	90	70-84
Average revenue	122	126-140	111	126-147

SMBSC Lime Rate by Organic Matter Testing-2010

Organic matter has a significant influence on sugar beet production in the Southern Minnesota Beet Sugar Cooperative growing area. Lime products, specifically precipitated calcium carbonate (PCC) or factory lime has shown to enhance sugar beet production. Since soil characteristics typically change as organic matter changes, the question whether or not the influence of lime would be influenced by soil organic matter.

Methods:

Sugarbeets were planted at two locations in 2010 to test if lime rate should be adjusted by organic matter level. Each location contained two plots. The two plot areas within each location consisted of one plot having low organic matter and one having high organic matter. In 2010 the tests were conducted in Raymond and Redwood Falls, MN. The data will be presented by site since statistical analysis of the data was conducted for homogeneity of combinability and determined that the data could not be combined across environments or locations. Pre PCC is crushed lime rock. PCC is precipitated calcium carbonate or lime rock that has been heated in a lime kiln and used in milk of lime during the sugar extraction process. Pelletized lime is a product made from finely crushed lime rock then pelletized to make the size of the product uniform.

PCC, Pre PCC and pelletized lime were applied at varying rates to research trials (plots) established in a high and a low organic matter area within a field. Table 1 shows the average pH and organic matter levels for each plot and location. Plots were 11 ft. (6 rows) wide and 50 ft long. At the Raymond location sugar beets were planted with a 6 row planter. Plots were not thinned as the sugarbeet stands did not warrant thinning. The research trials at Raymond were harvested with a 1 row research harvester. Two quality sub samples were collected from each plot and analyzed for quality and weighed for yield calculation. At Redwood Falls research trials were harvested with a 2 row research harvester. The weights were collected and weighed on the harvester for yield calculation and a subsample was analyzed in the SMBSC quality lab.

Table 1. Soil Test Results by Location

	pH	Om
Raymond - Low	7.9	3.4
Raymond - High	7.8	4.6
Redwood Falls - Low	6.1	2.2
Redwood Falls - High	7.5	4.7

1084 Raymond Lime Rate by Organic Matter - Low

Table 2. Lime Type and Rate Influence on Sugarbeet Yield and Quality, 2010

Trt No	Lime source	Rate Tons	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1		0	29.3	16.3	**92.8**	283	8310	95.9
2	PCC	4	31.0	16.4	**92.8**	**286**	8929	**103.5**
3	PCC	8	**34.6**	16.2	92.2	279	**9631**	**109.7**
4	PCC	12	**32.4**	16.2	92.4	280	**9066**	**103.7**
5	PCC	16	**33.1**	16.1	91.6	276	**9115**	**103.0**
6	Pre PCC	4	29.5	16.2	**92.6**	280	8256	94.3
7	Pre PCC	8	**33.1**	16.3	**93.0**	284	**9417**	**109.0**
8	Pre PCC	12	30.6	16.2	92.5	280	8579	98.2
9	Pre PCC	16	28.8	16.4	92.0	282	8124	93.5
10	Pell lime	0.25	28.5	16.2	91.7	278	7882	89.2
		CV	**12.2**	**2.4**	**0.9**	**3**	**11**	**10.7**
		LSD(.05)	**4.4**	**NS**	**1.0**	**9**	**1129**	**12.5**

1081 Raymond Lime Rate by Organic Matter - High

Table 3. Lime Type and Rate Influence on Sugarbeet Yield and Quality, 2010

Trt No	Lime source	Rate Tons	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1		0	30.3	15.7	91.9	268	8125	77.8
2	PCC	4	**35.3**	15.7	92.0	269	**9497**	**91.3**
3	PCC	8	**36.5**	15.7	92.3	270	**9842**	**94.7**
4	PCC	12	**34.7**	15.4	92.2	264	9170	86.7
5	PCC	16	**35.3**	15.7	92.2	270	**9536**	**92.0**
6	Pre PCC	4	33.2	15.7	91.9	270	8945	86.2
7	Pre PCC	8	33.9	15.6	92.3	269	9121	87.7
8	Pre PCC	12	31.0	15.8	91.9	271	8399	81.3
9	Pre PCC	16	32.9	15.6	92.4	269	8855	85.1
10	Pell lime	0.25	30.4	15.4	92.1	265	8118	77.5
		CV	**9.9**	**3.0**	**1.0**	**4**	**11**	**12.7**
		LSD(.05)	**3.8**	**NS**	**NS**	**NS**	**1145**	**12.7**

1083 Redwood Falls Lime Rate by Organic Matter - Low

Table 4. Lime Type and Rate Influence on Sugarbeet Yield and Quality, 2010

Trt No	Lime source	Rate Tons	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1		0	21.0	17.4	90.6	294	6179	89.9
2	PCC	4	**23.5**	17.4	90.4	293	6884	99.8
3	PCC	8	**25.2**	17.3	90.2	291	**7341**	**106.1**
4	PCC	12	**25.2**	17.4	90.5	293	**7378**	**107.1**
5	PCC	16	**24.2**	17.4	90.3	292	7075	**102.4**
6	Pre PCC	4	22.7	17.6	90.8	298	6773	99.6
7	Pre PCC	8	22.9	17.5	90.5	296	6768	99.0
8	Pre PCC	12	22.1	17.7	91.7	304	6731	100.3
9	Pre PCC	16	22.2	17.7	91.1	302	6700	99.4
10	Pell lime	0.25	22.4	17.4	90.7	295	6607	96.3
		CV	**5.1**	**2.71**	**1.72**	**5**	**7**	**9.0**
		LSD(.05)	**1.4**	**NS**	**NS**	**NS**	**525**	**10.5**

1082 Redwood Falls Lime Rate by Organic Matter - High

Table 5. Lime Type and Rate Influence on Sugarbeet Yield and Quality, 2010

Trt No	Lime source	Rate Tons	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1		0	33.9	17.0	89.8	285	9635	95.0
2	PCC	4	**36.0**	17.3	90.8	293	10540	106.4
3	PCC	8	35.4	17.3	**91.3**	295	10417	105.5
4	PCC	12	**35.8**	17.2	**91.8**	296	**10616**	**108.0**
5	PCC	16	**36.3**	17.3	**91.5**	296	**10754**	**109.4**
6	Pre PCC	4	30.7	17.3	**91.4**	297	9099	92.6
7	Pre PCC	8	31.1	17.2	91.0	293	9095	91.6
8	Pre PCC	12	32.1	**17.4**	**91.5**	298	9585	98.0
9	Pre PCC	16	32.2	**17.4**	**91.7**	298	9584	97.9
10	Pell lime	0.25	32.4	17.2	90.9	292	9475	95.5
		CV	**12.5**	**1.7**	**1.3**	**3**	**13**	**13.0**
		LSD(.05)	**4.9**	**0.3**	**1.3**	**9**	**1451**	**15.2**

Table 7a. Lime Analysis for Lime Rate by Organic Matter, 2010

Lime source	Moisture	Solids	Total N %	Available P %	Ca	Mg	ENP
PCC	0	100	0.54	1.18	568	29	1338
Pre PCC	0	100	1	4.03	746	10.5	1183

Table 7b. Lime analysis for Lime Rate by Organic Matter

Lime source	pH	N1 lb	P-O ppm	K ppm	Zn ppm
Pell Lime	6.2	38	3510	5527	13.47
PCC	10	7	856	588	4.64

Table 8. Probability of Homogeneity Across Locations, 2010

	Pr > F
Tons	0.0001
Sugar	0.0255
Purity	0.649
Ext.Suc Ton	0.1038
Ext.Suc Acre	0.0001
% Revenue	0.0001

*** Pr > F = .05**

**** Greater than .05 = NS**

Results and Discussion:

1. PCC at the 8 ton rate had the highest revenue of all tests combined.

2. All lime products tested positively influenced tons compared to no lime applied.

3. Lime rate may not need to be adjusted based on the level of organic matter.

4. There was an increase in revenue by $37.99 when applying 8 ton versus 4 ton.

5. The data presented is from one year of research. Conclusions should not be made based on one year of data.

Lime and Manure Influence on Rhizoctonia Solani

The following report is a summarization of testing fungicides for controlling rhizoctonia solani during the growing seasons of 2009 and 2010.

Objectives

The objective of these trials was to evaluate application of factory lime (PCC) and/or turkey manure for suppression of rhizoctonia solani (rhizoctonia root rot).

Methods

This test was conducted at the conclusion of evaluating field corn as a host to Rhizoctonia solani Ag 2-2 IIIB and IVA. In the spring of 2007 and 2008 separate testing areas were inoculated with inoculum of Rhizoctonia solani Ag 2-2 IIIB and IVA. The inoculation was conducted in cooperation with Dr. Carol Windels, North West Research and Outreach Center. Dr. Carol Windels research staff cooperated with Southern Minnesota Beet Sugar Cooperative (SMBSC) research staff to evaluate field corn as a host to Rhizoctonia solani Ag 2-2 IIIB and IVA. Sugarbeets were planted in the testing areas in 2008 and 2009 to evaluate for rhizoctonia root rot. In 2009 and 2010 sugarbeets were planted again in the testing areas to evaluate PCC and turkey manure influence on Rhizoctonia solani Ag 2-2 IIIB and IVA in sugarbeets. Precipitated Calcium Carbonate (PCC) and Turkey manure treatments were applied in the fall of 2008 and 2009 and incorporated with a plowing disk. Table 1 shows the specifics of activities conducted at the rhizoctonia testing sites in 2008 and 2009. Plots were 11 ft. (6 rows) wide and 35 ft long. Sugarbeet stands were counted at 4 leaf sugarbeet stage and at harvest for the whole plot and factored to a 100 ft relative stand. The test was replicated 4 times. Sugarbeets were harvested with a 4 row research harvester plow. The harvester plow lifted the sugarbeets out of the soil and places the sugarbeets on the soil surface. The sugar beets are then placed in a row for each plot for evaluation. The evaluation scale is a 1-7 scale. This scale is an industry standard used for rhizoctonia root rot evaluation. Evaluation was conducted of the roots from the middle two rows of the six row plot. Multiple evaluators were used to comprise the evaluations and a test of statistical homogeneity (combinability) was conducted and determined that the evaluators rating could be combined. The sugarbeets were collected and measured for yield and analyzed for quality. A test for homogeneity of 2009 and 2010 data was conducted and determined that the data could be combined (table

Results and Discussion

2009 data
The data collected from the testing site is summarized in tables 3a and b. Sugarbeet stand were the lowest and root rot ratings were the highest in the presence of AG 2-2 IIIB. The AG 2-2 IIIB rhizoctonia strain is a very aggressive strain and this data indicates the persistence in the soil over time.

The sugarbeet yield and revenue presented as a percent of the mean was directly related to the sugarbeet stand and root ratings. Sugarbeet yield and revenue presented as a percent of the mean tended to be best when lime-PCC was applied to the treatment. In the absence of Rhizoctonia solani the addition of lime-PPC or lime-PCC plus manure increased the tons per acre significantly. The rate of lime-PCC did not influence the effect on sugarbeet yield or revenue. The application of manure increased tons per acre but reduced quality when compared to untreated check where soil was not inoculated and where soil was inoculated with AG 2-2 IVA. Manure appeared to have a detrimental effect on sugarbeet production in treatments innoculated with Rhizoctonia solani AG 2-2 IIIB. The influence of lime appeared to be the greatest in the presence of Rhizoctonai solani AG 2-2 IIIB.

2010 data
The 2010 data is presented in tables 4a and b. Sugar beet stand was not significantly influenced by treatments. Rhizoctonia rating tended to be higher when manure was applied to the soil. Rhizoctonia ratings did not relate to the application or the strain of Rhizoctonia.

Revenue (presented as percent of mean) tended to be lower in the presence of Rhizoctonai Solani AG 2-2 IIIB. The application of lime-PCC gave the most consistent increase to sugarbeet revenue. The influence on revenue was directly related to tons per acre. Revenue increased with application of manure where soil was not inoculated or inoculated with AG 2-2 IVA but tended to be decreased where inoculated with AG 2-2 IIIB. Revenue was reduced when manure was applied with lime-PCC where Rhizoctonia solani AG 2-2 IVA and IIB were applied.

2009 and 2010 combined data

Combined data of research conducted in 2009 and 2010 pertaining to lime-PCC and turkey manure influence on rhizoctonia and sugar beet production is presented in tables 5 a and b. Treatments did not consistently influence stand count or Rhizoctonia ratings. Rhizoctonia ratings tended to be higher where Rhizoctonia solani inoculum was not applied. However, tons per acre tended to be higher where Rhizoctonia solani inoculum was not applied. The application of manure alone or with lime-PCC tended to reduce tons per acre. Lime – PCC applied alone either did or tended to increase tons per acre regardless whether Rhizoctonia solani inoculum was or was not applied. Lime-PCC applied at 4 ton was as beneficial as 8 ton of lime-PCC. Revenue (presented as percent of mean) was directly related to tons per acre. Thus the relationships identified for tons per acre can also be drawn for revenue. This indicates an advantage to the application of PCC prior to sugarbeets production.

Table 1. Site Specifics for Lime and Manure Influence on Rhizoctonia Solani in Sugarbeets

	Location	
Task	**Gluek 2009**	**Gluek 2010**
Sugarbeet-Varity	H4017	SV835RR
Planting-date	5/22/2009	4/27/2010
Harvest	9/25/2009	10/7/2010

Table 2. ANOVA Analysis of Probability of Significance for Measured Variables.

	P>F
Stand Count	0.8861
Root Rating Avg	0.2521
Tons	0.6951
% Sugar	0.6358
Purity	0.0115
Brie Nitrate	0.3291
Ext. Per Suc	0.1618
Ext. Suc Per Ton	0.1605
Ext. Suc Per Acre	0.4748
% Revenue	0.1346

*** Pr > F = .05**

**** Greater than .05 = NS**

0955 Gluek Rhizoc Influenced by Lime and Manure

Table 3 A. Lime and Manure Influence on Rhizoctonia Solani and Production in Sugarbeets, 2010

Trt No.	Rhizoctonia Strain	Treatment Description	Stand Count	Rhizoc Rating	Tons	% Sugar	Purity
1	AG 2-2 IIIB	Lime Check (A)	160	2.42	21.7	14.4	90.0
2	AG 2-2 IIIB	Lime (PCC) 4 ton	170	2.16	24.0	14.6	90.4
3	AG 2-2 IIIB	Manure 4 ton	180	2.47	19.3	14.3	89.8
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	100	2.34	14.1	14.9	90.8
5	AG 2-2 IIIB	Lime (PCC) 8 ton	140	2.97	21.6	15.1	90.5
6	AG 2-2 IIIB	Manure Check	160	2.68	17.1	14.3	89.4
7	AG 2-2 IV	Lime Check (A)	110	2.48	19.1	14.3	89.2
8	AG 2-2 IV	Lime (PCC) 4 ton	110	2.38	22.7	14.1	89.1
9	AG 2-2 IV	Manure 4 ton	130	2.66	24.6	14.1	88.8
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	130	2.57	22.9	14.3	89.3
11	AG 2-2 IV	Lime (PCC) 8 ton	80	2.63	16.3	11.8	76.3
12	AG 2-2 IV	Manure Check	120	2.84	21.7	14.7	89.6
13	Non Inoculated (1)	Lime Check (A)	100	2.94	17.8	13.1	87.8
14	Non Inoculated (1)	Lime (PCC) 4 ton	120	3.05	21.0	13.7	88.2
15	Non Inoculated (1)	Manure 4 ton	120	3.14	19.6	13.8	88.4
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	90	3.30	23.6	13.6	87.7
17	Non Inoculated (1)	Lime (PCC) 8 ton	100	2.63	20.7	14.4	89.0
18	Non Inoculated (1)	Manure Check	80	2.93	16.6	13.9	89.4
		CV	**46**	**27**	**24.2**	**7.87**	**1.92**
		LSD(.05)	**70**	**1.02**	**2.2**	**1.57**	**2.43**

0955 Gluek Rhizoc Influenced by Lime and Manure

Table 3 B. Lime and Manure Influence on Rhizoctonia Solani, Sugar Production and Revenue as a Percent of Means in Sugarbeets, 2010

Trt No.	Rhizoctonia Strain	Treatment Description	Rhizoc Rating	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	AG 2-2 IIIB	Lime Check (A)	2.42	239	5315	114.47
2	AG 2-2 IIIB	Lime (PCC) 4 ton	2.16	243	5882	126.47
3	AG 2-2 IIIB	Manure 4 ton	2.47	237	4617	96.84
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	2.34	250	3602	80.46
5	AG 2-2 IIIB	Lime (PCC) 8 ton	2.97	252	5457	120.75
6	AG 2-2 IIIB	Manure Check	2.68	236	4156	88.56
7	AG 2-2 IV	Lime Check (A)	2.48	235	4604	97.62
8	AG 2-2 IV	Lime (PCC) 4 ton	2.38	231	5268	106.93
9	AG 2-2 IV	Manure 4 ton	2.66	230	5484	106.25
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	2.57	235	5390	111.16
11	AG 2-2 IV	Lime (PCC) 8 ton	2.63	508	4399	103.73
12	AG 2-2 IV	Manure Check	2.84	242	5215	109.71
13	Non Inoculated (1)	Lime Check (A)	2.94	209	3882	72.99
14	Non Inoculated (1)	Lime (PCC) 4 ton	3.05	221	4763	93.93
15	Non Inoculated (1)	Manure 4 ton	3.14	224	4461	88.33
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	3.30	218	5227	100.46
17	Non Inoculated (1)	Lime (PCC) 8 ton	2.63	235	4899	101.46
18	Non Inoculated (1)	Manure Check	2.93	228	3894	79.89
		CV	**27**	**11**	**27**	**33.46**
		LSD(.05)	**1.02**	**34**	**568**	**47.50**

1052 Gluek Rhizoc Influenced by Lime and Manure
Table 4 A. Lime and Manure Influence on Rhizoctonia Solani and Production in Sugarbeets, 2010

Trt No.	Rhizoctonia Strain	Treatment Description	Stand Count	Rhizoc Rating	Tons	% Sugar	Purity
1	AG 2-2 IIIB	Lime Check (A)	79.3	3.62	22.1	16.10	88.00
2	AG 2-2 IIIB	Lime (PCC) 4 ton	87.9	3.16	25.6	16.35	88.81
3	AG 2-2 IIIB	Manure 4 ton	93.2	3.54	20.9	16.51	89.33
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	88.9	3.01	21.1	16.36	89.40
5	AG 2-2 IIIB	Lime (PCC) 8 ton	82.1	2.89	24.8	16.35	89.93
6	AG 2-2 IIIB	Manure Check	93.9	3.21	21.9	16.46	90.50
7	AG 2-2 IV	Lime Check (A)	92.1	2.62	23.8	16.02	87.59
8	AG 2-2 IV	Lime (PCC) 4 ton	88.2	2.63	21.9	16.15	89.06
9	AG 2-2 IV	Manure 4 ton	101.4	2.62	21.7	17.08	92.68
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	97.9	3.39	24.1	15.47	85.89
11	AG 2-2 IV	Lime (PCC) 8 ton	102.1	3.12	24.0	16.43	89.42
12	AG 2-2 IV	Manure Check	102.5	2.63	24.7	16.73	90.95
13	Non Inoculated (1)	Lime Check (A)	91.1	2.97	20.9	16.80	89.67
14	Non Inoculated (1)	Lime (PCC) 4 ton	78.9	3.58	26.3	16.89	90.47
15	Non Inoculated (1)	Manure 4 ton	91.4	3.53	24.3	16.06	84.74
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	81.4	2.94	25.2	16.95	89.52
17	Non Inoculated (1)	Lime (PCC) 8 ton	95.0	3.43	24.7	16.87	89.36
18	Non Inoculated (1)	Manure Check	90.4	3.03	22.3	16.58	89.26
		CV	19.0	6.8	5.1	5.69	3.71
		LSD(.05)	NS	0.93	1.7	1.33	4.71

1052 Gluek Rhizoc Influenced by Lime and Manure
Table 4 B. Lime and Manure Influence on Rhizoctonia Solani, Sugar Production and Revenue as a Percent of Means in Sugarbeets, 2010

Trt No.	Rhizoctonia Strain	Treatment Description	Rhizoc Rating	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	AG 2-2 IIIB	Lime Check (A)	3.62	261	5772	88.68
2	AG 2-2 IIIB	Lime (PCC) 4 ton	3.16	268	6856	107.70
3	AG 2-2 IIIB	Manure 4 ton	3.54	276	5796	93.43
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	3.01	271	5662	89.73
5	AG 2-2 IIIB	Lime (PCC) 8 ton	2.89	273	6780	108.07
6	AG 2-2 IIIB	Manure Check	3.21	281	6123	99.61
7	AG 2-2 IV	Lime Check (A)	2.62	260	6143	93.40
8	AG 2-2 IV	Lime (PCC) 4 ton	2.63	267	5819	90.69
9	AG 2-2 IV	Manure 4 ton	2.62	306	6630	114.82
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	3.39	240	5827	83.14
11	AG 2-2 IV	Lime (PCC) 8 ton	3.12	272	6509	103.32
12	AG 2-2 IV	Manure Check	2.63	283	6987	114.74
13	Non Inoculated (1)	Lime Check (A)	2.97	281	5858	95.52
14	Non Inoculated (1)	Lime (PCC) 4 ton	3.58	292	7685	129.02
15	Non Inoculated (1)	Manure 4 ton	3.53	247	5954	86.16
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	2.94	283	7128	116.86
17	Non Inoculated (1)	Lime (PCC) 8 ton	3.43	280	6901	112.26
18	Non Inoculated (1)	Manure Check	3.03	284	6357	104.77
		CV	6.8	10	12	20.08
		LSD(.05)	0.92	41	1061	29.01

Table 5 A. Combined Data for 2009-2010 Lime and Manure Influence on Rhizoctonia Solani and Production in Sugarbeets.

Trt No.	Rhizoctonia Strain	Treatment Description	Stand Count	Rhizoc Rating	Tons	% Sugar	Purity
1	AG 2-2 IIIB	Lime Check (A)	109	3.02	21.9	15.27	88.63
2	AG 2-2 IIIB	Lime (PCC) 4 ton	126	2.66	24.8	15.39	89.38
3	AG 2-2 IIIB	Manure 4 ton	132	3.00	20.1	15.44	89.49
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	94	2.67	17.6	15.62	90.08
5	AG 2-2 IIIB	Lime (PCC) 8 ton	111	2.93	23.2	15.73	90.24
6	AG 2-2 IIIB	Manure Check	108	2.94	19.5	15.41	90.06
7	AG 2-2 IV	Lime Check (A)	89	2.55	21.5	15.20	88.18
8	AG 2-2 IV	Lime (PCC) 4 ton	91	2.50	22.3	15.15	88.86
9	AG 2-2 IV	Manure 4 ton	101	2.64	22.8	15.72	91.06
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	99	2.98	23.5	14.89	87.39
11	AG 2-2 IV	Lime (PCC) 8 ton	83	2.87	20.2	14.83	83.66
12	AG 2-2 IV	Manure Check	92	2.73	23.2	15.71	90.45
13	Non Inoculated (1)	Lime Check (A)	83	2.96	19.4	14.95	88.65
14	Non Inoculated (1)	Lime (PCC) 4 ton	97	3.31	23.7	15.39	89.79
15	Non Inoculated (1)	Manure 4 ton	103	3.34	21.9	14.96	86.59
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	83	3.12	24.4	15.31	88.68
17	Non Inoculated (1)	Lime (PCC) 8 ton	98	3.03	22.7	15.62	89.18
18	Non Inoculated (1)	Manure Check	86	2.98	19.5	15.36	90.02
		CV	**55**	**25**	**17.5**	**10.43**	**5.20**
		LSD(.05)	**54**	**0.73**	**3.8**	**NS**	**4.58**

Table 5 B. Combined Data for 2009-2010 Lime and Manure Influence on Rhizoctonia Solani, Sugar Production and Revenue as a Percent of Means in Sugarbeets.

Trt No.	Rhizoctonia Strain	Treatment Description	Rhizoc Rating	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	AG 2-2 IIIB	Lime Check (A)	3.02	245	5351	97.92
2	AG 2-2 IIIB	Lime (PCC) 4 ton	2.66	253	6320	116.35
3	AG 2-2 IIIB	Manure 4 ton	3.00	251	5012	90.58
4	AG 2-2 IIIB	Lime (PCC) 4 ton + Manure (TM) 4 ton	2.67	262	4665	87.52
5	AG 2-2 IIIB	Lime (PCC) 8 ton	2.93	264	6139	117.79
6	AG 2-2 IIIB	Manure Check	2.94	257	4981	91.74
7	AG 2-2 IV	Lime Check (A)	2.55	243	5126	90.43
8	AG 2-2 IV	Lime (PCC) 4 ton	2.50	245	5433	96.55
9	AG 2-2 IV	Manure 4 ton	2.64	264	6165	111.17
10	AG 2-2 IV	Lime (PCC) 4 ton + Manure (TM) 4 ton	2.98	234	5624	97.04
11	AG 2-2 IV	Lime (PCC) 8 ton	2.87	372	5420	103.22
12	AG 2-2 IV	Manure Check	2.73	266	6115	116.39
13	Non Inoculated (1)	Lime Check (A)	2.96	243	4705	81.81
14	Non Inoculated (1)	Lime (PCC) 4 ton	3.31	256	6217	113.06
15	Non Inoculated (1)	Manure 4 ton	3.34	235	5159	87.52
16	Non Inoculated (1)	Lime (PCC) 4 ton + Manure (TM) 4 ton	3.12	250	6176	110.51
17	Non Inoculated (1)	Lime (PCC) 8 ton	3.03	257	5904	108.90
18	Non Inoculated (1)	Manure Check	2.98	256	5146	94.43
		CV	**25**	**34**	**28**	**31.65**
		LSD(.05)	**1**	**87**	**1558**	**31.55**

SMBSC Rhizoc soil assays, 2009
Soil root rot index

TRT	Aphanomyces	Rhizoctonia
Non inoculated	9	9
AG 2-2 IV	15	10
AG 2-2 IIIB	5	17

SMBSC Rhizoc soil assays, 2010
Soil root rot index

Trt. No	Aph	Rhizoc
AG 2-2 IIIB	28	60
AG 2-2 IV	32	44
Non inoculated	71	7

EFFECT OF PRECIPITATED CALCIUM CARBONATE ON RHIZOCTONIA ROOT AND CROWN ROT IN SUGARBEET

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Rhizoctonia root and crown rot, caused by *Rhizoctonia solani* Kühn, is currently the most damaging and difficult to control disease of sugarbeet (*Beta vulgaris* L.) in the North Dakota and Minnesota. Anastomosis group (AG) 2-2, and intraspecific groups (ISGs) AG 2-2 IV and AG 2-2 IIIB are the most prevalent ISGs in this sugarbeet production area. The diseases has become more widespread and severe over the past decade, probably because of warm and wet summers favorable for disease development and a transition in cropping sequence to now including *R. solani* host crops such as soybean, edible beans and maize. Varieties with high levels of resistance typically have lower yields compared to more susceptible varieties (Panella and Ruppel, 1996). Another important soilborne disease of sugarbeet is Aphanomyces root rot caused by *Aphanomyces cochlioides*. Research showed that application of precipitated calcium carbonate (or spent lime, a by-product of the sugar purification process), applied before planting sugarbeet, resulted in significantly reduced Aphanomyces root rot and increased recoverable sucrose in the presence of *A. cohlioides* (Windels et al., 2007). The seven sugarbeet processing factories in Minnesota and North Dakota produce about 500,000 tons of precipitated calcium carbonate annually, so it is readily available.

The objective of this research was to determine whether precipitated calcium carbonate controls Rhizoctonia root and crown rot in sugarbeet.

MATERIALS AND METHODS

Field trial was conducted in Hickson, ND in 2010. Precipitated calcium carbonate was applied at 0, 5, 10 and 15 tons/A (wet weight) and incorporated in November 2009. The Hickson site was inoculated on May 20, 2010 with *R. solani* AG 2-2 IIIB grown on barley and applied at 32 lbs/A. The inoculum was incorporated to about two inch depth just before planting. The experimental design was a split-plot with different rates of precipitated calcium carbonate as the main plot and a Rhizoctonia susceptible and resistant variety as the sub-plots with four replicates. Precipitated calcium carbonate was applied to blocks that were 44 ft wide and 60 ft long. A glyphosate tolerant Rhizoctonia susceptible and a glyphosate tolerant Rhizoctonia resistant variety (Proprietary materials, Crystal Beet Seed) were planted in the center of each block in strips that were 11 ft wide and 30 ft long. A Rhizoctonia resistant variety was planted as a border on each side of the strips. Plots were planted to stand on 20 May. Seeds were also treated with Tachigaren at 45 g/kg seed to provide early season protection against *Aphanomyces cochlioides*, and Poncho-Beta to provide protection against insect pests. Counter 15G was applied at 11.9 lbs/A to provide protection against insect pests. Weeds were controlled with four applications of glyphosate. The site was fertilized as recommended for sugarbeet on 19 April; the fertilizer was incorporated with a Kongskilde field cultivator on 20 April.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 4 October and weights were recorded. The harvested roots were rated (0-7 scale) and samples (12-15 roots) from each plot, not including roots on the ends of plots, were analyzed for quality at American Crystal Sugar Company tare laboratory at East Grand Forks, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

Warm and wet conditions resulted in good germination, emergence, and plant stand in early June. First symptoms appeared in early July and included wilting and yellowing of leaves with death of plants occurring later.

There was mortality of both Rhizoctonia susceptible and resistant plants; however mortality was significantly greater in the susceptible variety. As a result, there were significantly greater number of plants in the resistant compared to the susceptible variety at harvest. However, precipitated calcium carbonate did not impact yield nor help in controlling Rhizoctonia root and crown rot. Although there was a significantly greater number of resistant compared to susceptible plants for each treatment, there was no significant differences in yield or recoverable sucrose among the treatments. The susceptible variety tended to produce roots with greater sucrose concentration than the resistant variety.

Soil conditions were favorable for disease development starting at planting time (when the soil temperature at the 4'' depth was 62F). Disease incidence and severity was very high at this site. It is possible that infection started early and the plants were either unable to utilize nutrients from the precipitated calcium carbonate to build-up defense or that infection occurred before the precipitated calcium carbonate could stimulate the plants to develop resistance to the pathogen.

Table 1. Effect of Precipitated Calcium Carbonate (PCC) Applied at Different Rates on Rhizoctonia Root and Crown Rot at Hickson, ND in 2010.

PCC Rate in tons/A and Variety	9 June Stand Count	15 July Stand Count	11 August Mortality Count	4 October Stand Count	4 October Rhizoctonia root rating	4 October Yield	4 October Sucrose concenration	4 October Recoverable sucrose
	beets/60'	beets/60'	dead/60'	beets/60'	0-7	ton/A	%	lb/A
0 ton Susceptible Variety A	101	94	21	54	2.0	18.5	16.9	5721
0 ton Resistant Variety B	105	104	8	74	1.9	19.1	15.8	5596
5 ton Susceptible Variety A	110	107	20	70	2.4	19.4	16.9	6098
5 ton Resistant Variety B	113	118	11	86	1.9	23.1	16.4	6989
10 ton Susceptible Variety A	108	107	33	56	2.4	17.1	17.0	5349
10 ton Resistant Variety B	107	118	7	86	1.9	22.1	16.4	6804
15 ton Susceptible Variety A	105	99	20	59	2.4	20.3	17.1	6337
15 ton Resistant Variety B	111	110	8	88	2.1	22.4	16.3	6828
LSD (P=0.05)	**NS**	**NS**	**6**	**14**	**NS**	**NS**	**0.8**	**NS**

References

Panella, L. and E. G. Ruppel. 1996. Availability of germplasm for resistance against *Rhizoctonia* spp. Pages 515-527, *In*: *Rhizoctonia* Species: Taxonomy, molecular biology, ecology, pathology and disease control. B. Sneh, S. Jabaji-Hare, S. Neate, and G. Dijat, eds. Kluwer Academic Publishers, Dordrecht, Netherlands.

Windels, C. E., J. R. Brantner, A. L. Sims, and C. A. Bradley. 2007. Spent lime effects on sugarbeet, root rot, microorganisms, and rotation crops. In: 2007 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 37:208-219.

EFFECT OF QUADRIS ON CONTROLLING RHIZOCTONIA ROOT ROT IN SUGARBEET

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Rhizoctonia root and crown rot, caused by *Rhizoctonia solani* Kühn, is currently the most devastating soilborne disease of sugarbeet (*Beta vulgaris* L.) in North Dakota and Minnesota. In the bi-state area, *R. solani* anastomosis groups (AGs) AG-1, AG-2-2, AG-4, and AG-5 cause damping off and AG-2-2 causes and root and crown rot of sugarbeet (Windels and Nabben 1989). *R. solani* survives as thickened hyphae and sclerotia in organic material and is endemic in soils where sugar beet is grown. *R. solani* has a wide host range including broad leaf crops and weeds (Anderson 1982; Nelson et al. 1996). Severe disease occurs if sugar beet follows beans or potato (Baba and Abe 1966; Johnson et al. 2002). Crop rotations of 3 or more years with small grains planted before sugar beet is recommended to reduce disease incidence (Windels and Lamey 1998). In fields with a history of high disease severity, growers may plant varieties that are more resistant but with significantly lower yield potential compared to more susceptible varieties (Panella and Ruppel 1996). Research showed that timely application of azoxystrobin provided effective disease control but not when applied after infection, or after symptoms were observed (Brantner and Windels, 2002; Jacobsen et al. 2002).

The objective of this research was to determine the best time to apply Quadris for controlling Rhizoctonia root rot in sugarbeet.

MATERIALS AND METHODS

Field trial was conducted in Hickson, ND in 2010. The Hickson site was inoculated on May 20 with *R. solani* AG 2-2 IIIB grown on barley. Inoculum was applied using a three-point mounted rotary/spinner type broadcast spreader calibrated to deliver 32 lbs/A. The inoculum was incorporated to about two inch depth just before planting. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 25-feet long rows spaced 22 inches apart. Plots were planted to stand on 20 May with an approved glyphosate tolerant variety (Proprietary material, Crystal Beet Seeds) which was resistant to Rhizomania and very susceptible to *Rhizoctonia solani*. Seeds were also treated with Tachigaren at 45 g/kg seed to provide early season protection against *Aphanomyces cochlioides*, and Poncho-Beta to provide protection against insect pests. Counter 15G was also applied at 11.9 lb/A at planting to control insect pests. Weeds were controlled with four applications of glyphosate. The site was fertilized as recommended for sugarbeet on 19 April; the fertilizer was incorporated with a Kongskilde field cultivator on 20 April.

Quadris was applied at 14.26 fl oz/A in a 7’’ band on 2 June, or 23 June, or 2 and 23 June. Treatments were applied using a bike sprayer with flat fan nozzles (4002E) spaced 22’’ apart and calibrated to deliver 17 gal solution/A at 40 p.s.i pressure to the middle four rows of plots.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 4 October and weights were recorded. The harvested roots were rated for Rhizoctonia root rot (0-7 scale) and samples (12-15 roots) from each plot, not including roots on the ends of plots, were analyzed for quality at American Crystal Sugar Company tare laboratory at East Grand Forks, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

Symptoms included wilting, yellowing of leaves, and death of plants. First symptoms appeared in July and infected plants became brown to black carcasses after warm and dry weather conditions in August and early September.

The non-treated inoculated check had significantly lower plant stand starting from early August, significantly greater root rot rating at harvest, lower yield, sucrose concentration and recoverable sucrose than the fungicide treatments. Quadris applied once early (2 June; leaf stage v1.0-1.2; soil temperature at 4” soil depth was 58F), once late (23

June, leaf stage 6-8 lf; soil temperature at 4" soil depth was 68F), or twice (2 and 23 June) resulted in similar plant stands, root rot ratings, yield, sucrose concentration and recoverable sucrose. Soil temperature at the 4 inch depth and moisture was favorable for disease development starting early in the season (at planting, it was 62 F) and continued throughout the season. One application of Quadris was as effective as two applications; similar results were obtained in 2009 (Khan and Carlson, 2010). However, because of the prolonged favorable conditions for disease development, there was a trend of better disease control and higher yields with two applications of Quadris. It may become necessary to use two fungicide applications for effective Rhizoctonia root rot control. However, back-to-back use of Quadris, or any other fungicide should be avoided to delay the development of resistant isolates of *R. solani*. Further research should include rotation of different chemistries of fungicides for controlling Rhizoctonia root rot.

Table 1. Effect of Quadris Applied at Different Times on Rhizoctonia Root Rot Control at Hickson, ND in 2010.

		9 July	11 August	4 October				
Treatment and Rate/A	**Application date**	**Stand Count**	**Stand Count**	**Stand Count**	**Rhizoctonia Root Rating**	**Yield**	**Sucrose concentration**	**Recoverable sucrose**
		beets/50'	**beets/50'**	**beets/50'**	**0-7**	**ton/A**	**%**	**lb/A**
Nontreated check	-	71	55	35	3.4	14.6	16.2	4325
Quadris 14.26 fl oz	2 June	82	75	56	1.6	23.5	17.3	7553
Quadris 14.26 fl oz	23 June	81	77	63	1.3	25.3	17.6	8261
Quadris 14.26 fl oz	2 & 23 June	82	81	67	1.1	28.8	17.5	9362
LSD (P=0.05)		**NS**	**7**	**13**	**1.9**	**6.8**	**1.1**	**2174**

References

Anderson, N. A. 1982. The genetics and pathology of *Rhizoctonia solani*. Annu. Rev. Phytopathol. 20:329-347.

Baba, T. and H. Abe. 1966. Influence of preceding crops upon incidence of the sugar beet crown rot. Jpn. Bull. Sugar Beet Res. 7:69-71.

Brantner, J. and Windels, C.E. 2002. Band and broadcast applications of quadris for control of Rhizoctonia root and crown rot on sugarbeet. In: 2001 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 32:282-286.

Jacobsen, B. J., Zidack, N. K., Mickelson, J. and Ansley, J. 2002. Integrated management strategies for Rhizoctonia crown and root rot. In: 2001 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 32:293-295.

Johnson, D., Halloin, J. and Poindexter, S. 2002. Use of quadris to control natural infestations of Rhizoctonia crown and root in Michigan. In: 2001 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 32:287-292.

Khan, M. F. R. and A. Carlson. 2010. Effect of fungicides on controlling Rhizoctonia crown and root rot in sugarbeet. In: 2009 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 40:246-247.

Nelson, B., T. Helms, T. Christianson, and I. Kural. 1996. Characterization and pathogenicity of *Rhizoctonia solani* from soybean. Plant Dis. 80:74-80.

Panella, L. and E. G. Ruppel. 1996. Availability of germplasm for resistance against *Rhizoctonia* spp. Pages 515-527, *In*: *Rhizoctonia* Species: Taxonomy, molecular biology, ecology, pathology and disease control. B. Sneh, S. Jabaji-Hare, S. Neate, and G. Dijat, eds. Kluwer Academic Publishers, Dordrecht, Netherlands.

Windels, E. W. and H. A. Lamey. 1998. Identification and control of seedling diseases, root rot, andrhizomania on sugarbeet. Univ. Minnesota and North Dakota State Univ. Ext. Serv. Bull. PP-1142 , BU-7192-S.

Windels, C. E., and D. J. Nabben. 1989. Characterization and pathogenicity of anastomosis groups of *Rhizoctonia solani* isolated from *Beta vulgaris*. Phytopathol. 79:83-88.

EFFECT OF PRECIPITATED CALCIUM CARBONATE ON FUSARIUM YELLOWS IN SUGARBEET

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Fusarium yellows is caused by *Fusarium oxysporum* f. sp. *betae* and other as yet uncharacterized novel Fusarium species (Khan et al., 2003; Rivera et al., 2008). The disease has become a serious problem for sugarbeet growers in the Glyndon, Sabin and Moorhead areas and has been positively identified in some areas of southern Minnesota and in the Minn-Dak factory districts. Fusarium yellows causes severe reduction in yield and recoverable sucrose. Currently there are no fungicides which effectively control the disease. Growers should use Fusarium yellows resistant varieties for fields with a known history of the disease. *Aphanomyces cochlioides* is another important soilborne pathogen is which causes Aphanomyces root rot in sugarbeet. Research showed that application of precipitated calcium carbonate (or spent lime, a by-product of the sugar purification process), applied before planting sugarbeet, significantly reduced Aphanomyces root rot and increased recoverable sucrose in *A. cohlioides* infected soil (Windels et al., 2007).

The objective of this research was to determine whether precipitated calcium carbonate (PCC) controls Fusarium yellows in sugarbeet.

MATERIALS AND METHODS

Field trial was conducted in Moorhead, MN. Precipitated calcium carbonate was applied at 0, 5, 10 and 15 tons/A (wet weight) and incorporated on April 22, 2010. Sugarbeet samples collected from this site in 2009 were infected with several Fusarium species including *F. oxysporum* and *F*. nov. spp. The experimental design was a split-plot with different rates of precipitated calcium carbonate as the main plot and a Fusarium yellows susceptible and resistant variety as the sub-plots with four replicates. Precipitated calcium carbonate was applied to blocks that were 44 ft wide and 60 ft long. A glyphosate tolerant Fusarium yellows susceptible and a glyphosate tolerant glyphosate tolerant Fusarium yellows resistant variety (Proprietary materials, Crystal Beet Seed, and Syngenta Seeds) were planted in the center of each block in strips that were 11 ft wide and 30 ft long. A Fusarium yellows resistant variety was planted as a border on each side of the strips. Plots were planted to stand on 18 May. Seeds were treated with Tachigaren at 45 g/kg seed to provide early season protection against *Aphanomyces cochlioides*, and Poncho-Beta to provide protection against insect pests. Counter 15G at 11.9 lbs/A was also applied to provide protection against insect pests. Weeds were controlled with four applications of glyphosate. The site was fertilized as recommended for sugarbeet.

Stand counts were taken during the season and at harvest. Ten feet of the middle two-rows of plots were hand harvested on 1 September and weights were recorded. Only plots with Fusarium yellows resistant plants were harvested; there was not an adequate population of susceptible plants. Harvested roots from each plot were analyzed for quality at American Crystal Sugar Company tare laboratory at East Grand Forks, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

Warm and wet conditions resulted in good emergence and plant stand in early June. First symptoms appeared in mid-June and included wilting and death of young plants, chlorosis of older leaves, distinct yellowing and necrosis of half a leaf along the midrib, and death of older plants as the season progressed. There was over 95% mortality of the Fusarium yellows susceptible plants by late July resulting in none being harvested for yield and quality analysis. Some resistant plants also had typical Fusarium yellows symptoms and their population was reduced at harvest time. There was no significant difference in stand count at harvest, tonnage, sucrose concentration or recoverable sucrose per acre between the non-treated check (0 PCC) and the precipitated calcium carbonate treatments. Since infection started early, it is likely that that the plants were unable to utilize nutrients from the PCC to help in structural defense. Soils treated with PCC and planted one to two years later to sugarbeet tend to have higher populations of useful microorganisms such as fluorescent pseudomonad bacteria (Windels et al., 2007). Since planting was done less than one month after PCC application, there was probably not enough time for the useful microorganisms' population to increase so that they will become antagonistic to soilborne pathogens such as *F. oxysporum*.

Table 1. Effect of Precipitated Calcium Carbonate Applied (PCC) at Different Rates on Fusarium Yellows at Moorhead, MN in 2010.

	1 September			
PCC rate in tons/A & Variety	**Stand Count beets/60'**	**Yield tons/A**	**Sucrose concentration %**	**Recoverable sucrose lb/A**
0 ton Resistant Variety B	36	18.4	13.4	4465
5 ton Resistant Variety B	33	19.2	12.9	4497
10 ton Resistant Variety B	38	19.2	13.6	4772
15 ton Resistant Variety B	36	20.0	13.2	4827
LSD	NS	NS	NS	NS
Prob (F)	(p=0.3152)	(p=0.6134)	(p=0.1562)	(p=0.6204)

References

Khan, M. F. R., C. A. Bradley, and C. E. Windels. 2003. Fusarium yellows of sugarbeet. North Dakota State University and University of Minnesota bulletin, PP-1247.

Rivera, V., J. Rengifo, M. Khan, D. M. Geiser, M. Mansfield and G. Secor. 2008. First report of a novel *Fusarium* species causing yellowing decline of sugar beet in Minnesota. Plant Dis. 92:1589.

Windels, C. E., J. R. Brantner, A. L. Sims, and C. A. Bradley. 2007. Spent lime effects on sugarbeet, root rot, microorganisms, and rotation crops. In: 2007 Sugarbeet Res. Ext. Rep. Fargo, ND: NDSU Ext. Serv. 37:208-219.

EFFECT OF HOST GENOTYPE ON GENETIC DIVERSIFICATION OF BNYVV

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Recent studies indicate that viral adaptation to specific hosts, a phenomenon known as 'host adaptation,' may be affected by the genetic structure of the original virus population (6), and selection pressure imposed by the potential host genotype (2, 9). The emerging picture is that some viruses can rapidly adapt to different host environments. For instance, resistance breaking (RB) variants can arise during the first encounter with a restrictive host (1, 2, 5). However, despite their potential for rapid host adaptation, most plant viruses exhibit high genetic stability, surviving in the same host species for many years. Purifying selection apparently plays a critical role in maintaining this genetic stasis. To understand the practical implications of viral host adaptation, we explored the relationship between strength of host resistance and genetic diversity of a benyvirus, *Beet necrotic yellow vein virus* (BNYVV).

p25 (RNA-3) accounts for most of the rhizomania syndrome, is one of the most variable BNYVV genes with strong positive selection acting on some of their amino acids, and encodes a determinant to overcome *Rz1* (3, 7, 8, 10, 11). For these reasons, RNA-3 was chosen to analyze the genetic diversity of BNYVV after its passage through resistant *Rz1*- and *Rz2*-cultivars and a susceptible control. Based on previous results from our lab (2), we hypothesize that certain populational changes taking place before the emergence of RB variants may follow predictable patterns. Our main objective was to identify populational parameters affected by host genotype that could be related to plant resistance durability.

Materials and Methods

The serial host planting experiment. BNYVV-resistant sugarbeet cultivars carrying the dominant *Rz1* or *Rz2* alleles, and a susceptible (rz1rz2) control were grown in individual pots. Twelve plants of each cultivar were seeded into a commercial potting soil mix containing ca. 2 g of field soil infested with a wild type BNYVV (1, 2). As negative controls, the same number of plants of each cultivar was seeded into uninfested potting soil mix. The initial inoculum consisted of BNYVV-infested soil collected from the rhizosphere of susceptible plants cultivated in a commercial field near Climax, MN (Clx isolate, accession no. EU480492). Root tissue was harvested 12 to 14 weeks after planting and then, approximately 50% of the soil/root mixture from each pot was used as inoculum for the consecutive host planting. By following this experimental approach, it was expected that viruliferous sporosori of *P. betae* from the previously infected plants would be the sources to infect the following test plants, thereby creating virus lineages. However, the possibility that plants in the consecutive host planting also were infected by virions remaining from the original inoculum, rather than by virions from the previously infected plants, was not discarded. Therefore, truly serial host passages were not guaranteed, but this approach was preferred over mechanical inoculation of the virus from passage to passage because it more closely mimics what normally happens in the field from one cultivation cycle to the next.

Total RNA extractions from root tissue. Root tissue from the three host genotypes were collected on the same day for comparative purposes and stored in 2 ml microfuge tubes at -80ºC until processing. Total RNA extractions were performed from frozen 0.1 g of plant tissue according to the RNAqueous®-Mini kit protocol or the RNeasy Plant Mini Kit protocol. Both protocols gave similar reading of relative viral RNA content and did not affect the genetic composition of viral populations.

Real-time RT-PCR viral RNA quantifications. BNYVV titers in 20 ng of total RNA per sample were estimated by relative real-time RT-PCR quantifications using 18S ribosomal RNA as the endogenous control and a minimally infected sample as the calibrator. This procedure determines the number of times a target RNA is above or below the calibrator sample that is included as a second reference. Because we used a calibrator sample with the lowest detectable amount of viral RNA (ca. 100 molecules per ng of total RNA previously estimated by absolute quantification), all positive test samples were those with a virus titer above the calibrator sample. Primers 50F (5'-CCGTTTTCCACAGACACTAACTATGTA-3') and 51R (5'-TGCTAACCCTGAATCAGTTAAAGTACTT-3') plus TaqMan probe NYCP (6FAM-TGCACTTGTGTTATATGTTAATCTGTCTGACCCAG-TAMRA) were incorporated in one-step RT-PCR to target the core of the CP gene in RNA-2. Real-time reactions were performed by an ABI Prism 7000 system using the following parameters: reverse transcription at 48ºC for 30 min, reverse transcriptase inactivation at 95ºC for 10 min, and amplification during 40 cycles of denaturing at 95ºC for 15 s and annealing at 60ºC for one min.

Cloning, sequencing and sequencing analysis. First strand cDNA was synthesized using the Omniscript® reverse transcriptase kit. PCR was performed in a second tube and DNA amplification occurred during 30 cycles of denaturing at 94ºC for 30 s, annealing at 56ºC for 30 s, and extending at 68ºC for 1 min 30 s. Amplicons were cleaned, quantified by spectrophotometry, and submitted for consensus DNA sequencing and/or recombined with pCR-Blunt vector for sequencing individual cDNA clones. Amplicons and plasmid DNA were sequenced by Beckman Coulter Genomics Inc.

The basic processing of cDNA sequences, such as assembling, correction, and alignment was performed with Lasergene package v8, and the chromatograms were inspected with Sequence Scanner v1.0 to verify the presence of mutations. Genetic relationships were determined by the neighbor-joining algorithm as implemented in MEGA 3.1. This software was also used to calculate genetic distances between individual sequences and groups of sequences. Genetic differentiation between pairs of populations was statistically estimated by the Wright's FST index of dissimilarity.

Results

Diversification and survival of BNYVV from planting to planting. In each of three serial host plantings, 12 inoculated and 12 non-inoculated plants of each sugar beet genotype were grown and harvested at 12 to 14 weeks after planting, to determine virus content in root tissue. Except for one non-inoculated *Rz2*-plant that may have been accidentally contaminated during the first planting, no BNYVV was detected by real-time RT-PCR in the negative controls. Only in resistant sugar beets, virus titer decreased from planting to planting to the point where the percentage of infected plants was, by the end of the experiment, 70 and 37 in *Rz1* and *Rz2* genotypes, respectively. Because virus titer in the susceptible controls was similar from planting to planting, this trend in resistant plants indicated that the reload of viable virus into the soil from the previously infected plants played a significant role in the amount of inoculum available for the following host planting, and that host resistance significantly affected this variable.

Consensus DNA sequencing of each single-plant isolate revealed that some carried a mutation undetected in the original wild type virus population. None of these mutations were passed to the progeny during the following host planting, which suggests that virus lineages were rarely, if ever fixed in the population, during the course of the experiment. Significantly, 1.8 to 4.9 times more mutations were detected in resistant than susceptible plants. This high frequency of mutations was more prevalent during the second host planting and in *Rz2*- than *Rz1*-plants. By the third host planting, all of the six sequenced isolates from *Rz1*-plants were wild type, which suggests that, at this stage, the low content of competent mutants in the inoculum was depleted or at very low frequency in the resting spores of *P. betae*.

Host effect on the genetic diversity of BNYVV in the field. To determine if a similar host genotype-virus variability relationship was taking place in the field, viral isolates extracted from *Rz1*, *Rz2*, and susceptible symptomatic plants collected from southern Minnesota were consensus sequenced on the same RNA-3 region. The lowest nucleotide diversity was among isolates from susceptible plants ($\pi = 0.00038 \pm 0.0002$) with an average nucleotide difference between isolates of 0.50 ± 0.2 (Table 4). From this baseline, the genetic diversity was around two and five times greater between isolates from *Rz1* and *Rz2* symptomatic plants, respectively. These values agree with the data obtained through the serial host planting experiment and indicate that the type and/or strength of sugar beet resistance against BNYVV accumulation also affect the diversification of BNYVV in the field.

Discussion

By comparing the genetic structure of BNYVV populations generated in susceptible and resistant plants from the same parental wild type population, we found that the same wild type haplotype predominated in most of the susceptible plants, which is consistent with the high genetic stability of BNYVV observed in the field. By contrast, resistant plants were more frequently infected by different predominant haplotypes that might have been randomly picked from the original soil inoculum. Once the test plants were infected by a founder haplotype, spontaneous mutations in the progeny gave place to a spectrum of mutants closely related to each other by descent, but vertical transmission was not detected for any of these mutants. In addition, the data presented in this work demonstrate that virus diversification was directly proportional to strength of plant resistance to virus accumulation in root tissue. This virus behavior also occurred in the field and may define the capability of BNYVV to eventually overcome host resistance through the incorporation of adaptive mutations. To our knowledge, this is the first empirical demonstration of a relationship between the strength of plant resistance to virus accumulation and the populational genetic diversity of a plant virus.

The differential responses between resistant and susceptible plants during the serial planting experiment indicate that reloading of the soil with viruliferous *P. betae* was important in maintaining the high incidence of BNYVV infections observed in susceptible plants. Therefore, the reduced virus occurrence in resistant plants by the end of the experiment could be explained by at least two possible non-exclusive hypotheses. First, infectious particles carried on by the vector from the source plant into the soil and then from the soil into the following test plant may have been drastically reduced. It has been demonstrated that partial sugar beet resistance to BNYVV accumulation in lateral roots decreases the proportion of viruliferous resting spores of *P. betae* without affecting the reproduction of the vector (12). Therefore, acquisition of BNYVV could have been reduced in the *Rz1* and *Rz2* source plants according to their virus titer. Second, most virus mutants may have had reduced capacity to survive out of the plant or be transmitted by *P.*

betae. At present, no evidence supports this possible scenario, but further studies comparing the genetic composition of virus populations extracted from source plants versus viruliferous zoospore suspensions might shed some light on this aspect.

The fact that none of the mutants was vertically transmitted through the same lineage was an unexpected finding but, at the same time, it provides a more realistic idea about the chances a BNYVV mutant might have to predominate in the crop from season to season. To be successful, a BNYVV mutant most likely needs to be positively selected and, moreover, be in numerical superiority against the parental wild type population residing in the soil. Thus, the type of relationship between size and complexity of BNYVV populations in restrictive host environments seems to be a suitable parameter to assess the risk of resistance breakdown.

Literature Cited

1. Acosta-Leal, R., B. Brian, J. Smith, and C.M. Rush. 2010. Breakdown of host resistance by independent evolutionary lineages of Beet necrotic yellow vein virus involves a parallel C/U mutation in its p25 gene. Phytopathology 100: 127-133
2. Acosta-Leal, R., B.K. Bryan, and C.M. Rush. 2010. Host Effect on the Genetic Diversification of Beet necrotic yellow vein virus Single-plant Populations. Phytopathology. 100: 1204-1212.
3. Acosta-Leal, R., Fawley, M. W., and Rush, C. M. 2008. Changes in the intraisolate genetic structure of *Beet necrotic yellow vein virus* populations associated with plant resistance breakdown. Virology 376: 60-68.
4. Acosta-Leal, R. and Rush, C. M. 2007. Mutations associated with resistance-breaking isolates of *Beet necrotic yellow vein virus* and their allelic discrimination using TaqMan technology. Phytopathology 97: 325-330.
5. Hebrard, E., Pinel-Galzi, A., Bersoult, A., Sire, C., and Fargette, D. 2006. Emergence of a resistance-breaking isolate of Rice yellow mottle virus during serial inoculations is due to a single substitution in the genome-linked viral protein VPg. J. Gen. Virol. 87: 1369-1373.
6. Jridi, C., Martin, J. F., Marie-Jeanne, V., Labonne, G., and Blanc, S. 2006. Distinct viral populations differentiate and evolve independently in a single perennial host plant. J. Virol. 80: 2349-2357.
7. Koenig, R., et. al. 2009. A single U/C nucleotide substitution changing alanine to valine in the *Beet necrotic yellow vein* virus P25 protein promotes increased virus accumulation in roots of mechanically inoculated, partially resistant sugar beet seedlings. J. Gen. Virol. 90: 759-763.
8. Liu, H. Y. and Lewellen, R. T. 2007. Distribution and molecular characterization of resistance-breaking isolates of *Beet necrotic yellow vein virus* in the United States. Plant Dis. 91: 847-851.
9. Rico, P., Ivars, P., Elena, S. F., and Hernandez, C. 2006. Insights into the selective pressures restricting Pelargonium flower break virus genome variability: Evidence for host adaptation. J. Virol. 80: 8124-8132.
10. Rush, C. M., Liu, H. Y., Lewellen, R. T., and Acosta-Leal, R. 2006. The continuing saga of rhizomania of sugar beets in the United States. Plant Dis. 90: 4-15.
11. Schirmer, A., Link, D., Cognat, V., Moury, B., Beuve, M., Meunier, A., Bragard, C., Gilmer, D., and Lemaire, O. 2005. Phylogenetic analysis of isolates of Beet necrotic yellow vein virus collected worldwide. J. Gen. Virol. 86: 2897-2911.
12. Tuitert, G., Oorschot, M.-V., and Heijbroek, W. 1994. Effect of sugar beet cultivars with different levels of resistance to Beet necrotic yellow vein virus on transmission of virus by Polymyxa betae. Eur. J. Plant Pathol. 100: 201-220.

Acknowledgements

We thank Mark Bredehoeft (Southern Minnesota Beet Sugar Cooperative) and Al Cattanach (American Crystal Sugar Company) for their support and advice during field surveys. This work was funded in part by grants from the Beet Sugar Development Foundation, the Minnesota and North Dakota Research and Education Board, and USDA-NRI (Grant No. 2008-35319-04472).

SMBSC Evaluation of Fungicides for control of Cercospora Leaf Spot in Sugarbeet Growth-
A report of data from 2009 and 2010 combined

Objectives

The objectives of the fungicide testing in 2009 and 2010 for control of cercospora leaf spot was two fold. There were two test conducted to evaluate fungicides for cercospora leaf spot control.

The first test discussed in this report is an evaluation of individual fungicides to determine efficacy of the individual chemistry and the influence on sugarbeet production. This test will be termed as evaluation of single mode chemistry (Exp. # 0941 and 1041). The testing of the fungicides in this manner is to determine the efficacy of the individual product (active ingredient) and is not meant as an indicator of how the products should be used. A single fungicide should be never be used as a sole control of cercospora leaf spot with in a production season.

The second test discussed in this report is an evaluation of program scenarios for control of cercospora leaf spot and the influence on sugarbeet production. This test will be termed as evaluation of fungicide programs (Exp. # 0946 and 1046). This test is designed to determine how the products should be used with in a spray program. This is different form the single mode fungicide testing in that the first test (0941 and 1041) is only to test the individual product and not as a recommended practice and the test evaluating a spray program is geared toward developing recommendations.

Methods

Table 1 shows the specifics of activities conducted at the cercospora leaf spot sites in 2009 and 2010. Plots were 11 ft. (6 rows) wide and 35 ft long. The tests were replicated 6 times. Sugarbeets were not thinned since the stand did not warrant thinning. Normal production practices were conducted on the sugarbeets within the testing area. Sugarbeets were harvested on October 20th in 2009 and October 8th in 2010 with a 2 row research harvester. Sugar beets were weighed on the harvester for calculation of yield and a subsample was collected and analyzed in the SMBSC quality lab for sugar percent, purity and brie nitrate. The efficacy of the product was evaluated after each fungicide application. The KWS rating scale of 1-9 was used.

Results and Discussion

Fungicide Single Chemistry evaluation for Cercospora leaf spot control and sugar beet production

Tables 2-4 shows the data collected from the testing of fungicides with single chemistry. These tests were conducted as basic research to determine the value and efficacy of an individual fungicide. Table 2 and 3 show the results of the treatments effects on cercospora leaf spot control and sugar beet production in 2009 and 2010, respectively. Table 4 shows the results of the treatments effect on cercospora leaf spot control and sugar beet production with the data combined over the two years (2009-2010). The results will be discussed based on the data combined over the two years and are as follows.

1. All treatments significantly increased cercospora leaf spot control, sugar beet production and revenue compared to the treatments where no fungicide was applied (check).

2. Picoxy is an experimental fungicide that did not perform very well relative to all other products.

3. Headline gave percent revenue (revenue expressed as a percent of the mean) significantly greater than all other products except for Inspire XT. Inspire XT and Headline gave statistically similar percent revenue.

4. Proline and Inspire XT gave percent revenue that was statistically similar.

5. Sugar beet production and cercospora leaf spot control was statistically similar for Inspire XT, Proline, Gem and Headline.

6. The treatment with Proline and Gem applied in combination did not perform very well in 2009 but the performance in 2010 was good, thus the overall (2 yr) performance was significantly below the 2 year performance of Gem or Proline alone. Another year of testing will need to be conducted to determine the true efficacy of this treatment. The application of both products could be used as a resistance management strategy.

0946 Renville CLS Fungicide

Table 1a. Site Specific for CLS Fungicide, 2009

DATE	PLANTED	SPACING	SPRAYED	APPLIED	RATE	WEATHER	Innoculated
5/9/2009	X	5 "					
5/27/2009			X	Glyphoste	32 oz.	65' CloudySW 10	
6/5/2009			X	Quadris	30 oz.	65' N 10-15, Sunny'	
6/15/2009			X	Glyphoste	22 oz.	75' NW 5 sunny	
7/6/2009						Warm and humid	1st Innoculation
7/16/2009							2nd Innoculation
7/22/2009			1st app			80' NW 10 cloudy	
8/5/2009			2nd app			85 NW 5-10 P. Cloudy	
8/19/2009			3rd app			75 SW cloudy	
9/2/2009			4th app			75 NW sunny	

1046 Renville CLS Fungicide

Table 1b. Site Specific for CLS Fungicide, 2010

DATE	PLANTED	Harvest Date	SPACING	SPRAYED	APPLIED	RATE	WEATHER
4/20/2010	X		5"				
5/22/2010				X	Assana	4oz	80' Sunny S-5
5/26/2010				X	Roundup,Max	22oz	80' Pcloudy, NE-5
					Stinger	8oz	
6/22/2010				X	Quadris	14.2oz	85' Pcloudy, SE-5
7/21/2010				1st App			80' Cloudy, RH 70%
8/3/2010				2nd App			93' Sunny, RH 70%
8/12/2010				X			90' Sunny, SE 10-15
8/17/2010				3rd App			73' Sunny, RH 44%,
10/8/2010		X					

Table 2. Influence of Fungicides Applied as Single Mode of Action on Cercospora Leaf Spot and Sugarbeet Production, 2010

Trt No.	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 7/28/09	CLS Rating 8/11/09	CLS Rating 8/25/09	Tons	Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Check	N/A	N/A	2	2	6	18.6	14.10	91.71	239	4457	57.35
2	PICOXY SC + NIS	6 +2%	First appl.	2	2	2	24.0	15.32	93.11	266	6394	91.36
	PICOXY SC + NIS	6 +2%	14									
	PICOXY SC + NIS	6 +2%	14									
3	PICOXY SC + NIS	9 + 2%	First appl.	2	2	3	21.3	15.01	92.92	260	5522	77.04
	PICOXY SC + NIS	9 + 2%	14									
	PICOXY SC + NIS	9 + 2%	14									
4	PICOXY SC + NIS	12 + 2%	First appl.	2	2	2	24.2	15.05	92.83	260	6301	88.26
	PICOXY SC + NIS	12 + 2%	14									
	PICOXY SC + NIS	12 + 2%	14									
5	EMINENT	13	First appl.	1	1	2	27.4	15.85	92.85	275	7530	110.34
	EMINENT	13	14									
	EMINENT	13	14									
6	HEADLINE	9.2	First appl.	2	2	2	31.5	15.67	93.09	272	8582	124.74
	HEADLINE	9.2	14									
	HEADLINE	9.2	14									
7	PROLINE+NIS	5+0.125%	First appl.	2	1	2	31.6	15.31	92.28	263	8310	117.21
	PROLINE+NIS	5+0.125	14									
	PROLINE+NIS	5+0.125	14									
8	GEM 500 SC	3.5	First appl.	1	2	2	31.5	15.48	92.93	268	8434	121.00
	GEM 500 SC	3.5	14									
	GEM 500 SC	3.5	14									
9	INSPIRE-XT A8122	7	First appl.	1	1	1	31.3	16.01	93.33	280	8783	130.80
	INSPIRE-XT A8122	7	14									
	INSPIRE-XT A8122	7	14									
10	QUADRIS TOPS-A13703	8.5	First appl.	1	2	1	28.6	15.75	92.29	271	7773	112.66
	QUADRIS TOPS-A13703	8.5	14									
	QUADRIS TOPS-A13703	8.5	14									
11	TAEGRO	2.6	First appl.	1	2	2	28.9	15.29	93.03	265	7688	109.49
	TAEGRO	2.6	14									
	TAEGRO	2.6	14									
12	TAEGRO	5.2	First appl.	2	2	3	29.7	14.33	91.40	242	7201	93.85
	TAEGRO	5.2	14									
	TAEGRO	5.2	14									
13	EMINENT	13	First appl.	2	2	2	31.4	15.63	92.71	270	8492	122.71
	EMINENT	13	14									
	EMINENT	13	14									
14	SUPERTIN	5	First appl.	2	2	3	31.0	15.04	92.57	259	8026	111.63
	SUPERTIN	5	14									
	SUPERTIN	5	14									
15	JAU6476&TRIFLOXYSTROBIN	11	First appl.	1	1	1	29.1	15.58	92.92	270	7864	113.45
	JAU6476&TRIFLOXYSTROBIN	11	14									
	JAU6476&TRIFLOXYSTROBIN	11	14									
16	Agritin	5	First appl.	2	2	3	28.6	14.74	92.46	253	7219	98.10
	Agritin	5	14									
	Agritin	5	14									
17	GEM 500 SC +PROLINE+NIS	2 + 3+.125%	First appl.	2	2	5	21.3	13.98	91.17	235	5008	63.32
	GEM 500 SC +PROLINE+NIS	2 + 3+.125%										
	GEM 500 SC +PROLINE+NIS	2 + 3+.125%										
18	Check	N/A	N/A	2	2	6	20.1	13.73	90.80	230	4609	56.64
			CV	13	15	27	9.5	4.35	0.71	5	11	14.39
			LSD(.05)	0	0	1	3.7	0.93	0.93	18	18	20.42

Table 3. Influence of Fungicides Applied as Single Mode of Action on Cercospora Leaf Spot control and Sugarbeet Production, 2010

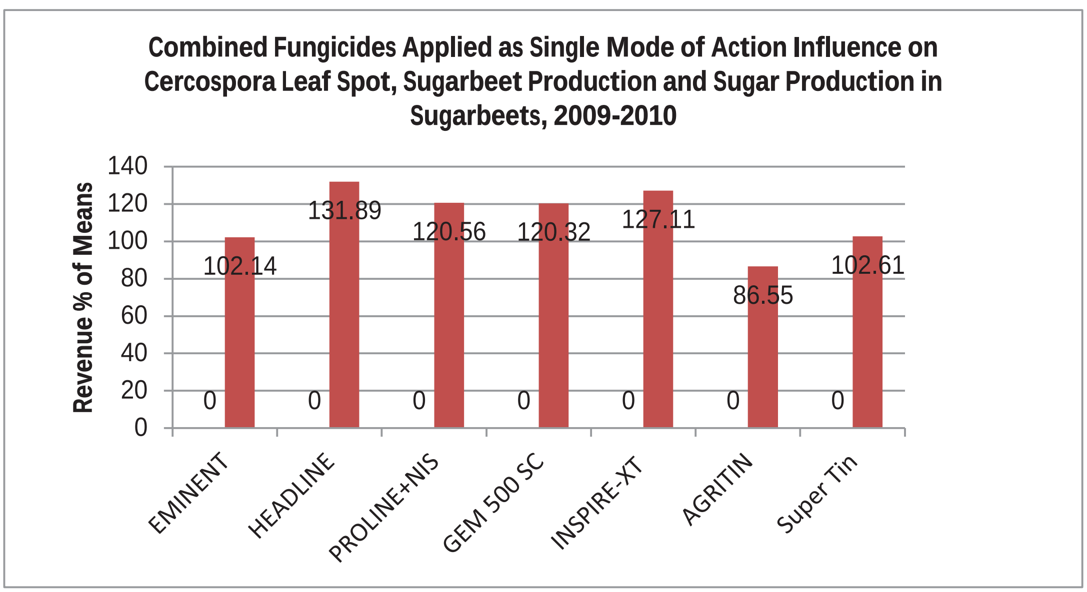
Trt No.	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 8/2/10	CLS Rating 8/12/10	CLS Rating 8/25/10	Tons	Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Check	N/A	N/A	3	8	9	28.6	13.02	87.81	207	5912	49.85
2	PICOXY SC + NIS	6 +2%	First appl.	2	4	6	33.9	14.84	90.35	247	8395	88.10
	PICOXY SC + NIS	6 +2%	14									
	PICOXY SC + NIS	6 +2%	14									
3	PICOXY SC + NIS	9 + 2%	First appl.	2	5	7	31.9	13.26	89.42	217	6924	62.65
	PICOXY SC + NIS	9 + 2%	14									
	PICOXY SC + NIS	9 + 2%	14									
4	PICOXY SC + NIS	12 + 2%	First appl.	2	3	6	35.3	14.24	90.36	237	8379	84.22
	PICOXY SC + NIS	12 + 2%	14									
	PICOXY SC + NIS	12 + 2%	14									
5	EMINENT	13	First appl.	2	3	4	35.4	15.11	89.86	250	8847	93.95
	EMINENT	13	14									
	EMINENT	13	14									
6	HEADLINE	9.2	First appl.	2	2	3	37.0	17.37	92.83	303	11203	139.04
	HEADLINE	9.2	14									
	HEADLINE	9.2	14									
7	PROLINE+NIS	5+0.125%	First appl.	2	2	3	37.1	16.43	92.21	283	10492	123.91
	PROLINE+NIS	5+0.125	14									
	PROLINE+NIS	5+0.125	14									
8	GEM 500 SC	3.5	First appl.	2	3	3	37.5	16.08	91.88	276	10338	119.65
	GEM 500 SC	3.5	14									
	GEM 500 SC	3.5	14									
9	INSPIRE-XT	7	First appl.	2	2	3	35.2	16.95	91.82	291	10232	123.42
	INSPIRE-XT	7	14									
	INSPIRE-XT	7	14									
10	QUADRIS	9.2	First appl.	2	3	4	35.9	15.49	91.65	264	9507	106.24
	QUADRIS	9.2	14									
	QUADRIS	9.2	14									
11	QUADRIS + INSPIRE XT	9.2 + 7	First appl.	2	2	3	38.6	16.98	91.79	292	11228	135.44
	QUADRIS + INSPIRE XT	9.2 + 7	14									
	QUADRIS + INSPIRE XT	9.2 + 7	14									
12	QUADRIS + INSPIRE XT	6 + 4	First appl.	2	2	3	38.4	16.10	90.60	271	10409	118.73
	QUADRIS + INSPIRE XT	6 + 4	14									
	QUADRIS + INSPIRE XT	6 + 4	14									
13	QUADRIS + INSPIRE XT	4 + 4	First appl.	2	2	3	40.8	16.47	91.77	282	11489	135.27
	QUADRIS + INSPIRE XT	4 + 4	14									
	QUADRIS + INSPIRE XT	4 + 4	14									
14	EMINENT	13	First appl.	2	3	4	36.2	15.01	90.37	251	9093	96.81
	EMINENT	13	14									
	EMINENT	13	14									
15	SUPERTIN	5	First appl.	2	3	5	34.7	15.04	90.64	252	8745	93.59
	SUPERTIN	5	14									
	SUPERTIN	5	14									
16	AGRITIN	5	First appl.	2	4	7	33.5	14.17	88.79	230	7718	75.00
	AGRITIN	5	14									
	AGRITIN	5	14									
17	GEM 500 SC +PROLINE+NIS	2 + 3+.125%	First appl.	2	2	4	37.2	16.09	90.83	272	10116	115.78
	GEM 500 SC +PROLINE+NIS	2 + 3+.125%	14									
	GEM 500 SC +PROLINE+NIS	2 + 3+.125%	14									
18	Check	N/A	N/A	3	8	9	31.0	13.42	89.31	219	6791	62.11
			CV	13	17	16	5.3	4.07	1.98	5	7	11.13
			LSD(.05)	0	1	1	2.7	0.89	2.55	19	965	16.00

2009-2010 Combined Fugicide Screening

Table 4 Site Specific for Fungicide Screening Single Mode of Action.

Trt No.	FUNGICIDE	Rate oz/acre	Interval Days	Avg CLS Rating	Avg CLS Rating	Avg CLS Rating	Tons	Sugar %	Purity	Ext. Suc.per ton	Ext. Suc.per acre	% Revenue
1	Check	N/A	N/A	2.22	5.22	7.38	23.6	13.6	89.8	223	5185	53.60
2	PICOXY SC + NIS	6 +2%	14	1.84	2.84	3.83	29.0	15.1	91.7	257	7395	89.73
	PICOXY SC + NIS	6 +2%	14									
	PICOXY SC + NIS	6 +2%	14									
3	PICOXY SC + NIS	9 + 2%	14	1.81	3.47	4.89	26.6	14.1	91.2	238	6223	69.85
	PICOXY SC + NIS	9 + 2%	14									
	PICOXY SC + NIS	9 + 2%	14									
4	PICOXY SC + NIS	12 + 2%	14	1.73	2.64	4.09	29.7	14.6	91.6	249	7340	86.24
	PICOXY SC + NIS	12 + 2%	14									
	PICOXY SC + NIS	12 + 2%	14									
5	EMINENT	13	14	1.63	1.98	2.78	31.4	15.5	91.4	263	8188	102.14
	EMINENT	13	14									
	EMINENT	13	14									
6	HEADLINE	9.2	14	1.67	2.02	2.45	34.3	16.5	93.0	288	9893	131.89
	HEADLINE	9.2	14									
	HEADLINE	9.2	14									
7	PROLINE+NIS	5+0.125%	14	1.50	1.64	2.05	34.3	15.9	92.2	273	9401	120.56
	PROLINE+NIS	5+0.125	14									
	PROLINE+NIS	5+0.125	14									
8	GEM 500 SC	3.5	14	1.55	2.09	2.67	34.5	15.8	92.4	272	9386	120.32
	GEM 500 SC	3.5	14									
	GEM 500 SC	3.5	14									
9	INSPIRE-XT	7	14	1.58	1.83	2.14	33.2	16.5	92.6	285	9507	127.11
	INSPIRE-XT A8122	7	14									
	INSPIRE-XT A8122	7	14									
14	SUPERTIN	5	14	1.91	2.59	3.67	32.8	15.0	91.6	256	8386	102.61
	SUPERTIN	5	14									
	SUPERTIN	5	14									
16	AGRITIN	5	14	1.91	3.20	4.95	31.1	14.5	90.6	242	7469	86.55
	SA-Tin		14									
	SA-Tin		14									
17	GEM 500 SC +PROLINE+NIS	2 + 3+.125%	14	1.73	2.16	4.28	29.2	15.0	91.0	254	7562	89.55
18	Check	N/A	N/A	2.34	4.83	7.39	25.5	13.6	90.1	224	5700	59.37
	-control		CVT.	13.17	17.29	19.02	6.5	3.6	1.4	4	7	10.19
			LSD(0.5)	0.57	2.99	2.68	5.5	1.9	2.2	41	1743	30.34

Table 4 Graph



Results and Discussion

Fungicide program evaluation for Cercospora leaf spot control and sugarbeet production

Tables 2-4 shows the data collected from the testing of fungicides with single chemistry. These tests were conducted as basic research to determine the value and efficacy of an individual fungicide. Table 5 and 6 show the results of the treatments effects on cercospora leaf spot control and sugar beet production in 2009 and 2010, respectively. Table 7 shows the results of the treatments effect on cercospora leaf spot control and sugar beet production with the data combined over the two years (2009-2010). The results will be discussed based on the data combined over the two years and are as follows.

1. All treatments significantly increased cercospora leaf spot control, sugar beet production and revenue compared to the treatments where no fungicide was applied (check).

2. In similar treatments with Proline and Supertin in the first and second application respectively, Headline outperformed Gem for percent revenue (revenue expressed as a percent of the mean. In this treatment scenario in 2010 the performance was statistically similar; however in 2009 this treatment scenario with Gem performed significantly poorer than when Headline was included in the program scenario.

3. The addition of Topsin to the Supertin in the 2nd application significantly increased the performance of the Proline/Supertin/Gem scenario. This is primarily due to the poor performance of the Proline/Supertin/Gem scenario in the 2009 testing.

4. The application of Proline and Gem together in the first application or an early Proline (trt 7) significantly increased the control of the Proline/Supertin/Gem scenario. In 2010 an early application of Quadris with the Proline/Supertin/Gem scenario resulted in cercospora leaf sot and sugar beet production similar to when proline was applied in an early application with the Proline/Supertin/Gem scenario.

5. The application of the traizole products (Eminent, Inspire XT and Proline) performed equally when included in a program scenario as tested in the fungicide program testing.

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Table 5a. Influence of Fungicide Program for Control of Cercospora Leaf Spot and Sugarbeet Production, 2009

TRT	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 7/28/09	CLS Rating 8/11/09	CLS Rating 8/25/09	CLS Rating 9/16/09	Tons	% Sugar	Purity
1	UNTREATED CHECK		14	1.5	2.2	6.6	9.0	22.1	13.92	90.88
2	PROLINE SC + Induce XL	5+0.125% V/V	first appl.	1.5	2.0	6.4	9.0	23.9	14.42	91.71
	SUPER-TIN 80WP	3.75	14							
	GEM 500 SC	3.500	14							
3	PROLINCE SC+ INDUCE XL	5+0.125% V/V	first appl.	1.4	2.0	6.3	9.0	24.8	14.43	91.84
	SUPER-TIN 80WP	3.75	14							
	HEADLINE	7	14							
4	PROLINE SC + INDUCE XL	5+0.125% V/V	first appl.	1.5	1.9	6.3	9.0	25.2	14.38	91.56
	SUPER-TIN 80WP+ TOPSIN M	3.75+ 6.1	14							
	GEM 500 SC	4	14							
5	PROLINE SC+INDUCE XL	5+0.125% V/V	first appl.	1.5	2.0	6.4	9.0	24.0	14.29	91.50
	SUPER-TIN 80WP +TOPSIN M	3.75+ 6.1	14							
	HEADLINE	7	14							
6	JAU647 & TRIFLOXYSTROBIN	11	first appl.	1.5	2.0	6.4	9.0	24.5	14.38	91.65
	SUPER-TIN 80 WP	4	14							
	GEM 500 SC	4	14							
7	PROLINE SC + INDUCE	5+0.125% V/V	pre canopy	1.5	2.0	6.3	9.0	24.6	14.37	91.64
	PROLINE SC + INDUCE	5+0.125% V/V	first appl.							
	SUPER-TIN 80 WP	4	14							
	GEM 500 SC	4	14							
8	Inspire XT	7	first appl.	1.5	2.0	6.3	9.0	24.6	14.35	91.59
	Supertin	5	14							
	Headline	9	14							
9	EMINENT	13	first appl.	1.5	2.0	6.4	9.0	24.4	14.35	91.59
	SUPER TIN 80 WP	5	14							
	HEADLINE	9.2	14							
10	Eminent	13	first appl.	1.5	2.0	6.3	9.0	24.5	14.36	91.62
	SA-140301	5	14							
	HEADLINE 2.09	9	14							
11	Eminent	13	first appl.	1.5	2.0	6.3	9.0	24.5	14.36	91.61
	HEADLINE 2.09	9	14							
	SA-140301	5	14							
12	QUADRIS TOPS-A13703	8.5	first appl.	1.5	2.0	6.4	9.0	24.5	14.36	91.60
	SUPER TIN	5	14							
	QUADRIS TOPS-A13703	8.5	14							
13	QUADRIS TOPS-A13703	8.5	first appl.	1.5	2.0	6.4	9.0	24.5	14.36	91.61
	PROLINE SC+INDUCE	5+0.125%	14							
	SUPER-TIN 80WP	3.75	14							
	GEM 500 SC	3.5	14							
14	SUPER TIN 80 WP	5	first appl.	1.5	2.0	6.3	9.0	24.5	14.36	91.61
	EMINENT	13	14							
	SUPER TIN 80 WP	5	14							
	HEADLINE	9.2	14							
15	PROLINE SC + INDUCE	5oz /A + 0.125% V/V	first appl.	1.5	2.0	6.3	9.0	24.5	14.36	91.61
	SUPER TIN 80 WP	5	14							
	HEADLINE	9.2	14							
16	EMINENT	13	first appl.	1.5	2.0	6.4	9.0	24.5	14.36	91.61
	SUPER TIN 80 WP	5	14							
	HEADLINE	9.2	14							
	SUPER TIN 80 WP	5	14							
17	EMINENT	13	first appl.	1.5	2.0	6.4	9.0	24.5	14.36	91.61
	SUPER TIN 80 WP	5	as needs							
	HEADLINE	9.2	as needs							
18	EMINENT	13	as needed	1.5	2.0	6.3	9.0	24.5	14.36	91.61
	SUPER TIN 80 WP	5	needs							
	HEADLINE	9.2	needs							
19	Inspire XT	7	first appl.	1.5	2.0	6.3	9.0	24.5	14.36	91.61
	Supertin	5	14							
	Headline	9	14							
20	Check	N/A		1.5	2.0	6.4	9.0	24.5	14.36	91.61
			CV	**10.6**	**15.4**	**15.0**	**24.2**	**3.0**	**3.70**	**0.96**
			LSD(0.5)	**0.2**	**0.4**	**0.5**	**1.4**	**4.2**	**0.82**	**1.26**

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Table 5b. Influence of Fungicide Program for Control of cercospora Leaf Spot and Sugarbeet Production in Sugarbeets, 2009

TRT	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 9/16/09	Ext. Suc.per ton	Ext. Suc.per acre	% Revenue
1	UNTREATED CHECK		14	9.0	234	5283	56.15
2	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	9.0	245	5912	88.85
	SUPER-TIN 80WP	3.75oz/A	14				
	GEM 500 SC	3.5oz/A	14				
3	PROLINCE SC+ INDUCE XL	5oz /A+0.125% V/V	first appl.	9.0	246	6148	103.56
	SUPER-TIN 80WP	3.75oz/A	14				
	HEADLINE	7oz /A	14				
4	PROLINE SC + INDUCE XL	5oz /A + 0.125% V/V	first appl.	9.0	244	6219	102.16
	SUPER-TIN 80WP+ TOPSIN M	3.75oz/A + 6.1oz./A	14				
	GEM 500 SC	3.5oz/A	14				
5	PROLINE SC+INDUCE XL	5oz /A+0.125% V/V	first appl.	9.0	242	5891	104.91
	SUPER-TIN 80WP +TOPSIN M	3.75oz/A+6.1 oz./A	14				
	HEADLINE	7oz /A	14				
6	JAU647 & TRIFLOXYSTROBIN	11 oz/A	first appl.	9.0	244	6043	100.44
	SUPER-TIN 80 WP	3.75oz/A	14				
	GEM 500 SC	3.5oz/A	14				
7	PROLINE SC + INDUCE	5oz /A + 0.125% V/V	pre canopy	9.0	244	6075	108.57
	PROLINE SC + INDUCE	5oz /A +0.125% V/V	first appl.				
	SUPER-TIN 80 WP	3.75oz/A	14				
	GEM 500 SC	3.5oz/A	14				
8	Inspire XT	7 oz./A	first appl.	9.0	244	6057	108.50
	Supertin	5 oz/A	14				
	Headline	9 oz/A	14				
9	EMINENT	13 oz/A	first appl.	9.0	243	6016	113.62
	SUPER TIN 80 WP	5 oz/A	14				
	HEADLINE	9.2 oz/A	14				
10	Eminent	13	14	9.0	244	6048	94.90
	SA-140301	5	14				
	HEADLINE 2.09	9	14				
11	Eminent	13	14	9.0	244	6049	118.56
	HEADLINE 2.09	9	14				
	SA-140301	5	14				
12	QUADRIS TOPS-A13703	8.5	14	9.0	244	6043	111.69
	SUPER TIN	5	14				
	QUADRIS TOPS-A13703	8.5	14				
13	QUADRIS TOPS-A13703	8.5		9.0	244	6039	123.37
	PROLINE SC+INDUCE	5+0.125%	14				
	SUPER-TIN 80WP	3.75	14				
	GEM 500 SC	3.5	14				
14	SUPER TIN 80 WP	5	14	9.0	244	6045	113.34
	EMINENT	13	14				
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
15	PROLINE SC + INDUCE	5oz /A + 0.125% V/V	14	9.0	244	6044	93.68
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
16	EMINENT	13	14	9.0	244	6043	104.11
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
	SUPER TIN 80 WP	5	14				
17	EMINENT	13	14	9.0	244	6042	92.69
	SUPER TIN 80 WP	5	needs				
	HEADLINE	9.2	needs				
18	EMINENT	13	needs	9.0	244	6043	97.90
	SUPER TIN 80 WP	5	needs				
	HEADLINE	9.2	needs				
19	Inspire XT	7 oz./A		9.0	244	6043	106.70
	Supertin	5 oz/A					
	Headline	9 oz/A					
20	Check	N/A		9.0	244	6043	56.29
			CVT.	**24.2**	**4**	**10**	**11.21**
			LSD(0.5)	**1.4**	**17**	**1174**	**157.56**

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Table 6a. Influence of Fungicide Program for Control of cercospora Leaf Spot and Sugarbeet Production, 2010

TRT	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 8/2/10	CLS Rating 8/12/10	CLS Rating 8/25/10	Tons	% Sugar	Purity
1	UNTREATED CHECK		14	2.4	7.4	9.0	29.8	15.90	97.63
2	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	1.5	3.6	5.1	34.5	15.90	89.97
	SUPER-TIN 80WP	3.75oz/A	14						
	GEM 500 SC	3.5oz/A	14						
3	PROLINCE SC+ INDUCE XL	5oz /A+0.125% V/V	first appl.	1.2	3.4	4.7	38.6	15.69	90.33
	SUPER-TIN 80WP	3.75oz/A	14						
	HEADLINE	7oz /A	14						
4	PROLINE SC + INDUCE XL	5oz /A + 0.125% V/V	first appl.	1.4	2.7	3.6	34.8	16.48	91.51
	SUPER-TIN 80WP+ TOPSIN M	3.75oz/A + 6.1oz./A	14						
	GEM 500 SC	3.5oz/A	14						
5	PROLINE SC+INDUCE XL	5oz /A+0.125% V/V	first appl.	1.8	3.0	3.6	37.0	16.23	91.38
	SUPER-TIN 80WP +TOPSIN M	3.75oz/A+6.1 oz./A	14						
	HEADLINE	7oz /A	14						
6	JAU647 & TRIFLOXYSTROBIN	11 oz/A	first appl.	1.4	2.4	2.9	36.1	16.87	91.41
	SUPER-TIN 80 WP	3.75oz/A	14						
	GEM 500 SC	3.5oz/A	14						
7	PROLINE SC + INDUCE	5oz /A + 0.125% V/V	pre canopy	1.5	2.8	3.9	38.3	15.78	90.96
	PROLINE SC + INDUCE	5oz /A +0.125% V/V	first appl.						
	SUPER-TIN 80 WP	3.75oz/A	14						
	GEM 500 SC	3.5oz/A	14						
8	Inspire XT	7 oz./A	first appl.	1.5	2.9	3.9	35.6	16.14	89.73
	Supertin	5 oz/A	14						
	Headline	9 oz/A	14						
9	EMINENT	13 oz/A	first appl.	1.6	3.3	4.1	34.8	15.44	89.92
	SUPER TIN 80 WP	5 oz/A	14						
	HEADLINE	9.2 oz/A	14						
10	QUADRIS + INSPIRE	6 oz/A+4 oz/A	first appl.	1.8	2.4	3.8	33.8	15.85	88.64
	SUPER TIN	5 oz/A	14						
	QUADRIS + INSPIRE	8.5 oz/A	14						
11	QUADRIS	9.2 oz/A	pre canopy	1.7	2.6	4.1	33.6	16.54	90.41
	PROLINE SC+INDUCE	5 oz/A+0.125%	first appl.						
	SUPER-TIN 80WP	3.75 oz/A	14						
	GEM 500 SC	3.5 oz/A	14						
12	SUPER TIN 80 WP	5oz/A	first appl.	1.8	2.7	3.9	34.2	15.99	89.19
	EMINENT	13 oz/A	14						
	SUPER TIN 80 WP	5oz/A	14						
	HEADLINE	9.2 oz/A	14						
13	PROLINE SC + INDUCE	5oz /A + 0.125% V/V	first appl.	1.9	3.1	3.5	35.3	15.59	88.53
	SUPER TIN 80 WP	5 oz/A	14						
	HEADLINE	9.2 oz/A	14						
14	EMINENT	13 oz/A	first appl.	1.6	3.6	4.6	34.5	17.28	89.66
	SUPER TIN 80 WP	5 oz/A	14						
	HEADLINE	9.2 oz/A	14						
	SUPER TIN 80 WP	5 oz/A	14						
15	EMINENT	13 oz/A	14	1.4	2.8	4.5	36.1	16.34	89.04
	SUPER TIN 80 WP	5 oz/A	needs						
	HEADLINE	9.2 oz/A	needs						
16	EMINENT	13 oz/A	needs	1.8	3.3	4.9	33.0	15.94	90.01
	SUPER TIN 80 WP	5 oz/A	needs						
	HEADLINE	9.2 oz/A	needs						
17	Inspire XT	7 oz./A	first appl.	1.4	2.8	3.6	34.7	16.50	90.31
	Supertin	5 oz/A	14						
	Headline	9 oz/A	14						
18	Check	N/A		2.8	8.1	9.0	28.7	13.67	87.19
			CVT.	24.8	24.4	25.4	5.0	3.89	2.78
			LSD(0.5)	0.6	1.2	1.7	2.5	0.87	3.53

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Table 6b. Influence of Fungicide Program for Control of cercospora Leaf Spot and Sugarbeet Production in Sugarbeets, 2010

TRT	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 8/25/10	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	UNTREATED CHECK		N/A	9.0	216	6207	55.33
2	PROLINE SC + Induce XL	5+0.125% V/V	first appl.	5.1	265	9155	101.65
	SUPER-TIN 80WP	3.75	14				
	GEM 500 SC	3.5	14				
3	PROLINCE SC+ INDUCE XL	5+0.125% V/V	first appl.	4.7	263	10129	111.55
	SUPER-TIN 80WP	3.75	14				
	HEADLINE	7	14				
4	PROLINE SC + INDUCE XL	5+0.125% V/V	first appl.	3.6	281	9784	114.11
	SUPER-TIN 80WP+ TOPSIN M	3.75 + 6.1	14				
	GEM 500 SC	3.5	14				
5	PROLINE SC+INDUCE XL	5+0.125% V/V	first appl.	3.6	276	10237	117.71
	SUPER-TIN 80WP +TOPSIN M	3.75+6.1	14				
	HEADLINE	7	14				
6	JAU647 & TRIFLOXYSTROBIN	11	first appl.	2.9	288	10404	123.50
	SUPER-TIN 80 WP	3.75	14				
	GEM 500 SC	3.5	14				
7	PROLINE SC + INDUCE	5 + 0.125% V/V	pre canopy	3.9	267	10223	114.07
	PROLINE SC + INDUCE	5 +0.125% V/V	first appl.				
	SUPER-TIN 80 WP	3.75	14				
	GEM 500 SC	3.5	14				
8	Inspire XT	7	first appl.	3.9	268	9554	107.19
	Supertin	5	14				
	Headline	9	14				
9	EMINENT	13	first appl.	4.1	257	8931	96.33
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
10	QUADRIS + INSPIRE	6 +4	first appl.	3.8	259	8762	95.27
	SUPER TIN	5	14				
	QUADRIS + INSPIRE	8.5	14				
11	QUADRIS	9.2	pre canopy	4.1	278	9361	108.19
	PROLINE SC+INDUCE	5 +0.125%	first appl.				
	SUPER-TIN 80WP	3.75	14				
	GEM 500 SC	3.5	14				
12	SUPER TIN 80 WP	5	first appl.	3.9	264	9008	99.51
	EMINENT	13	14				
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
13	PROLINE SC + INDUCE	5 + 0.125% V/V	first appl.	3.5	254	8961	95.70
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
14	EMINENT	13	first appl.	4.6	288	9942	118.08
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
	SUPER TIN 80 WP	5	14				
15	EMINENT	13	first appl.	4.5	269	9709	109.16
	SUPER TIN 80 WP	5	as needs				
	HEADLINE	9.2	as needs				
16	EMINENT	13	as needed	4.9	266	8767	97.61
	SUPER TIN 80 WP	5	as needs				
	HEADLINE	9.2	as needs				
17	Inspire XT	7	first appl.	3.6	277	9626	110.90
	Supertin	5	14				
	Headline	9	14				
			CV	25.4	5	8	12.24
			LSD(0.5)	1.7	20	1056	17.38

Table 7a. Influence of Fungicide Program for Control of Cercospora Leaf Spot and Sugarbeet Production, 2009-2010

TRT	FUNGICIDE	Rate oz/acre	Interval Days	CLS Rating 8/2/10	CLS Rating 8/12/10	CLS Rating 8/25/10	Tons	% Sugar	Purity
1	UNTREATED CHECK		N/A	2.3	7.1	9.0	24.9	14.10	90.88
2	PROLINE SC + Induce XL	5+0.125% V/V	first appl.	1.5	2.8	4.8	30.5	15.91	91.51
	SUPER-TIN 80WP	4	14						
	GEM 500 SC	4	14						
3	PROLINCE SC+ INDUCE XL	5+0.125% V/V	first appl.	1.4	2.6	4.3	35.2	15.62	91.95
	SUPER-TIN 80WP	4	14						
	HEADLINE	7	14						
4	PROLINE SC + INDUCE XL	5 + 0.125% V/V	first appl.	1.5	2.1	3.3	32.6	16.18	92.29
	SUPER-TIN 80WP+ TOPSIN M	3.75 + 6.1	14						
	GEM 500 SC	4	14						
5	PROLINE SC+INDUCE XL	5+0.125% V/V	first appl.	1.6	2.3	3.7	33.9	15.88	91.36
	SUPER-TIN 80WP +TOPSIN M	3.75+6.1 oz./A	14						
	HEADLINE	7	14						
6	JAU647 & TRIFLOXYSTROBIN	11	first appl.	1.4	2.0	3.0	33.0	16.28	92.07
	SUPER-TIN 80 WP	4	14						
	GEM 500 SC	4	14						
7	PROLINE SC + INDUCE	5 + 0.125% V/V	pre canopy	1.6	2.5	4.8	35.2	15.68	91.39
	PROLINE SC + INDUCE	5 +0.125% V/V	first appl.						
	SUPER-TIN 80 WP	4	14						
	GEM 500 SC	4	14						
8	Inspire XT	7	first appl.	1.5	1.9	3.3	33.4	15.95	91.78
	Supertin	5	14						
	Headline	9	14						
9	EMINENT	13	first appl.	1.6	2.5	3.8	34.7	15.39	90.42
	SUPER TIN 80 WP	5	14						
	HEADLINE	9.2	14						
14	SUPER TIN 80 WP	5	first appl.	1.6	2.3	5.1	34.3	15.8	91.2
	EMINENT	13	14						
	SUPER TIN 80 WP	5	14						
	HEADLINE	9.2	14						
15	PROLINE SC + INDUCE	5 + 0.125% V/V	first appl.	1.7	2.6	4.9	31.9	15.7	90.5
	SUPER TIN 80 WP	5	14						
	HEADLINE	9.2	14						
16	EMINENT	13	first appl.						
	SUPER TIN 80 WP	5	14	1.5	2.8	5.5	32.6	16.6	91.3
	HEADLINE	9.2	14						
	SUPER TIN 80 WP	5	14						
17	EMINENT	13	first appl.						
	SUPER TIN 80 WP	5	as needs	1.4	2.4	5.4	32.4	16.0	90.6
	HEADLINE	9.2	as needs						
18	EMINENT	13	as needs	1.6	2.6	5.6	31.6	15.8	91.1
	SUPER TIN 80 WP	5	as needs						
	HEADLINE	9.2	as needs						
			CVT.	26.0	32.1	23.7	6.2	4.92	2.67
			LSD(0.5)	0.4	0.7	1.2	2.9	0.60	2.33

Combined 2 years

Table 7b. Influence of Fungicide Program for Control of Cercospora Leaf Spot and Sugarbeet Production, 2009-2010

TRT	FUNGICIDE	Rate oz/acre	Interval Days	Ext. Per Suc	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	UNTREATED CHECK		14	11.8	236	5923	55.74
2	PROLINE SC + Induce XL	5+0.125% V/V	first appl.	13.5	271	8212	96.61
	SUPER-TIN 80WP	4	14				
	GEM 500 SC	4	14				
3	PROLINCE SC+ INDUCE XL	5 /A+0.125% V/V	first appl.	13.4	267	9389	109.57
	SUPER-TIN 80WP	4	14				
	HEADLINE	7	14				
4	PROLINE SC + INDUCE XL	5 + 0.125% V/V	first appl.	13.9	279	9101	110.26
	SUPER-TIN 80WP+ TOPSIN M	3.75 + 6.1	14				
	GEM 500 SC	4	14				
5	PROLINE SC+INDUCE XL	5+0.125% V/V	first appl.	13.5	270	9118	107.24
	SUPER-TIN 80WP +TOPSIN M	3.75+6.1	14				
	HEADLINE	7	14				
6	JAU647 & TRIFLOXYSTROBIN	11	first appl.	14.0	279	9240	112.09
	SUPER-TIN 80 WP	4	14				
	GEM 500 SC	4	14				
7	PROLINE SC + INDUCE	5 + 0.125% V/V	pre canopy	13.3	266	9322	107.95
	PROLINE SC + INDUCE	5 +0.125% V/V	first appl.				
	SUPER-TIN 80 WP	4	14				
	GEM 500 SC	4	14				
8	Inspire XT	7	first appl.	13.6	273	9109	108.14
	Supertin	5	14				
	Headline	9	14				
9	EMINENT	13	first appl.	12.9	258	8943	101.09
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
14	SUPER TIN 80 WP	5	first appl.	13.4	268	9206	106.43
	EMINENT	13	14				
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
15	PROLINE SC + INDUCE	5 + 0.125% V/V	first appl.	13.2	264	8362	94.69
	SUPER TIN 80 WP	5	14				
	HEADLINE	9.2	14				
16	EMINENT	13	first appl.				
	SUPER TIN 80 WP	5	14	14.1	283	9228	111.09
	HEADLINE	9.2	14				
	SUPER TIN 80 WP	5	14				
17	EMINENT	13	first appl.				
	SUPER TIN 80 WP	5	needs	13.5	270	8728	100.92
	HEADLINE	9.2	needs				
18	EMINENT	13	needs	13.4	268	8467	97.76
	SUPER TIN 80 WP	5	needs				
	HEADLINE	9.2	needs				
			CVT.	7.6	8	10	14.96
			LSD(0.5)	0.7	14	990	14.07

Table 7a. Graph

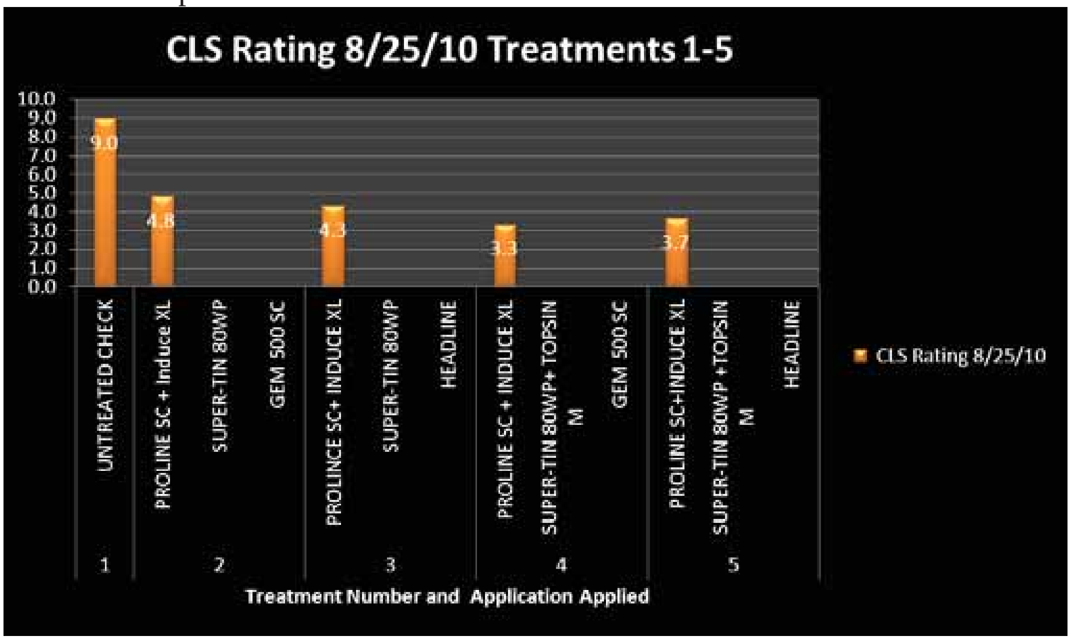
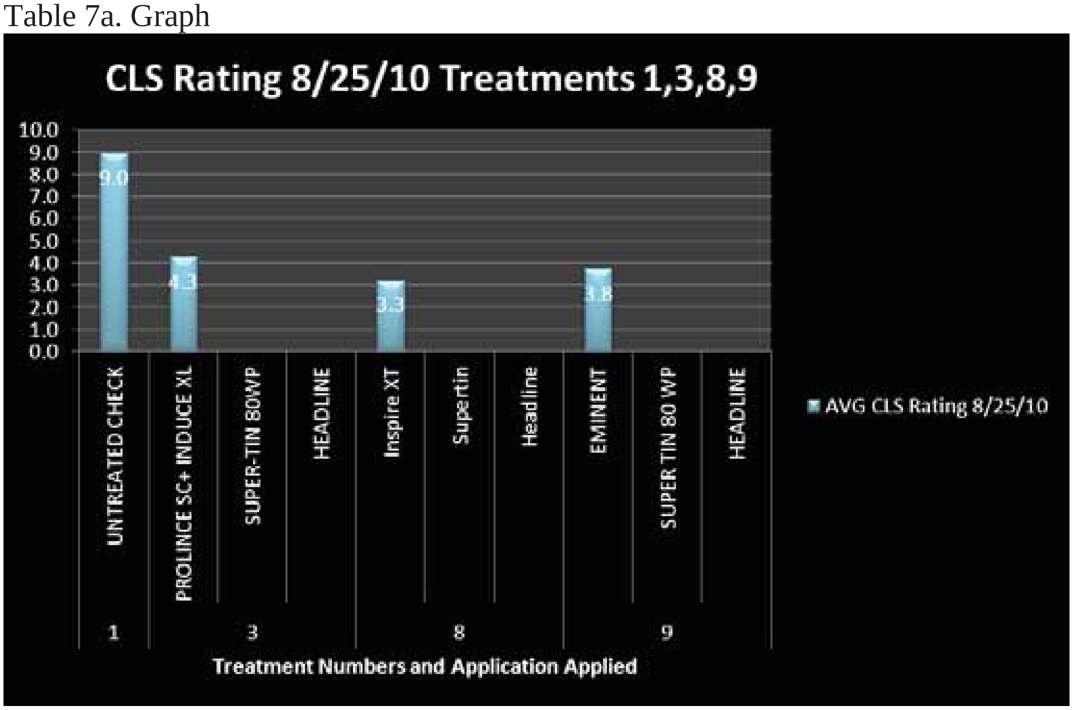


Table 7a. Graph



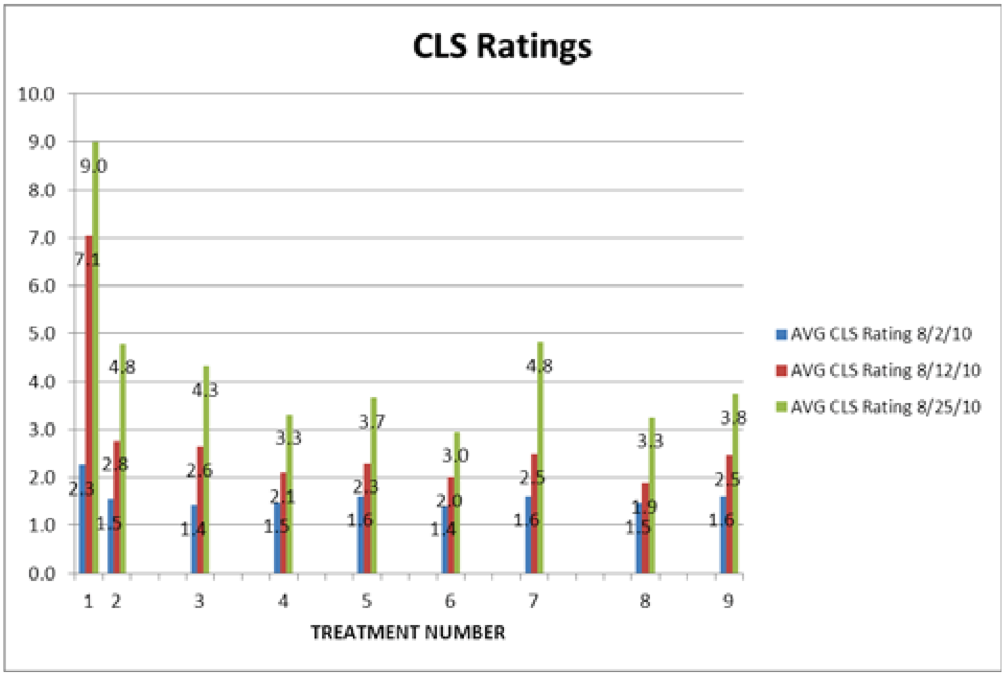
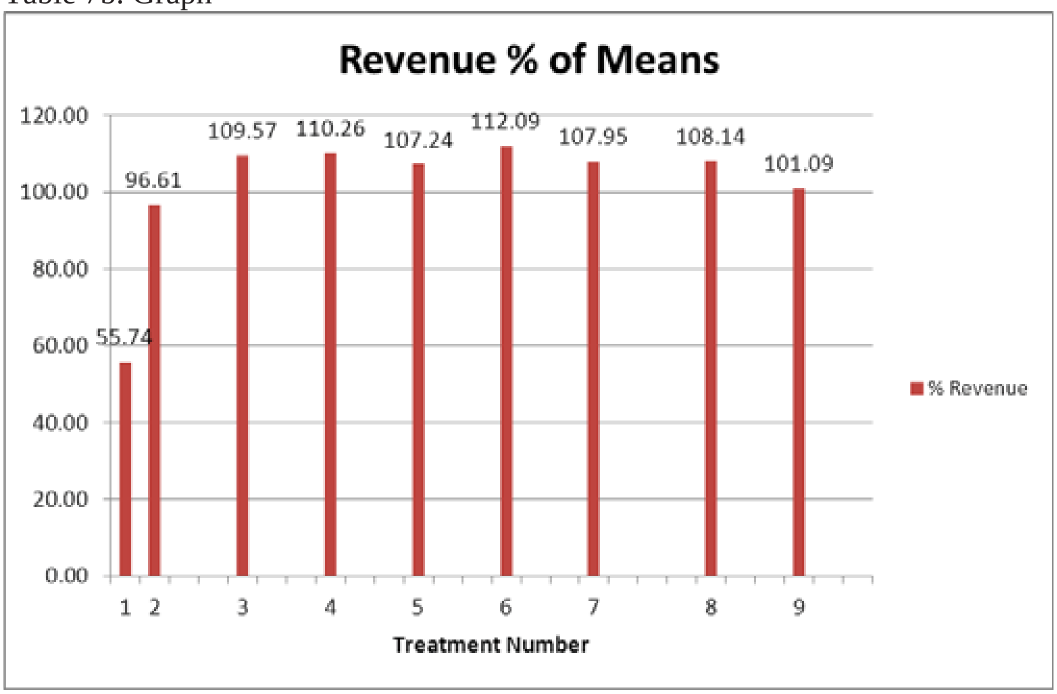
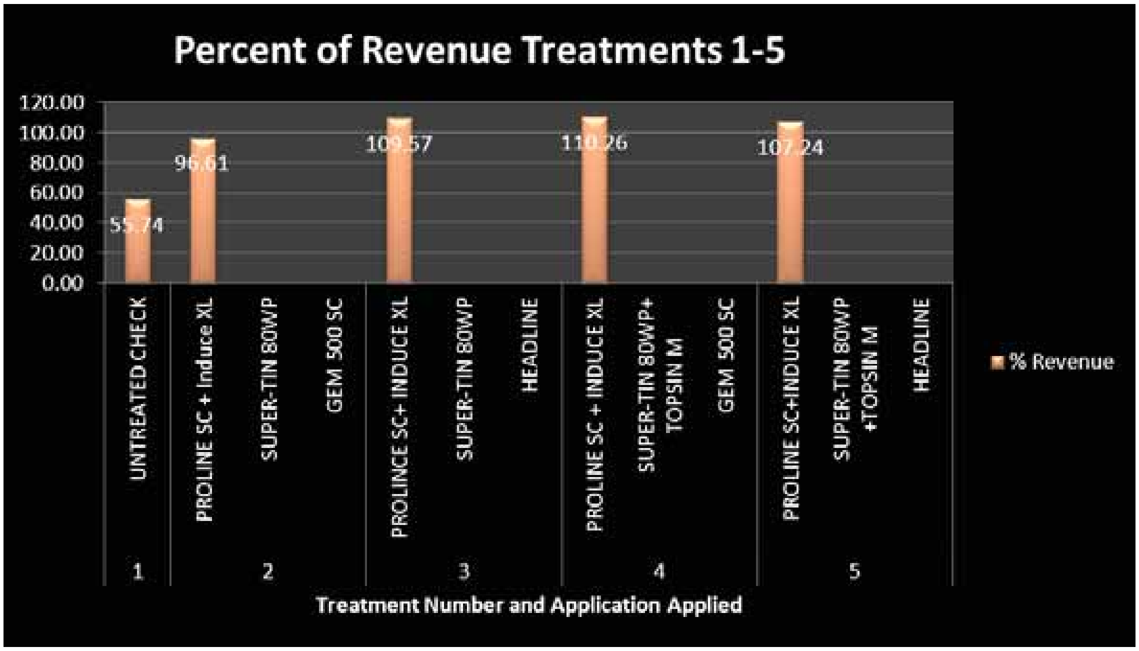


Table Above is 7a. Graph

Table 7b. Graph




Percent of Revenue Treatments 1-5
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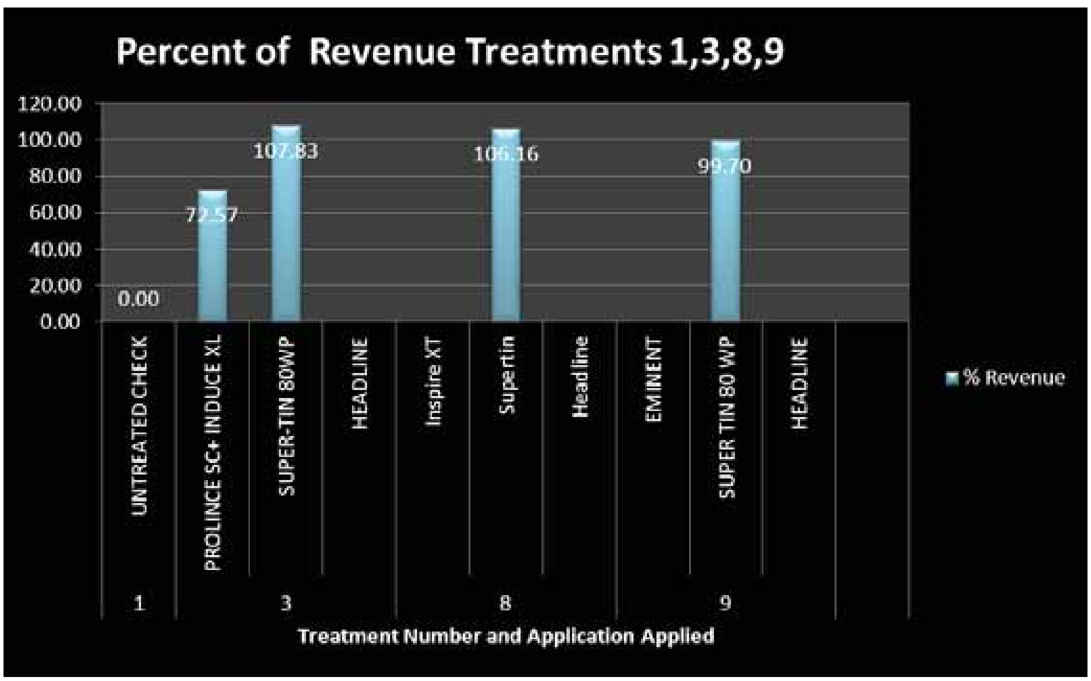
100.00
80.00
60.00
40.00
20.00
0.00
55.74
96.61
109.57
110.26
107.24
UNTREATED CHECK
PROLINE SC + Induce XL
SUPER-TIN 80WP
GEM 500 SC
PROLINCE SC+ INDUCE XL
SUPER-TIN 80WP
HEADLINE
PROLINE SC + INDUCE XL
SUPER-TIN 80WP+ TOPSIN M
GEM 500 SC
PROLINE SC+INDUCE XL
SUPER-TIN 80WP +TOPSIN M
HEADLINE
1
2
3
4
5
Treatment Number and Application Applied
% Revenue


Percent of Revenue Treatments 1,3,8,9
120.00
100.00
80.00
60.00
40.00
20.00
0.00
0.00
72.57
107.83
106.16
99.70
UNTREATED CHECK
PROLINCE SC+ INDUCE XL
SUPER-TIN 80WP
HEADLINE
Inspire XT
Supertin
Headline
EMINENT
SUPER TIN 80 WP
HEADLINE
1
3
8
9
Treatment Number and Application Applied
% Revenue

SMBSC Evaluation of Fungicides Influence on Sugar Beet Production in the Absence of Cercospora Leaf Spot

A report of 2009 and 2010 data combined

The use of fungicides to enhance sugar beet production in the absence of cercospora leaf spot has been an issue of debate. Fungicide manufacturers have made claims to the enhancement of crop production with the application of fungicides. Most research has shown an advantage with fungicide applications but has not consistently shown a specific fungicide that enhances sugar beet production. However, with all the promotion of the fungicide application for crop production enhancement, SMBSC initiated research to evaluate the application of fungicides, normally used for control of cercospora leaf spot control, for enhancement of sugar beet production.

Objectives

The objectives of this test were to evaluate fungicide in the absence of cercospora leaf spot for enhancement of sugar beet production. The test measured two aspects influencing sugar beet production, nutrient availability to the plant by testing nutrient content in the sugar beet plant leaf and plant health.

Methods

Table 1 shows the specifics of activities conducted at test sites in 2009 and 2010. Plots were 11 ft. (6 rows) wide and 35 ft. long. The tests were replicated 6 times. Sugarbeets were not thinned since the stand did not warrant thinning. Normal production practices were conducted on the sugarbeets within the testing area. Sugarbeets were harvested on October 20th in 2009 and October 8th in 2010 with a 2 row research harvester. Sugar beets were weighed on the harvester for calculation of yield and a subsample was collected and analyzed in the SMBSC quality lab for sugar percent, purity and brie nitrate. The efficacy of the product was evaluated after each fungicide application. Cercospora leaf spot ratings were not collected due to the absence of the disease.   Leaf samples were collected following application of the fungicides for analysis of nutrient presence.

Results and Discussion

Gem fungicide was not included in the 2009 testing, but added to the products tested in 2010.Data from each year will be discussed briefly. The majority of the discussion will be in reference to combined data from 2009 and 2010.

<u>2009 data</u>

Nutrient in sugar beet leaves (table 2) was not significantly influence by the fungicide treatment. Treatments with both early and late applications of fungicides tended to increase micronutrient levels in the leaf of sugar beet.

Fungicide treatments gave higher sugar percent, extractable sucrose per ton, extractable sucrose per acre and revenue. Revenue is presented as percent of the mean for revenue per acre (table 3). Overall the revenue percent was in general highest for Inspire XT, next highest for Eminent, Proline was the next highest and Headline was the lowest for the products tested.

2010 data

Nutrient in sugar beet leaves (table 4) was not significantly influence by the fungicide treatment. There was no discrete or consistent trend to the treatment influence on nutrients in the sugar beet leaves.

Fungicide treatments gave higher sugar percent, tons per acre, extractable sucrose per ton, extractable sucrose per acre and revenue. Revenue is presented as percent of the mean for revenue per acre (table 5). There was no consistent trend relative to the timing of fungicide application. Overall the revenue percent was highest with Gem. Headline, Inspire XT and Proline all perform relatively the same. However, Gem, Inspire XT, Proline, and Headline performed statistically similar at all treatment timings. Eminent applied separately at 90 and 45 days before harvest gave revenue percent statistically similar to all other fungicide treatments except when Eminent was applied at both 45 and 90 days before harvest.

Combined data 2009-2010

Fungicide treatments gave higher sugar percent, tons per acre, extractable sucrose per ton, extractable sucrose per acre and revenue. Revenue is presented as percent of the mean for revenue per acre (table 7). Overall the revenue percent was highest with Inspire XT. Eminent and Proline influenced revenue percent relatively the same with Headline showing the least influence. Statistically the influence of fungicides on revenue percent was similar for fungicides tested in both 2009 and 2010.

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Table 1. Site Specific for the CLS Health Benefit, 2009

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
5/9/2009	X	4017	4 3/8"	moist				
6/5/2009					X	Quadris	30 oz.	N 10-15, Sunny, 65'
								Warm and humid

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Table 1. Site Specific for the CLS Health Benefit, 2010

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/24/2010	X	4017	4 3/8"	Dry				
5/22/2010					X	Select	8oz.	80' Sunny, S-5
						Assana	4oz.	
6/22/2010					X	Quadris	14.2oz.	85' Pcloudy, SE-5
7/16/2010					X	Eminent	13 oz.	
7/21/2010					1st App	Interval A		80' Cloudy RH 70% Wind 0-5
8/3/2010					2nd App	Interval B		93' Sunny, RH 70%,
8/12/2010					X	Roundup/Max	32oz.	90' Sunny, SE10-15

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Table 2. Evaluation of Fungicides for there Influence on Presence of Nutrients in the Sugar Beet Plant, 2009

Trt No	FUNGICIDE	Rate oz/acre	Days prior to harvest	Total N Percent	P Percent	K Percent	S Percent	Ca Percent	Mg Percent	Na Percent	Zn	Fe	Mn	Cu	B
1	Check	N/A	N/A	270.0	0.20	2.90	0.37	1.06	0.61	2.49	26.00	46.00	34.00	6.00	25.00
2	HEADLINE	9 OZ./A	90 days	1.90	0.24	4.10	0.34	0.75	0.36	2.03	20.00	40.00	19.00	5.00	26.00
3	HEADLINE	9 OZ./A	45 days	3.90	0.22	3.00	0.83	1.75	1.22	2.74	47.00	90.00	38.00	7.00	29.00
4	HEADLINE	9 OZ./A	90/45 days	2.40	0.22	5.40	0.49	0.91	0.48	1.93	28.00	88.00	43.00	7.00	28.00
5	EMINENT	13 OZ./A	90 days	2.40	0.21	4.10	0.77	1.46	0.78	2.24	40.00	81.00	54.00	9.00	26.00
6	EMINENT	13 OZ./A	45 days	2.30	0.20	4.20	0.59	1.17	0.71	2.43	41.00	86.00	48.00	4.00	30.00
7	EMINENT	13 OZ./A	90/45 days	2.30	0.21	4.00	0.69	1.41	0.97	3.01	37.00	91.00	48.00	7.00	37.00
8	PROLINE	5 OZ./A	90 days	2.10	0.12	3.40	0.71	1.96	0.95	2.50	49.00	485.00	77.00	3.00	21.00
	NIS	0.125 % V/V													
9	PROLINE	5 OZ./A	45 days	2.40	0.17	5.00	0.48	1.44	0.89	2.44	38.00	84.00	65.00	4.00	32.00
	NIS	0.125 % V/V													
10	PROLINE	5 OZ./A		1.80	0.14	4.20	0.64	2.54	1.22	3.42	60.00	197.00	106.00	3.00	27.00
	NIS	0.125 % V/V	90/45 days												
11	INSPIRE XT	7 OZ./A	90 days	2.80	0.19	4.90	0.49	1.40	0.91	2.47	33.00	76.00	69.00	7.00	34.00
12	INSPIRE XT	7 OZ./A	45 days	1.80	0.16	3.70	0.52	1.93	1.16	3.40	48.00	176.00	102.00	4.00	25.00
13	INSPIRE XT	7 OZ./A	90/45 days	2.30	0.26	5.00	0.33	0.97	0.64	2.11	34.00	104.00	52.00	7.00	23.00
			CV	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			LSD(.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

0943 Renville Health Benefit

Table 3. Influence of Fungicides on Sugar Beet Production in the Absence of Cercospora Leaf Spot,2009

Trt No	FUNGICIDE	Rate oz/acre	Interval sprays	Tons	% Sugar	Purity	Ext. Suc Ton	Ext. Suc Acre	% Revenue
1	Check	N/A	N/A	24	13.64	92.04	232	5528	$56.54
2	HEADLINE	9 OZ./A	90 days	29	15.36	92.98	266	7860	$92.82
3	HEADLINE	9 OZ./A	45 days	32	15.33	92.26	263	8415	$97.82
4	HEADLINE	9 OZ./A	90/45 days	29	15.43	92.99	268	7774	$91.34
5	EMINENT	13 OZ./A	90 days	29	16.31	92.90	284	8233	$102.12
6	EMINENT	13 OZ./A	45 days	34	15.49	93.56	271	9256	$110.68
7	EMINENT	13 OZ./A	90/45 days	31	16.41	93.84	289	8838	$110.90
8	PROLINE	5 OZ./A	90 days	29	15.86	93.17	276	8120	$98.41
	NIS	0.125 % V/V							
9	PROLINE	5 OZ./A	45 days	28	15.79	93.31	276	7723	$93.25
	NIS	0.125 % V/V							
10	PROLINE	5 OZ./A		29	16.08	93.19	280	8180	$100.34
	NIS	0.125 % V/V	90/45 days						
11	INSPIRE XT	7 OZ./A	90 days	34	16.27	93.27	284	9518	$117.82
12	INSPIRE XT	7 OZ./A	45 days	33	16.40	93.72	288	9489	$118.89
13	INSPIRE XT	7 OZ./A	90/45 days	31	16.29	92.95	284	8805	$109.07
			CV	**15**	**4.63**	**0.77**	**5**	**15**	**16.92**
			LSD(.05)	**6**	**1.05**	**1.03**	**19**	**1827**	**24.27**

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Table 4. Evaluation of Fungicides for there Influence on Presence of Nutrients in the Sugar Beet Plant, 2010

Trt No	FUNGICIDE	Rate oz/acre	Interval sprays	Total N Percent	P Percent	K Percent	S Percent	Ca Percent	Mg Percent	Na Percent	Zn	Fe	Mn	Cu	B
1	Check	N/A	N/A	490.0	37.0	410.0	35.0	59.0	52.0	93.0	31.00	103.00	29.00	10.00	20.00
2	HEADLINE	9 OZ./A	90 days	440.0	30.0	520.0	62.0	154.0	107.0	175.0	38.00	128.00	56.00	10.00	17.00
3	HEADLINE	9 OZ./A	45 days	470.0	38.0	490.0	46.0	90.0	86.0	128.0	49.00	110.00	52.00	11.00	22.00
4	HEADLINE	9 OZ./A	90/45 days	380.0	33.0	440.0	32.0	63.0	50.0	156.0	26.00	68.00	28.00	8.00	23.00
5	EMINENT	13 OZ./A	90 days	350.0	29.0	500.0	34.0	76.0	61.0	150.0	24.00	62.00	36.00	7.00	21.00
6	EMINENT	13 OZ./A	45 days	430.0	37.0	520.0	50.0	80.0	67.0	136.0	31.00	111.00	36.00	10.00	21.00
7	EMINENT	13 OZ./A	90/45 days	450.0	32.0	510.0	51.0	97.0	76.0	155.0	35.00	124.00	54.00	11.00	21.00
8	PROLINE	5 OZ./A	90 days	450.0	33.0	570.0	61.0	109.0	94.0	156.0	37.00	115.00	50.00	10.00	20.00
	NIS	0.125 % V/V													
9	PROLINE	5 OZ./A	45 days	440.0	41.0	390.0	31.0	41.0	35.0	102.0	27.00	76.00	23.00	9.00	19.00
	NIS	0.125 % V/V													
10	PROLINE	5 OZ./A		420.0	37.0	480.0	37.0	81.0	56.0	142.0	31.00	86.00	32.00	9.00	19.00
	NIS	0.125 % V/V	90/45 days												
11	INSPIRE XT	7 OZ./A	90 days	430.0	31.0	510.0	48.0	75.0	64.0	206.0	21.00	78.00	36.00	7.00	23.00
12	INSPIRE XT	7 OZ./A	45 days	370.0	34.0	540.0	46.0	91.0	69.0	213.0	28.00	92.00	38.00	8.00	22.00
13	INSPIRE XT	7 OZ./A	90/45 days	450.0	32.0	450.0	42.0	85.0	71.0	152.0	33.00	92.00	43.00	10.00	21.00
14	GEM	3.5 OZ./A	90 days	480.0	43.0	400.0	36.0	53.0	44.0	107.0	34.00	94.00	30.00	11.00	22.00
15	GEM	3.5 OZ./A	45 days	500.0	32.0	510.0	59.0	122.0	91.0	173.0	32.00	120.00	46.00	11.00	22.00
16	GEM	3.5 OZ./A	90/45 days	470.0	29.0	450.0	27.0	69.0	46.0	173.0	24.00	76.00	28.00	7.00	21.00
			CV	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
			LSD(.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

1043 Renville Health Benefit

Table 5. Influence of Fungicides on Sugar Beet Production in the Absence of Cercospora Leaf Spot, 2010

Trt No	FUNGICIDE	Rate oz/acre	Interval sprays	Tons	% Sugar	Purity	Ext. Suc Ton	Ext. Suc Acre	% Revenue
1	Check	N/A	N/A	33.9	16.27	87.71	262	8919	81.35
2	HEADLINE	9 OZ./A	90 days	36.9	17.51	88.09	285	10530	102.65
3	HEADLINE	9 OZ./A	45 days	35.2	17.56	89.32	291	10240	101.34
4	HEADLINE	9 OZ./A	90/45 days	39.2	18.00	85.03	279	10942	104.94
5	EMINENT	13 OZ./A	90 days	36.0	17.64	88.95	291	10477	103.76
6	EMINENT	13 OZ./A	45 days	36.3	17.52	87.26	281	10161	97.55
7	EMINENT	13 OZ./A	90/45 days	35.8	17.74	83.23	266	9488	87.06
8	PROLINE	5 OZ./A	90 days	34.2	17.28	88.58	284	9639	93.02
	NIS	0.125 % V/V							
9	PROLINE	5 OZ./A	45 days	36.3	17.20	89.75	287	10398	101.77
	NIS	0.125 % V/V							
10	PROLINE	5 OZ./A		38.3	17.38	88.58	285	10891	105.93
	NIS	0.125 % V/V	90/45 days						
11	INSPIRE XT	7 OZ./A	90 days	36.4	17.55	85.95	276	10066	95.83
12	INSPIRE XT	7 OZ./A	45 days	37.9	17.83	87.42	287	10883	106.60
13	INSPIRE XT	7 OZ./A	90/45 days	38.1	17.86	86.01	281	10656	102.40
14	GEM	3.5 OZ./A	90 days	36.4	17.14	89.05	283	10321	100.07
15	GEM	3.5 OZ./A	45 days	36.0	17.77	88.99	294	10576	105.36
16	GEM	3.5 OZ./A	90/45 days	38.0	18.16	87.45	293	11107	110.37
			CV	**7.5**	**4.00**	**3.33**	**8**	**10**	**14.62**
			LSD(.05)	**3.9**	**1.00**	**4.15**	**31**	**1449**	**20.81**

2009-2010 Combined Data (Treatment 14,15,16 Removed from this Table) Renville Health Benefit

Table 7a. Influence of Fungicides on Sugar Beet Production in the Absence of the Disease.

Trt No	FUNGICIDE	Rate oz/acre	Interval sprays	Total N Percent	P Percent	K Percent	S Percent	Ca Percent	Mg Percent	Na Percent	Zn	Fe	Mn	Cu	B
1	Check	N/A	N/A	2.46	0.19	2.06	0.18	0.30	0.26	0.48	28.50	74.50	31.50	8.00	22.50
2	HEADLINE	9 OZ./A	A	2.21	0.15	2.62	0.31	0.77	0.54	0.89	29.00	84.00	37.50	7.50	21.50
3	HEADLINE	9 OZ./A	B	2.37	0.19	2.47	0.23	0.46	0.44	0.65	48.00	100.00	45.00	9.00	25.50
4	HEADLINE	9 OZ./A	A/B	1.91	0.17	2.23	0.16	0.32	0.25	0.79	27.00	78.00	35.50	7.50	25.50
5	EMINENT	13 OZ./A	A	1.76	0.15	2.52	0.17	0.39	0.31	0.76	32.00	71.50	45.00	8.00	23.50
6	EMINENT	13 OZ./A	B	2.16	0.19	2.62	0.25	0.41	0.34	0.69	36.00	98.50	42.00	7.00	25.50
7	EMINENT	13 OZ./A	A/B	2.26	0.16	2.57	0.26	0.49	0.38	0.79	36.00	107.50	51.00	9.00	29.00
8	PROLINE	5 OZ./A	A	2.26	0.17	2.87	0.31	0.55	0.47	0.79	43.00	300.00	63.50	6.50	20.50
	NIS	0.125 % V/V	A												
9	PROLINE	5 OZ./A	B	2.21	0.21	1.98	0.16	0.21	0.18	0.52	32.50	80.00	44.00	6.50	25.50
	NIS	0.125 % V/V	B												
10	PROLINE	5 OZ./A	A/B	2.11	0.19	2.42	0.19	0.42	0.29	0.73	45.50	141.50	69.00	6.00	23.00
	NIS	0.125 % V/V	A/B												
11	INSPIRE XT	7 OZ./A	A	2.16	0.16	2.57	0.24	0.38	0.32	1.04	27.00	77.00	52.50	7.00	28.50
12	INSPIRE XT	7 OZ./A	B	1.86	0.17	2.72	0.23	0.46	0.35	1.08	38.00	134.00	70.00	6.00	23.50
13	INSPIRE XT	7 OZ./A	A/B	2.26	0.16	2.28	0.21	0.43	0.36	0.77	33.50	98.00	47.50	8.50	22.00
			CV	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
			LSD(.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

2009-2010 Combined Data (Treatment 14,15,16 Removed from this Table) Renville Health Benefit

Table 7b. Influence of Fungicides on Sugar Beet Production in the Absence of the Disease.

Trt No	FUNGICIDE	Rate oz/acre	Interval sprays	Tons	% Sugar	Purity	Ext. Suc Ton	Ext. Suc Acre	% Revenue
1	Check	N/A	N/A	28.9	14.95	89.88	247	7223	68.94
2	HEADLINE	9 OZ./A	A	33.1	16.44	90.53	276	9195	97.74
3	HEADLINE	9 OZ./A	B	33.6	16.44	90.79	277	9328	99.58
4	HEADLINE	9 OZ./A	A/B	34.2	16.72	89.01	273	9358	98.14
5	EMINENT	13 OZ./A	A	32.5	16.98	90.92	287	9355	102.94
6	EMINENT	13 OZ./A	B	35.2	16.50	90.41	276	9708	104.11
7	EMINENT	13 OZ./A	A/B	33.2	17.08	88.54	277	9163	98.98
8	PROLINE	5 OZ./A	A	31.8	16.57	90.88	280	8880	95.72
	NIS	0.125 % V/V	A						
9	PROLINE	5 OZ./A	B	32.2	16.49	91.53	281	9061	97.51
	NIS	0.125 % V/V	B						
10	PROLINE	5 OZ./A	A/B	33.7	16.73	90.88	283	9535	103.13
	NIS	0.125 % V/V	A/B						
11	INSPIRE XT	7 OZ./A	A	35.0	16.91	89.61	280	9792	106.82
12	INSPIRE XT	7 OZ./A	B	35.4	17.11	90.57	288	10186	112.74
13	INSPIRE XT	7 OZ./A	A/B	34.5	17.08	89.48	282	9730	105.73
			CV	**11.2**	**4.47**	**2.49**	**7**	**12**	**15.97**
			LSD(.05)	**4.1**	**0.77**	**3.28**	**22**	**1444**	**22.04**

SMBSC Evaluation of Fungicides for control of Rhizoctonia solani in Sugarbeet Growth-2009

The following report is a summarization of testing fungicides for controlling rhizoctonia solani during the growing seasons of 2010.

Objectives

The objective of these trials was to evaluate fungicides for control of rhizoctonia solani (rhizoctonia root rot) with a susceptible and resistant variety.

Methods

Table 1 and 2 shows the specifics of activities conducted at the rhizoctonia testing. The test are designated by there experiment numbers of 1055 (Clara City, Mn), 1054 (Buffalo Lake, Mn).   Plots were 11 ft. (6 rows) wide and 20 ft long. Sugarbeet plots were inoculated with the rhizoctonia solani fungus at the 4 leaf stage of the sugarbeets. The rhizoctonia strain inoculated was the AG 2-2 IIIB. The inoculum was prepared on barley grain by Dr. Carol Windels and her staff. The inoculum was applied via a Gandy band applicator in 2010. Sugarbeet stands were counted at 4 leaf sugarbeet stage and at harvest for the whole plot and factored to a 100 ft relative stand. Sugarbeets were not thinned in order to let the treatment not be influenced by variability in the thinning process. The tests were replicated 4 times. Sugarbeets were harvested with a 2 row research harvester plow. The harvester plow lifted the sugarbeets out of the soil and places the sugarbeets on the soil surface. The sugar beets are then placed in a row for each plot for evaluation. The evaluation scale is a 1-7 scale. This scale is an industry standard used for rhizoctonia root rot evaluation. Evaluation was conducted of the roots from the middle two rows of the six row plot. Multiple evaluators were used to comprise the evaluations and a test of statistical homogeneity (combinability) was conducted and determined that the evaluators rating could be combined. The sugarbeets were collected and measured for yield and analyzed for quality.

Results and Discussion

The sugarbeet stand was not significantly changed over time at either location, thus the sugar beet stand presented is the at harvest stand counts. The data from both locations were analyzed for homogeneity and determined that he data could not be combined. The data from the two test sites are presented separately in tables 3 (Buffalo Lake, Mn site) and table 4 (Clara City, Mn site). Even though the general results were similar it is not unusual for disease trials results to not test out for homogeneity du to magnitude or inherent variability with in the data. Thus, data will be discussed for each site separately and the data will also be discussed in general.

Clara City site – 1055

Rhizoctonia rating in the untreated check of the susceptible variety was 5.4, which indicates a high level of disease pressure. The tolerant variety gave significantly less rhizoctonia rating than the susceptible variety. With the susceptible variety all rhizoctonia ratings were unacceptable where Actinigrow (biological fungicide) was applied infurrow. The treatments that gave the best control of Rhizoctonia solani with the susceptible variety were where Quadris was applied at 14.3 oz. infurrow either alone or with Actinogrow. The application of Quadris gave significantly better Rhizoctonia Solani control than Proline applied without NIS with the susceptible variety. Rhizoctonia solani control with the susceptible variety was statistically similar when Proline was applied with NIS or Quadris applied alone. The same trend followed with the tolerant variety, except for that the Rhizoctonia root rating were significantly less with the tolerant compared to the susceptible variety.

The revenue (expressed as a percent of the mean) from the tolerant variety was significantly higher for like treatments in the tolerant compared to the susceptible variety. Revenue was higher for higher all treatments including Quadris, Proline with or without NIS and Proline plus Gem compared to the untreated check with the susceptible and tolerant variety. Performance of sugar beet production was directly related to rhizoctonia ratings. Both varieties were positively influenced for rhizoctonia control and sugar beet production by the application of fungicides

Buffalo Lake site – 1054

Disease pressure was high as indicated by the Rhizoctonia rating in the untreated check of the susceptible variety. The rhizoctonia rating was significantly less with the tolerant variety as indicated by the Rhizoctonia rating compared to the Rhizoctonia rating for the susceptible variety. The only two treatments where the susceptible variety was planted that would be considered acceptable was when Proline at 5.7 plus 1.25% NIS or Quadris at 14.3 were applied in a 5 inch band at the 4 leaf sugarbeet stage.

The tolerant variety performed significantly better than the susceptible variety for all variables measured. The tolerant variety when not treated with a fungicide (untreated) gave 103 and 78.91% greater revenue than the susceptible variety untreated at the Buffalo Lake and Clara City sites, respectively .All variables measured were directly influenced by the degree of the presence of Rhizoctonia solani.

Even when using a tolerant variety, the use of a fungicide enhanced control of Rhizoctonia solani and the production of sugar beets. Actinogrow (biological fungicide) was very inconsistent in the control of rhizoctonia. The application of Quadris at 14.3 oz. either did or tended to reduce Rhizoctonia ratings and significantly increase sugar beet production. Proline applied alone or with .125% NIS either tended or did reduce Rhizoctonia ratings and significantly increased sugar beet production.

General Comments

1. The tolerant variety performed significantly better in the presence of Rhizoctonia solani compared to the susceptible variety.
2. Fungicides applications were beneficial to both susceptible and tolerant varieties
3. Proline plus NIS or Quadris applied on a 7 inch band at the 4^{th} leaf stage of sugar beet both gave very good rhizoctonia control and sugar beet production regardless of the varieties tolerance to Rhizoctonia solani.

1055 Clara City Rhizoc Fungicide by Varity

Table 1. Site Specific for Rhizoc Fungicide by Varity

DATE	PLANTED	SPACING	SPRAYED	APPLIED	RATE	WEATHER	Inoculated
5/18/2010	**X**	4 3/8"					
6/7/2010			**X**	Roundup,Max	32 oz.	80^{o} Sunny, RH 70%	
6/15/2010			4 lf band			75^{o} Sunny, RH 80%	
6/16/2010							**X**
7/13/2010			1st CLS			70^{o} Sunny, RH 60%	
7/16/2010			Check CLS			75^{o} Sunny, RH 70%	
8/2/2010			2 nd CLS			84^{o} Sunny, RH 75%	
7/19/2010			3 rd CLS			73^{o} Sunny, RH 40%	

1054 Buffalo Lake Rhizoc Fungicide by Variety

Table 2. Site Specific for Rhizoc Fungicide by Variety

DATE	PLANTED	SPACING	SPRAYED	APPLIED	RATE	WEATHER	Inoculated
4/17/2010	**X**	4 3/8"					
6/15/2010			4 lf band			75^{o} Sunny, RH 80%	
6/16/2010							**X**
7/8/2010			**X**	Roundup,Max	32 oz.	80^{o} Sunny, RH 80%	
				Select Max	7 oz.		
7/19/2010			1st CLS			70^{o} Sunny, RH 50%	
7/19/2010			2 nd CLS			85^{o} Sunny, RH 65%	
7/19/2010			3 rd CLS			65^{o} Sunny, RH 40%	

1055 Clara City Rhizoctonia Fungicide by Varity

Table 3. Site Specific for Rhizoc Fungicide by Varity, 2010

Trt #	**Product**	**Rate oz/Acre**	**Application Criteria**	**Variety Type**	Stand Count	Root Rating	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ActinoGrow	3	Infurrow	Susceptible	169	8.0	13.3	13.28	81.20	188	2466	18.03
2	ActinoGrow	6	Infurrow	Susceptible	173	6.3	13.3	18.65	79.89	181	2415	16.72
3	ActinoGrow	9	Infurrow	Susceptible	169	6.2	13.5	14.74	82.71	216	2887	26.40
4	ActinoGrow	12	Infurrow	Susceptible	182	5.6	18.7	15.52	84.47	237	4434	46.19
5	ActinoGrow	6	Infurrow	Susceptible	172	2.7	36.2	15.85	87.80	257	9318	105.28
	Quadris	14.3	5" band @ 4 lf SB									
6	Quadris	14.3	5" band @ 4 lf SB	Susceptible	180	2.8	39.2	16.36	87.56	264	10344	119.45
7	Untreated Check			Susceptible	180	5.9	22.3	14.53	83.14	215	4811	44.54
8	PROLINE + NIS	5.7 + .125%	5" band @ 4 lf SB	Susceptible	149	4.1	29.2	16.41	86.29	260	7623	87.05
9	PROLINE	5.7	5" band @ 4 lf SB	Susceptible	146	4.8	29.5	15.22	83.33	226	6789	68.29
10	PROLINE + GEM + NIS	4 + 3 + .125%	5" band @ 4 lf SB	Susceptible	182	3.6	31.8	16.42	86.38	260	8182	92.23
11	ActinoGrow	3	Infurrow	Tolerant	174	4.2	52.8	15.26	84.78	233	12322	125.93
12	ActinoGrow	6	Infurrow	Tolerant	214	4.0	49.5	15.03	85.99	235	11632	119.83
13	ActinoGrow	9	Infurrow	Tolerant	238	4.1	45.6	15.38	85.40	238	10810	112.46
14	ActinoGrow	12	Infurrow	Tolerant	239	3.8	39.7	16.24	87.45	261	10331	117.72
15	ActinoGrow	6	Infurrow	Tolerant	209	2.2	47.8	16.65	88.96	275	13112	156.23
	Quadris	14.3	5" band @ 4 lf SB									
16	Quadris	14.3	5" band @ 4 lf SB	Tolerant	228	2.0	52.2	17.22	88.10	280	14597	176.83
17	Untreated Check			Tolerant	230	3.8	41.3	15.76	86.50	249	10282	112.45
18	PROLINE + NIS	5.7 + ,125%	5" band @ 4 lf SB	Tolerant	232	2.24	46.44	17.22	88.36	281	13059	158.84
19	PROLINE	5.7	5" band @ 4 lf SB	Tolerant	216	2.5	44.7	16.91	88.22	276	12307	147.28
20	PROLINE + GEM + NIS	4 + 3 + .125%	5" band @ 4 lf SB	Tolerant	216	2.7	46.5	16.84	87.36	271	12582	148.24
				CVT.	**11**	**25.0**	**8.7**	**7.513**	**2.876**	**12**	**13**	**22.50**
				LSD(0.5)	**31**	**1.4**	**4.4**	**1.67**	**3.49**	**40**	**1722**	**31.863**

1054 Buffalo Lake Rhizoctonia Fungicide by Varity

Table 4. Site Specific for Rhizoc Fungicide by Varity, 2010

Trt. No.	**Products**	**Rate** **Rate oz/Acre**	**Application Criteria**	**Variety Type**	Stand Count	Root Rating	Tons	% Sugar	Purity	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ActinoGrow	3	Infurrow	Susceptible	110	5.1	11.2	14.6	84.0	220	2466	30.83
2	ActinoGrow	6	Infurrow	Susceptible	110	4.9	12.1	15.6	85.3	242	2939	41.14
3	ActinoGrow	9	Infurrow	Susceptible	120	5.9	9.6	13.7	80.3	190	1840	18.55
4	ActinoGrow	12	Infurrow	Susceptible	130	5.9	11.9	13.9	82.5	203	2428	27.36
5	ActinoGrow	6	Infurrow	Susceptible	130	3.8	19.8	15.4	86.3	242	4792	66.95
	Quadris	14.3	5" band @ 4 lf SB									
6	Quadris	14.3	5" band @ 4 lf SB	Susceptible	110	3.5	26.3	15.5	85.9	242	6385	89.41
7	Untreated Check		14.56	Susceptible	100	5.4	11.6	13.3	78.8	178	2133	20.03
8	PROLINE + NIS	5.7 + .125%	5" band @ 4 lf SB	Susceptible	120	4.2	26.8	15.3	85.2	237	6350	86.67
9	PROLINE	5.7	5" band @ 4 lf SB	Susceptible	120	4.2	19.6	15.1	85.3	233	4555	61.07
10	JAU6476&TRIFLOXY + NIS	4 + 3 + .125%	5" band @ 4 lf SB	Susceptible	100	4.7	17.1	14.8	83.6	221	3773	47.47
11	ActinoGrow	3	Infurrow	Tolerant	130	3.7	34.6	18.8	87.2	304	10484	177.29
12	ActinoGrow	6	Infurrow	Tolerant	150	3.7	30.9	15.6	86.0	244	7525	105.76
13	ActinoGrow	9	Infurrow	Tolerant	180	3.4	43.0	16.2	87.3	259	11105	165.48
14	ActinoGrow	12	Infurrow	Tolerant	140	3.5	31.7	15.8	86.3	249	7914	114.02
15	ActinoGrow	6	Infurrow	Tolerant	140	2.4	41.8	16.9	87.9	274	11462	179.79
	Quadris	14.3	5" band @ 4 lf SB									
16	Quadris	14.3	5" band @ 4 lf SB	Tolerant	120	3.0	38.5	16.5	87.5	266	10233	156.41
17	Untreated Check		14.56	Tolerant	160	3.4	32.4	16.3	86.6	258	8348	123.95
18	PROLINE + NIS	5.7 + ,125%	5" band @ 4 lf SB	Tolerant	150	2.8	41.5	16.9	87.6	272	11268	175.38
19	PROLINE	5.7	5" band @ 4 lf SB	Tolerant	140	2.6	42.8	17.6	87.0	282	12051	193.05
20	JAU6476&TRIFLOXY + NIS	4 + 3 + .125%	5" band @ 4 lf SB	Tolerant	140	3.2	31.6	16.2	86.2	255	8092	119.40
				CVT.	**20**	**14.7**	**7.5**	**8.34**	**3.23**	**12**	**13**	**23.07**
				LSD(0.5)	**37**	**0.8**	**2.8**	**1.86**	**3.90**	**40**	**1296**	**32.66**

IMPACT OF NITROGEN, VARIETY, AND FUNGICIDE ON SUGARBEET YIELD AND QUALITY

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Nitrogen (N) is the most important nutrient element applied as fertilizer for sugarbeet since few soils have adequate amounts of nitrogen in an available form for optimum sugarbeet yield. Nitrogen improves color and vigor of the canopy which resulted in over-use of this type of fertilizer. In the United Kingdom, nitrogen usage was reduced from about 13 pounds per ton of roots in the 1970s to about 3.7 pounds per ton of roots in 2000 (Draycott and Martindale, 2000). In North Dakota, 8.5 pounds of nitrogen per ton of roots was recommended in the 1970s (Wagner et al., 1976). The N rate was reduced to 6.6 pounds per ton of roots in the 1990s and is currently about 5.2 pounds per ton of roots. Prior to the mid-2000s, most of the sugarbeet varieties were of the larger, triploid type. With the advent of Rhizomania in all sugarbeet production areas, diploid varieties, typically smaller than triploid varieties, became more widely used. In the late 1990s and early to mid-2000s, an average yield of 20 tons per acre was considered a good yield. Over the past five years, average yield in North Dakota and Minnesota increased to about 25 tons per acre. The nitrogen recommendation of 130 lb N per acre was not changed even when yield increased by 25%. Leaf architecture of diploid varieties may be characterized as either erect or somewhat prostrate and close to the ground. Fungicides are typically used for controlling Cercospora leaf spot but are sometimes used in the absence of disease in an attempt to increase yield. It will be useful to know whether N rates should be adjusted for optimum yield and quality of newer diploid varieties, and whether fungicides increase sugarbeet yield.

The objective of this research was to determine the best N rate for sugarbeet varieties with different leaf architecture and whether fungicides increase sugarbeet yield and quality.

MATERIALS AND METHODS

Research was conducted at Foxhome, MN in 2010. The experimental design was a split-split plot arrangement of a randomized complete block design with four replicates. There were four levels of the whole plot factor, nitrogen rate (70, 100, 130 and 160 lb per acre); two levels of the subplot factor, variety (A and B; proprietary material of Syngenta seeds and Crystal Beet Seeds, respectively); and five levels of the sub-subplot factor, fungicide (non-treated check, Inspire XT applied at 7 fl oz/A, Headline at 9 fl oz/A, Eminent at 13 fl oz/A, and Proline+NIS at 5 fl oz/A + 0.125% v/v, respectively). Individual plots comprised of six 30-feet long rows spaced 22 inches apart. The site was fertilized with urea on 19 May, and incorporated immediately, just prior to planting. Seeds were treated with Tachigaren (45 g/kg seed) and Poncho beta, and Counter 15G insecticide was applied at planting. The center two-rows of plots were thinned manually on 18 and 28 June to 41,580 plants per acre. Weeds were controlled with two applications of glyphosate.

Fungicide spray treatments were applied with a CO_2 pressurized 4-nozzle boom sprayer with 11002 TT TwinJet nozzles calibrated to deliver 17 gpa of solution at 60 p.s.i pressure to the middle four rows of plots on 20 August.

Plots were defoliated mechanically and harvested using a mechanical harvester on 29 September. Stand counts were taken after defoliation and before harvest. The middle two rows of each plot were harvested and weighed for root yield. Twelve to 15 representative roots from each plot, not including roots on the ends of the plot, were analyzed for quality at the American Crystal Sugar Company Quality Tare Laboratory, Moorhead, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010).

RESULTS AND DISCUSSIONS

Warm and wet conditions resulted in good germination, emergence, and plant stand in early June. Variety A was greener compared to Variety B. Both varieties took longer to close canopy at the 70 lb per acre N rate compared to the higher N rates. There were some Rhizoctonia infected plants by mid-July, and Cercospora leaf spot was present before fungicide treatments were applied.

There were no significant interactions among the N rates, varieties, and fungicides. The main effects were significant for some of the parameters evaluated. Nitrogen resulted in significantly greater tonnage and recoverable sucrose at the 100 to 160 lb per acre rate compared to the 70 lb per acre rate. However, sucrose concentration was significantly lower at the 160 lb per acre N rate compared to the 70 to 130 lb per acre N rate. Variety A produced significantly greater tonnage, sucrose concentration, and recoverable sucrose than Variety B. Variety A had better Cercospora leaf spot and Rhizoctonia tolerance than Variety B. Since both diseases were present at Foxhome, the more disease susceptible variety B suffered yield and quality losses. Cercospora leaf spot impacted the plants later in the season. Fungicides provided leaf spot protection and resulted in significantly higher sucrose concentration and recoverable sucrose than the non-treated check. There were no significant differences in sugarbeet yield and quality among fungicides.

Table 1. Effect of Nitrogen rate, variety, and fungicide on sugarbeet yield and quality at Foxhome, MN in 2010.

Total soil Nitrogen (lbs/A)	**Yield (tons/A)**	**Sucrose concentration (%)**	**Recoverable sucrose (lbs/A)**
70	22.7	16.6	7068
100	28.6	16.6	8870
130	29.9	16.7	9307
160	30.6	16.3	9238
N Rate LSD (P=0.05)	2.4	0.2	719
Variety			
A	29.5	16.8	9199
B	26.4	16.3	8043
Variety LSD (P=0.05)	0.5	0.2	240
Fungicide			
Nontreated check	27.4	16.2	8229
Inspire XT at 7 fl oz/A	28.4	16.7	8849
Headline at 9 fl oz/A	28	16.6	8639
Eminent at 13 fl oz/A	27.8	16.6	8618
Proline + NIS at 5 fl oz/A + 0.125% v/v	28.3	16.6	8771
Fungicide LSD (P=0.05)	NS	0.2	289

References

Draycott, A.P., Martindale, W. 2000. Effective use of Nitrogen fertilizer. British Sugar Beet Review. 68 (2), 18-21.

Wagner, D.F., Dahnke, W.C., Moraghan, J.T., Cattanach, A.W. 1976 Fertilizing Sugar Beets. North Dakota State Univ. Coop. Ext. Service Circular S-F4 Revised.

SMBSC Evaluation of Glyphosate for Weed Control in Sugarbeet Considering with and without Soil Active Herbicides and Timing of Application-2009

Objectives

The objectives of the testing for weed control programs in 2010 were conducted to determine the optimum weed control program with Glyphosate (Roundup).

Methods

Table 1 shows the specifics of activities conducted at the weed control program sites in 2010 at Clara City, Renville and Danube, Mn. Plots were 11 ft. (6 rows) wide and 35 ft long. Sugarbeet stands were 160-200 plants/100 ft and were not thinned. Sugarbeets were harvested with a 1 row harvester at Danube, Mn and a 2 row research harvester at Renville and Clara City. Sugarbeet plots harvested at Danube were taken from row 3 of six rows by taking two 10 ft. samples. The sugarbeets were weighed for yield calculation and analyzed for quality at the SMBSC quality lab. The sugarbeets were weighed on the two row harvester at Renville and Clara City for yield and a sub-sample was collected to be analyzed for quality in the SMBSC quality lab.

The tests were replicated 4 times and conducted in a randomized complete block experimental design. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. The sites are designated by experiment number. Research site 1031 was near Clara City, Mn, 1032 was near Renville, Mn and 1033 was near Danube, Mn.

The treatments were initiated by weed stage and subsequent application were in accordance with treatment description in data tables. Treatments were applied in 14 gpa mix at 40 psi.

Results and Discussion

Each location will be discussed separately since the statistical analysis for homogeneity indicated the data fro the three locations could not be combined.

1031 – Clara City location

Weed control *(Table 3a)*

All treatments controlled common lambsquarter similarly except with treatment number 6. Treatment number 6 gave significantly less common lambsquarter control than the treatments giving the best control at the 6-29-2010 evaluation and significantly less than all treatments at the 7-12-2010 evaluation. Treatment number 6 was a single application of Nortron at 120 oz. /acre and glyphosate at 32 oz. per acre and Ammonium Sulfate (AMSU) at 2% solution 14 days after treatment (DAT) of 2 lf sugarbeets. The delayed application hindered the control of common lambsquarter. Experimental herbicide MON 63410 tended to give lower control when applied in a single application with glyphosate 14 DAT of 2 lf sugarbeet. Common lambsquarter control was not reduced with other scenarios of glyphosate applied alone or glyphosate applied with either Outlook or Dual Magnum at the 14 DAT of 2 lf sugarbeet timing. Glyphosate applied alone or glyphosate applied with either Outlook or Dual Magnum gave similar control regardless of the application timing.

Sugar beet production *(Table 3b and 3c)*
Ton's per acre was influenced by treatment and was relative to the over all control of common lambsquarter. Sugar percent and purity was not directly related to treatment and appeared to have a greater relationship with positioning with in the test area. Revenue per acre (presented as a percent of the mean) was directly related to tons per acre and as stated earlier, tons per acre were related to the over all weed control of the treatment. Application of specific treatment as single delayed applications was a noticeable trend in the influence of the treatment on tons per acre and revenue.

1032 *– Renville location*
Weed control *(Table 4)*
Weeds that evaluated for control at the Renville site were common lambsquarter, alfalfa and amaranth species. The amaranth species are grouped as one and mostly included red root and smooth pigweed, tall waterhemp and palmer amaranth. Alfalfa control was lower when applications were delayed or glyphosate was not accompanied with a complimentary (soil active) product. Reduced rates of soil active products in individual application tended to reduce control of alfalfa. Even the total amount of soil active products in multiple applications was more than a single application; the control was less when soil active products were applied at lower rates in individual applications.

Sugar beet production *(Table 5a and 5b)*
Sugar beet production did not appear to relate to treatment control of alfalfa. Common lambsquarter and amaranth species control was very good with all treatment and thus sugarbeet production did not relate directly to weed control.   Revenue per acre (presented as a percent of the mean) was generally better with treatment which had multiple applications. Timing did not appear to have a significant influence on treatment affect on sugar beet production.

1033 *– Danube location*
Weed control *(Table 6)*
Weeds that evaluated for control at the Danube site were common lambsquarter, velvet leaf, cocklebur, and smartweed and amaranth species. The amaranth species are grouped as one and mostly included red root and smooth pigweed, and tall waterhemp. Wed control in general was good across treatments and time of application except in the following situations. Mon 63410 applied in the first of 3 glyphosate applications gave significantly less general weed control compared to

when Mon 63410 was applied in the second or third application of glyphosate. Sequence applied in the third of 3 glyphosate applications gave significantly less general weed control compared to when Sequence was applied in the second or third application of glyphosate.

Sugar beet production *(Table 7a and 7b)*
Sugar beet production directly related to treatments. In general multiple applications of treatments gave better sugarbeet productions compared to treatments with single applications. The statement in general is used since the benefit of multiple applications was specifically within groupings of the absence or presence of soil active products. Considering groupings of no soil active herbicide, or soil active herbicides Nortron, Sequence, Outlook and Mon 63410 the production of sugarbeets was increased or tended to be increased by making more than one application. This was the case whether or not weed control was influenced by the treatment.

General comments

1. Weed control in general was better and more consistent when glyphosate was applied with a soil active herbicide in at least one of the application timings.
2. Weed control tended to be better the herbicides were applied more than once.
3. Sugarbeet production tended to be directly related to weed control.
4. Multiple applications tended to increase sugar beet production.
5. The use of soil applied products tended to increase sugarbeet production.

Table 1. Site Specifics for Lay-by Herbicide for Glyphosate Resistant Sugarbeets, 2010

	Location		
Task	**Clara City**	**Renville**	**Danube**
Sugarbeet-Varity	95RR03	95RR03	9093
Planting-date	4/22/2010	4/21/2010	4/25/2010
Harvest	9/9/2010	10/11/2010	9/9/2010

1031 Clara City Weed Control Program

Table 2a. Site specific for Lay-by Herbicide for RR Sugarbeets, 2010

DATE	PLANTED	VARIETY	SPACING	SPRAYED	APPLIED	RATE	WEATHER
4/22/2010	X	95RR03	4 3/8"		10-34-0	3 gpa	
5/25/2010				sprayed 2 lf SB			80' Sunny wind 5-10
5/27/2010				sprayed trt 11,13,20			
6/10/2010				sprayed 14 DAT of 2 lf SB			
6/22/2010				sprayed 14 DAT			80' Sunny, RH 70%, 0-5
7/27/2010				X	Supertin	7oz	90' Pcloudy, SW5
8/12/2010				X	Roundup/Max	32oz	
					Supertin	7oz	85' Sunny, SE 10-15

1032 Renville Weed Control Program

Table 2b. Site specific for Lay-by Herbicide for RR Sugarbeets, 2010

DATE	PLANTED	VARIETY	SPACING	SPRAYED	APPLIED	RATE	WEATHER
4/21/2010	X	95RR03	4 3/8"				
5/22/2010				X	Select Max	8oz	Sunny, 80' wind S5
5/25/2010				X			Sunny, 70' wind 5mph
5/27/2010				TRT 11,13,20			Sunny, 75' Calm
6/9/2010				14 days of 2LF SB			Sunny, 65' wind 10-15
6/22/2010				X	Quadris	14.2oz	Pcloudy, 85' wind SE 5
6/22/2010				14 DAT			Sunny, 75', RH 80% wind 0-5

1033 Danube Weed Control Program

Table 2c. Site specific for Lay-by Herbicide for RR Sugarbeets, 2010

DATE	PLANTED	VARIETY	SPACING	SPRAYED	APPLIED	RATE	WEATHER
4/25/2010	X	9093	5 1/4				
5/26/2010				X	Select Max	8oz	70' Pcloudy wind SE 5
					Assana	4oz	
5/26/2010				2 leaf SB			80' Sunny wind 0-5
6/10/2010				sprayed 14 DAT of 2 lf SB			80' Sunny wind 0-5
6/22/2010				Sprayed 14 DAT			75' RH75% Sunny ,wind0-5
7/12/2010				X	Eminent		

Note: Application timing goes for all tables as followed:
*First application is at 2 leaf sugar beets
*Second application is 14 days after 2 leaf sugar beets
*Third application is 14 days after the second application

1031 Clara City Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 3a. Lay-by-Herbicide and Glyphosate Influence on Weed Control, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Lambs quarter 6/29/10	Lambs quarter 7/12/10
1	Glyphosate + AMSU	32 + 2%	2 lf SB	98	98
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	97	98
3	Glyphosate + AMSU	32 + 2%	2 lf SB	96	98
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB		
4	Glyphosate + AMSU	32 + 2%	2 lf SB	95	92
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB		
	Glyphosate + AMSU	22 + 2%	14 DAT		
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	99	99
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	91	84
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	99	99
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT		
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	99	98
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	95	98
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	99	99
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT		
11	Sequence	68	at 2 LF SB	98	99
12	Sequence	68	14 DAT 2 LF SB	93	97
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	99	99
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT		
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	99	99
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	97	98
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	99	99
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT		
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	93	94
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	90	92
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	99	99
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT		
20	Sequence	39	2 LF SB	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT		
	Glyphosate + AMSU	22 + 2%	14 DAT		
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	99	99
	Sequence	39	14 DAT		
	Glyphosate + AMSU	22 + 2%	14 DAT		
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	99	97
	Glyphosate + AMSU	22 + 2%	14 DAT		
	Sequence	39	14 DAT		
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT		
	Glyphosate + AMSU	22 + 2%	14 DAT		
24	Mon 63410	32	pre emergence	95	96
	Glyphosate + AMSU	32 + 2%	at 2 LF SB		
			CV	**4**	**5**
			LSD (.05)	**6**	**7**

1031 Clara City Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 3b. Lay-by-Herbicide and Glyphosate Influence on Sugarbeet Production, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Tons	% Sugar	Purity
1	Glyphosate + AMSU	32 + 2%	2 lf SB	35.9	16.05	89.40
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	30.8	15.91	89.64
3	Glyphosate + AMSU	32 + 2%	2 lf SB	31.4	15.79	89.04
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
4	Glyphosate + AMSU	32 + 2%	2 lf SB	29.7	16.10	91.13
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
	Glyphosate + AMSU	22 + 2%	14 DAT			
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	32.9	15.88	89.25
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	27.1	16.13	89.19
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	30.1	16.20	90.51
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT			
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	33.4	15.96	89.49
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	29.4	15.85	89.29
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	31.7	16.16	90.99
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT			
11	Sequence	68	at 2 LF SB	33.4	15.82	89.59
12	Sequence	68	14 DAT 2 LF SB	30.5	15.68	89.33
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	32.5	16.34	89.90
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT			
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	35.2	15.98	89.71
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	28.2	16.09	89.94
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	33.9	15.93	89.61
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT			
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	33.7	16.19	90.01
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	31.3	16.04	89.31
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	33.2	15.73	89.34
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT			
20	Sequence	39	2 LF SB	32.6	15.63	88.75
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	34.0	15.97	89.73
	Sequence	39	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	32.8	15.84	89.86
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Sequence	39	14 DAT			
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	32.1	16.20	90.15
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
24	Mon 63410	32	pre emergence	28.4	16.30	90.86
	Glyphosate + AMSU	32 + 2%	at 2 LF SB			
			CV	4.6	2.45	1.34
			LSD (.05)	2.0	0.55	1.70

1031 Clara City Lay-by Herbicides for Glyphosate Resistant Sugarbeet

Table 3c. Lay-by-Herbicide and Glyphosate Influence on Ext. Per Suc and Revenue as Percent of Means, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Ext. Per Suc	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Glyphosate + AMSU	32 + 2%	2 lf SB	13.3	265	9540	113.79
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	13.2	264	8135	96.58
3	Glyphosate + AMSU	32 + 2%	2 lf SB	13.0	259	8135	95.10
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB				
4	Glyphosate + AMSU	32 + 2%	2 lf SB	13.7	273	8100	98.99
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB				
	Glyphosate + AMSU	22 + 2%	14 DAT				
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	13.1	262	8623	101.68
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	13.3	266	7199	86.06
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	13.6	272	8196	99.95
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT				
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	13.2	264	8818	104.79
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	13.1	261	7680	90.42
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	13.7	274	8663	106.03
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT				
11	Sequence	68	at 2 LF SB	13.1	262	8764	103.43
12	Sequence	68	14 DAT 2 LF SB	12.9	259	7892	92.02
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	13.6	273	8857	108.06
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT				
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	13.3	265	9329	111.26
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	13.4	268	7554	90.94
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	13.2	264	8949	106.31
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT				
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	13.5	270	9108	110.36
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	13.2	265	8281	98.62
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	13.0	260	8617	100.82
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT				
20	Sequence	39	2 LF SB	12.8	256	8321	95.94
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	13.3	265	9015	107.52
	Sequence	39	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	13.2	264	8632	102.35
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Sequence	39	14 DAT				
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	13.6	271	8692	105.54
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
24	Mon 63410	32	pre emergence	13.8	276	7840	96.52
	Glyphosate + AMSU	32 + 2%	at 2 LF SB				
			CV	3.8	4	6	8.61
			LSD (.05)	0.7	14	721	12.15

1032 Renville Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 4. Lay-by-Herbicide and Glyphosate Influence on Weed Control, 2010

Trt No.	Herbicide	Rate (oz/acre)	Application Timing	Lambs quarter 6/24/10	Alfalfa 6/24/10	Amrath 6/24/10	Lambs quarter 7/19/10	Alfalfa 7/19/10	Amrath 7/19/10
1	Glyphosate + AMSU	1.125 + 2%	2 lf SB	93	89	98	97	99	99
2	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	99	98	99	99	99	99
3	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	99	99	99	99	99	98
	Glyphosate + AMSU	0.75 + 2%	14 DAT of 2 lf SB						
4	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	98	89	99	98	99	98
	Glyphosate + AMSU	0.75 + 2%	14 DAT of 2 lf SB						
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
5	Nortron + Glyphosate +AMSU	3.75 + 1.125 +2%	2 lf SB	99	84	99	99	99	99
6	Nortron + Glyphosate +AMSU	3.75 + 1.125 +2%	14 DAT of 2 lf SB	99	98	99	99	99	99
7	Nortron + Glyphosate +AMSU	2.17 + 1.125 + 2%	2 lf SB	99	98	99	99	99	99
	Nortron + Glyphosate +AMSU	1.575 + 0.75 + 2%	14 DAT of 2 LF SB						
8	Dual + Glyphosate + AMSU	1.59 + 1.125 + 2%	at 2 LF SB	99	97	99	99	99	99
9	Dual + Glyphosate + AMSU	1.59 + 1.125 + 2%	14 DAT of 2 LF SB	99	98	99	99	99	99
10	Dual + Glyphosate + AMSU	1.43 + 1.125 + 2%	at 2 LF SB	99	98	99	99	99	99
	Dual + Glyphosate + AMSU	1.04 + 0.75 + 2%	14 DAT						
11	Sequence	2.78	at 2 LF SB	97	91	99	99	98	98
12	Sequence	2.78	14 DAT 2 LF SB	99	83	99	99	99	99
13	Sequence + Glyphosate + AMSU	1.61 + 0.5 + 2%	at 2 LF SB	99	96	99	99	99	99
	Sequence + Glyphosate + AMSU	1.172 + 0.25 + 2%	14 DAT						
14	Outlook + Glyphosate + AMSU	0.984 + 1.125 + 2%	at 2 LF SB	99	99	99	99	98	99
15	Outlook + Glyphosate + AMSU	0.984 + 1.125 + 2%	14 DAT of 2LF SB	98	89	99	99	99	99
16	Outlook + Glyphosate + AMSU	0.656 + 1.125 + 2%	at 2LF SB	99	84	99	99	99	99
	Outlook + Glyphosate + AMSU	0.469 + 0.75 + 2%	14 DAT						
17	Mon 63410 + Glyphosate + AMSU	1.33 + 1.125 + 2%	at 2 LF SB	99	98	99	93	86	96
18	Mon 63410 + Glyphosate + AMSU	1.33 + 1.125 + 2%	14 DAT of 2LF SB	99	98	99	99	99	99
19	Mon 63410 + Glyphosate + AMSU	1.0 + 1.125 + 2%	at 2 LF SB	99	92	99	99	99	99
	Mon 63410 + Glyphosate + AMSU	0.724 + 0.75 + 2%	14 DAT						
20	Sequence	1.64	2 LF SB	99	98	99	99	99	98
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
21	Glyphosate + AMSU	0.75 + 2%	at 2LF SB	99	98	99	99	99	99
	Sequence	1.64	14 DAT						
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
22	Glyphosate + AMSU	0.75 + 2%	at 2LF SB	97	91	99	99	99	99
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
	Sequence	1.64	14 DAT						
23	Glyphosate + AMSU	0.75 + 2%	at 2 LF SB	99	77	99	99	99	99
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
	Glyphosate + AMSU	0.75 + 2%	14 DAT						
24	Mon 63410	1.33	pre emergence	99	96	99	93	99	99
	Glyphosate + AMSU	1.125	at 2 LF SB						
			CV%	2	9	0	2	2	1
			LSD (0.05)	3	12	0	2	2	1

1032 Renville Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 5a. Lay-by-Herbicide and Glyphosate Influence on Sugarbeet Production, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Tons	% Sugar	Purity
1	Glyphosate + AMSU	32 + 2%	2 lf SB	32.8	13.34	88.35
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	33.4	13.42	87.33
3	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	34.3	13.93	88.54
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
4	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	35.8	13.36	88.18
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
	Glyphosate + AMSU	22 + 2%	14 DAT			
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	38.3	13.49	87.48
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	33.8	13.17	87.65
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	33.3	13.68	88.40
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT of 2 LF SB			
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	32.8	13.15	87.52
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	35.5	13.63	87.54
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	34.6	13.35	87.43
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT			
11	Sequence	68	at 2 LF SB	34.7	14.31	89.74
12	Sequence	68	14 DAT 2 LF SB	35.7	13.48	86.90
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	33.7	13.74	87.96
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT			
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	32.8	13.32	86.82
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	31.5	13.58	87.28
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	33.2	13.09	86.94
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT			
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	31.3	13.30	87.02
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	33.8	12.71	87.03
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	33.9	14.13	88.53
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT			
20	Sequence	39	2 LF SB	36.2	13.61	87.84
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	35.9	12.96	87.22
	Sequence	39	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	33.5	13.37	87.24
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Sequence	39	14 DAT			
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	35.1	13.35	86.63
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
24	Mon 63410	32	pre emergence	30.0	13.05	87.01
	Glyphosate + AMSU	32 + 2%	at 2 LF SB			
			CV	**3.5**	**4.83**	**1.26**
			LSD (.05)	**1.7**	**0.91**	**1.55**

1032 Renville Lay-by Herbicides for Glyphosate Resistant Sugarbeet

Table 5b. Lay-by-Herbicide and Glyphosate Influence on Ext. Per Suc and Revenue as Percent of Means, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Ext. Per Suc	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	Glyphosate + AMSU	32 + 2%	2 lf SB	10.7	215	7031	99.70
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	10.6	212	7099	99.29
3	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	11.3	225	7727	116.68
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB				
4	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	10.7	214	7676	108.65
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB				
	Glyphosate + AMSU	22 + 2%	14 DAT				
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	10.7	214	8196	115.87
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	10.5	209	7067	96.76
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	11.0	221	7357	108.16
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT of 2 LF SB				
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	10.4	208	6846	93.22
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	10.8	217	7693	110.52
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	10.6	212	7319	101.81
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT				
11	Sequence	68	at 2 LF SB	11.8	236	8185	130.36
12	Sequence	68	14 DAT 2 LF SB	10.6	212	7571	105.50
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	11.0	220	7425	108.80
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT				
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	10.4	209	6860	93.73
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	10.7	215	6776	96.28
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	10.3	205	6829	91.02
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT				
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	10.5	209	6540	89.56
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	10.0	199	6738	85.69
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	11.4	229	7753	119.15
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT				
20	Sequence	39	2 LF SB	10.9	218	7874	113.68
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	10.2	204	7325	96.74
	Sequence	39	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	10.6	211	7072	98.20
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Sequence	39	14 DAT				
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	10.4	209	7324	99.96
	Glyphosate + AMSU	22 + 2%	14 DAT				
	Glyphosate + AMSU	22 + 2%	14 DAT				
24	Mon 63410	32	pre emergence	10.3	205	6157	81.81
	Glyphosate + AMSU	32 + 2%	at 2 LF SB				
			CV	6.3	6	7	15.43
			LSD (.05)	0.9	19	740	21.76

1033 Danube Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 6a. Lay-by-Herbicide and Glyphosate Influence on Weed Control, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Lambs quarter 6/24/10	Velvetleaf 6/24/10	Amaranth 6/24/10	Cockel bur 6/24/10	Smart weed 6/24/10
1	Glyphosate + AMSU	32 + 2%	2 lf SB	97	99	99	86	99
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	99	98	99
3	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	99	98	99
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB					
4	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	99	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB					
	Glyphosate + AMSU	22 + 2%	14 DAT					
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	97	99	99	96	99
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	99	99	99	99	99
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	98	99	99	99	99
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT					
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	99	99	99	96	99
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	99	99	99	98	99
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	99	99	99	98	99
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT					
11	Sequence	68	at 2 LF SB	99	99	99	96	99
12	Sequence	68	14 DAT 2 LF SB	91	99	99	98	98
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	99	99	99	99	99
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT					
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	98	99	99	97	99
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	99	99	99	99	99
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	99	99	99	99	99
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT					
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	74	74	74	74	74
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	99	99	99	98	99
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	99	99	97	98	99
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT					
20	Sequence	39	2 LF SB	99	99	99	98	99
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	99	99	99	98	99
	Sequence	39	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	74	74	74	75	74
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Sequence	39	14 DAT					
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	99	99	99	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
24	Mon 63410	32	pre emergence	97	99	99	99	99
	Glyphosate + AMSU	32 + 2%	at 2 LF SB					
			CV%	2	0	0	2	1
			LSD (0.05)	3	0	0	3	1

1033 Danube Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 6b. Lay-by-Herbicide and Glyphosate Influence on Weed Control, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Lambs quarter 7/12/10	Velvetleaf 7/12/10	Amaranth 7/12/10	Cockel bur 7/12/10	Smart weed 7/12/10
1	Glyphosate + AMSU	32 + 2%	2 lf SB	99	98	99	68	97
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	99	81	99
3	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	99	93	99
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB					
4	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	99	99	98	81	99
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB					
	Glyphosate + AMSU	22 + 2%	14 DAT					
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	99	99	99	70	99
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	99	99	99	83	99
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	99	99	99	80	98
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT					
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	87	99	99	79	99
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	99	99	99	81	99
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	99	99	99	75	88
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT					
11	Sequence	68	at 2 LF SB	88	90	90	75	88
12	Sequence	68	14 DAT 2 LF SB	92	99	98	88	98
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	98	99	99	98	99
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT					
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	94	99	92	75	99
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	99	99	99	99	99
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	99	99	99	76	99
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT					
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	74	74	74	67	74
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	99	99	99	82	99
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	99	99	99	55	99
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT					
20	Sequence	39	2 LF SB	99	99	99	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	99	99	99	99	99
	Sequence	39	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	72	74	74	58	74
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Sequence	39	14 DAT					
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	99	99	99	99	99
	Glyphosate + AMSU	22 + 2%	14 DAT					
	Glyphosate + AMSU	22 + 2%	14 DAT					
24	Mon 63410	32	pre emergence	98	99	99	90	98
	Glyphosate + AMSU	32 + 2%	at 2 LF SB					
			CV%	2	0	0	2	1
			LSD (0.05)	3	0	0	3	1

1033 Danube Lay-by Herbicides for Glyphosate Resistant Sugarbeet
Table 7a. Lay-by-Herbicide and Glyphosate Influence on Sugarbeet Production, 2010

Trt No.	Herbicide	Rate (acre)	Application Timing	Tons	% Sugar	Purity
1	Glyphosate + AMSU	32 + 2%	2 lf SB	17.9	15.01	91.94
2	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	18.8	14.56	91.75
3	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	19.5	14.43	111.07
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
4	Glyphosate + AMSU	32 + 2%	14 DAT of 2 lf SB	25.3	15.07	92.06
	Glyphosate + AMSU	22 + 2%	14 DAT of 2 lf SB			
	Glyphosate + AMSU	22 + 2%	14 DAT			
5	Nortron + Glyphosate +AMSU	120 + 32 +2%	2 lf SB	20.8	15.20	91.64
6	Nortron + Glyphosate +AMSU	120 + 32 +2%	14 DAT of 2 lf SB	22.9	15.18	92.61
7	Nortron + Glyphosate +AMSU	70 + 32 + 2%	2 lf SB	23.7	15.42	93.27
	Nortron + Glyphosate +AMSU	50 + 22 + 2%	14 DAT			
8	Dual + Glyphosate + AMSU	27 + 32 + 2%	at 2 LF SB	20.6	15.20	91.88
9	Dual + Glyphosate + AMSU	27 + 32 + 2%	14 DAT of 2 LF SB	24.1	14.76	91.79
10	Dual + Glyphosate + AMSU	24 + 1.125 + 2%	at 2 LF SB	23.2	14.33	100.44
	Dual + Glyphosate + AMSU	17+ 0.75 + 2%	14 DAT			
11	Sequence	68	at 2 LF SB	22.0	14.73	91.72
12	Sequence	68	14 DAT 2 LF SB	22.6	14.86	91.78
13	Sequence + Glyphosate + AMSU	37 + 15 + 2%	at 2 LF SB	23.2	14.93	91.72
	Sequence + Glyphosate + AMSU	29 + 7.5 + 2%	14 DAT			
14	Outlook + Glyphosate + AMSU	21 + 32 + 2%	at 2 LF SB	21.6	15.21	92.42
15	Outlook + Glyphosate + AMSU	21 + 32 + 2%	14 DAT of 2LF SB	21.7	15.60	91.91
16	Outlook + Glyphosate + AMSU	14 + 32 + 2%	at 2LF SB	23.9	15.21	91.79
	Outlook + Glyphosate + AMSU	10 + 22 + 2%	14 DAT			
17	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	at 2 LF SB	19.8	15.35	90.96
18	Mon 63410 + Glyphosate + AMSU	32 + 32 + 2%	14 DAT of 2LF SB	19.3	14.23	91.98
19	Mon 63410 + Glyphosate + AMSU	24 + 32 + 2%	at 2 LF SB	20.3	15.40	92.60
	Mon 63410 + Glyphosate + AMSU	17 + 22 + 2%	14 DAT			
20	Sequence	39	2 LF SB	28.8	15.34	92.41
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
21	Glyphosate + AMSU	22 + 2%	at 2LF SB	24.0	15.07	92.29
	Sequence	39	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
22	Glyphosate + AMSU	22 + 2%	at 2LF SB	22.3	16.11	92.45
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Sequence	39	14 DAT			
23	Glyphosate + AMSU	22 + 2%	at 2 LF SB	25.6	14.72	91.89
	Glyphosate + AMSU	22 + 2%	14 DAT			
	Glyphosate + AMSU	22 + 2%	14 DAT			
24	Mon 63410	32	pre emergence	18.3	14.84	91.85
	Glyphosate + AMSU	32 + 2%	at 2 LF SB			
			CV	**6.3**	**2.99**	**6.01**
			LSD (.05)	**1.9**	**0.63**	**7.90**

1033 Danube Lay-by Herbicides for Glyphosate Resistant Sugarbeets

Table 7b. Lay-by Herbicide and Glyphosate Influence on Ext. Per Suc and Revenue as Percent of Means, 2010

Trt No.	Herbicide	Rate (oz/acre)	Application Timing	Ext. Suc	Ext Per Ton	Ext Per Acre	% Revenue
1	Glyphosate + AMSU	1.125 + 2%	2 lf SB	12.8	256	4582	105.04
2	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	12.4	248	4650	103.11
3	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	14.5	290	5631	142.48
	Glyphosate + AMSU	0.75 + 2%	14 DAT of 2 lf SB				
4	Glyphosate + AMSU	1.125 + 2%	14 DAT of 2 lf SB	12.9	258	6515	149.99
	Glyphosate + AMSU	0.75 + 2%	14 DAT of 2 lf SB				
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
5	Nortron + Glyphosate +AMSU	3.75 + 1.125 +2%	2 lf SB	12.9	259	5390	124.37
6	Nortron + Glyphosate +AMSU	3.75 + 1.125 +2%	14 DAT of 2 lf SB	13.1	262	6008	140.38
7	Nortron + Glyphosate +AMSU	2.17 + 1.125 + 2%	2 lf SB	13.4	268	6350	151.46
	Nortron + Glyphosate +AMSU	1.575 + 0.75 + 2%	14 DAT				
8	Dual + Glyphosate + AMSU	1.59 + 1.125 + 2%	at 2 LF SB	13.0	260	5349	123.86
9	Dual + Glyphosate + AMSU	1.59 + 1.125 + 2%	14 DAT of 2 LF SB	12.6	251	6061	136.26
10	Dual + Glyphosate + AMSU	1.43 + 1.125 + 2%	at 2 LF SB	13.1	263	6117	143.77
	Dual + Glyphosate + AMSU	1.04 + 0.75 + 2%	14 DAT				
11	Sequence	2.78	at 2 LF SB	12.5	250	5506	123.28
12	Sequence	2.78	14 DAT 2 LF SB	12.7	253	5711	129.20
13	Sequence + Glyphosate + AMSU	1.61 + 0.5 + 2%	at 2 LF SB	12.7	254	5891	133.81
	Sequence + Glyphosate + AMSU	1.172 + 0.25 + 2%	14 DAT				
14	Outlook + Glyphosate + AMSU	0.984 + 1.125 + 2%	at 2 LF SB	13.1	262	5650	131.99
15	Outlook + Glyphosate + AMSU	0.984 + 1.125 + 2%	14 DAT of 2LF SB	13.4	267	5807	137.88
16	Outlook + Glyphosate + AMSU	0.656 + 1.125 + 2%	at 2LF SB	13.0	260	6192	143.31
	Outlook + Glyphosate + AMSU	0.469 + 0.75 + 2%	14 DAT				
17	Mon 63410 + Glyphosate + AMSU	1.33 + 1.125 + 2%	at 2 LF SB	13.0	259	5119	118.21
18	Mon 63410 + Glyphosate + AMSU	1.33 + 1.125 + 2%	14 DAT of 2LF SB	12.1	242	4693	101.78
19	Mon 63410 + Glyphosate + AMSU	1.0 + 1.125 + 2%	at 2 LF SB	13.3	266	5389	127.49
	Mon 63410 + Glyphosate + AMSU	0.724 + 0.75 + 2%	14 DAT				
20	Sequence	1.64	2 LF SB	13.2	264	7374	173.16
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
21	Glyphosate + AMSU	0.75 + 2%	at 2LF SB	12.9	259	6194	142.94
	Sequence	1.64	14 DAT				
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
22	Glyphosate + AMSU	0.75 + 2%	at 2LF SB	13.9	278	6202	152.48
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
	Sequence	1.64	14 DAT				
23	Glyphosate + AMSU	0.75 + 2%	at 2 LF SB	12.6	251	6433	144.36
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
	Glyphosate + AMSU	0.75 + 2%	14 DAT				
24	Mon 63410	1.33	pre emergence	12.7	253	4629	104.74
	Glyphosate + AMSU	1.125	at 2 LF SB				
			CV%	**4.6**	**5**	**8**	**11.23**
			LSD (0.05)	**0.8**	**17**	**680**	**20.93**

Weed Control in Sugar Beets with Glyphosate as influenced by Sugar, AMSU and Citric Acid

Objectives

The objectives of this testing evaluated weed control with Glyphosate plus additives including sugar in 2009 and 2010.

Methods

Table 1 shows the specifics of activities conducted at the sites testing glyphosate with additives in 2009 at Clara City and 2010 at Clara City and Renville, Mn. Plots were 11 ft. (6 rows) wide and 35 ft long. Sugarbeet stands were 160-200 plants/100 ft and were not thinned. Sugarbeets were harvested with a 2 row research harvester at all testing sites. Two rows of the six row plot were harvested with weights for yield calculation collected on the harvester and a sub sample collected for quality analysis in the SMBSC tare lab.

The tests were replicated 4 times and conducted in a randomized complete block experimental design. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. The sites are designated by experiment number. Research site 0940 was near Clara City, Mn in 2009, 1040 was near Clara City, Mn and 1047 was near Renville, Mn in 2010.

The treatments were initiated by weed stage. Treatments were applied when weeds reached the 4 inch height stage. Treatments were applied in 14 gpa mix at 40 psi.

Results and Discussion

Results from each testing site are presented in tables 2a, 2b, 3a, 3b, 4a, 4b. The discussion of the data will concentrate on the combined site results in table 5a and 5b. Weed control of common lambs quarter was similar with all treatments and was only statistically different with one treatment. The LSD to determine significance for control of common lambsquarter is only 1 and the largest difference is common lambsquarter control is 2. This small difference is insignificance in a practical sense. Thus, this author summarizes that there were no differences in common lamb quarter with glyphosate with or without the additives tested. Tons per acre and sugar content differences were statistically non significant. The highest sugar beet revenue (expressed as revenue percent of mean) was with Roundup Power Max plus citric acid and Honcho plus Ammonium Sulfate (AMS) Roundup PowerMax was used for the glyphosate herbicide. Roundup Power Max which is a 4.5 lbs. a.e. per gallon product and Honcho is 3 lb. per gallon product. The data indicates that the formulation of the glyphosate product is insignificant. A more significant factor may have to do with the surfactants included in the formulation or added in the spray mixture. Relative to control of common lambsquarter the formulation of the glyphosate or additive used was insignificant. Relative to revenue all treatments were statistically similar except for one treatment. The treatment that gave significantly lower revenue was also the one treatment that gave significantly less common lambsquarter control. Although the reduction in common lambsquarter was small, this reduction in common lambsquarter apparently had an influence on sugar beet revenue. These data along with other research conducted at SMBSC shows the significance of small differences in weed control in sugar beets. The rule that should be used to maximize sugar beet production relative to weed control is early and complete weed control is best.

Table 1. Site Specifics for AMSU Sugar Citric Acid Comparison

	Location		
Task	**Clara City**	**Clara City**	**Renville**
Sugarbeet-Varity	B95RR03	B95RR03	B95RR03
Planting-date	4/24/2009	4/22/2010	4/21/2010
Harvest	9/17/2009	10/17/2010	10/11/2010

0940 Clara City AMSU Sugar Citric Acid Comparison

Table 2a. Spray Additive with Glyphosate Influence on Weed Control Efficacy and Sugarbeet Production, 2009

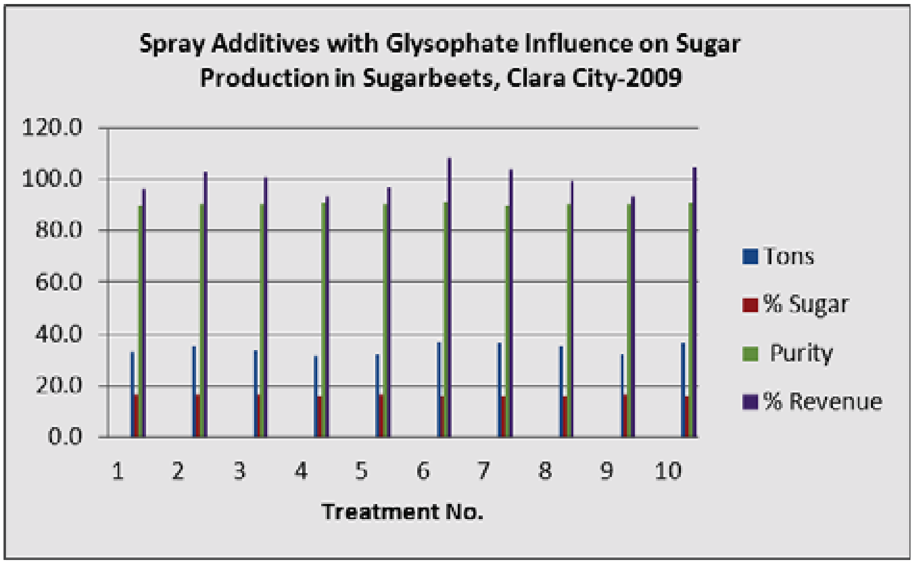
TRT No.	PRODUCT	Rate oz/acre	App stage	Lambs quarter	Tons	% Sugar	Purity
1	ROUNDUP POWER MAX	22	4"WDS	95	32.8	16.50	89.97
	ROUNDUP POWER MAX	22	4"WDS				
	ROUNDUP POWER MAX	22	If needed				
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	96	35.5	16.43	90.07
	ROUNDUP POWER MAX + AMS	22+17	4"WDS				
	ROUNDUP POWER MAX + AMS	22+17	If needed				
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	95	33.6	16.61	90.40
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed				
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	94	31.8	16.38	90.64
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS				
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed				
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	96	31.8	16.86	90.44
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed				
6	HONCHO	32	4"WDS	97	36.9	16.34	91.14
	HONCHO	32	4"WDS				
	HONCHO	32	If needed				
7	HONCHO + AMS	32+17	4"WDS	98	36.4	16.37	89.90
	HONCHO + AMS	32+17	4"WDS				
	HONCHO + AMS	32+17	If needed				
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	97	35.4	16.14	90.07
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS				
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed				
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	96	31.9	16.42	90.27
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed				
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	96	36.7	16.16	90.72
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed				
			CV	1	12.0	3.754	0.71
			LSD (.05)	2	NS	NS	0.94

0940 Clara City AMSU Sugar Citric Acid Comparison
Table 2b. Spray Additive with Glyphosate Influence on Sugar Production in Sugarbeets, 2009

TRT No.	PRODUCT	Rate oz/acre	App stage	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWER MAX	22	4"WDS	276	9080	96.47
	ROUNDUP POWER MAX	22	4"WDS			
	ROUNDUP POWER MAX	22	If needed			
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	275	9728	102.65
	ROUNDUP POWER MAX + AMS	22+17	4"WDS			
	ROUNDUP POWER MAX + AMS	22+17	If needed			
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	279	9409	100.95
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed			
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	276	8790	93.45
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed			
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	284	8977	96.90
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed			
6	HONCHO	32	4"WDS	277	10200	108.42
	HONCHO	32	4"WDS			
	HONCHO	32	If needed			
7	HONCHO + AMS	32+17	4"WDS	273	9913	103.97
	HONCHO + AMS	32+17	4"WDS			
	HONCHO + AMS	32+17	If needed			
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	270	9541	99.28
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed			
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	276	8796	93.13
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed			
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	273	9984	104.77
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed			

CV	**4**	**13**	**15.16**
LSD (.05)	**NS**	**NS**	**NS**

TABLES 2 A & B



Spray Additives with Glysophate Influence on Sugar Production in Sugarbeets, Clara City-2009
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1
2
3
4
5
6
7
8
9
10
Treatment No.
Tons
% Sugar
Purity
% Revenue

1040 Clara City AMSU Sugar Citric Acid Comparison

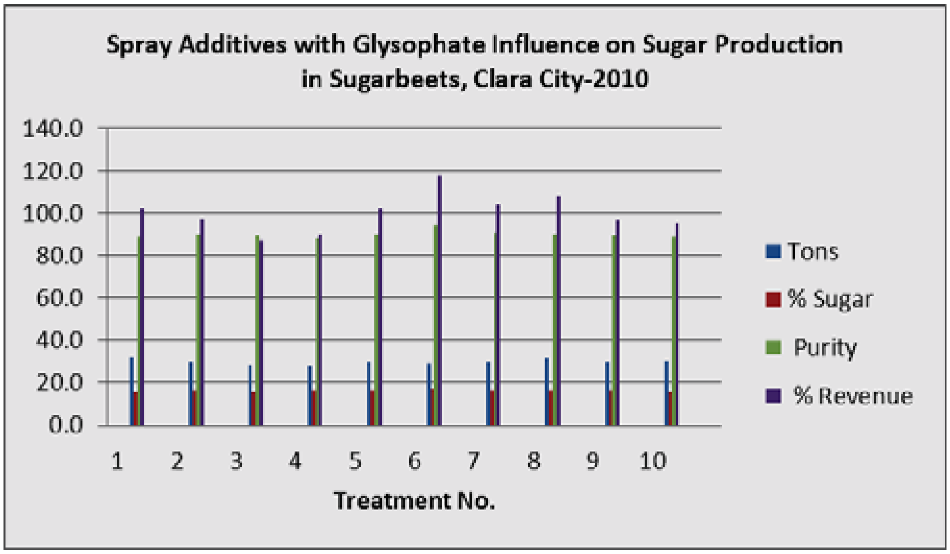
Table 3a. Spray Additive with Glyphosate Influence on Weed Control Efficacy and Sugarbeet Production, 2010

TRT No.	PRODUCT	Rate oz/acre	App stage	Lambsquarter 6/29/10	Lambsquarter 7/12/10	Tons	% Sugar	Purity
1	ROUNDUP POWER MAX	22	4"WDS	97	99	31.8	16.05	89.11
	ROUNDUP POWER MAX	22	4"WDS					
	ROUNDUP POWER MAX	22	If needed					
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	98	99	29.6	16.14	89.86
	ROUNDUP POWER MAX + AMS	22+17	4"WDS					
	ROUNDUP POWER MAX + AMS	22+17	If needed					
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	96	99	28.5	15.58	89.16
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed					
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	94	99	28.0	16.23	88.51
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS					
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed					
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	97	99	29.6	16.42	90.16
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed					
6	HONCHO	32	4"WDS	99	99	29.1	16.99	94.11
	HONCHO	32	4"WDS					
	HONCHO	32	If needed					
7	HONCHO + AMS	32+17	4"WDS	98	99	29.6	16.45	90.64
	HONCHO + AMS	32+17	4"WDS					
	HONCHO + AMS	32+17	If needed					
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	98	99	31.3	16.48	89.83
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS					
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed					
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	97	99	29.6	16.15	89.18
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed					
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	98	99	30.5	15.94	88.83
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed					
			CV	2	0	6.1	4.77	3.19
			LSD (.05)	2	0	2.6	1.12	4.17

1040 Clara City AMSU Sugar Citric Acid Comparison
Table 3b. Spray Additive with Glyphosate Influence on Sugar Production in Sugarbeets, 2010

TRT No.	PRODUCT	Rate oz/acre	App stage	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWER MAX	22	4"WDS	264	8395	101.86
	ROUNDUP POWER MAX	22	4"WDS			
	ROUNDUP POWER MAX	22	If needed			
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	269	7929	97.42
	ROUNDUP POWER MAX + AMS	22+17	4"WDS			
	ROUNDUP POWER MAX + AMS	22+17	If needed			
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	256	7324	86.75
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed			
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	265	7416	90.21
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed			
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	275	8136	102.06
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed			
6	HONCHO	32	4"WDS	301	8783	118.07
	HONCHO	32	4"WDS			
	HONCHO	32	If needed			
7	HONCHO + AMS	32+17	4"WDS	277	8203	103.66
	HONCHO + AMS	32+17	4"WDS			
	HONCHO + AMS	32+17	If needed			
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	275	8603	108.01
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed			
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	266	7896	96.50
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed			
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	261	7952	95.46
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed			
			CV	**9**	**11**	**17.36**
			LSD (.05)	**35**	**1268**	**25.19**

TABLE 3 A & B


Spray Additives with Glysophate Influence on Sugar Production
in Sugarbeets, Clara City-2010
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1
2
3
4
5
6
7
8
9
10
Treatment No.
Tons
% Sugar
Purity
% Revenue

1047 Renville AMSU Sugar Citric Acid Comparison

Table 4a. Spray Additive with Glyphosate Influence on Weed Control Efficacy and Sugarbeet Production, 2010

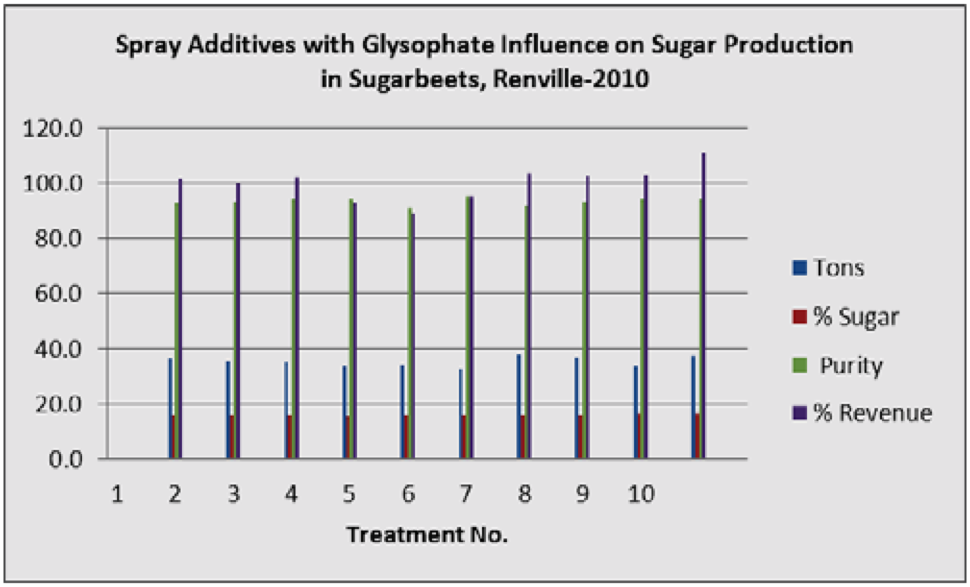
Trt. No.	PRODUCT	Rate oz/acre	App. stage	Lambsquarter 6/24/10	Lambsquarter 7/19/10	Tons	% Sugar	Purity
1	ROUNDUP POWER MAX	22	4"WDS	98	99	36.6	16.19	92.63
	ROUNDUP POWER MAX	22	4"WDS					
	ROUNDUP POWER MAX	22	If needed					
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	99	99	35.7	16.05	93.42
	ROUNDUP POWER MAX + AMS	22+17	4"WDS					
	ROUNDUP POWER MAX + AMS	22+17	If needed					
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	99	99	35.0	16.30	94.33
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed					
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	99	99	33.9	15.78	93.96
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS					
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed					
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	99	99	34.4	15.97	91.09
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed					
6	HONCHO	32	4"WDS	99	99	32.9	16.12	94.84
	HONCHO	32	4"WDS					
	HONCHO	32	If needed					
7	HONCHO + AMS	32+17	4"WDS	99	99	37.9	16.22	91.90
	HONCHO + AMS	32+17	4"WDS					
	HONCHO + AMS	32+17	If needed					
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	99	99	37.0	16.02	93.39
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS					
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed					
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	99	99	33.7	16.74	93.91
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed					
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	99	99	37.6	16.37	94.33
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS					
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed					
			CV	1	0	2.9	5.27	2.87
			LSD (.05)	1	0	1.5	NS	3.88

1047 Renville AMSU Sugar Citric Acid Comparison

Table 4b. Spray Additive with Glyphosate Influence on Sugar Production in Sugarbeets, 2010

Trt. No.	PRODUCT	Rate oz/acre	App. stage	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWER MAX	22	4"WDS	281	10276	101.72
	ROUNDUP POWER MAX	22	4"WDS			
	ROUNDUP POWER MAX	22	If needed			
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	281	10036	99.54
	ROUNDUP POWER MAX + AMS	22+17	4"WDS			
	ROUNDUP POWER MAX + AMS	22+17	If needed			
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	289	10098	102.22
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed			
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	278	9427	92.63
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed			
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	271	9278	89.01
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed			
6	HONCHO	32	4"WDS	287	9438	95.09
	HONCHO	32	4"WDS			
	HONCHO	32	If needed			
7	HONCHO + AMS	32+17	4"WDS	278	10534	103.61
	HONCHO + AMS	32+17	4"WDS			
	HONCHO + AMS	32+17	If needed			
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	280	10360	102.47
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed			
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	295	9981	102.97
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed			
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	290	10902	110.72
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed			
			CV	**8**	**8**	**14.63**
			LSD (.05)	**NS**	**1233**	**21.23**

TABLES 4 A & B



Spray Additives with Glysophate Influence on Sugar Production in Sugarbeets, Renville-2010
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1
2
3
4
5
6
7
8
9
10
Treatment No.
Tons
% Sugar
Purity
% Revenue

Combined AMSU Sugar Citric Acid Comparison, 2009-2010

Table 5a. Spray Additive with Glyphosate Influence on Weed Control Efficacy and Sugarbeet Production, 2009-2010

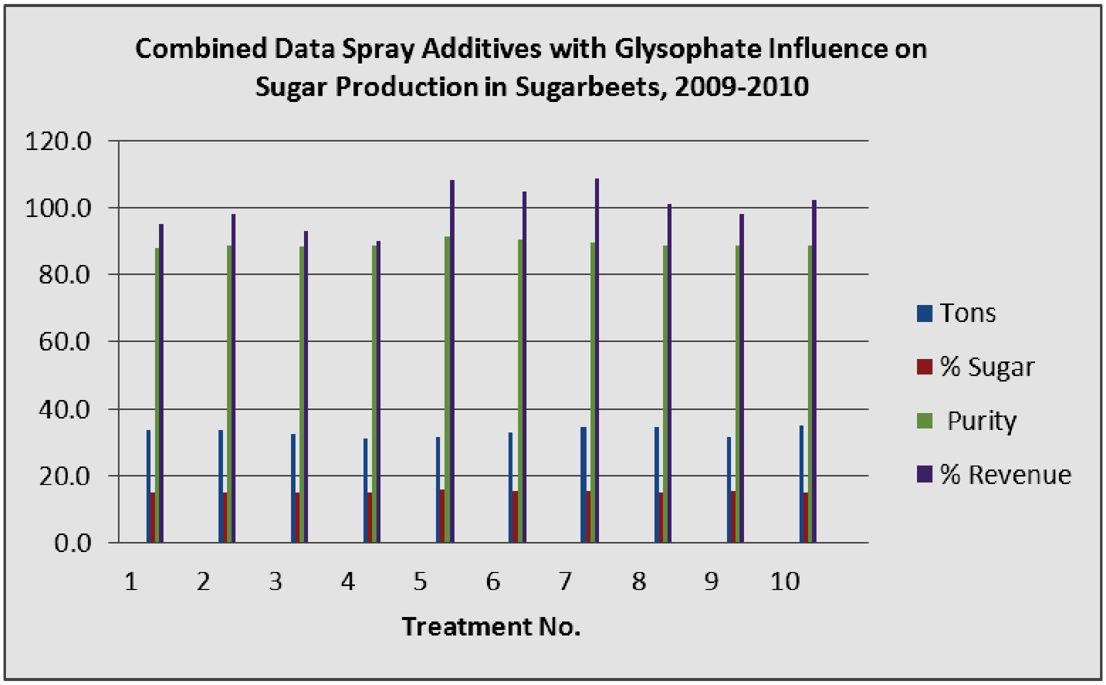
TRT No.	PRODUCT	Rate oz/acre	App stage	Lambsquarter	Tons	% Sugar	Purity
1	ROUNDUP POWER MAX	22	4"WDS	98	33.7	15.09	88.06
	ROUNDUP POWER MAX	22	4"WDS				
	ROUNDUP POWER MAX	22	If needed				
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	98	33.6	15.14	88.69
	ROUNDUP POWER MAX + AMS	22+17	4"WDS				
	ROUNDUP POWER MAX + AMS	22+17	If needed				
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	98	32.4	15.02	88.47
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed				
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	97	31.3	15.08	88.60
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS				
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed				
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	98	31.8	15.90	91.35
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed				
6	HONCHO	32	4"WDS	98	33.0	15.36	90.62
	HONCHO	32	4"WDS				
	HONCHO	32	If needed				
7	HONCHO + AMS	32+17	4"WDS	99	34.6	15.52	89.84
	HONCHO + AMS	32+17	4"WDS				
	HONCHO + AMS	32+17	If needed				
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	98	34.6	15.15	88.67
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS				
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed				
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	98	31.8	15.34	88.82
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed				
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	98	34.8	15.06	88.84
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS				
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed				
			CV	1	10.2	6.07	4.42
			LSD (.05)	1	2.2	0.65	3.14

Combined AMSU Sugar Citric Acid Comparison, 2009-2010

Table 5b. Spray Additive with Glyphosate Influence on Sugar Production in Sugarbeets,2009- 2010

TRT No.	PRODUCT	Rate oz/acre	App stage	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWER MAX	22	4"WDS	244	8162	95.14
	ROUNDUP POWER MAX	22	4"WDS			
	ROUNDUP POWER MAX	22	If needed			
2	ROUNDUP POWER MAX + AMS	22+17	4"WDS	248	8265	98.15
	ROUNDUP POWER MAX + AMS	22+17	4"WDS			
	ROUNDUP POWER MAX + AMS	22+17	If needed			
3	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS	245	7894	92.99
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	22+1lb+1.5lb(100 gal)	If needed			
4	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS	246	7634	90.12
	ROUNDUP POWER MAX + Sug.	22+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	22+1lb	If needed			
5	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS	272	8495	108.12
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	22+1.5lb(100 gal)	If needed			
6	HONCHO	32	4"WDS	259	8520	104.72
	HONCHO	32	4"WDS			
	HONCHO	32	If needed			
7	HONCHO + AMS	32+17	4"WDS	259	8867	108.85
	HONCHO + AMS	32+17	4"WDS			
	HONCHO + AMS	32+17	If needed			
8	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS	248	8508	101.25
	ROUNDUP POWER MAX + Sug.	32+1lb	4"WDS			
	ROUNDUP POWER MAX + Sug.	32+1lb	If needed			
9	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS	251	7953	98.15
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Citric Acid	32+1.5lb(100 gal)	If needed			
10	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS	246	8539	102.52
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	4"WDS			
	ROUNDUP POWER MAX + Sug. + Citric Acid	32+1lb+1.5lb(100 gal)	If needed			
			CV	**12**	**16**	**24.90**
			LSD (.05)	**23**	**848**	**16.53**

TABLES5 A& B


Combined Data Spray Additives with Glysophate Influence on Sugar Production in Sugarbeets, 2009-2010
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1
2
3
4
5
6
7
8
9
10
Treatment No.
Tons
% Sugar
Purity
% Revenue

Evaluation of Optimal Weed Control Timing in a Glyphosate Weed Control System

The optimal timing of weed control has been an issue of discussions relative to efficacy of weed control and optimizing production. Comparisons continue to be made in reference to the two systems related to the influence of the herbicides and variety comparisons. A test was initiated in 2010 to investigate the question of differences when considering these comparisons.

Methods

Table 1 shows the specifics of activities conducted at each of the 2 sites conducted 2010 at Clara City and Renville, Mn, respectively. Plots were 11 ft. (6 rows) wide and 30 ft. long. Sugarbeet stands were 180-200 plants/100 ft. and were not thinned. Sugarbeets were harvested with a 2 row harvester at both locations. Rows 3 and 4 of the 6 row plot were harvested and the complete length of the plot was harvested. Weights were collected on the harvester and used to calculate yield per acre and a subsample was taken on the harvester to be analyzed for quality in the SMBSC quality lab.

The tests were replicated 4 times and conducted in a randomized complete block experimental design. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. The sites are designated by experiment number. Clara City site was designated as 1037 and the Renville site was designated as 1038.

The treatments were initiated by weed stage for both conventional and glyphosate we system scenarios. The timing of treatments is designated in the data tables. Treatments were applied in 14 gpa mix at 40 psi.. Post emergent conventional herbicides were applied to cotyledon weeds. Glyphosate product used in this experiment was Roundup Power Max and was applied to 2 inch weeds and again when sugar beets were 6-8 leaf stage.

Three different varieties were used in this testing. There were two conventional varieties and one glyphosate tolerant variety. One of the glyphosate tolerant varieties is close genetically to the glyphosate tolerant variety. The conventional varieties did not perform significantly different so the two conventional varieties will be discussed as one.

Results and Discussion

Statistical analysis was conducted of homogeneity of combinability and determined that the two sites could not be combined. The reason that the data could not be combined was due to the magnitude difference in tons per acre between the 2 sites. The results relative to the influence of the treatments were similar disregarding the magnitude differential. Therefore, the results will be discussed in general and not specific to one location. The tables are arranged in that the weed control and the direct production variables (tons per acre, sugar percent and purity) for each site is separate from the tables showing production data resulting from the direct variable data each site. Revenue percent of mean is calculated by taking the experiment mean for revenue per acre divided by treatment revenue per acre multiplied by 100. The discussion will refer to the glyphosate chemistry and will not be specific to a single product name. The rates given however are specific to Roundup Power Max which is a 4.5 a.e. product. The discussion of the results is as follows.

Table 1. Site Specifics for Weed Control Timing, 2010

	Location		
Task	**Clara City**	**Renville**	**Danube**
Sugarbeet-Varity	95RR03	95RR03	9093
Planting-date	4/22/2010	4/21/2010	4/25/2010
Harvest	9/9/2010	10/11/2010	9/9/2010

1034 Clara City Weed Removal Timing
Table 2 a. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl.Timing	Lambs quarter 6/29/10	Lambs quarter 7/15/10	Tons	% Sugar	Purity
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	98	99	32.5	15.99	90.67
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	97	99	29.1	15.56	89.41
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	94	97	29.7	16.26	89.70
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	95	92	28.2	16.08	90.45
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	93	99	28.7	15.72	88.91
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	98	99	30.5	16.40	91.21
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	98	98	28.5	15.98	89.66
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	92	93	28.6	15.94	90.34
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	93	97	26.5	16.15	90.99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	95	99	24.7	16.35	92.44
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds					
			CV	3	4	5.5	2.14	1.06
			LSD (.05)	4	5	2.3	0.49	1.38

1034 Clara City Weed Removal Timing

Table 2 b. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

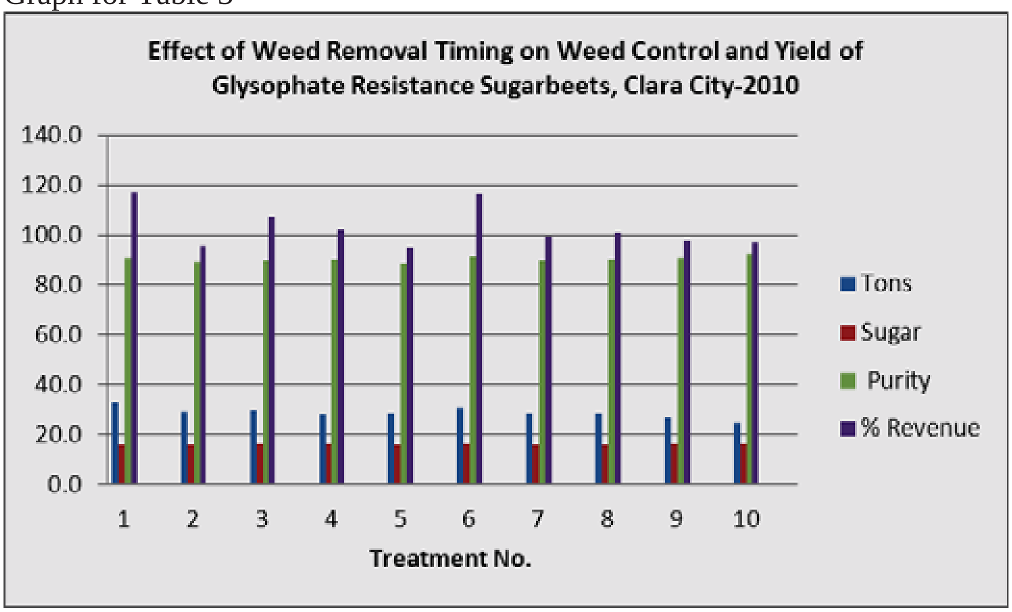
TRT NO	Product	Rate (oz/acre)	Appl.Timing	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	269	8753	116.83
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	257	7471	95.65
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	270	8027	107.47
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	270	7615	101.89
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	258	7408	95.14
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	279	8495	116.64
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	265	7568	99.69
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	267	7632	101.22
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	273	7256	98.08
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	283	6987	96.98
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
			CV	**3**	**7**	**9.16**
			LSD (.05)	**12**	**787**	**13.28**

1034 Clara City Weed Removal Timing

TABLE 3. Effect of Weed Removal Timing on Weed Control in Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl. Timing	Lambs quarter 6/29/10	Lambs quarter 7/15/10
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	98	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	97	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	94	97
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	95	92
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	93	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	98	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	98	98
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	92	93
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	93	97
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	95	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds		
			CV	**3**	**4**
			LSD (.05)	**4**	**5**

Graph for Table 3



1035 Renville Weed Removal Timing

Table 4. Effect of Weed Removal Timing on Weed Control in Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl. Timing	Alfalfa 6/24/10	Lambs quarter 6/24/10	Amaranth 6/24/10	Alfalfa 7/19/10	Lambs quarter 7/19/10	Amaranth 7/19/10
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	89	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	95	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	92	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	96	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	97	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	94	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	97	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	91	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	97	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	98	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds						
			CV	6	0	0	0	0	0
			LSD (.05)	8	0	0	0	0	0

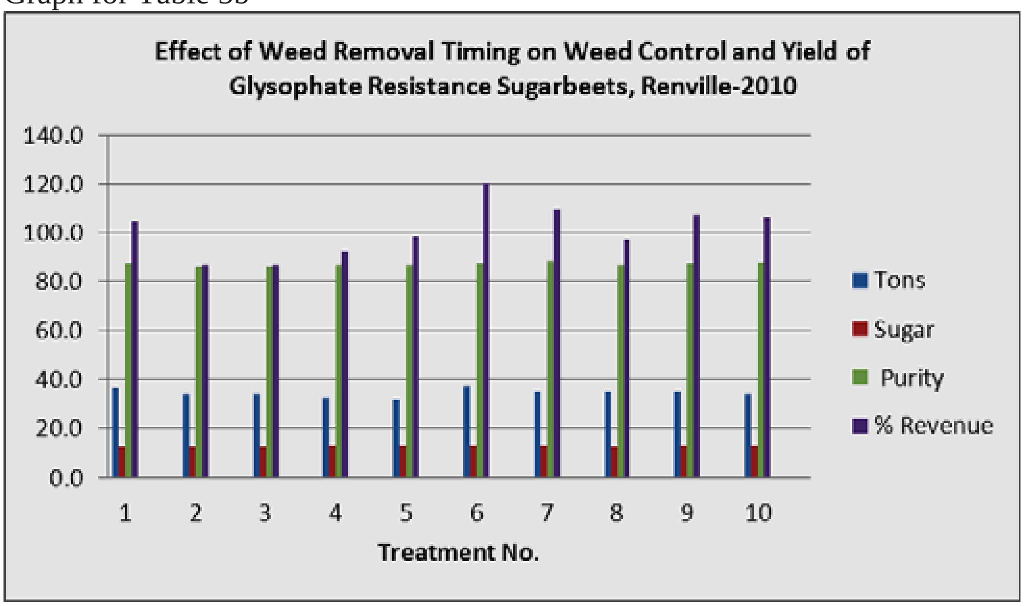
1035 Renville Weed Removal Timing
Table 5a. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl. Timing	Tons	% Sugar	Purity
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	36.9	12.82	86.91
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	34.4	12.45	86.24
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	34.3	12.52	85.90
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	32.5	12.91	86.51
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	32.0	13.28	86.52
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	37.1	13.38	87.36
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	35.3	13.04	88.06
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	35.0	12.77	86.59
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	35.2	13.14	87.03
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	34.3	13.12	87.54
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
			CV	**4.1**	**4.26**	**34.1**
			LSD (.05)	**2.1**	**0.80**	**NS**

1035 Renville Weed Removal Timing
Table 5b. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl. Timing	Ext. Suc Per Ton	Ext. Suc Per Acre	% Revenue
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	201	7410	104.60
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	192	6614	86.88
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	192	6606	86.80
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	201	6539	92.48
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	207	6623	98.11
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	212	7860	120.09
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	208	7357	109.85
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	199	6968	96.89
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	207	7282	107.36
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	208	7134	106.21
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
			CV	6	9	17.26
			LSD (.05)	NS	870	25.04

Graph for Table 5b



1036 Danube Weed Removal Timing

Table 6. Effect of Weed Removal Timing on Weed Control in Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl. Code	Appl. Timing	Lambs quarter 6/24/10	Velvet Leaf 6/24/10	Amrath 6/24/10	Cockel bur 6/24/10	Smart weed 6/24/10	Lambs quarter 7/12/10	Velvet Leaf 7/12/10	Amrath 7/12/10	Cockel bur 7/12/10	Smart weed 7/12/10
1	ROUNDUP POWERMAX + AMSU	22 + 2%	A	2 inch weeds	79	80	99	75	99	99	99	99	97	98
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
2	ROUNDUP POWERMAX + AMSU	22 + 2%	B	4 d. after A	98	99	98	96	97	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
3	ROUNDUP POWERMAX + AMSU	22 + 2%	C	8 d. after A	99	99	99	95	99	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
4	ROUNDUP POWERMAX + AMSU	22 + 2%	D	12 d. after A	86	99	99	92	91	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
5	ROUNDUP POWERMAX + AMSU	22 + 2%	E	16 d. after A	99	99	98	99	93	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
6	ROUNDUP POWERMAX + AMSU	32 + 2%	A	2 inch weeds	48	53	61	51	61	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
7	ROUNDUP POWERMAX + AMSU	32 + 2%	B	4 d. after A	97	99	99	89	99	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
8	ROUNDUP POWERMAX + AMSU	32 + 2%	C	8 d. after A	99	99	98	98	99	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
9	ROUNDUP POWERMAX + AMSU	32 + 2%	D	12 d. after A	96	99	99	96	98	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
10	ROUNDUP POWERMAX + AMSU	32 + 2%	E	16 d. after A	99	99	99	99	99	99	99	99	99	99
	ROUNDUP POWERMAX + AMSU	22 + 2%	F	3 inch weeds										
				CV	8	7	4	7	7	0	0	0	1	1
				LSD (.05)	10	9	5	9	9	0	0	0	1	1

1036 Danube Weed Removal Timing

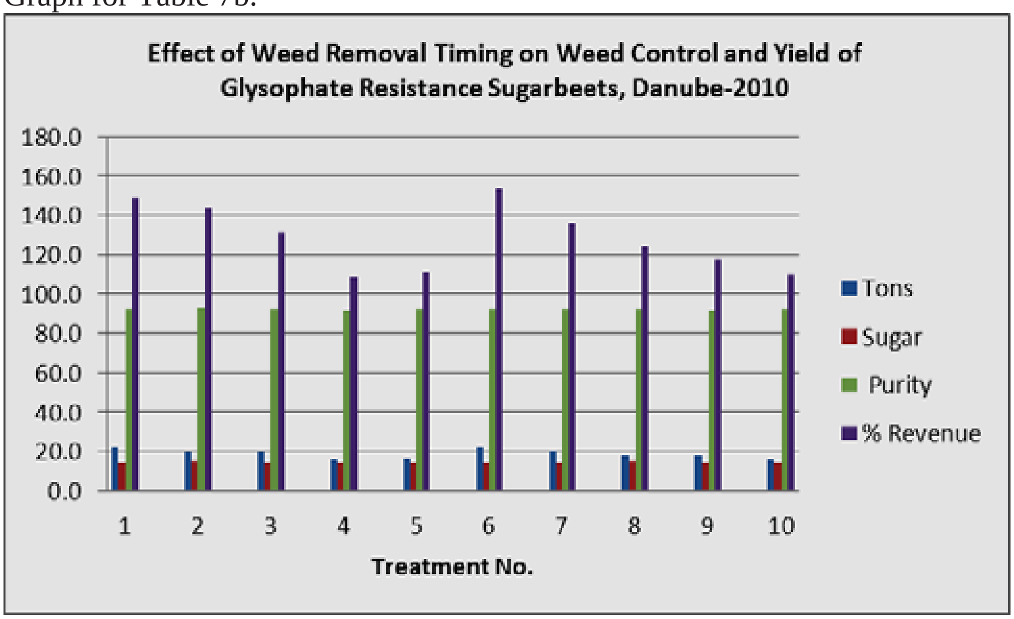
Table 7a. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl.Timing	Tons	% Sugar	Purity
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	22.6	14.61	91.87
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	19.5	15.26	92.70
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	19.6	14.72	91.97
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	16.1	14.80	91.70
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	16.5	14.69	92.32
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	22.3	14.85	92.23
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	20.2	14.76	91.83
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	17.6	15.02	92.32
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	17.9	14.62	91.78
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	16.1	14.85	91.95
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
			CV	22.3	16.34	5.7
			LSD (.05)	4.7	NS	0.1

1036 Danube Weed Removal Timing
Table 7b. Effect of Weed Removal Timing on Weed Control and Yield of Glyphosate Resistant Sugarbeets, 2010

TRT NO	Product	Rate (oz/acre)	Appl.Timing	Ext. Suc.per ton	Ext. Suc.per acre	% Revenue
1	ROUNDUP POWERMAX + AMSU	22 + 2%	2 inch weeds	249	5631	148.70
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
2	ROUNDUP POWERMAX + AMSU	22 + 2%	4 d. after A	264	5150	143.42
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
3	ROUNDUP POWERMAX + AMSU	22 + 2%	8 d. after A	251	4932	131.47
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
4	ROUNDUP POWERMAX + AMSU	22 + 2%	12 d. after A	252	4055	108.31
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
5	ROUNDUP POWERMAX + AMSU	22 + 2%	16 d. after A	252	4152	110.90
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
6	ROUNDUP POWERMAX + AMSU	32 + 2%	2 inch weeds	254	5686	153.40
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
7	ROUNDUP POWERMAX + AMSU	32 + 2%	4 d. after A	252	5091	135.91
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
8	ROUNDUP POWERMAX + AMSU	32 + 2%	8 d. after A	258	4537	124.16
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
9	ROUNDUP POWERMAX + AMSU	32 + 2%	12 d. after A	249	4456	117.61
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
10	ROUNDUP POWERMAX + AMSU	32 + 2%	16 d. after A	253	4074	109.60
	ROUNDUP POWERMAX + AMSU	22 + 2%	3 inch weeds			
			CV	**7**	**184**	**32.99**
			LSD (.05)	**1**	**169**	**4.12**

Graph for Table 7b.



Giant ragweed control in Roundup Ready® sugarbeet, SW Hutchinson, MN Site #1, 2010. (Fisher and Stachler). 'Betaseed 95RR03' sugarbeet was seeded April 23, 2010 in 22 inch rows in a grower's field having glyphosate-resistant giant ragweed SW of Hutchinson, MN. Sugarbeet seed was treated with Tachigaren at 45 grams dry product per 100,000 seeds. Herbicide treatment information is provided in the table below. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles with a bicycle sprayer to the center four rows of six row plots 40 feet in length. Glyphosate and/or clopyralid were applied according to the treatments in the data table below. Ammonium sulfate as AmStik from West Central was included in all treatments at 2.5 qt/A. Giant ragweed was evaluated 21 days after each application with the most pertinent data presented. Visual evaluations are an estimate of percent control in the treated plot area compared to the adjacent untreated strips and based upon a scale of 0 (no control) to 100% (complete control). Sugarbeet was harvested September 8 from one of the two center rows of each plot. Experiment designed as a randomized complete block having four replications.

Table. Application information.

Application Code	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Date of Application	May 18	June 9	June 29	May 27	June 24	July 8	June 2	June 24	July 13
Time of Day	1:30 pm	2:00 pm	1:00 pm	4:30 pm	3:30 pm	12:30 pm	2:30 pm	3:30 pm	11:00 am
Air Temperature (^oF)	77	67	70	83	81	80	67	81	75
Relative Humidity (%)	20	70	45	19	58	50	56	58	78
Soil Temp. (^oF at 6")	64	57	70	67	69	66	56	69	66
Wind Velocity (mph)	6	10	3	5	3	4	4	3	4
Cloud Cover (%)	15	70	5	0	25	100	30	25	100
Sugarbeet (stage – range)	Cot.-2lf	V6-V13	V10-V24	V2-V5.5	V6-V17	V10-V24	V2-V10	V6-V17	V11-V26.5
Giant Ragweed (stage/height - range)	Cot.-2.5N/ 0.125-1.75"	-	-	Cot.-5N/ 0.5-9"	-	-	Cot.-6N/ 0.5-17.5"	-	-
Giant Ragweed (avg. density)	23/ft^2	-	-	22/ft^2	-	-	23/ft^2	-	-

Summary: Sugarbeet injury increased with increasing rates of Stinger applied once or multiple times, although plants recovered over time with little injury observed at the last evaluation (data not shown). Glyphosate applied once and multiple times inadequately controlled giant ragweed, although multiple glyphosate applications controlled more giant ragweed and increased sugarbeet yield compared to a single application. Glyphosate controlled more giant ragweed 1" in height compared to larger giant ragweed at 21 days after the initial application. The inadequate control with glyphosate is a result of the presence of a glyphosate-resistant biotype in the population.

Stinger controlled more giant ragweed and increased sugarbeet yield as rates of a single application increased. Stinger more effectively controlled smaller giant ragweed plants compared to larger plants at 21 days after the initial application. Stinger controlled more giant ragweed and improved sugarbeet yield when applied multiple times compared to a single application. Giant ragweed control was maximized within each timing when Stinger was applied at 0.94 followed by 0.188 lb ae/A.

Season-long giant ragweed competition caused 84% reduction of sugarbeet root yield compared to removing giant ragweed at 1" in height. Root yield improved when weeds were removed at 1" compared to 3 or 6". Stinger (0.047 lb/A) plus glyphosate (0.75 lb ae/A) applied to giant ragweed 1" in height and followed by the same treatment 21 days later maximized sugarbeet root yield, indicating Stinger should be applied initially to giant ragweed 1" in height and at the lowest effective rate to minimize competition and sugarbeet injury.

Experiment continued on next page.

Table. Giant ragweed control in Roundup Ready® sugarbeet, SW Hutchinson, MN Site #1 (Fisher and Stachler).

Treatment*	Rate	Timing	21 DAT 1,4,7	21 DAT 3,6,9	Harvest	
			Girw cntrl		Root Yield	Extr Sucr
	(lb ae/A)		%		Ton/A	lb/A
Untreated	-	-	0	0	3.9	555
Weed Free Check-1”	-	-	100	100	24.0	2253
Glyt-PM + AMS	0.75	1	53	6	1.0	803
Clpy + Glyt-PM + AMS	0.047 + 0.75	1	70	16	4.2	1896
Clpy + Glyt-PM + AMS	0.094 + 0.75	1	77	48	8.3	1031
Clpy + Glyt-PM + AMS	0.188 + 0.75	1	92	63	18.5	1637
Clpy + Glyt-PM + AMS	0.047 + 0.75	1,2	70	93	25.5	2383
Clpy + Glyt-PM + AMS	0.094 + 0.75	1,2	76	95	21.1	2301
Clpy + Glyt-PM + AMS Clpy + Glyt-PM + AMS	0.094 + 0.75 0.188 + 0.75	1 2	78	100	21.5	2330
Clpy + Glyt-PM + AMS Clpy + Glyt-PM + AMS	0.047 + 0.75 0.094 + 0.75	1,2 3	66	96	22.5	2053
Clpy + Glyt-PM + AMS	0.094 + 0.75	1,2,3	77	99	22.3	2237
Weed-Free Check-3”	-	-	100	100	17.9	2041
Glyt-PM + AMS	0.75	4	46	21	1.3	1099
Clpy + Glyt-PM + AMS	0.047 + 0.75	4	65	39	9.1	1210
Clpy + Glyt-PM + AMS	0.094 + 0.75	4	71	63	11.0	1406
Clpy + Glyt-PM + AMS	0.188 + 0.75	4	84	88	19.1	1929
Clpy + Glyt-PM + AMS	0.047 + 0.75	4,5	65	82	17.4	1653
Clpy + Glyt-PM + AMS	0.094 + 0.75	4,5	80	96	21.7	2223
Clpy + Glyt-PM + AMS Clpy + Glyt-PM + AMS	0.094 + 0.75 0.188 + 0.75	4 5	75	100	16.6	1645
Clpy + Glyt-PM + AMS Clpy + Glyt-PM + AMS	0.047 + 0.75 0.094 + 0.75	4,5 6	68	89	22.3	2107
Clpy + Glyt-PM + AMS	0.094 + 0.75	4,5,6	76	97	20.1	2059
Glyt-PM + AMS	0.75	4,5	50	39	8.6	1599
Glyt-PM + AMS	0.75	4,5,6	50	59	11.0	1288
Weed-Free Check-6”	-	-	100	100	18.8	1874
Glyt-PM + AMS	0.75	7	34	15	1.4	1830
Clpy + Glyt-PM + AMS	0.047 + 0.75	7	58	38	4.9	1790
Clpy + Glyt-PM + AMS	0.094 + 0.75	7	64	48	5.8	1641
Clpy + Glyt-PM + AMS	0.188 + 0.75	7	75	81	15.4	1876
Clpy + Glyt-PM + AMS	0.047 + 0.75	7,8	60	81	15.2	1679
Clpy + Glyt-PM + AMS	0.094 + 0.75	7,8	69	96	17.6	1622
Clpy + Glyt-PM+ AMS Clpy + Glyt-PM + AMS	0.094 + 0.75 0.188 + 0.75	7 8	67	97	16.1	1551
Clpy + Glyt-PM + AMS Clpy + Glyt-PM + AMS	0.047 + 0.75 0.094 + 0.75	7,8 9	56	88	16.5	1548
Clpy + Glyt-PM + AMS	0.094 + 0.75	7,8,9	65	95	19.6	1970
LSD (0.05)			6.2	4.6	5.7	1019

*Glyt-PM = Roundup PowerMAX from Monsanto; Clpy = Stinger from Dow AgroSciences; AMS = Amstik from West Central at 2.5 qt/A.

Giant ragweed control in Roundup Ready® sugarbeet, SW Hutchinson, MN Site #2, 2010. (Fisher and Stachler) 'Betaseed 95RR03' sugarbeet was seeded April 23, 2010 in 22 inch rows in a grower's field having glyphosate-resistant giant ragweed southwest of Hutchinson, MN. Sugarbeet seed was treated with Tachigaren at 45 grams dry product per 100,000 seeds. Application information is provided in the table below. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles with a bicycle sprayer to the center four rows of six row plots 40 feet in length. Glyphosate and/or clopyralid were applied according to the treatments in the results table below. Ammonium sulfate as AmStik from West Central was included in all treatments at 2.5 qt/A. Giant ragweed was evaluated 21 days after each application. Only selected data is presented in the table below. Visual evaluations are an estimate of percent control in the treated plot area compared to the adjacent untreated strips and based upon a scale of 0 (no control) to 100% (complete control). Sugarbeet was harvested September 8 from one center row of each plot. Experiment designed as a randomized complete block having four replications.

Table. Application information.

Application Code	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Date of Application	May 18	June 9	June 29	May 27	June 24	July 8	June 2	June 24	July 13
Time of Day	5:00 pm	5:30 pm	4:00 pm	7:30 pm	7:00 pm	3:30 pm	5:00 pm	7:00 pm	12:00 pm
Air Temperature (^{o}F)	78	70	70	80	77	81	75	77	75
Relative Humidity (%)	13	50	39	24	68	41	36	68	78
Soil Temp. (^{o}F at 6")	73	64	70	72	72	74	63	72	67
Wind Velocity (mph)	5	6	4	4	2	5	3	2	4
Cloud Cover (%)	20	15	0	0	5	20	5	5	100
Sugarbeet (stage - range)	V1-V2	V5-V11	V9-V19.5	V2-V6	V6-V18	V10-V26	V5-V9.3	V6-V18	V9-V25
Giant Ragweed (stage/height –range)	Cot.-2N/ 0.125-1.5"	-	-	Cot.-4.5N/ 0.25-3.5"	-	-	Cot.-5.5N/ 0.5-8.5"	-	-
Giant Ragweed (avg. density)	3.3/ft^2	-	-	3.4/ft^2	-	-	4.7/ft^2	-	-

Summary: Yield data are not presented due to excessive and variable root and leaf diseases. Sugarbeet injury increased with increasing rates of Stinger applied once or multiple times, although plants recovered over time with little injury observed at the last evaluation (data not shown). Glyphosate applied once and multiple times inadequately controlled giant ragweed, although multiple glyphosate applications controlled more giant ragweed compared to a single application. Glyphosate controlled more giant ragweed at 1" in height compared to giant ragweed 3" in height at 21 days after the initial application. The inadequate control is a result of the presence of glyphosate-resistant biotype(s) in the population.

Stinger applied once controlled more giant ragweed as rates were increased, regardless of plant size. Stinger more effectively controlled smaller giant ragweed plants compared to larger plants at 21 days after the initial application. Stinger controlled more giant ragweed when applied multiple times compared to a single application. Giant ragweed control was maximized within each timing when Stinger was applied at 0.94 followed by 0.188 lb ae/A and three times at 0.94 lb/A per application.

Experiment continued on next page.

Table. Giant ragweed control in Roundup Ready® sugarbeet, SW Hutchinson Site #2, MN (Fisher and Stachler)

Treatment*	Rate	Timing	21 DAT 1,4,7	21 DAT 3,6,9
			Girw cntl	
	(lb ae/A)		%	
Untreated	-	-	0	0
Weed-Free Check-1"	-	-	100	100
Glyt-PM + AMS	0.75	1	46	6
Clpy + Glyt-PM + AMS	0.047 + 0.75	1	70	23
Clpy + Glyt-PM + AMS	0.094 + 0.75	1	83	38
Clpy + Glyt-PM + AMS	0.188 + 0.75	1	91	80
Clpy + Glyt-PM + AMS	0.047 + 0.75	1,2	67	89
Clpy + Glyt-PM + AMS	0.094 + 0.75	1,2	82	93
Clpy + Glyt-PM + AMS	0.094 + 0.75	1		
Clpy + Glyt-PM + AMS	0.188 + 0.75	2	84	100
Clpy + Glyt-PM + AMS	0.047 + 0.75	1,2		
Clpy + Glyt-PM + AMS	0.094 + 0.75	3	75	99
Clpy + Glyt-PM + AMS	0.094 + 0.75	1,2,3	80	100
Weed-Free Check-3"	-	-	100	100
Glyt-PM + AMS	0.75	4	38	10
Clpy + Glyt-PM + AMS	0.047 + 0.75	4	63	53
Clpy + Glyt-PM + AMS	0.094 + 0.75	4	75	76
Clpy + Glyt-PM + AMS	0.188 + 0.75	4	90	92
Clpy + Glyt-PM + AMS	0.047 + 0.75	4,5	64	78
Clpy + Glyt-PM + AMS	0.094 + 0.75	4,5	75	97
Clpy + Glyt-PM + AMS	0.094 + 0.75	4		
Clpy + Glyt-PM + AMS	0.188 + 0.75	5	74	96
Clpy + Glyt-PM + AMS	0.047 + 0.75	4,5		
Clpy + Glyt-PM + AMS	0.094 + 0.75	6	65	89
Clpy + Glyt-PM + AMS	0.094 + 0.75	4,5,6	78	100
Glyt-PM + AMS	0.75	4,5	40	30
Glyt-PM + AMS	0.75	4,5,6	40	50
Weed-Free Check-6"	-	-	100	100
Glyt-PM + AMS	0.75	7	48	16
Clpy + Glyt-PM + AMS	0.047 + 0.75	7	63	36
Clpy + Glyt-PM + AMS	0.094 + 0.75	7	70	50
Clpy + Glyt-PM + AMS	0.188 + 0.75	7	78	79
Clpy + Glyt-PM + AMS	0.047 + 0.75	7,8	63	51
Clpy + Glyt-PM + AMS	0.094 + 0.75	7,8	71	90
Clpy + Glyt-PM + AMS	0.094 + 0.75	7		
Clpy + Glyt-PM + AMS	0.188 + 0.75	8	81	99
Clpy + Glyt-PM + AMS	0.047 + 0.75	7,8		
Clpy + Glyt-PM + AMS	0.094 + 0.75	9	65	87
Clpy + Glyt-PM + AMS	0.094 + 0.75	7,8,9	70	100
LSD (0.05)			6.6	8.5

*Glyt-PM = Roundup PowerMAX from Monsanto; Clpy = Stinger from Dow AgroSciences; AMS = Amstik from West Central at 2.5 qt/A.

Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Hector, MN, 2010. (Stachler) 'Betaseed 87RR38' Roundup Ready sugarbeet at 63,360 seeds per acre (4.5" spacing in 22 inch rows) was seeded in six row plots 30 feet long in a cooperator's field having glyphosate-resistant waterhemp on May 10. Sugarbeet seed was treated with Tachigaren at 45 grams dry product per 100,000 seeds. Preplant incorporated treatments were applied May 5. A C-shank field cultivator with tine harrow was set to a depth of 2 to 3" and driven once at approximately 4 to 5 mph through the center of all plots to incorporate the applied herbicides. Preemergence treatments were applied May 10. Postemergence treatments were applied June 18 and July 2. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Sugarbeet injury was evaluated June 3 and July 2. Waterhemp control was evaluated June 18, July 2, July 16 and July 28. All evaluations are a visual estimate of percent weed control or percent sugarbeet injury in the treated plot compared to the adjacent untreated strips and plots. Study designed as a randomized complete block with 4 replications originally, but one was lost due to an extremely low waterhemp density. Sugarbeet from 10 feet of the center two rows in each plot was counted and harvested September 9.

Table. Application information.

Date of Application	**May 5**	**May 10**	**June 18**	**July 2**
Time of Day	4:00 pm	2:00 pm	4:30 pm	5:00 pm
Air Temperature (^{o}F)	53	55	82	85
Relative Humidity (%)	56	54	35	56
Soil Temp. (^{o}F at 6")	56	41	64	70
Wind Velocity (mph)	24	10	17	14
Cloud Cover (%)	90	100	0	0
Soil Moisture	fair	good	good	good
Sugarbeet Stage (range/Avg)	PPI	PRE	V 5 – V12.5/V 10.2	V 6.0 – V 18.5/V 16.8
Waterhemp (range/Avg)	PPI	PRE	Cot-18 lf/10 lf; 0.25-6.5"/3"	4-16lf/14 lf; 1-15.5"/13"
Waterhemp (avg. density)	PPI	PRE	20/M^2	7/M^2

Summary: No substantial sugarbeet injury was observed with any treatments on June 3rd and July 2nd.

On July 28th, Roundup PowerMAX applied twice controlled 73% of waterhemp and caused 78% mortality of 10 plants flagged prior to the initial application, indicating the presence of glyphosate-resistant biotype(s) in the population.

At the time of the first postemergence application (June 18th), Ro-Neet and Nortron applied preplant incorporated controlled more waterhemp than applied preemergence. Waterhemp control was similar for Eptam plus Ro-Neet, Dual 8 EC, and Warrant regardless of type of application. Incorporated Ro-Neet followed by Outlook plus Roundup PowerMAX and followed by Roundup PowerMAX and incorporated Ro-Neet plus Eptam followed by Roundup PowerMAX and followed by Roundup PowerMAX controlled the most waterhemp on July 28th. All treatments controlled waterhemp similarly on July 28th, except Warrant followed by Roundup PowerMAX, Ro-Neet applied preemergence and followed by Roundup PowerMAX, and Roundup PowerMAX alone.

Treatment differences could not be determined for sugarbeet population, root yield, sucrose, and extractable sucrose. Preplant incorporated treatments tended to have reduced root yield compared to preemergence treatments.

Experiment continued on next page.

Table. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Hector, MN, 2010. (Stachler)

Treatment[1]	Rate	Date of Applic.	June 3 Sgbt Inju	June 18 Wahe Cntl	July 2 Sgbt Inju	July 2 Wahe Cntl	July 16 Wahe Cntl	July 28 Wahe Cntl
	lb ai/A or lb ae/A		%					
Untreated Check	0	---	0	0	0	0	0	0
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	0	1	78	81	73
Ro-Neet (PPI)	4	May 5						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	65	2	89	88	87
Ro-Neet (PRE)	4	May 10						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	7	2	79	83	80
Ro-Neet (PPI)	4	May 5						
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	65	0	97	95	94
Ro-Neet (PRE)	4	May 10						
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	12	3	93	92	92
Ro-Neet (PPI)	4	May 5						
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	70	2	93	93	91
Ro-Neet (PRE)	4	May 10						
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	10	1	89	88	88
Ro-Neet+Eptam (PPI)	2.5 + 2	May 5						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	83	2	94	94	95
Ro-Neet+Eptam (PRE)	2.5 + 2	May 10						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	63	2	88	88	88
Nortron (PPI)	3.75	May 5						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	87	0	90	90	89
Nortron (PRE)	3.75	May 10						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	60	0	96	95	90
Dual 8 EC (PPI)	1.4	May 5						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	73	0	88	90	88
Dual 8 EC (PRE)	1.4	May 10						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	77	2	89	86	87
Warrant (PPI)	1.4	May 5						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	33	2	81	80	78
Warrant (PRE)	1.4	May 10						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18						
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	0	20	1	76	81	80
LSD (5%)			0	27	3	15	10	10

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Experiment continued on next page.

Table. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Hector, MN, 2010. (continued)

Treatment[1]	Rate	Date of Applic.	September 9 Sgbt Popl	Sucrose	Extract Sucrose	Root Yield
	lb ai/A or lb ae/A		plts/20ft	%	lb/A	ton/A
Untreated Check	0	---	---	---	---	---
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	34	14.0	5115	22.2
Ro-Neet (PPI)	4	May 5				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	29	12.7	3461	16.7
Ro-Neet (PRE)	4	May 10				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	34	14.2	5319	22.6
Ro-Neet (PPI)	4	May 5				
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	32	13.3	4090	18.7
Ro-Neet (PRE)	4	May 10				
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	34	13.7	4748	20.6
Ro-Neet (PPI)	4	May 5				
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	32	13.9	4435	19.2
Ro-Neet (PRE)	4	May 10				
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	32	13.9	4429	19.1
Ro-Neet+Eptam (PPI)	2.5 + 2	May 5				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	36	13.8	4846	21.4
Ro-Neet+Eptam (PRE)	2.5 + 2	May 10				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	35	13.5	5050	22.9
Nortron (PPI)	3.75	May 5				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	32	13.8	4409	19.4
Nortron (PRE)	3.75	May 10				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	35	13.4	4706	21.5
Dual 8 EC (PPI)	1.4	May 5				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	30	12.9	3983	18.9
Dual 8 EC (PRE)	1.4	May 10				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	36	14.7	5691	23.0
Warrant (PPI)	1.4	May 5				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	31	13.6	5448	24.7
Warrant (PRE)	1.4	May 10				
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 18				
RUPowerMAX+AMS	0.75 + 2.5% v/v	July 2	29	13.5	4558	20.9
LSD (5%)			NS	NS	NS	NS

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Sharpen tank-mixtures in Roundup Ready soybean, Hector, MN, 2010. (Stachler) Soybean at 140,000 seeds per acre was seeded in six row plots 30 feet long May 10. 'Pioneer 90M80' soybean was planted in rows 1-3 and 'Northrup King S08-C3' soybean was planted in rows 4-6 in a cooperator's field having glyphosate resistant waterhemp. Preemergence treatments were applied May 10. Postemergence treatments were applied June 1 and June 18. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 18 and July 2. Waterhemp control was evaluated June 18, July 2, July 16 and July 28. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	**May 10**	**June 1**	**June 18**
Time of Day	2:00 pm	11:30 am	4:30 pm
Air Temperature (^{o}F)	55	72	82
Relative Humidity (%)	54	90	35
Soil Temp. (^{o}F at 6")	41	64	64
Wind Velocity (mph)	10	6	11
Cloud Cover (%)	100	95	0
Soil Moisture	Good	Good	Good
Soybean Stage (range/Avg)	Preemergence	Unifol-1 Trif/1 Trifol	2-3.5 trif/3 trif
Waterhemp (range/Avg) Trt. 21	Preemergence	Cot-6 lf/4 lf; 0.125-1"/0.5"	Cot-15 lf/10 lf; 0.125-8.5"/3.75"
Waterhemp (avg. density) Trt. 21	Preemergence	58/M^2	160/M^2

Summary:

Sharpen (2 fl oz/A) plus Dimetric (5.33 oz/A) and Sharpen (2 fl oz/A) plus Valor (2.5 oz/A) caused the greatest soybean injury on June 18th. Injury was slightly greater for the Northrup King variety on June 18th. Fierce (3.0 oz/A) plus/minus FirstRate (0.15 oz/A) and Sharpen (1.0 fl oz/A) plus Prefix (2.0 pt/A) or Outlook (12 fl oz/A) caused the greatest soybean injury on July 2nd, especially to the Northrup King variety. On July 2nd the Northrup King soybean variety had nearly twice the amount of injury for most herbicide combinations compared to the Pioneer variety. Injury increased over time due to a high percentage of the study being located in an area of the field with severe iron chlorosis. The combination of preemergence herbicides and iron chlorosis can severely stunt soybean throughout the growing season. Slight injury was observed on July 2nd from most herbicide treatments in areas of the study in which iron chlorosis was not present or limited.

On July 28th, Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 57% mortality of waterhemp plants flagged at time of initial application and controlled 45% of waterhemp, confirming presence of glyphosate-resistant waterhemp at this site. Sharpen (1 or 2 fl oz/A) plus Prefix and Sharpen (2 fl oz/A) plus Outlook (12 fl oz/A) controlled the most waterhemp on June 18th at the time of the Roundup PowerMAX application to all treatments. In addition, Sharpen (1.0 fl oz/A) plus Fierce (3.0 oz/A) or Outlook, Sharpen (2.0 fl oz/A) plus Fierce (3.0 oz/A) or Valor, Fierce (3.75 oz/A) and Fierce (3.0 oz/A) plus FirstRate controlled 90% or greater waterhemp on June 18th. Sharpen (1.0 fl oz/A) plus Prefix followed by Roundup PowerMAX controlled the most waterhemp on July 28th. In addition, Sharpen (2.0 fl oz/A) plus Fierce (3.0 oz/A) or Prefix, Fierce (3.75 oz/A), and Fierce (3.0 oz/A) plus FirstRate followed by Roundup PowerMAX controlled 90% or greater waterhemp. Increasing the rate of Fierce and Sharpen improved waterhemp control at the time of the Roundup PowerMAX application, but when followed with glyphosate control was not always improved at the later evaluations. Tank-mixing Command 3ME with Sharpen reduced waterhemp control on July 28th compared to Sharpen alone. No preemergence herbicide or combination tested in this trial that is currently labeled controlled enough glyphosate-resistant waterhemp to rely upon a single postemergence glyphosate application to improve control.

Experiment continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Hector, MN, 2010. (Stachler)

Treatment[1]	Rate	Date of Applic.	June 18 Pion[2] Inju	June 18 NK[3] Inju	June 18 Wahe Cntl	July 2 Pion Inju	July 2 NK Inju	July 2 Wahe Cntl	July 16 Wahe Cntl	July 28 Wahe Cntl
	product/A		%							
Sharpen	1 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	0	0	32	6	17	76	70	57
Sharpen	2 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	7	77	7	11	78	77	68
Sharpen+Valor SX	1 oz + 2.5 oz	May 10								
RUPowerMAX+ AMS	32 oz + 2.5% v/v	June 18	6	11	83	7	17	89	86	79
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	3	6	58	8	17	73	72	68
Sharpen+Outlook	1 oz + 12 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	8	94	17	30	95	85	84
Sharpen+Fierce	1 oz + 3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	10	11	95	12	22	98	90	89
Sharpen+Prefix	1 oz + 2 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	9	98	15	33	100	96	96
Sharpen+Dimetric	1 oz + 5.33 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	13	84	10	20	88	78	75
Sharpen+Command 3 ME	1 oz +2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	4	5	47	7	17	71	66	42
Sharpen+Valor SX	2 oz + 2.5 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	16	90	8	12	92	88	85
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	3	4	74	7	13	82	85	82
Sharpen+Outlook	2 oz +12 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	8	10	98	19	27	100	94	86
Sharpen+Fierce	2 oz + 3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	7	96	23	27	99	95	90
Sharpen+Prefix	2 oz + 2 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	6	11	98	7	15	99	97	93
Sharpen+Dimetric	2 oz + 5.33 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	15	20	81	12	22	88	83	73
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	6	9	65	7	12	75	70	57
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	5	5	87	8	10	89	90	85
Fierce	3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	14	82	17	33	90	89	84
Fierce	3.75 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	12	91	12	27	98	94	93
Fierce+FirstRate	3 oz + 0.15 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	11	15	95	18	33	96	92	90
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 1								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	0	0	23	0	0	57	57	45
Untreated Check	0		0	0	0	0	0	0	0	0
LSD (5%)			6	7	8	7	11	9	6	11

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; [2]Pion=Pioneer 90M80; [3]NK=Northrup King S08-C3.

<u>Sharpen tank-mixtures in Roundup Ready soybean, Hutchinson, MN, 2010</u>. (Stachler) Soybean at 140,000 seeds per acre was seeded in six row plots 25 feet long April 23. 'Northrup King S08-C3' soybean was planted in rows 1-3 and 'Pioneer 90M80' soybean was planted in rows 4-6 in a cooperator's field having glyphosate resistant giant ragweed. Preemergence treatments were applied April 23. Postemergence treatments were applied May 18 and June 9. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 9 and June 24. Giant ragweed and common lambsquarters control were evaluated June 9 and July 21. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	**April 23**	**May 18**	**June 9**
Time of Day	4:00 pm	5:17 pm	5:30 pm
Air Temperature (^oF)	68	78	70
Relative Humidity (%)	37	13	50
Soil Temp. (^oF at 6")	51	73	64
Wind Velocity (mph)	19	8	11
Cloud Cover (%)	100	20	15
Soil Moisture	Fair	Good	Good
Soybean Stage (range/avg.)	Preemergence	Emer-Unif/Unifol	3-4 trif/3.5 trif
Giant Ragweed (range/avg.) Trt. 21	Preemergence	Cot-2N/1N; 0.25-1.5"/1"	1-5 Node/3N; 0.5-6"/2.5"
Giant Ragweed (avg. density) Trt. 21	Preemergence	35/M^2	40/M^2
Com. Lambsqtrs (range/avg.) Trt. 21	Preemergence	not recorded	4-7 lf/6 lf; 0.5-1"/1"
Com. Lambsqtrs (avg. density) Trt. 21	Preemergence	not recorded	3/M^2

Summary:

Sharpen (2 fl oz/A) plus Prefix (2 pt/A), Fierce (3 oz/A), or Valor (2.5 oz/A) caused the greatest soybean injury, although minimal and declined with time. Soybean injury was similar for the two soybean varieties at this location.

Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 47% mortality of giant ragweed plants flagged at the initial application and controlled only 71% of giant ragweed on July 21st, confirming resistance in giant ragweed to glyphosate. Fierce (3.0 oz/A) plus FirstRate (0.15 oz/A) and Sharpen (2.0 fl oz/A) plus Prefix controlled the most giant ragweed and provided effective lambsquarters control on June 9th at the time of the Roundup PowerMAX application. Sharpen (1 fl oz/A) plus Prefix, Sharpen (2.0 fl oz/A) plus Valor or Command 3 ME controlled greater than 90% giant ragweed at the time of the Roundup PowerMAX application. On July 21st, Prefix (2.0 pt/A) plus Sharpen (1.0 or 2.0 fl oz/A) followed by Roundup PowerMAX controlled the most giant ragweed and provided nearly perfect lambsquarters control. Other treatments controlling 90% or greater giant ragweed on July 21st includes Fierce (3.0 oz/A) plus FirstRate, Sharpen (1 fl oz/A) plus Fierce (3.0 oz/A), and Sharpen (2.0 fl oz/A) plus Command 3ME, Fierce (3.0 oz/A), Prowl (2.1 pt/A), or Valor followed by Roundup PowerMAX. Increasing the rate of Sharpen from 1 fl oz/A to 2.0 fl oz/A improved giant ragweed control on June 9th, but not on July 21st after the Roundup PowerMAX application. Increasing the rate of Fierce from 3.0 oz/A to 3.75 oz/A improved giant ragweed control at both evaluation times. Tank-mixtures with Sharpen certainly improve weed control at the time of the postemergence herbicide application and may continue to improve control after this point in time. Unfortunately at this time, the Sharpen label prohibits tank-mixtures of Sharpen with other PPO-inhibiting herbicides (such as Fierce, Prefix, and Valor) and does not allow the 2 fl oz/A rate to be applied. Therefore no currently labeled preemergence herbicide or combination applied in this study will effectively control glyphosate-resistant giant ragweed with glyphosate applied alone. All treatments effectively controlled lambsquarters, although control was reduced with Roundup PowerMAX followed by Roundup PowerMAX and Sharpen (1.0 fl oz/A) plus Outlook (12 fl oz/A) followed by Roundup PowerMAX.

Experiment continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Hutchinson, MN, 2010. (Stachler)

Treatment[1]	Rate	Date of Applic.	June 9 NK[2] Inju	June 9 Pion[3] Inju	June 9 Girw Cntl	June 9 Colq Cntl	June 24 NK Inju	June 24 Pion Inju	July 21 Girw Cntl	July 21 Colq Cntl
	product/A		%							
Sharpen	1 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	2	45	58	1	1	78	97
Sharpen	2 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	3	3	80	84	3	3	83	99
Sharpen+Valor SX	1 oz + 2.5 oz	April 23								
RUPowerMAX+ AMS	32 oz + 2.5% v/v	June 9	1	2	74	94	2	3	75	100
Sharpen+Prowl H2O	1 oz + 2.1 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	6	2	56	94	3	6	78	99
Sharpen+Outlook	1 oz + 12 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	82	88	2	5	65	96
Sharpen+Fierce	1 oz + 3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	5	85	98	2	3	90	100
Sharpen+Prefix	1 oz + 2 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	5	92	96	0	1	98	98
Sharpen+Dimetric	1 oz + 5.33 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	1	55	92	2	1	80	98
Sharpen+Command 3 ME	1 oz + 2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	2	63	98	3	6	83	100
Sharpen+Valor SX	2 oz + 2.5 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	7	7	91	98	1	2	92	100
Sharpen+Prowl H2O	2 oz + 2.1 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	4	2	87	95	2	3	94	99
Sharpen+Outlook	2 oz + 12 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	84	86	2	5	86	98
Sharpen+Fierce	2 oz + 3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	5	7	78	98	3	5	93	100
Sharpen+Prefix	2 oz + 2 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	7	8	96	96	1	3	99	100
Sharpen+Dimetric	2 oz + 5.33 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	3	6	85	87	2	5	88	98
Sharpen+Command 3 ME	2 oz +2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	3	91	99	2	2	97	100
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	73	98	2	3	88	100
Fierce	3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	4	28	86	2	4	63	100
Fierce	3.75 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	0	50	97	1	2	77	100
Fierce+FirstRate	3 oz + 0.15 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	0	97	98	2	4	93	100
RUPowerMAX+AMS	32 oz + 2.5% v/v	May 18								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	1	57	84	0	0	71	96
Untreated Check	0		0	0	0	0	0	0	0	0
LSD (5%)			4	5	17	9	3	5	11	3

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; [2]NK=Northrup King S08-C3; [3]Pion=Pioneer 90M80.

Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (Stachler) Soybean at 204,000 seeds per acre was seeded in six row plots 25 feet long May 12. 'Pioneer 90M80' soybean was planted in rows 1-3 and 'Northrup King S08-C3' soybean was planted in rows 4-6 in a cooperator's field having glyphosate resistant common ragweed. Preemergence treatments were applied May 12. Postemergence treatments were applied June 4 and June 16. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 16 and June 30. Common ragweed, common lambsquarters and pigweed (mostly redroot, but some prostrate) control were evaluated June 16, June 30, July 15 and July 26. Annual grass control was evaluated June 16. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	**May 12**	**June 4**	**June 16**
Time of Day	7:15 pm	11:30 am	3:00 pm
Air Temperature (^{o}F)	52	73	78
Relative Humidity (%)	68	32	57
Soil Temp. (^{o}F at 6")	43	59	66
Wind Velocity (mph)	6	14	8
Cloud Cover (%)	100	5	50
Soil Moisture	Good	Good	Good
Soybean Stage (range/Avg)	Preemergence	1-1.5 trif/1 trifoliate	2-3.5 trif/2.5 trifoliate
Com. Ragweed (range/Avg) Trt. 21	Preemergence	Cot-3.5 N/2 Node; 0.125-2.5"/0.75"	Cot-4 N/2.5 N; 0.25-1.75"/0.75"
Com. Ragweed (avg. density) Trt. 21	Preemergence	116/M^2	43/M^2
Com. Lambsqtrs (range/Avg) Trt. 21	Preemergence	Cot-10 lf/7 lf; 0.75"-1.25"/1.25"	Cot-6 lf/2 leaf; 0.125-1"/0.5"
Com. Lambsqtrs (avg. density) Trt. 21	Preemergence	341/M^2	17/M^2
Pigweed (range/Avg) Trt. 21	Preemergence	Cot-8 lf/5 leaf; 0.75"-1.25"/1"	Cot-2 leaf/cot; 0.125"-0.5"/0.33"
Pigweed (avg. density) Trt. 21	Preemergence	313/M^2	7/M^2
Annual Grass (range/Avg) Trt. 21	Preemergence	Not recorded	1 leaf; 0.25"
Annual Grass (avg. density) Trt. 21	Preemergence	Not recorded	1/M^2

Summary:

Fierce alone or mixed with Sharpen or FirstRate caused the greatest soybean injury on June 16th. The Northrup King variety usually had an elevated level of injury compared to the Pioneer variety. Soybean injury declined over time for nearly all herbicides and herbicide combinations and was negligible or non-existent beyond June 30th, except the combination of Sharpen plus Prowl. Severe stem cracking was the most frequent injury symptom observed with the Prowl treatments, supporting the label restriction of not applying Prowl preemergence to soybean.

Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 85% mortality of common ragweed plants flagged as survivors after the initial application and controlled 85% common ragweed on July 26th, somewhat confirming glyphosate-resistant common ragweed at this site. Sharpen (2.0 fl oz/A) plus Command 3ME (2.67 pt/A) or Valor (2.5 oz/A) controlled the most glyphosate-resistant common ragweed on June 16th at the time of the Roundup PowerMAX application. In addition, Sharpen (1.0 fl oz/A) plus Fierce (3.0 oz/A), Sharpen (2.0 fl oz/A) plus Outlook (12 fl oz/A) or Fierce (3.0 oz/A), Sharpen (1.0 fl oz/A) plus Dimetric (5.33 oz/A) plus Command 3ME, and Fierce (3.0 oz/A) plus/minus FirstRate controlled 90% or greater common ragweed. All of these herbicides and combinations controlled greater than 92% lambsquarters and pigweed, except for the pigweed with the Command treatments.

Sharpen (2.0 fl oz/A) plus Command or Valor followed by Roundup PowerMAX controlled the most glyphosate-resistant common ragweed on July 26th. In addition, Sharpen (1.0 fl oz/A) + Command or Fierce (3.0 oz/A), Sharpen (2.0 fl oz/A) plus Dimetric (5.33 oz/A) or Fierce (3.0 oz/A) or Outlook or (1.5 pt/A), and Sharpen (1.0 fl oz/A) plus Command plus Dimetric followed by Roundup PowerMAX controlled greater than 91% of common ragweed and greater than 92% lambsquarters and pigweed, with some exceptions. Of the treatments tested, only Sharpen (1.0 fl oz/A) plus Command or Dimetric plus Command can legally be applied to soybeans today and followed with a single glyphosate application to provide effective control of glyphosate-resistant common ragweed, lambsquarters, and pigweed.

Experiment continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (Stachler)

Treatment[1]	Rate	Date of Applic.	June 16 Pion[2] Inju	NK[3] Inju	Corw Cntl	Colq Cntl	Pigw Cntl	Grass Cntl
	product/A		%					
Sharpen	1 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	1	2	61	76	71	0
Sharpen	2 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	4	83	94	90	0
Sharpen+Valor SX	1 oz + 2.5 oz	May 12						
RUPowerMAX+ AMS	32 oz + 2.5% v/v	June 16	9	13	88	94	98	63
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	10	13	70	95	92	83
Sharpen+Outlook	1 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	68	83	89	88
Sharpen+Fierce	1 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	19	21	94	97	99	82
Sharpen+Prefix	1 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	8	80	81	91	81
Sharpen+Dimetric	1 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	4	80	92	89	60
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	84	92	80	95
Sharpen+Valor SX	2 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	11	15	95	98	99	79
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	11	14	76	96	93	80
Sharpen+Outlook	2 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	8	93	95	98	82
Sharpen+Fierce	2 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	16	19	93	98	99	84
Sharpen+Prefix	2 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	6	87	85	92	76
Sharpen+Dimetric	2 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	4	4	89	95	98	71
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	97	97	91	99
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	10	93	95	92	89
Fierce	3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	18	20	91	93	99	97
Fierce	3.75 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	26	25	89	95	99	89
Fierce+FirstRate	3 oz + 0.15 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	16	19	92	95	99	93
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	0	0	86	96	98	99
Untreated Check	0		0	0	0	0	0	0
LSD (5%)			4	4	7	7	7	18

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; [2]Pion=Pioneer 90M80; [3]NK=Northrup King S08-C3.

Table continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (continued)

			June 30				
Treatment[1]	Rate	Date of Applic.	Pion[2] Inju	NK[3] Inju	Corw Cntl	Colq Cntl	Pigw Cntl
	product/A		%				
Sharpen	1 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	75	93	97
Sharpen	2 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	91	97	99
Sharpen+Valor SX	1 oz + 2.5 oz	May 12					
RUPowerMAX+ AMS	32 oz + 2.5% v/v	June 16	8	8	91	100	100
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	38	36	74	97	97
Sharpen+Outlook	1 oz + 12 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	5	78	97	100
Sharpen+Fierce	1 oz + 3 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	10	9	96	100	100
Sharpen+Prefix	1 oz + 2 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	90	99	100
Sharpen+Dimetric	1 oz + 5.33 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	92	98	100
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	93	99	99
Sharpen+Valor SX	2 oz + 2.5 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	7	6	98	100	100
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	34	30	81	98	100
Sharpen+Outlook	2 oz + 12 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	96	99	100
Sharpen+Fierce	2 oz + 3 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	8	8	95	100	100
Sharpen+Prefix	2 oz + 2 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	4	5	94	98	100
Sharpen+Dimetric	2 oz + 5.33 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	7	4	94	95	98
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	2	2	99	100	100
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	5	96	98	99
Fierce	3 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	15	13	93	100	100
Fierce	3.75 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	15	13	95	100	100
Fierce+FirstRate	3 oz + 0.15 oz	May 12					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	5	95	100	100
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4					
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	0	0	90	88	91
Untreated Check	0		0	0	0	0	0
LSD (5%)			6	7	6	3	2

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; [2]Pion=Pioneer 90M80; [3]NK=Northrup King S08-C3.

Table continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (continued)

			July 15			July 26		
Treatment[1]	Rate	Date of Applic.	Corw Cntl	Colq Cntl	Pigw Cntl	Corw Cntl	Colq Cntl	Pigw Cntl
	product/A		%					
Sharpen	1 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	81	84	90	77	75	86
Sharpen	2 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	89	93	96	89	87	93
Sharpen+Valor SX	1 oz + 2.5 oz	May 12						
RUPowerMAX+ AMS	32 oz + 2.5% v/v	June 16	90	99	100	91	98	99
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	70	88	88	65	84	86
Sharpen+Outlook	1 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	81	94	100	80	89	100
Sharpen+Fierce	1 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	95	99	100	94	98	100
Sharpen+Prefix	1 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	89	96	100	90	93	99
Sharpen+Dimetric	1 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	88	95	99	91	91	96
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	91	93	94	93	94	92
Sharpen+Valor SX	2 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	98	100	100	98	99	100
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	82	93	95	80	87	92
Sharpen+Outlook	2 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	94	94	99	94	90	98
Sharpen+Fierce	2 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	96	100	100	95	99	100
Sharpen+Prefix	2 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	91	96	100	93	96	100
Sharpen+Dimetric	2 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	93	91	98	92	87	96
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	98	95	98	98	94	95
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	95	95	95	94	91	92
Fierce	3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	90	98	100	88	93	100
Fierce	3.75 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	92	99	100	90	98	99
Fierce+FirstRate	3 oz + 0.15 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	92	100	100	90	100	100
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	90	81	81	85	70	73
Untreated Check	0		0	0	0	0	0	0
LSD (5%)			6	6	6	7	8	8

[1]AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.