2012

SMBSC RESEARCH REPORT

Southern Minnesota Beet Sugar Cooperative

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SMBSC Official Variety Trial Procedures

Four Official Variety Trial locations were planted in 2012. 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 feet long. Each variety is replicated six times across the trial. 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 at approximately the four leaf stage to suppress rhizoctonia root and crown rot.

Weed control was accomplished by applying Roundup WeatherMax and SelectMax. Outlook was applied as a lay-by treatment at Murdock and Hector. All spraying operations are conducted by a tractor sprayer driving down the tilled 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 is tilled under on each end of every 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 the SMBSC Aphanomyces nursery near Renville. Rhizoctonia tolerance was tested at a SMBSC location near Clara City as well as the BSDF rhizoctonia nursery near Ft. Collins, CO.

All the data is summarized and merged with the 2010 and 2011 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.

2012 SMBSC Official Variety Trials Specifications

Trial Location	Cooperator	Entry Designation	Previous Crop	Starter Fertilizer	Planting Date	Stand Counts	Disease	Harvest Date
Hector	G.E. Johnson Inc	Official Trial	Field Corn	No	4/30/12	5/28/12	Light - Moderate aphanomyces Light - Moderate rhizoctonia	9/29/12
Lake Lillian	Mike, Brad, and Jeff Schmoll	Official Trial	Sweet Corn	No	4/26/12	5/24/12	Light disease pressure Sprayed for Lygus bugs in early August	10/2/12
Renville	C&P Farms	Official Trial	Field Corn	Yes	4/24/12	5/22/12	Light root aphid pressure in border rows	9/25/12
Murdock	Kyle Petersen	Official Trial	Field Corn	Yes	4/20/12	5/18/12	Light - Moderate root aphid pressure	10/9/12

All trials were sprayed with Roundup 2 - 3 times for weed control.
Outlook lay-by was applied to the Murdock and Hector locations
Quadris was band applied to all trials at approximately the 4 leaf beet stage for rhizoctonia suppression.
Five CLS fungicide applications were applied to all trial locations.

2012 Disease Nursery Trial Specifications

Disease	Cooperator	Location	Ratings Performed By	Use of Ratings in 2012 Variety Approval
Cercospora	Betaseed	Rosemount	Betaseed	50 % of 2012 CLS Rating
Cercospora	SMBSC Randy Frieborg	Renville	SMBSC Research Staff	50% of 2012 CLS Rating
Aphanomyces	Betaseed	Shakopee	Betaseed, Jason Brantner, Carol Windels, Mark Bloomquist	50% of 2012 Aphanomyces Rating
Aphanomyces	SMBSC	Renville	SMBSC Research Staff	50% of 2012 Aphanomyces Rating
Rhizoctonia	USDA/ARS/BSDF Lee Panella	Ft. Collins, CO	USDA/ARS	Rhizoctonia Specialty Approval Status
Rhizcotonia	SMBSC Bob Condon	Clara City	SMBSC Research Staff	Rhizoctonia Specialty Approval Status

2011-2012 Rhizoctonia Root Ratings for 2013 SMBSC Approved Varieties

Variety	2012 Root Ratings BSDF - Ft. Collins CO BL Adj Root Rating	2012 Root Ratings SMBSC - Clara City BL Adj Root Rating	2012 Combined Root Ratings Ave. Adj. Rating	2011-2012 2 Year Mean Baseline Adjusted Root Rating	2011 Data SMBSC and Ft. Collins Root Rating (combined) + BL Adj Root Rating	
Hilleshög 4063RR	3.74	3.99	3.87	3.40	2.94	2013 SMBSC Rhizoctonia Specialty Approved Varieties
Hilleshög 9093RR	3.90	3.69	3.80	3.45	3.10	
Beta 99RR53	3.59	3.51	3.55	3.62	3.69	
Beta 91RR01	3.59	3.42	3.50	3.71	3.91	
Crystal RR018	3.74	2.92	3.33	3.75	4.16	
Beta 98RR08	4.06	4.71	4.38	4.46	4.53	
Beta 99RR84	4.37	4.82	4.59	4.60	4.61	
Beta 90RR54	3.59	4.05	3.82	4.02	4.23	
Crystal RR265	3.74	3.58	3.66	3.97	4.27	
Crystal RR850	3.12	4.21	3.66	4.08	4.50	
Crystal RR459	4.21	4.30	4.26	4.56	4.86	
Hilleshög 4017RR	4.84	4.64	4.74	4.60	4.46	
SV36937 RR	4.21	4.40	4.31	4.49	4.68	
SV36938 RR	4.84	5.55	5.19	4.85	4.50	
SV36939 RR	4.84	5.17	5.00	4.70	4.39	
SV36094 RR	4.52	5.11	4.82	4.68	4.54	
SV36135 RR	4.99	4.58	4.79	4.64	4.50	
Rhizoctonia Resistant Check	3.74	4.36	4.05	3.69	3.33	
Rhizoctonia Susceptible Check	4.52	6.06	5.29	4.97	4.65	
Baseline 5a Beta 95RR03	4.37	4.64	4.51	4.61	4.72	
Baseline 5b Beta 95RR03	4.68	4.84	4.76	4.55	4.33	
Baseline 6a Crystal RR265	4.68	3.93	4.31	4.26	4.21	
Baseline 6b Crystal RR265	4.21	4.23	4.22	4.43	4.64	
Baseline 7a Hilleshog 4017RR	4.52	4.74	4.63	4.65	4.66	
Baseline 7b Hilleshog 4017RR	4.21	4.99	4.60	4.80	4.99	
Baseline 8a Hilleshog 9093RR	4.37	3.41	3.89	3.65	3.41	
Baseline 8b Hilleshog 9093RR	3.12	3.27	3.20	3.17	3.15	
Ft. Collins check varieties						
Highly Resistant Check	2.03					
Resistant Check	3.43					
Susceptible Check	5.46					
Highly Resistant Check	1.72					
Commercial Susceptible Check	3.43					
Commercial Moderately Tolerant	4.06					
Commercial Highly Tolerant	3.90					
Trial Statistics:						
CV%	32.00	17.26				
LSD .05	1.67	0.86				
Test Mean:	4.21	4.40				

+ Root ratings of rhizoctonia symptoms are assessed in late August or early Sept. (1=healthy, 7=severe damage)

++ 2011, and 2012 root ratings are a combination of SMBSC nursery and Ft. Collins nursery.

SMBSC APPROVED VARIETIES 2013

FULLY APPROVED
<u>UNLIMITED SALES VARIETIES</u>

Beta 90RR54
Beta 98RR08
Crystal RR018 (Rhizoctonia)
Crystal RR265
Crystal RR850
SV 36094RR
SV 36938RR

RHIZOCTONIA
SPECIALTY
<u>APPROVED VARIETIES</u>

Hilleshog 9093RR (Rhizoctonia)
Hilleshog 4063RR (Rhizoctonia)
Beta 99RR53 (Rhizoctonia)
Beta 91RR01 (Rhizoctonia)

<u>TEST MARKET VARIETIES</u> - All have 2 years testing.
(Sales shall not exceed 10% of total seed sales for each variety).

Crystal RR459 (High Sugar)
SV 36135RR
SV 36937RR
SV 36939RR
Beta 99RR84

Previously Approved Varieties and not
<u>Making 2013 Approval – Last year of sales.</u>

Hilleshog 4017RR

Table 1. Comparison of Three Year 2013 SMBSC Varieties Aproved for Unlimited Sales - Based Upon Approval Criteria

Entry - Converted	RST+RSA	Rec/T (lbs) 3 yr avg	Rec/T (lbs) % of mean	Rec/A (lbs) 3 yr avg	Rec/A (lbs) % of mean	Yield (T/A) 3 yr avg	Yield (T/A) % of mean	Sugar % 3 yr avg	Sugar % % of mean	Cercospora Leaf Spot 3 yr avg	Cercospora Leaf Spot % of mean	Emergence (%) 3 yr avg	Emergence (%) % of mean	Aphanomyces 3 yr avg	Aphanomyces % of mean	Purity (%) 3 yr avg	Purity (%) % of mean	Revenue/* Ton % of mean	Revenue/* Acre % of mean
2013 APPROVED VARIETIES																			
Beta 90RR54	201.95	289.53	101.12	8486.83	100.83	28.96	99.02	17.00	100.72	4.43	96.16	65.06	103.03	4.72	106.38	91.08	100.25	101.52	100.57
Beta 98RR08	196.03	286.86	100.19	8066.69	95.84	28.04	95.86	16.93	100.32	4.46	96.95	63.52	100.59	4.13	93.01	90.68	99.82	100.14	96.04
Crystal RR018	203.92	289.23	101.02	8661.34	102.90	29.94	102.37	17.07	101.13	4.81	104.62	59.20	93.75	4.53	102.02	90.89	100.05	101.76	104.22
Crystal RR265	198.05	281.17	98.20	8403.77	99.84	29.64	101.35	16.68	98.84	4.51	97.93	62.44	98.89	3.67	82.71	90.41	99.52	97.41	98.78
Crystal RR850	200.45	278.83	97.39	8675.12	103.07	31.05	106.16	16.55	98.07	5.49	119.36	65.24	103.32	4.09	92.05	90.43	99.54	96.31	102.29
SV 36094RR	199.26	288.78	100.86	8282.10	98.40	28.48	97.37	16.93	100.30	4.26	92.57	61.51	97.42	4.93	111.03	91.24	100.43	101.22	98.60
SV 36938RR	200.33	289.77	101.21	8342.79	99.12	28.62	97.87	16.98	100.62	4.25	92.41	65.03	102.99	5.01	112.79	91.21	100.40	101.63	99.51
		286.31	100.00	8416.95	100.00	29.25	100.00	16.88	100.00	4.60	100.00	63.14	100.00	4.44	100.00	90.85	100.00	100.00	100.00
RHIZOCTONIA SPECIALTY APPROVED VARIETIES WITH THREE YEARS OF DATA																			
Beta 99RR53	194.09	266.82	93.19	8492.28	100.90	31.59	108.02	15.80	93.61	5.27	114.53	67.53	106.95	4.75	107.05	90.74	99.88	90.30	97.59
Hilleshog 4063RR	191.83	277.43	96.90	7990.25	94.93	28.87	98.70	16.51	97.85	3.97	86.26	70.00	110.86	4.37	98.33	90.46	99.57	96.05	94.84
Hilleshog 9093RR	191.90	279.18	97.51	7945.08	94.39	28.57	97.70	16.61	98.45	4.17	90.72	71.09	112.58	4.48	100.99	90.53	99.65	97.06	94.87
PREVIOUSLY APPROVED VARIETY WITH THREE YEARS OF DATA - NOT MAKING APPROVAL FOR 2012 - LAST YEAR OF SALES																			
Hilleshog 4017RR	189.56	283.83	99.13	7610.83	90.42	26.69	91.26	16.86	99.93	5.15	111.92	68.16	107.94	4.87	109.73	90.41	99.51	99.00	90.39

* Revenue per Ton and Revenue per Acre figures were produced using the SMBSC payment formula for the 2011 crop

Table 2. Comparison of 2013 Approved Varieties to Candidate Test Market Varieties Based on 2 Year Data, 2011 - 2012

Entry - Converted	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
2013 APPROVED VARIETIES																			
Beta 90RR54	202.28	296.80	101.16	8227.35	101.13	27.27	99.36	17.48	100.72	4.57	98.77	64.81	105.99	4.81	105.89	90.75	100.27	101.54	100.94
Beta 98RR08	194.52	291.79	99.45	7734.40	95.07	26.32	95.89	17.32	99.82	4.59	99.32	61.85	101.14	4.09	90.17	90.18	99.64	99.08	95.05
Crystal RR018	205.22	297.35	101.35	8450.54	103.87	28.24	102.88	17.60	101.44	4.75	102.70	59.01	96.50	4.63	102.03	90.55	100.06	102.21	105.20
Crystal RR265	196.24	285.76	97.40	8041.62	98.84	27.91	101.70	17.01	98.01	4.62	99.83	59.68	97.59	3.41	75.09	90.04	99.49	96.16	97.84
Crystal RR850	199.64	285.74	97.39	8318.40	102.24	28.96	105.50	17.01	98.01	5.35	115.80	63.69	104.16	4.23	93.24	90.15	99.61	96.37	101.72
SV 36094RR	201.03	298.18	101.63	8087.20	99.40	26.69	97.23	17.54	101.09	4.21	91.09	57.62	94.23	5.25	115.66	90.92	100.46	102.45	99.65
SV 36938RR	201.07	298.16	101.62	8090.77	99.45	26.74	97.43	17.51	100.92	4.28	92.49	61.38	100.38	5.35	117.92	90.92	100.46	102.19	99.61
		293.40	100.00	8135.75	100.00	27.45	100.00	17.35	100.00	4.62	100.00	61.15	100.00	4.54	100.00	90.50	100.00	100.00	100.00
TEST MARKET VARIETIES FOR LIMITED SALES WITH 2 YEARS OF DATA (% OF MEAN IS OF APPROVED MEAN)																			
Beta 99RR84	200.87	294.18	100.27	8185.15	100.61	27.49	100.17	17.37	100.08	5.41	117.01	63.13	103.25	4.44	97.83	90.74	100.27	100.60	100.81
Crystal RR459	203.56	306.77	104.56	8055.02	99.01	25.78	93.94	18.01	103.80	4.20	90.94	64.47	105.44	5.01	110.50	91.04	100.59	106.68	100.26
SV 36135RR	199.68	294.16	100.26	8088.73	99.42	27.36	99.69	17.26	99.45	4.25	91.96	61.42	100.45	5.16	113.64	90.97	100.51	100.11	99.84
SV 36937RR	198.85	292.20	99.59	8075.32	99.26	27.16	98.95	17.17	98.93	4.09	88.55	67.79	110.87	5.21	114.81	90.92	100.46	99.25	98.25
SV 36939RR	199.44	294.22	100.28	8067.45	99.16	27.17	98.98	17.35	99.97	4.07	87.94	65.97	107.88	5.30	116.76	90.84	100.38	100.63	99.65
2013 RHIZOCTONIA SPECIALTY APPROVED VARIETIES (% OF MEAN IS OF APPROVED MEAN)																			
Beta 91RR01	199.18	288.30	98.26	8210.47	100.92	28.29	103.06	17.15	98.81	4.31	93.28	63.87	104.46	4.02	88.61	90.00	99.44	97.25	100.27
Beta 99RR53	189.86	272.23	92.79	7897.72	97.07	28.60	104.19	16.14	93.02	5.13	110.99	64.36	105.26	4.72	104.01	90.45	99.94	89.65	93.45
Hilleshog 4063RR	191.55	284.65	97.02	7691.12	94.53	26.91	98.05	16.98	97.83	3.99	86.25	66.87	109.36	4.48	98.78	90.29	99.76	96.39	94.56
Hilleshog 9093RR	192.10	286.27	97.57	7690.87	94.53	26.78	97.56	17.07	98.38	4.13	89.43	68.92	112.71	4.69	103.29	90.23	99.70	97.09	94.76
PREVIOUSLY APPROVED VARIETY - NOT MAKING APPROVAL FOR 2013 - LAST YEAR OF SALES																			
Hilleshog 4017RR	187.65	289.25	98.59	7245.92	89.06	24.79	90.31	17.26	99.45	5.00	108.10	65.84	107.68	5.12	112.85	89.95	99.39	98.07	88.61

* Revenue per Ton and Revenue per Acre figures were produced using the SMBSC payment forumla for the 2011 crop.

Table 3. Comparison of 2013 Full Approved Varieties to Test Market and Specialty Approved Varieties Based on 1 Year Data, 2012

Entry - Converted	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	Emergence (%) 1 yr avg	Emergence (%) % of mean	Aphanomyces 1 yr avg	Aphanomyces % of mean	Purity (%) 1 yr avg	Purity (%) % of mean	Revenue/* Ton % of mean	Revenue/* Acre % of mean
2013 APPROVED VARIETIES																				
Beta 90RR54		201.66	318.37	100.31	10203.39	101.35	31.93	100.35	18.43	99.97	4.60	99.91	67.71	107.69	4.62	100.18	91.83	100.23	100.34	100.69
Beta 98RR08		194.72	317.18	99.94	9542.19	94.78	30.09	94.56	18.44	100.02	4.39	95.48	62.75	99.80	3.85	83.47	91.54	99.91	99.88	94.45
Crystal RR018		204.95	321.37	101.26	10439.68	103.70	32.76	102.95	18.65	101.16	4.82	104.80	68.70	109.26	4.21	91.37	91.52	99.89	101.46	104.45
Crystal RR265		193.81	307.83	96.99	9746.91	96.82	31.72	99.69	18.04	97.85	4.74	103.07	60.23	95.79	3.34	72.53	91.06	99.39	95.91	95.61
Crystal RR850		197.43	310.73	97.90	10019.61	99.53	32.49	102.11	18.14	98.40	5.33	115.85	64.93	103.27	4.16	90.11	91.23	99.57	97.00	99.04
SV 36094RR		202.97	323.59	101.95	10169.30	101.01	31.53	99.09	18.71	101.49	4.11	89.42	55.44	88.17	5.85	126.86	92.05	100.47	102.92	101.98
SV 36938RR		204.46	322.63	101.65	10350.24	102.81	32.22	101.26	18.64	101.11	4.21	91.46	60.37	96.01	6.25	135.48	92.11	100.53	102.49	103.78
			317.39	**100.00**	**10067.33**	**100.00**	**31.82**	**100.00**	**18.44**	**100.00**	**4.60**	**100.00**	**62.88**	**100.00**	**4.61**	**100.00**	**91.62**	**100.00**	**100.00**	**100.00**
TEST MARKET VARIETIES WITH 1 YEAR DATA (% OF MEAN IS OF APPROVED MEAN)																				
Beta 99RR84		202.08	318.42	100.33	10243.87	101.75	32.29	101.48	18.52	100.46	5.28	114.67	67.40	107.20	4.05	87.86	91.91	100.32	101.19	102.68
Crystal RR459	High Sugar	206.41	338.22	106.56	10051.89	99.85	29.87	93.87	19.48	105.66	4.20	91.29	69.15	109.98	5.76	124.84	92.16	100.59	109.11	102.42
SV 36135RR		196.70	309.90	97.64	9972.52	99.06	32.29	101.48	17.94	97.31	3.92	85.25	54.97	87.43	5.37	116.41	92.06	100.48	96.97	98.40
SV 36937RR		203.98	322.02	101.46	10321.42	102.52	31.89	100.22	18.59	100.84	4.22	91.75	69.00	109.74	5.57	120.71	92.14	100.57	102.16	102.38
SV 36939RR		204.26	321.52	101.30	10364.95	102.96	32.34	101.63	18.50	100.35	4.01	87.27	69.35	110.30	5.63	122.12	92.32	100.76	101.79	103.46
2013 RHIZOCTONIA SPECIALTY APPROVED VARIETIES (% OF MEAN IS OF APPROVED MEAN)																				
Beta 91RR01	RZC	194.87	309.94	97.65	9786.95	97.21	31.60	99.31	18.18	98.61	4.52	98.34	63.89	101.61	3.81	82.56	90.94	99.26	96.76	96.09
Beta 99RR53	RZC	195.66	304.25	95.86	10046.67	99.79	33.19	104.31	17.69	95.96	4.86	105.73	62.32	99.12	4.44	96.30	91.70	100.09	94.39	98.45
Hilleshog 4063RR	RZC	189.86	307.80	96.98	9350.40	92.88	30.49	95.82	17.98	97.53	4.12	89.48	67.90	107.99	4.32	93.72	91.34	99.69	95.97	91.96
Hilleshog 9093RR	RZC	190.61	309.73	97.59	9364.83	93.02	30.53	95.95	18.12	98.29	4.20	91.38	69.87	111.12	4.80	104.15	91.23	99.57	96.84	92.92
PREVIOUSLY APPROVED VARIETY - NOT MAKING APPROVAL FOR 2013 - LAST YEAR OF SALES																				
Hilleshog 4017RR		189.32	314.60	99.12	9080.94	90.20	28.96	91.01	18.39	99.75	5.07	110.18	67.77	107.78	5.43	117.68	90.98	99.30	98.44	89.59

* Revenue per Ton and Revenue per Acre figures were produced using the SMBSC payment forumla for the 2011 crop.

SMBSC Variety Strip Trial - Danube

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
SV 36135RR	28.4	15.80	37	90.10	7492	91.0
Beta 90RR54	29.38	16.83	57	90.94	8387	107.5
Crystal RR018	26.1	17.55	29	90.34	7720	101.1
Beta 99RR84 + Metlock	27.5	16.56	33	90.81	7703	97.5
Beta 99RR84	27.4	16.97	22	91.49	7951	102.9
average	27.76	16.74	35.30	90.74	7850.60	100.0

6 rows by length of field
Located south of Danube
Harvested Sept. 7
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Gluek South

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	30.5	18.12	46	89.54	9221	99.4
Beta 99RR84 + Metlock	31	18.54	30	90.10	9680	106.3
Beta 90RR54	29.2	18.29	25	89.78	8947	97.2
Crystal RR018	29.2	18.42	22	90.97	9171	101.0
SV 36135RR	31.1	17.69	22	90.77	9334	100.2
SV 36092RR	30.1	17.75	27	90.12	8981	96.0
average	30.18	18.14	28.67	90.21	9222.33	100.0

8 rows by length of field
Located near Gluek
Harvested Sept 11
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Bird Island early harvest

Variety	Tons / Acre	Sugar %	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	24	15.68	89.10	6187	107.0
Beta 99RR84 + Metlock	22.49	15.21	88.95	5601	94.3
Beta 90RR54	25.69	15.22	88.34	6342	106.0
Crystal RR018	23.36	15.44	89.06	5921	101.1
SV 36135RR	21.47	15.30	88.36	5332	94.6
SV 36092RR	23.93	15.11	88.19	5849	97.0
average	23.49	15.33	88.67	5872.00	100.0

Six rows by length of field
Located near Bird Island
Harvested August 16
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Raymond

Variety	Tons / Acre	Sugar %	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	25.8	17.00	91.80	7533	90.1
Beta 99RR84 + Metlock	25.22	17.80	90.70	7611	92.9
Beta 90RR54	26.22	19.00	91.80	8606	109.9
Crystal RR018	25.93	18.30	91.00	8091	100.6
SV 36135RR	24.94	18.00	91.40	7691	95.0
SV 36092RR	26.54	19.20	91.10	8722	111.5
average	25.78	18.22	91.30	8042.33	100.0

Twelve rows by length of field
Located north of Raymond
Harvested September 19
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Montevideo

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	25.5	18.44	15	92.60	8199	100.5
Beta 99RR84 + Metlock	27.3	18.18	29	91.92	8569	103.6
Beta 90RR54	28.46	18.06	18	91.14	8776	105.1
Crystal RR018	27.27	17.98	36	91.38	8398	100.5
SV 36135RR	27.54	17.52	33	92.15	8340	98.9
SV 36092RR	24.69	17.85	22	92.17	7628	91.4
average	26.79	18.01	25.50	91.89	8318.33	100.0

Eight rows by length of field
Located near Benson piler
Harvested September 18
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Gluek North

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	26.73	19.05	32	91.53	8765	101.4
Beta 99RR84 + Metlock	26.14	19.25	64	91.10	8614	99.9
Beta 90RR54	28.03	19.69	33	91.53	9515	112.0
Crystal RR018	25.54	19.69	19	90.44	8537	99.8
SV 36135RR	25.15	18.81	43	91.38	8121	93.2
SV 36092RR	24.76	18.97	31	91.67	8099	93.6
average	26.06	19.24	37.00	91.28	8608.50	100.0

Eight rows by length of field
Located near Gluek
Harvested September 24
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Appleton

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	43.87	16.50	27	90.95	12265	105.1
Beta 99RR84 + Metlock	44.61	16.47	33	91.18	12489	107.1
Beta 90RR54	40.99	16.35	25	91.69	11468	98.3
Crystal RR018	39.84	16.49	26	91.41	11204	96.4
SV 36135RR	45.43	16.14	34	91.01	12419	104.8
SV 36092RR	39.46	16.68	24	91.10	11183	96.7
Hilleshog 4063RR	42.6	16.23	32	90.24	11585	97.4
SV 36938RR	39.67	16.46	26	90.81	11041	94.3
average	42.06	16.42	28.38	91.05	11706.75	100.00

Hand harvested (8 foot of row at 10 locations per variety)
Northern Irrigated Strip Trial
Located near Appleton
Harvested September 20
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Renville

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	27.8	16.21	42	89.41	7459	99.3
Beta 99RR84 + Metlock	27.14	16.40	32	90.46	7487	101.6
Beta 90RR54	28.04	16.41	40	89.96	7684	103.8
Crystal RR018	29.46	16.78	48	89.38	8194	111.8
SV 36135RR	26.12	16.47	39	90.51	7243	98.7
SV 36092RR	28.28	16.11	43	89.60	7559	100.4
Hill 9093**	28.1	15.75	58	89.21	7291	94.7
Crystal RR850**	25.75	15.86	51	89.96	6806	89.7
average	27.59	16.25	44.13	89.81	7465.38	100.0

Twelve rows by length of field.
Located near South of Renville
Harvested September 18
Revenue calculated using Fall 2011 Payment Estimate
** Varieties added by cooperator to strip trial

SMBSC Variety Strip Trial - Murdock

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	28.08	18.53	23	91.34	8920	100.9
Beta 99RR84 + Metlock	31.67	18.74	25	90.97	10128	115.0
Beta 90RR54	26.2	18.51	9	91.11	8287	93.5
Crystal RR018	25.17	18.57	14	90.65	7936	89.4
SV 36135RR	29.4	18.12	12	91.07	9088	101.3
average	28.10	18.49	16.60	91.03	8871.80	100.0

Eight rows by length of field
Located near Murdock piler
Harvested September 25
Revenue Calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Belgrade Early Harvest

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	33.9	15.97	27	91.44	9219	101.5
Beta 99RR84 + Metlock	35.81	16.15	22	91.93	9922	110.6
Beta 90RR54	35.25	15.73	21	91.48	9439	102.8
Crystal RR018	34.94	16.12	26	91.43	9595	106.3
SV 36135RR	33.96	14.85	31	91.19	8520	88.3
SV 36092RR	34.49	15.43	23	91.01	8989	96.0
Hilleshog 4063RR	33.34	15.79	22	91.03	8907	96.8
Hilleshog 9093RR	33.71	15.62	18	91.74	8992	97.6
average	34.43	15.71	23.75	91.41	9197.88	100.0

Hand harvested (8 foot of row at 10 locations per variety)
Northern Irrigated Strip Trial
Located near Brooten
Harvested September 20

Belgrade Strip Trial - Late Harvest

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre	Notes
Beta 99RR84	32.49	17.77	40	91.47	9895	107.92	
Beta 99RR84 + Metlock	35.04	17.74	27	91.36	10636	115.79	
Beta 90RR54	34.74	17.23	33	90.94	10165	108.27	
Crystal RR018	34.75	18.14	18	91.19	10773	118.69	
SV 36135RR	27.14	16.75	35	90.85	7698	80.41	
SV 36092RR	29.46	17.32	33	91.35	8718	93.50	
Hilleshog 4063RR	24.4	17.41	28	91.40	7265	78.20	Deep Sprayer Tracks
Hilleshog 9093RR	31.82	17.13	25	90.51	9197	97.22	
Average	31.23	17.44	29.88	91.13	9293	100.00	

Northern Irrigated Strip Trial
Located near Brooten
Harvested October 18
8 rows by length of field

SMBSC Variety Strip Trial - Bird Island Late Harvest

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	31.11	18.86	26	91.35	10069	105.1
Beta 99RR84 + Metlock	30.37	19.43	17	92.73	10334	110.6
Beta 90RR54	27.52	19.58	13	92.48	9409	101.0
Crystal RR018	28.84	19.23	18	91.84	9592	101.5
SV 36135RR	27.01	18.62	15	91.91	8693	90.5
SV 36092RR	27.38	18.56	16	91.97	8789	91.3
average	28.71	19.05	17.50	92.05	9481.00	100.0

Six rows by length of field
Located near Bird Island
Harvested October 13
Revenue calculated using Fall 2011 Payment Estimate

SMBSC Variety Strip Trial - Hector

Variety	Tons / Acre	Sugar %	Brei N	Purity %	ESA	Percent Revenue / Acre
Beta 99RR84	25	17.97	40	89.76	7517	85.9
Beta 99RR84 + Metlock	27.5	18.25	23	91.32	8595	100.4
Beta 90RR54	31.7	18.43	19	90.10	9837	114.4
Crystal RR018	31.2	18.40	27	89.75	9616	111.4
SV 36135RR	28.5	16.89	43	90.26	8087	89.1
SV 36092RR	28.9	17.63	24	90.96	8666	98.8
average	28.80	17.93	29.33	90.36	8719.67	100.0

Eight rows by length of field
2 strips per variety
Harvested October 11
Located near Hector piler
Revenue calculated using Fall 2011 Payment Estimate

Analysis of 2012 SMBSC Variety Strip Trials - Nine Locations with Six Entries

Variety	Entry	Tons / Acre	Sugar %	Purity %	ESA	Revenue % of Mean
Beta 99RR84	1	27.66	17.68	90.73	8316.1	98.8
Beta 99RR84 + Metlock	2	28.02	17.87	90.96	8569.7	102.8
Beta 90RR54	3	28.84	17.99	90.67	8809	105.6
Crystal RR018	4	28.39	18.04	90.56	8699.2	104.4
SV 36135RR	5	26.55	17.34	90.84	7837.7	92.4
SV 36092RR	6	27.11	17.61	90.79	8112.3	96.1
						100.0
CV%		5.87	2.23	0.55	6.57	7.43
lsd (.05)		N/S	0.38	N/S	525.37	7.10
Pr>F		0.055	0.0048	0.62	0.0043	0.003
reps		9	9	9	9	9

* 9 strip trial locations. Each one treated as a rep.

**Revenue calculated using November 2011 Payment Estimate

Analysis of 2012 SMBSC Variety Strip Trials - All Locations with Five Entries

Variety	Entry	Tons / Acre	Sugar %	Purity %	ESA	Revenue % of Mean
Beta 99RR84	1	27.67	17.69	90.85	8337.8	98.7
Beta 99RR84 + Metlock	2	28.31	17.83	90.95	8632.5	102.9
Beta 90RR54	3	28.65	17.93	90.74	8723.2	103.9
Crystal RR018	4	27.89	18.05	90.55	8540.8	102.0
SV 36135RR	5	27.0	17.27	90.80	7919.9	92.6
						100.0
CV%		6.53	2.05	0.552	7.04	7.75
lsd (.05)		N/S	0.31	N/S	511.29	6.67%
Pr>F		0.268	0.0001	0.425	0.023	0.0095
reps		11	11	11	11	11

* 11 strip trial locations. Each one treated as a rep.

**Revenue calculated using November 2011 Payment Estimate

NITROGEN MANAGEMENT STRATEGIES FOR INCREASING SUGAR BEET ROOT QUALITY

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Justification of Research: Sugar beet growers are concerned about sugar beet root yield and quality. To remain competitive, the growers must fine tune their nitrogen fertilizer management to increase sugar beet quality and thus making a better economic situation for sugar production. Since 2002, the Southern Minnesota Beet Sugar Cooperative has had a goal of better quality. The purity of the root has increased from 87 % to 92 % during this time. This has occurred from a combination of refined varieties, harvest management, and nitrogen fertilizer application. The nitrogen fertilizer recommendation for this area has been reduced 50 lb/A since this time. This reduction has not reduced root yields. In fact, average root yields have increased from a cooperative average of 21 ton/A to 28 ton/A. The increase in percent sucrose in the root has not occurred. The reasons for this include, the large amount of soil organic matter (N) in this area, rainfall occurring just before harvest that increases N mineralization from the organic matter, and frost occurrence during the early harvest that causes the plant to re-grow and thus using the sucrose accumulated in the beet for an energy source. There is a need to explore and review other nitrogen fertilizer management practices. This proposed project will look at the effect of ‘feeding’ nitrogen to the sugar beet during the growing season by using a slow release nitrogen source or split applications. The slow release products may be able to supply enough nitrogen for root growth while not reducing the sucrose in the beet.

Summary of Literature Review: The current fertilizer guideline for growing sugar beet is a total of 130 lb N/A as soil nitrate-N to a depth of four feet and fertilizer nitrogen applied (Lamb et. al 2001a). This guideline was revised for the southern Minnesota and published in the 2010 Sugarbeet Production Guide to 100 lb N/A. There has been a considerable amount of research that has been done with nitrogen management since 1996, Lamb et al. 2006a, 2006b, 2005, 2004, 2003, 2001b, 2000, and 1999). Most of that work was to determine the optimum nitrogen rate for economic sugar beet production.
Lamb and Moraghan 1993 reported on the effect of foliar applications during the growing season in addition to the initial pre-plant soil applications on sugar beet root yield and quality. They concluded that the later the foliar N application was made, the more the root quality reduced. Root yield was not affected.

Sims, 2010 reported new work on the use of a slow release nitrogen product called ESN by Agrium. The release of nitrogen is controlled by coating a urea prill with a polymer. The speed of release is governed by the polymer coating, amount moisture and temperature in the soil. It is thought that the slower release may be beneficial to sugar beet root growth and quality. In 2009, the use of ESN in the RRV did not perform any better than urea. This was one year of data.

Split applications of nitrogen to the soil have been investigated in the RRV and SMBSC growing areas in Minnesota, Lamb, 1986, 1987, 1988, and 1989. The results were neutral for root yield and quality when the nitrogen fertilizer was split applied a pre-plant and four weeks after emergence. The sugar beet varieties have changed since that time.

Objectives:

1. Determine if split applications of nitrogen or the use of slow release forms of nitrogen (ESN), can increase root quality.

Materials and Methods: An experiment was established at four locations in the Southern Minnesota Beet Sugar Cooperative growing area to meet the objective. One of the locations was abandoned because of wet planting conditions causing poor earlier growth. The study included the factorial combination of six nitrogen application rates (0, 30, 60, 90, 120, and 150 lb N/A) and two nitrogen sources (urea and ESN). The split applications of nitrogen at pre-plant and early July of urea at 60 and 120 lb N/A and split treatment of 60 and 120 lb N/A with the pre-plant, split applied as ESN and the July application as urea. Another method used was to split apply nitrogen as a liquid. Two nitrogen liquid products, NaChurs SRN and Kugler KQ-XRN were used as treatments. The preplant application was with 30 or 60 lb. N/A as urea or ESN and the liquid applications occurred at the 10 and 20 leaf stage, July 8 and August 20, 2011, respectively. The liquids were applied at a rate of 2 gallons per acre delivering a total of 12 lb. N/A. The SRN product is a 28 % liquid nitrogen product that is 7.8% urea-N and 20.2% slowly available water soluble nitrogen derived from urea triazone solution. Kugler KQ-XRN is a 28 % liquid nitrogen product with 72 % of its nitrogen as proprietary formulation slow release nitrogen.

A summary of the treatments are in Table 1. The study had five replications. Petiole samples were taken mid-July from the each treatment and analyzed for nitrate-N. The sugar beet roots were harvested in October for root yield and quality determination. Root quality was determined at the Southern Minnesota Beet Sugar Cooperative quality laboratory in Renville, Minnesota.

Table 1. Treatments for ESN and Split N application trial in 2011.

Trt	Pre-plant N (lb N/A)	Split application (lb N/A)	Total application (lb N/A)
1	0	0	0
2	Urea 30	0	30
3	Urea 60	0	60
4	Urea 90	0	90
5	Urea 120	0	120
6	Urea 150	0	150
7	0	0	0
8	ESN 30	0	30
9	ESN 60	0	60
10	ESN 90	0	90
11	ESN 120	0	120
12	ESN 150	0	150
13	ESN 30 + Urea 30	0	60
14	ESN 60 + Urea 60	0	120
15	ESN 15 + Urea 15	Urea 30	60
16	ESN 30 + Urea 30	Urea 60	120
17	Urea 30	SRN 12 lb. N/A foliar	42
18	Urea 60	SRN 12 lb. N/A foliar	72
19	ESN 30	SRN 12 lb. N/A foliar	42
20	ESN 60	SRN 12 lb. N/A foliar	72
21	Urea 30	KQ-XRN 12 lb. N/A foliar	42
22	Urea 60	KQ-XRN 12 lb. N/A foliar	72

Results and Discussion:

Site 1176

N Rate study with urea and ESN: Root yield, extractable sucrose per ton, extractable sucrose per acre, and petiole nitrate-N in mid-July were significantly affected by nitrogen application rate, Table 2. Root yield was increased with 60 lb. /A of N applied, Figure 1. With the soil test of 70 lb. N/A, then the total N needed was 130 lb. N/A for optimum root yield. The effect on root yield was similar whether we used urea or ESN as the preplant N source.

Extractable sucrose per ton was reduced from 290 lb. /ton to 255 lb. /ton with the addition of nitrogen fertilizer, Figure 1. The source of preplant N did not affect this decline in quality.

Because of the effect of N application on quality the optimum extractable sucrose per acre occurred with 30 to 60 lb. N/A applied, Table 1. The source of N did not affect the extractable sucrose per acre. The total N need for optimum extractable sucrose per acre was between 100 and 130 lb. /A. This falls well in line with the current guidelines for Southern Minnesota Beet Sugar Cooperative growing area.

The most recently matured sugar beet petiole was sampled from 15 plants in each plot during mid-July in 2011. The addition of preplant applied nitrogen, either as urea or ESN, increased the amount of nitrate-N in the petiole at that time of sampling, Figure 1. This increase is an indicator that more nitrogen is getting into the plant for the addition of more fertilizer N. Since nitrogen is purity, it also indicates why the extractable sucrose per ton was reduced with the N application.

Table 2. Statistical analysis of N rate and N source on root yield, extractable sucrose per ton, extractable sucrose per acre, and petiole nitrate-N concentration in mid-July at site 1176 in 2011.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Petiole nitrate-N
Statistic	----------------------- P > F ------------------------			
N rate	0.0006	0.001	0.03	0.0001
N source	0.21	0.81	0.42	0.54
N rate X N source	0.05	0.57	0.15	0.07
C.V. (%)	5.4	4.6	6.9	23.7

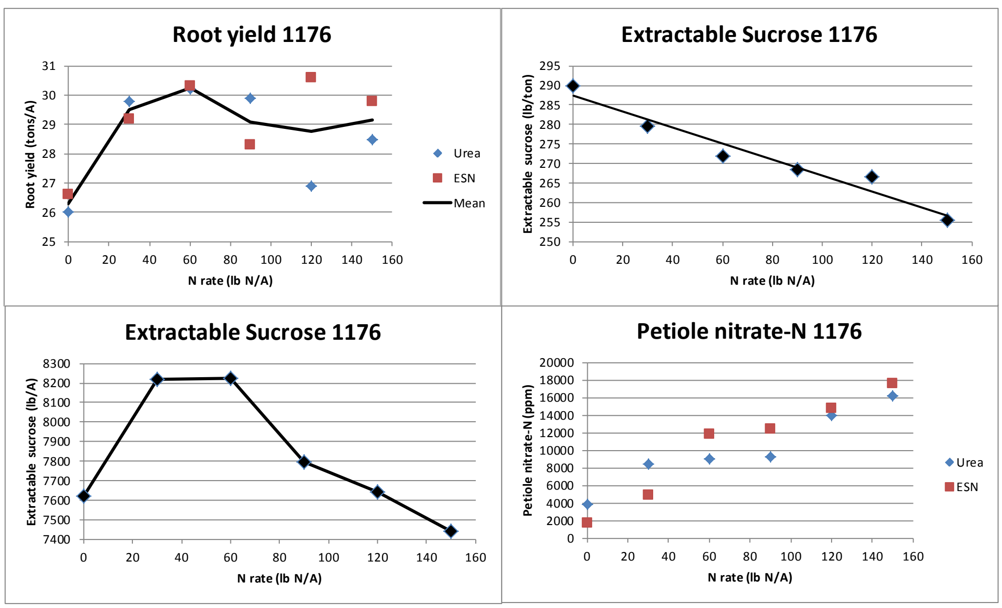

Figure 1. Root yield, extractable sucrose per ton, extractable sucrose per acre, and petiole nitrate-N concentration in mid-July 2011 at site 1176.

<u>Evaluation of split applications</u>: The use of split applications of nitrogen has been suggested as a way to grown large sugar beet roots while minimizing the detrimental effects of nitrogen on root quality. This evaluation was done using the 60 lb. N/A treatments. The slow availability split applications of SRN and XRN actually had 72 lb. N/A applied. The statistical analysis indicates that there was no difference in root yield, extractable sucrose per ton, and extractable sucrose per acre caused by the different products and split application management, Table 3 and Figure 2. Petiole nitrate-N concentration was affected by the treatments, Table 3 and Figure 2. The petiole nitrate-N concentration was the least with the split application of urea, preplant May 14 and July 7, 2011. The plants treated with preplant ESN did have the greatest petiole nitrate-N concentration. This was caused by the N in this treatment being all from ESN and the slow release characteristic of this product. The lower petiole nitrate-N concentration in the plants treated with the split application urea show a possible strategy to increase quality, but the root yield was not increased by the treatment.

Table 3. Statistical analysis of split applications with several N sources at the 60 lb. N/A rate for root yield, extractable sucrose per ton, extractable sucrose per acre, and petiole nitrate-N concentration in mid-July at site 1176 in 2011.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Petiole nitrate-N
Statistic	---------------------- P > F ------------------------			
Product	0.33	0.58	0.28	0.008
C.V. (%)	4.7	4.4	5.5	31.0

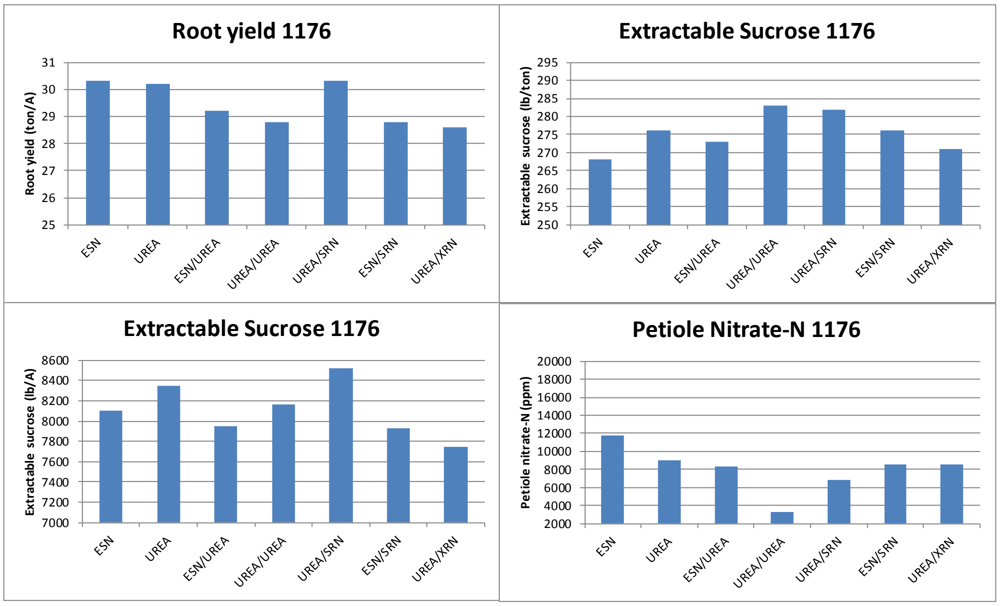

Figure 2. Root yield, extractable sucrose per ton, extractable sucrose per acre, and petiole nitrate-N concentration in mid-July 2011 at site 1176 as affected by different split applications and products at 60 lb. N/A.

Site 1274

<u>N Rate study with urea and ESN:</u> Root yield and extractable sucrose per acre responses to the addition of ESN and Urea fertilizer caused an interaction, Table 4, and Figure 3. The addition of N as urea increased both root yield and extractable sucrose per acre with increasing amounts added. The optimum N rate when urea was the N source for root yield was 120 lb. N/A while the optimum N rate for extractable sucrose per acre was 90 lb. N/A. This result would have put the optimum N rate plus soil test N at this site at 160 lb. N/A. This is on the high side of the current guideline. The use of ESN had the opposite effect and the root yield decrease with the addition of N as ESN. The addition of N as either ESN or Urea decreased the amount of extractable sucrose per ton. As the amount of N applied increased above 30 lb. N/A, the extractable sucrose per ton decreased 1 lb. /ton for every 3.4 lb. N applied.

Table 4. Statistical analysis of N rate and N source on root yield, extractable sucrose per ton, and extractable sucrose per acre at site 1274 in 2012.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre
Statistic	---------------------- P > F ------------------------		
N rate	0.22	0.0001	0.62
N source	0.81	0.45	0.49
N rate X N source	0.0001	0.51	0.008
C.V. (%)	7.9	3.6	9.2

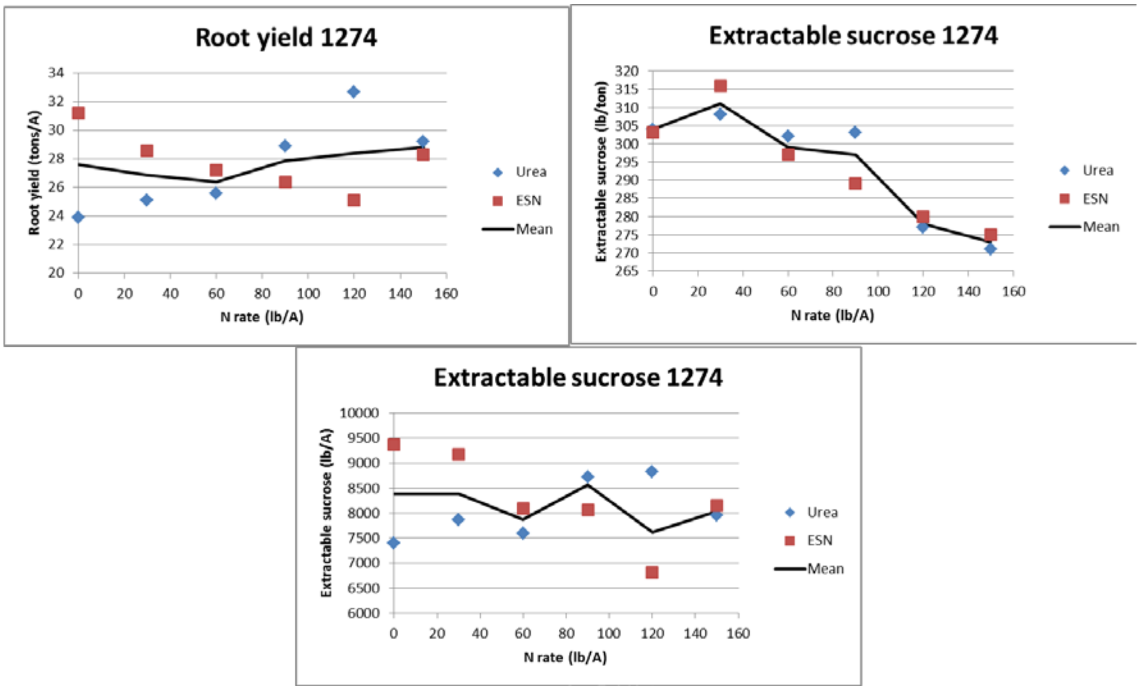

Figure 3. Root yield, extractable sucrose per ton, and extractable sucrose per acre in 2012 at site 1274.

Evaluation of split applications: The use of split applications and slow release products did not significantly affect root yield, extractable sucrose per ton, or extractable sucrose per acre, Table 5, Figure 4. Because of the dry summer, there was considerable variability in the measurements of root yield and extractable sucrose at this site.

Table 5. Statistical analysis of split applications with several N sources at the 60 lb. N/A rate for root yield, extractable sucrose per ton, and extractable sucrose per acre at site 1274 in 2012.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre
Statistic	---------------------- P > F ------------------------		
Product	0.23	0.54	0.60
C.V. (%)	10.7	4.7	13.7

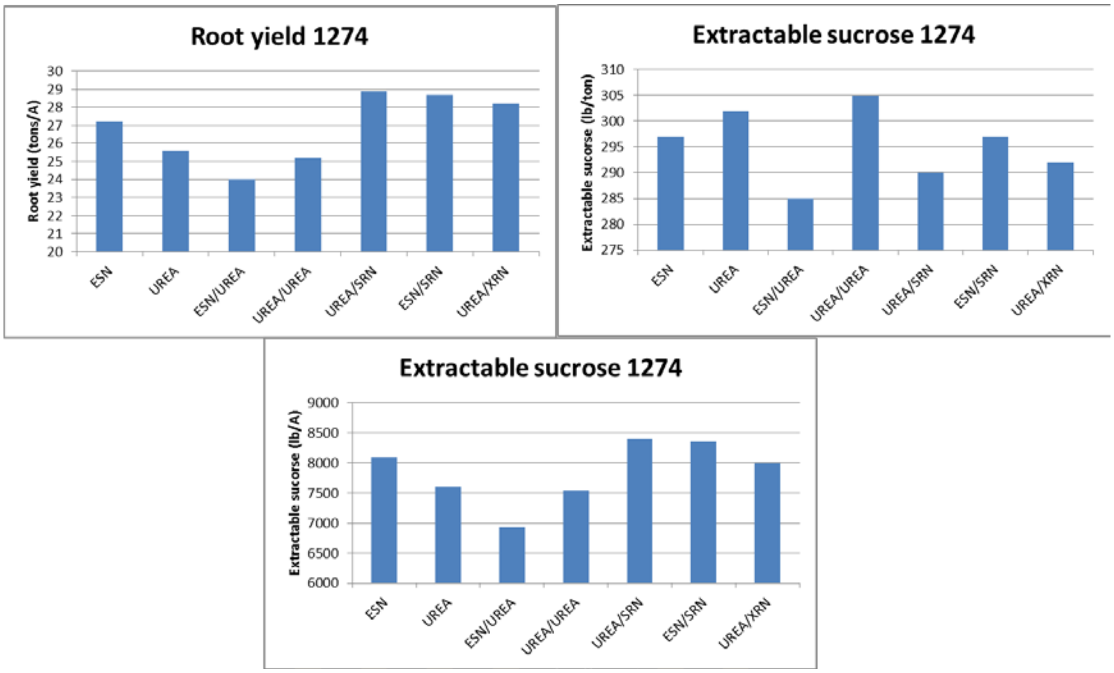

Figure 4. Root yield, extractable sucrose per ton, and extractable sucrose per acre in 2012 at site 1274 as affected by different split applications and products at 60 lb. N/A.

Site 1275

<u>N Rate study with urea and ESN:</u> Root yield, extractable sucrose per ton, and extractable sucrose per acre were significantly affected by nitrogen application rate and had an interaction with the source of N, Table 6, and Figure 5. When urea was the N source, root yield was increased with 60 lb. /A and 150 lb. /A of N applied, Figure 5. The effect of dry weather caused some strange root yields at the 90 and 120 lb. N/A of urea treatments. The ESN treatment, did not affect root yields. The response for root yield was similar for the extractable sucrose per acre. The extractable sucrose per ton was reduced by increasing N rates as urea. The reduction was 1 lb. /ton per each 3.75 lb. N/A application. With the soil test of 48 lb. N/A, the optimum N application should have been between 50 and 70 lb. N/A.

Table 6. Statistical analysis of N rate and N source on root yield, extractable sucrose per ton, and extractable sucrose per acre at site 1275 in 2012.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre
Statistic	----------------------- P > F ------------------------		
N rate	0.0002	0.0007	0.02
N source	0.76	0.62	0.45
N rate X N source	0.01	0.01	0.02
C.V. (%)	8.18	3.4	8.5

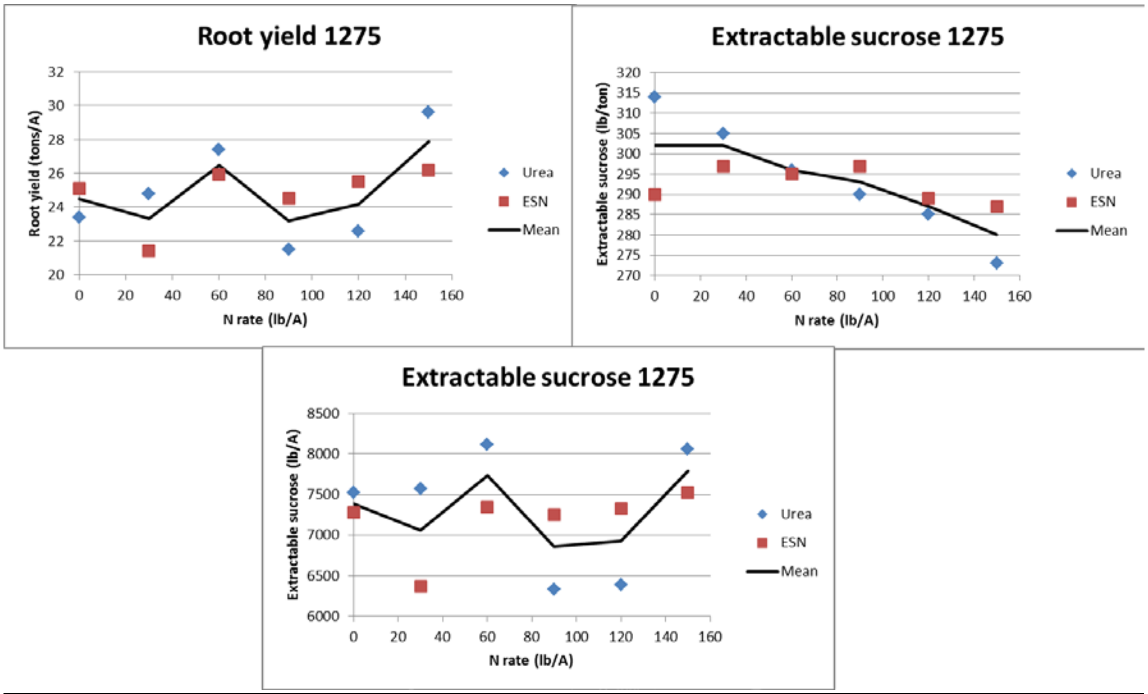

Figure 5. Root yield, extractable sucrose per ton, and extractable sucrose per acre in 2012 at site 1275.

Evaluation of split applications: As in the other two sites, the use of split applications of nitrogen was done using the 60 lb. N/A treatments. The slow availability split applications of SRN and XRN actually had 72 lb. N/A applied. The statistical analysis indicates that there was no difference in root yield, extractable sucrose per ton, and extractable sucrose per acre caused by the different products and split application management, Table 7 and Figure 6.

Table 7. Statistical analysis of split applications with several N sources at the 60 lb. N/A rate for root yield, extractable sucrose per ton, and extractable sucrose per acre at site 1275 in 2012.

	Root yield	Extractable sucrose per ton	Extractable sucrose per acre
Statistic	---------------------- P > F ------------------------		
Product	0.22	0.32	0.32
C.V. (%)	8.3	3.9	9.2

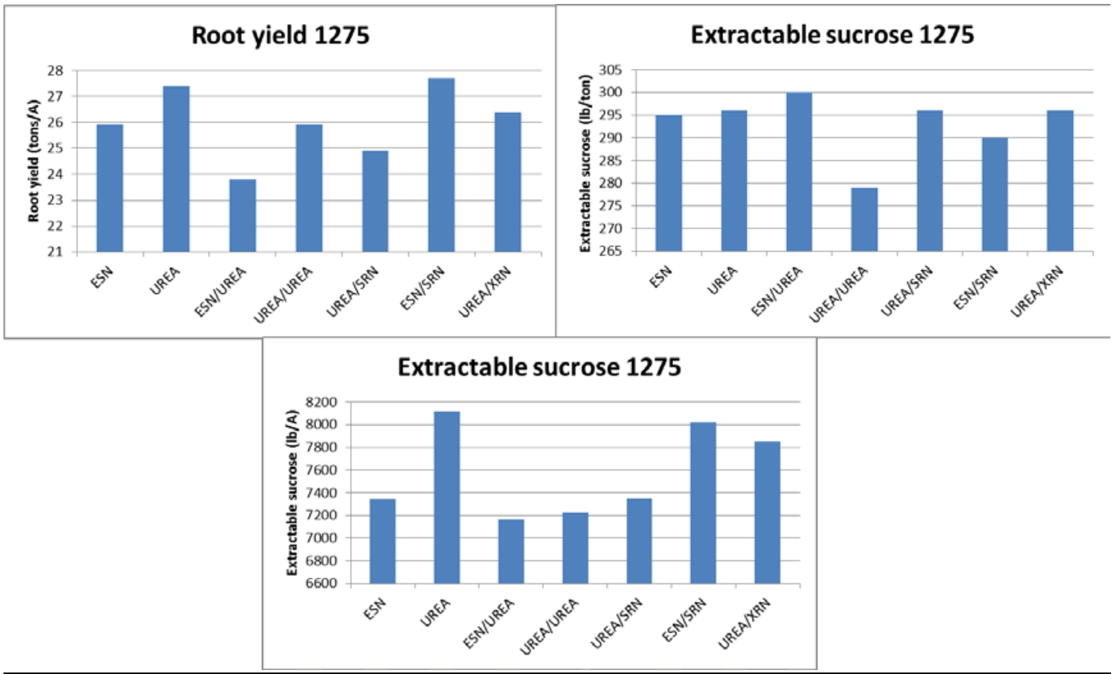

Figure 6. Root yield, extractable sucrose per ton, and extractable sucrose per acre in 2012 at site 1275 as affected by different split applications and products at 60 lb. N/A.

Summary: The information from three sites has indicated that the use of ESN as a N source did not increase root yield or extractable sucrose per acre. Its use decreased sugar beet quality as measured by extractable sucrose per ton similarly to urea. In this study, there was also no advantage to the use of a split application of urea or the use of foliar slow release products to sugar beet production.

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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 four 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 combine 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. Corn was grown in 2011 and hand harvested for grain yield fall 2011. In the fall of 2011, the last litter and fertilizer N treatments were applied and sugar beet grown in 2012.

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 turkey litter 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 litter per acre 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 turkey 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 turkey 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 turkey litter treatments with fertilizer, a nitrogen rate study was conducted within the turkey 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 turkey litter application treatment for revenue. This information would suggest that the time of turkey litter application in the sugar beet rotation was important at this location.

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

<u>Olivia Site:</u>

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 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 was 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 beet was planted in 2010 with N rate treatments and 3 and 6 turkey litter per acre 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 and 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 turkey 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 turkey litter 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 per ton by the different turkey litter treatments. The extractable sucrose per acre 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 turkey litter applications. The fall 2009 turkey litter application (either rate) increased root yield over the other turkey litter treatments and thus increased the extractable sucrose per acre and revenue per acre more than the other turkey litter 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 litter 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

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 75 lb. nitrate-N/acre in the surface four feet, 13 ppm Olsen P, and 155 ppm soil test K in the surface six inches in the fall of 2009, Table 16. The application of 3 and 6 tons of turkey litter in the fall of 2009, 2010, or 2011, did not affect the soil test values for nitrate-N, Olsen –P, or K. The Clara City site behaved different than the other two sites. At those sites, manure application before sugar beet production did increase the soil nitrate-N values over the check treatments.

Table 16. Soil test results fall 2009, fall 2010, and fall 2011 at Clara City, Minnesota.

	Nitrate-N 0-4 ft. (lb./A)			Olsen-P (ppm)			Soil test K (ppm)		
Treatment	Fall 09	Fall 10	Fall 11	Fall 09	Fall 10	Fall 11	Fall 09	Fall 10	Fall 11
3 tons turkey litter fall 09		52	20		19	11		131	149
6 tons turkey litter fall 09		45	29		19	15		130	156
3 tons turkey litter fall 10			26			13			149
6 tons turkey litter fall 10			39			19			160
120 lb. N/A fall 10			23			11			147
Check	75	40	23	13	17	17	155	145	156

Corn grain yields in 2011 were measured at the Clara City site, Table 17. The only significant difference in corn grain yield was between the 3 ton and 6 ton/A of turkey litter applications in the fall of 2010. The difference was a reduction in corn yield from the 3 ton/A treatment to the 6 ton/A treatment. There were no significant differences in corn grain yields between the other treatments.

Table 17. Corn grain yields as affected by the application of 120 pounds N per acre, 3 and 6 tons of turkey litter in fall 2009, and 3 and 6 tons of turkey litter in fall 2010 at Clara City, Minnesota in 2011.

Treatment	Corn grain yield (bushels per acre)
Zero N (check)	208
120 pounds N per acre applied fall 2010	203
3 tons turkey litter applied fall 2009	203
6 tons turkey litter applied fall 2009	206
3 tons turkey litter applied fall 2010	210
6 tons turkey litter applied fall 2010	188
Statistics	P > F
Check vs. rest	0.22
120 lb. N per acre vs. turkey litter	0.51
2009 vs. 2010 turkey litter	0.36
2009 3 ton vs. 6 ton turkey litter	0.58
2010 3 ton vs. 6 ton turkey litter	0.02

Sugar beets were planted in 2012 with N rate treatments and 3 and 6 turkey litter applications made fall 2011. The root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue for the turkey litter treatments are reported in Table 18 while the statistical analysis is reported in Table 19. Root yield, extractable sucrose per acre, and revenue was significantly increased by any of the litter and fertilizer treatments compared to sugar beet that received no fertilizer during the study at this site, 3 years. At this site, root yield, extractable sucrose per acre, and revenue were greater for the treatments receiving 120 lb. N/A fertilizer before corn production and 3 and 6 ton turkey litter per acre in the fall of 2011 than the sugar beet receiving 3 and 6 tons turkey litter per acre in the fall of 2009 and fall 2010. The extractable sucrose per ton of sugar beet was reduced from the 6 ton turkey litter per acre treatment then when compared to the 3 ton turkey litter per acre treatment from the fall of 2010.

Table 18. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of turkey litter since 2009 at Clara City, MN in 2012.

Treatments			Root yield	Extractable sucrose		Revenue
Fall 09	Fall 10	Fall 11	ton/A	lb./ton	lb./A	$/A
Check	Check	Check	27.8	291	8019	2358
3 ton turkey litter			29.4	301	8849	2649
6 ton turkey litter			29.2	302	8800	2637
	3 ton turkey litter		29.2	304	8851	2660
	6 ton turkey litter		32.7	292	9486	2796
	120 lb. N/A	3 ton turkey litter	32.8	295	9655	2864
	120 lb. N/A	6 ton turkey litter	34.9	288	10049	2951

Table 19. Statistical analysis for sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue at Clara City, MN in 2012.

		Extractable sucrose		
Contrast	Root yield	lb./ton	lb./A	Revenue
	P>F			
Check vs. rest	0.02	0.34	0.002	0.0016
Turkey litter fall 09 and 10 vs. 11	0.008	0.35	0.03	0.05
Turkey litter fall 09 vs. fall 10	0.31	0.39	0.43	0.50
Turkey litter 09, 3 vs. 6 tons	0.92	0.83	0.93	0.94
Turkey litter 10, 3 vs. 6	0.13	0.04	0.32	0.47
Turkey litter 11, 3 vs. 6	0.33	0.23	0.49	0.61
N rate fertilizer	0.54	0.90	0.32	0.28

To compare litter treatments with fertilizer, a nitrogen rate study was conducted within the litter treatments, Table 20. In 2012, there was no significant response to nitrogen application at the Clara City site, Table 19. This information would suggest that the time of turkey litter application in the sugar beet rotation was important at this location. You actually have better yields with turkey litter applied the fall before sugar beet production.

Table 20. Sugar beet root yield, extractable sucrose per ton, extractable sucrose per acre, and revenue as affected by the application of nitrogen fertilizer fall 2011 at Clara City, MN in 2012.

Fall 10	Fall 11	Root yield	Extractable sucrose		Revenue
lb. nitrogen/A		ton/A	lb./ton	lb./A	$/A
120	0	30.5	294	8965	2656
120	30	31.8	292	9230	2722
120	60	34.2	300	9961	2978
120	90	33.9	297	10057	2991
120	120	32.3	292	9656	2845
120	150	35.0	295	10333	3063
120	180	34.5	294	10344	3066

Summary:

After three 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. Caution about the use of any kind of manure in rotation should be used. In this study the manure application rates were not excessive. Excessive applications could cause problems with quality. Applications made more than once during a three year rotation should be avoided for the same reason. Too much of a good thing (turkey litter) can cause problems with management of the residual soil nitrates in the soil system.

SMBSC Evaluation of Phosphorus and its Influence on Sugarbeet Growth 2010-2012

Sugarbeets were planted at one location in 2010 at Maynard, MN and one location in 2011 at Cosmos, MN. There were two locations in 2012, one at Clara City, MN and one at Wood Lake, MN. The data will be presented combined over the four locations. Analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across environments.

Methods

Table 1-4 shows the specifics of activities conducted at each site. Plots were 11 ft. (6 rows) wide and 35 ft. long. Phosphorus fertilizer source 0-46-0 was applied with urea in order not to add a nitrogen variable with phosphorus sources such as 11-52-0 or 18-46-0. Phosphorus fertilizer indicated as P-rate in the data table was applied at rates of 0, 15, 30, 45 and 60 lbs. per acre. Sugarbeets were planted with a 6 row planter. Starter fertilizer was 10-34-0 applied at a 3 GPA rate. The starter was mixed with water at a 1:1 ratio and was applied at 6 GPA mix in-furrow on the seed. Harvest data was collected from the middle two rows of a 6 row plot. Research trials were harvested with a 2 row research harvester. At Cosmos and Clara City the whole plot length was harvested and weighed. One quality sub-sample was collected from each plot and analyzed for quality at the SMBSC Tare Lab. The Wood Lake research trial was harvested with a 1 row research harvester. At Wood Lake 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. Plots were not thinned as the sugarbeet stands did not warrant thinning.

Results and Discussion

The data is presented separately for each location and is also presented as combined data for locations 1120 and 1221. Sugarbeet quality was not significantly enhanced at the majority of the sites and did not follow any relationship to starter or phosphorus fertilizer application. Thus the influence of starter or phosphorus fertilizer on sugarbeet quality was considered to be random. In general the results showed that application of broadcast phosphorus fertilizer incorporated into the soil plus starter fertilizer gave greater yields than without starter fertilizer. In 2010 the use of starter fertilizer was highest when 15 pounds of phosphorus fertilizer was applied to the soil. In 2011 and 2012 the application of phosphorus fertilizer at rates of 60 lbs. per acre showed to be more advantageous than lower rates of phosphorus fertilizer when applied with starter fertilizer. The combined locations in 2011 and 2012 showed that tons and revenue increased as the rate of phosphorous increased. The sugar percent was not affected by the use of starter fertilizer. Starter fertilizer applied without phosphorous fertilizer incorporated performed better than any treatment that did not have starter applied. This testing of phosphorous rate supports the previous work showing a benefit to the use of starter fertilizer for sugarbeet production. These results also show the benefit of incorporating phosphorus fertilizer even when using starter fertilizer. The data would indicate that at a minimum 15 pounds of phosphorus fertilizer should be applied to optimize sugarbeet yields. Greater amount of phosphorus fertilizer (up to 60 lbs.) applied broadcast to the soil was shown to be beneficial at a majority of the test sites.

The test showed the current University phosphorous recommendation is accurate. At Maynard and Cosmos the current recommendation was to add 35lbs P_20_5, at Wood Lake 10 lbs P_20_5 was needed and at Clara City 55 lbs P_20_5 was the recommendation.

Table 1. Site Specifics for Starter by Phosphorus Rate Testing Maynard, 2010

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/23/2010	X	4 3/8"	Moist			
6/7/2010				Roundup/Max	32 oz	75' Cloudy, E-5
7/6/2010				Roundup/Max	32oz	70' Cloudy, NE-5
7/27/2010				Supertin	7oz	90' Pcloudy, SW-5-10
	pH	**N1 lb**	**N2 lb**	**N3 lb**	**Total N**	**P-O ppm**
	7.8	74.5	48.8	48.0	171.3	10.0

Table 2. Site Specifics for Starter by Phosphorus Rate Testing Cosmos, 2011

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
5/18/2011	X	4 9/16"	Boggy			
7/13/2011				Powermax	32 oz.	71' Pcloudy E-11
				Select Max	7 oz.	
				Eminent	13 oz.	
	pH	**0-6 in. N lb**	**6-24 in. N lb**	**24-48 in. N lb**	**Total N**	**P-O ppm**
	6.9	13.8	27.8	26.0	67.5	8.0

Table 3. Site Specifics for Starter by Phosphorus Rate Testing Wood Lake, 2012

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/25/2012	X	4.75	Dry			
6/12/2012				Roundup PowerMax	32 oz.	50' Pcloudy, NE-9
6/28/2012				Roundup PowerMax	32 oz.	82' Sunny, N-3
				SelectMax	6 oz.	
7/2/2012				Eminent	13 oz.	93' Sunny, S-12
				Manzate	1.5qt	
7/18/2012				Supertin WP	8 oz.	76' Cloudy, E-4
				Roundup PowerMax	44 oz.	
8/1/2012				Gem	3.5 oz.	82' Pcloudy, S-6
	pH	**N1 lb**	**N2 lb**	**N3 lb**	**Total N**	**P-O ppm**
	7.6	**28.3**	**84.8**	**42**	**155**	**13**

Table 4. Site Specifics for Starter by Phosphorus Rate Testing Clara City, 2012

DATE	PLANTED	SPACING	SOIL	APPLIED	RATE	WEATHER
4/23/2012	**X**	4.75	Damp			
5/15/2012				Roundup PowerMax	32 oz.	65' Sunny, SSW-8
5/30/2012				Roundup PowerMax	32 oz.	85' Cloudy, S-1
7/3/2012				Eminent	13 oz.	82' Sunny, SW-4
				Manzate	1.5qt	
7/17/2012				Supertin WP	8 oz.	84' Cloudy, ENE-4
				Roundup PowerMax	44 oz.	
8/1/2012				Gem	3.5 oz.	73' Pcloudy, S-7
	pH	**N1 lb**	**N2 lb**	**N3 lb**	**Total N**	**P-O ppm**
	8	**25**	**107**	**112**	**244**	**6.5**

Table 5. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Maynard, 2010

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	25.7	16.97	92.20	7494	92.45
2	Yes	15	36.0	16.62	91.17	10149	**122.00**
3	Yes	30	29.4	16.69	91.78	8412	102.33
4	Yes	45	21.3	16.31	91.74	6094	74.10
5	Yes	60	29.4	16.75	90.86	8326	100.53
6	No	0	26.1	16.90	91.38	7549	92.65
7	No	15	27.7	16.39	91.07	7778	93.21
8	No	30	27.3	16.67	90.70	7692	92.44
9	No	45	26.8	16.40	91.45	7524	90.23
10	No	60	27.5	16.09	90.82	7481	87.31
		C.V	12.7	1.49	0.72	11	9.06
		LSD (0.05)	6.2	NS	NS	1845	24.43

Table 6. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Cosmos, 2011

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	12.4	15.77	89.91	3269	90.92
2	Yes	15	15.0	15.77	90.02	3942	**109.74**
3	Yes	30	16.4	15.11	89.02	4069	107.72
4	Yes	45	16.0	15.65	90.22	4187	**116.13**
5	Yes	60	17.8	15.36	90.15	4569	**124.54**
6	No	0	11.8	15.32	91.83	3074	85.21
7	No	15	13.0	15.64	89.77	3372	92.97
8	No	30	13.8	14.93	89.43	3403	89.58
9	No	45	13.0	15.61	90.39	3390	94.01
10	No	60	12.3	15.59	90.00	3197	88.11
		C.V	8.3	3.39	1.79	9	11.61
		LSD (0.05)	1.7	NS	NS	500	16.84

Table 7. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Clara City, 2012

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	33.4	18.33	87.75	9945	104.53
2	Yes	15	35.5	17.39	87.89	10076	103.61
3	Yes	30	36.4	18.05	87.94	10685	111.56
4	Yes	45	37.1	18.01	88.38	10950	114.59
5	Yes	60	38.4	18.61	89.22	11885	**126.98**
6	No	0	25.4	18.29	89.35	7735	82.05
7	No	15	29.9	18.14	88.66	8901	93.55
8	No	30	28.2	18.24	89.13	8522	90.19
9	No	45	27.2	18.56	89.17	8391	89.45
10	No	60	26.0	18.27	89.06	7883	83.51
CV%			**9.0**	**4.07**	**1.31**	**11**	**12.99**
LSD (0.05)			**4.2**	**1.08**	**NS**	**1556**	**18.85**

Table 8. With and without Starter - Phosphorus Rate influence on Sugarbeet Production Wood Lake, 2012

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	24.7	13.92	92.64	5887	93.83
2	Yes	15	26.9	12.83	93.13	5895	88.97
3	Yes	30	30.9	13.70	92.94	7275	115.10
4	Yes	45	31.9	12.20	92.54	6571	94.79
5	Yes	60	30.9	13.30	93.47	7106	110.90
6	No	0	28.0	13.52	92.01	6536	102.84
7	No	15	28.0	13.51	92.09	6407	99.49
8	No	30	25.8	13.69	92.86	6062	95.83
9	No	45	28.5	13.67	92.01	6622	103.87
10	No	60	26.8	13.41	91.90	6096	94.38
CV%			12.4	7.57	1.42	14	17.81
LSD (0.05)			5.1	1.47	NS	NS	25.84

Table 9. With and without Starter - Phosphorus Rate Influence on Sugarbeet Production, Combined (1121-1220) 2011-2012

Trt No.	Starter	P Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Yes	0	22.9	17.05	88.83	6609	97.79
2	Yes	15	25.3	16.58	88.95	7016	107.03
3	Yes	30	26.4	16.58	88.48	7381	109.81
4	Yes	45	26.6	16.83	89.30	7566	115.22
5	Yes	60	28.1	16.98	89.68	8232	126.03
6	No	0	18.6	16.80	90.59	5397	83.26
7	No	15	21.4	16.89	89.22	6133	93.10
8	No	30	21.0	16.59	89.28	5963	89.93
9	No	45	20.1	17.08	89.78	5897	92.03
10	No	60	19.2	16.93	89.53	5540	85.80
CV%			8.4	3.29	1.59	12	10.78
LSD (0.05)			2.0	0.57	1.47	813	11.13

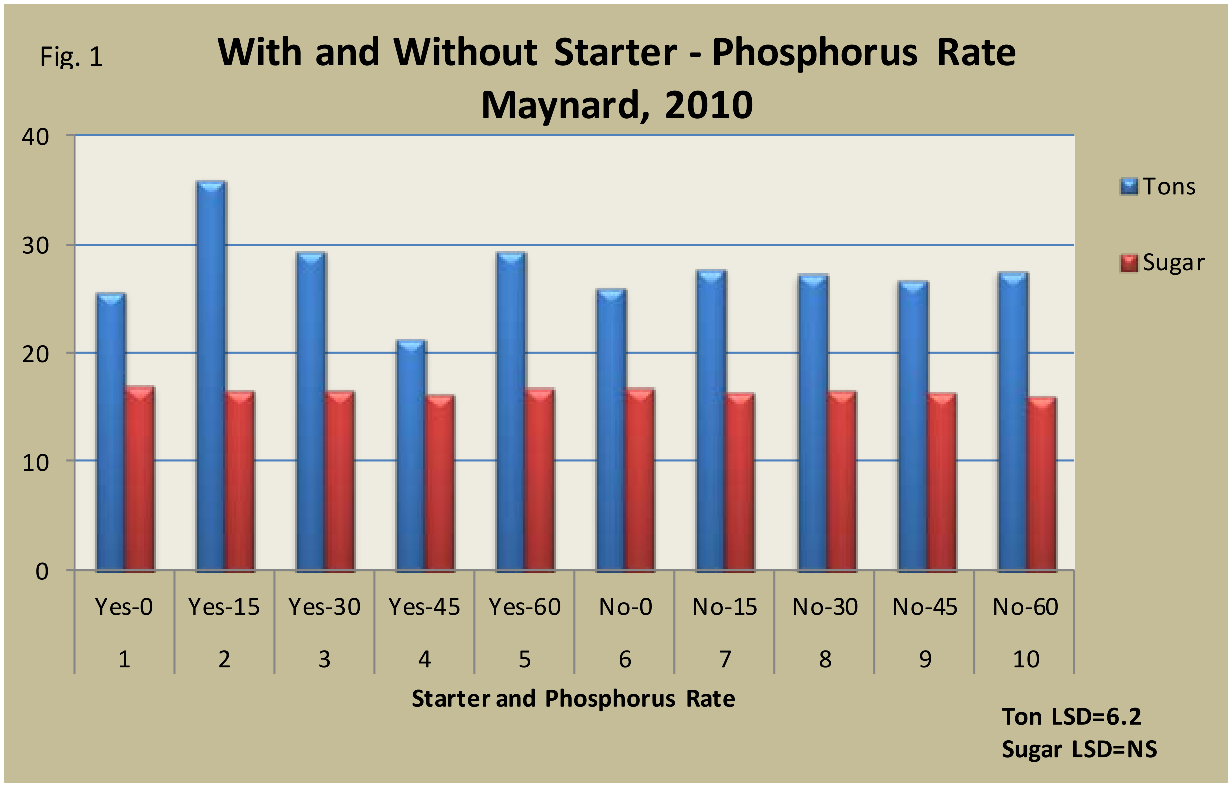


Fig. 1
With and Without Starter - Phosphorus Rate
Maynard, 2010
40
30
20
10
0
Tons
Sugar
Yes-0
Yes-15
Yes-30
Yes-45
Yes-60
No-0
No-15
No-30
No-45
No-60
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
Ton LSD=6.2
Sugar LSD=NS

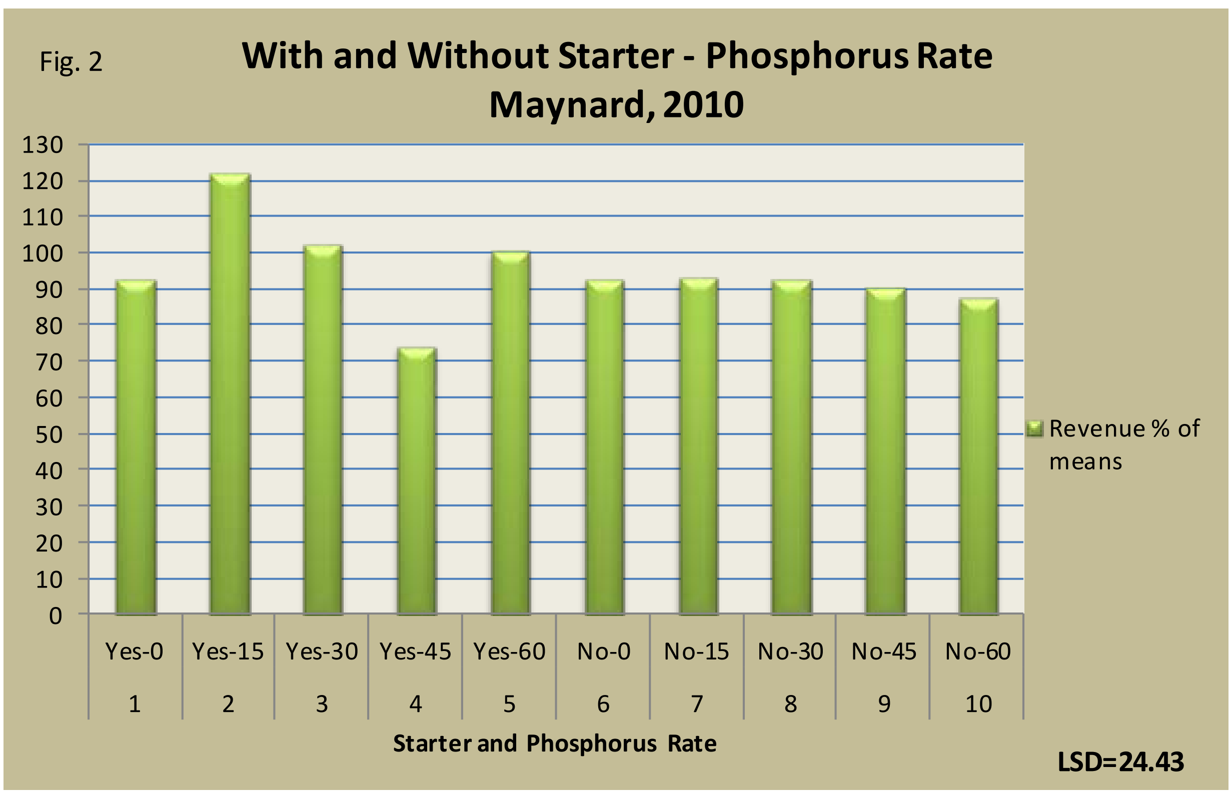


Fig. 2
With and Without Starter - Phosphorus Rate
Maynard, 2010
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Revenue % of means
Yes-0
Yes-15
Yes-30
Yes-45
Yes-60
No-0
No-15
No-30
No-45
No-60
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
LSD=24.43

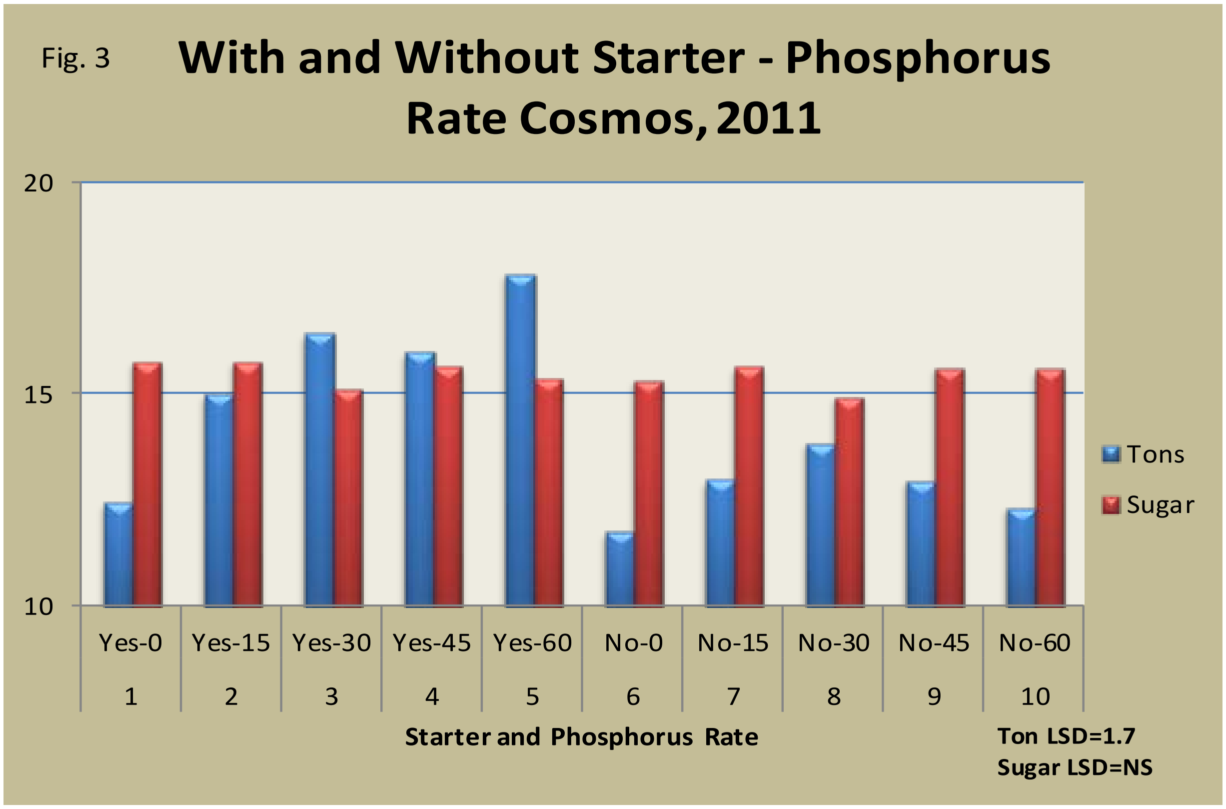


Fig. 3
With and Without Starter - Phosphorus Rate Cosmos, 2011
20
15
10
Tons
Sugar
Yes-0
Yes-15
Yes-30
Yes-45
Yes-60
No-0
No-15
No-30
No-45
No-60
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
Ton LSD=1.7
Sugar LSD=NS

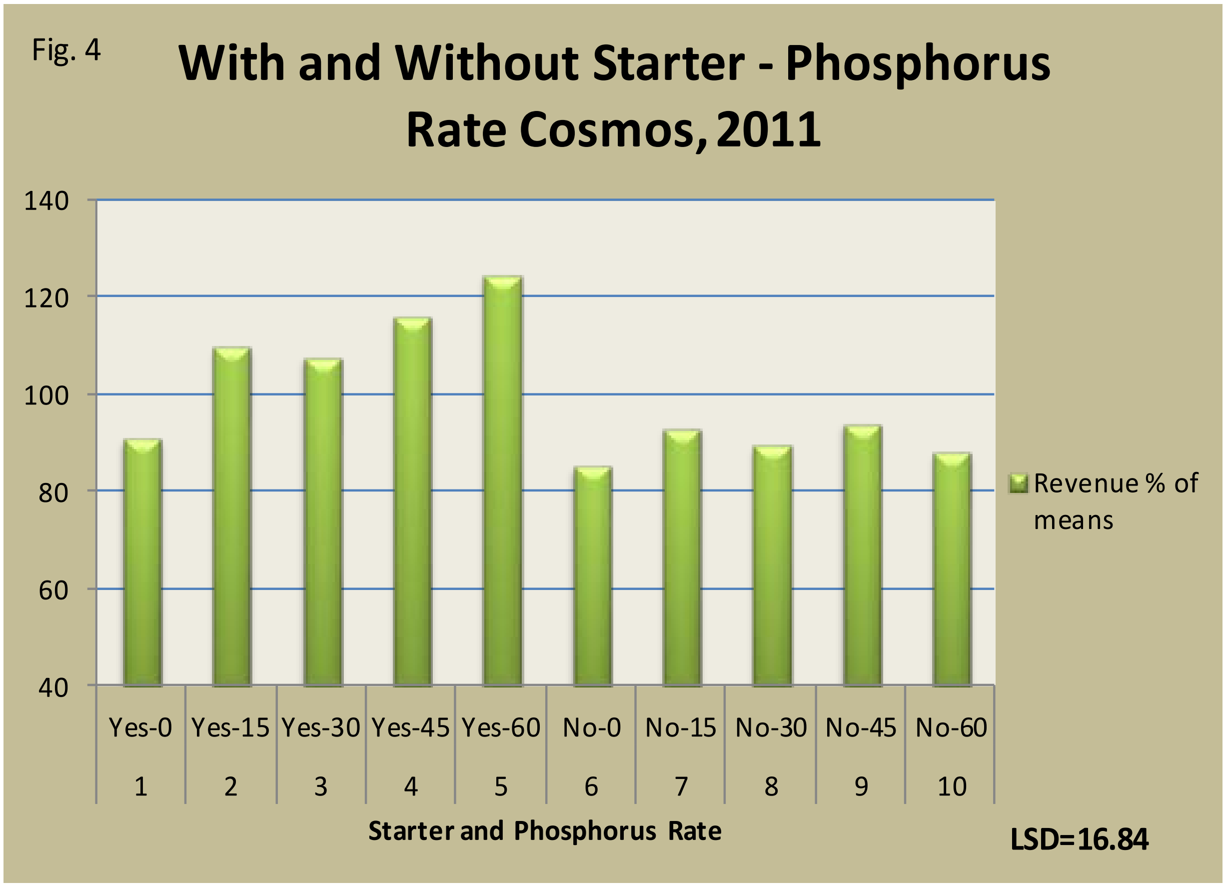


Fig. 4
With and Without Starter - Phosphorus Rate Cosmos, 2011
140
120
100
80
60
40
Revenue % of means
Yes-0
Yes-15
Yes-30
Yes-45
Yes-60
No-0
No-15
No-30
No-45
No-60
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
LSD=16.84

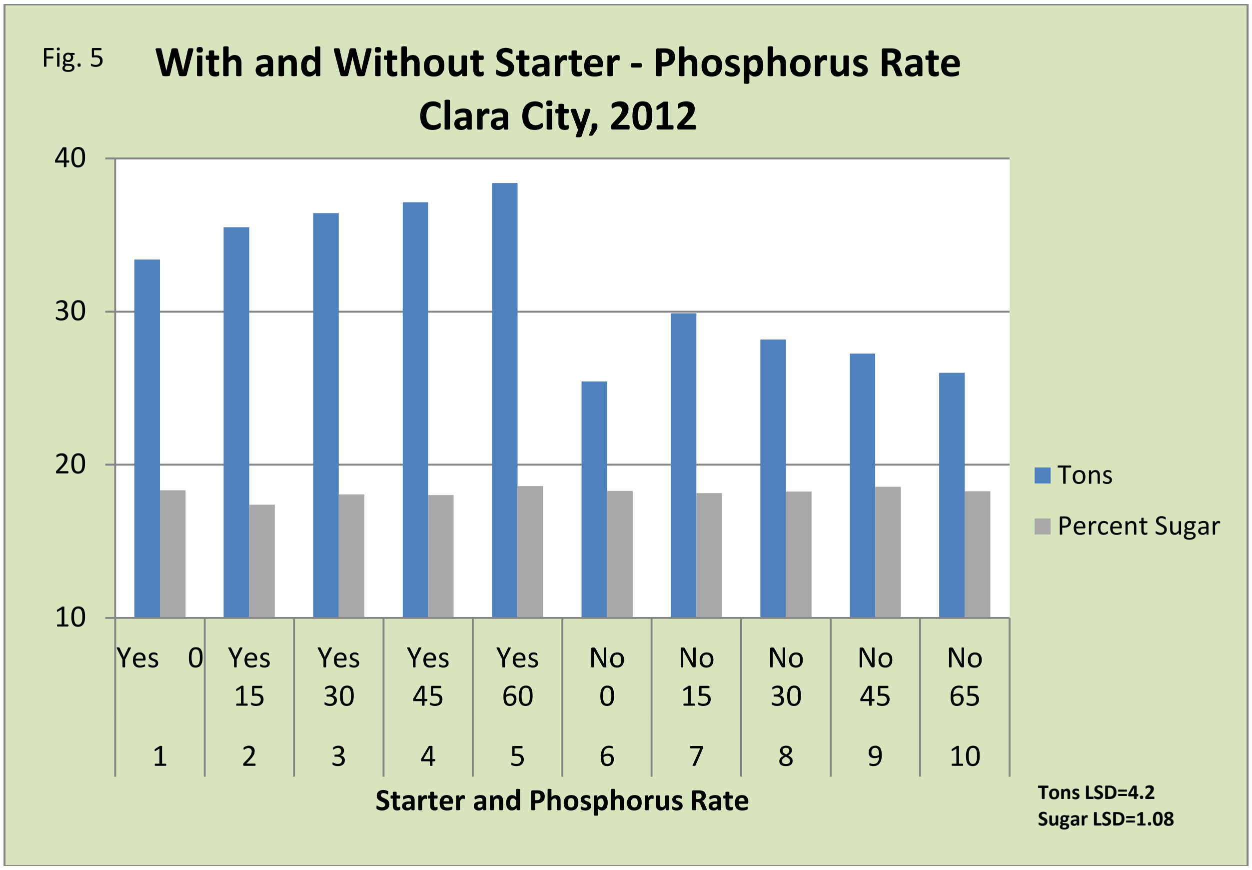


Fig. 5
With and Without Starter - Phosphorus Rate
Clara City, 2012
40
30
20
10
Yes 0
Yes 15
Yes 30
Yes 45
Yes 60
No 0
No 15
No 30
No 45
No 65
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
Tons
Percent Sugar
Tons LSD=4.2
Sugar LSD=1.08

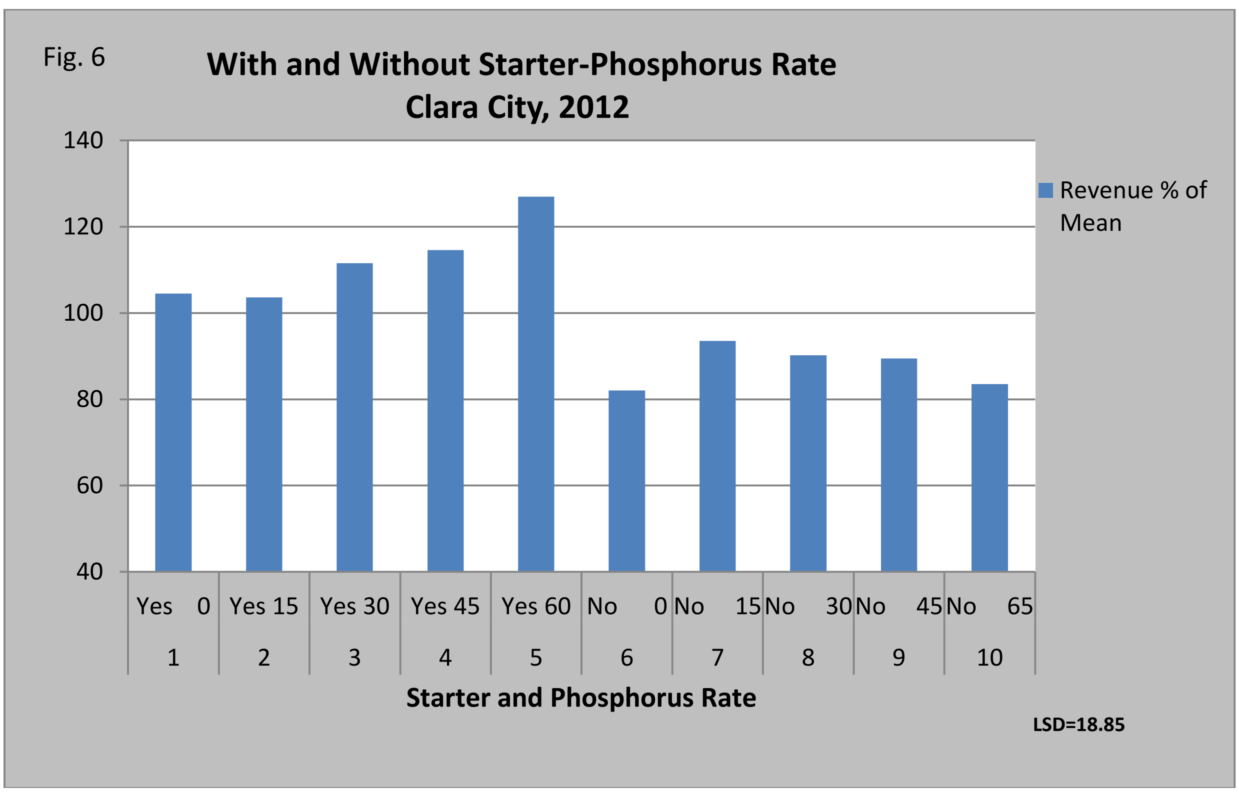


Fig. 6
With and Without Starter-Phosphorus Rate
Clara City, 2012
140
120
100
80
60
40
Yes 0
Yes 15
Yes 30
Yes 45
Yes 60
No 0
No 15
No 30
No 45
No 65
1
2
3
4
5
6
7
8
9
10
Starter and Phosphorus Rate
Revenue % of Mean
LSD=18.85

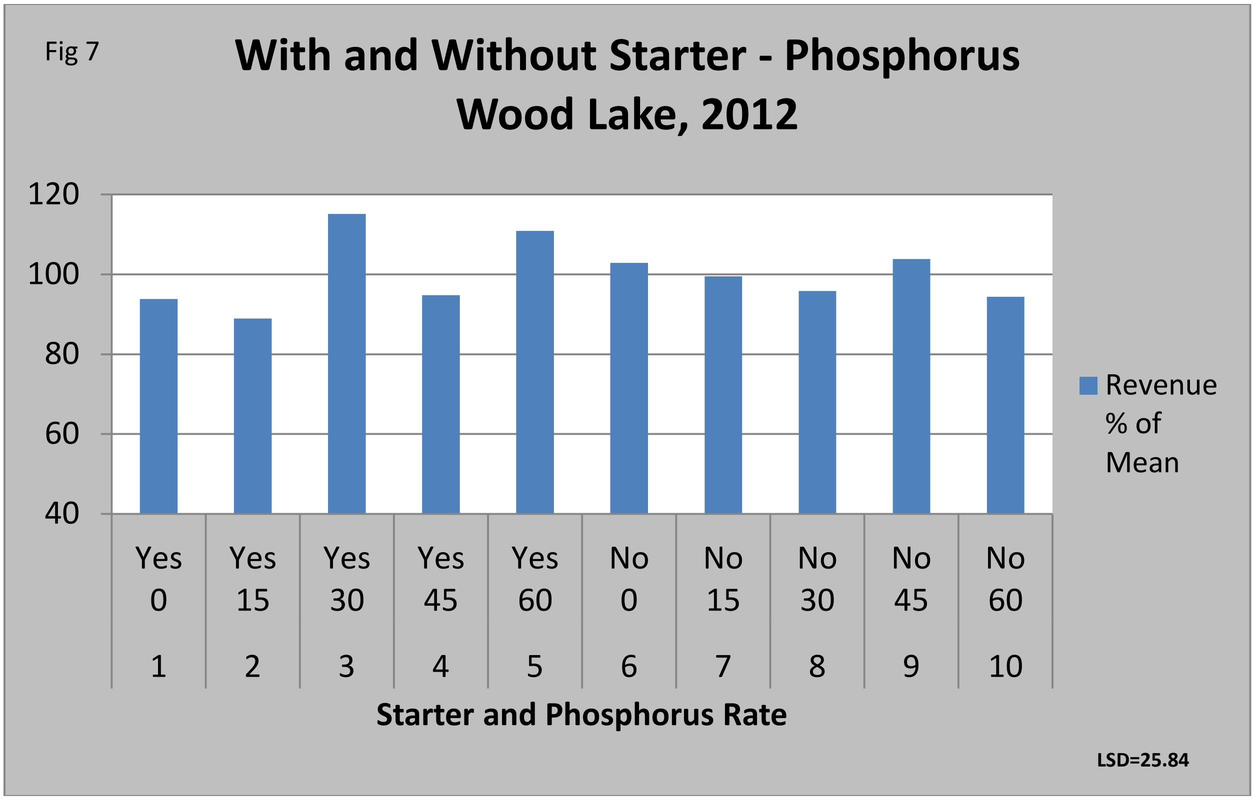


Fig 7
With and Without Starter - Phosphorus
Wood Lake, 2012
120
100
80
60
40
Revenue % of Mean
Yes 0 1
Yes 15 2
Yes 30 3
Yes 45 4
Yes 60 5
No 0 6
No 15 7
No 30 8
No 45 9
No 60 10
Starter and Phosphorus Rate
LSD=25.84

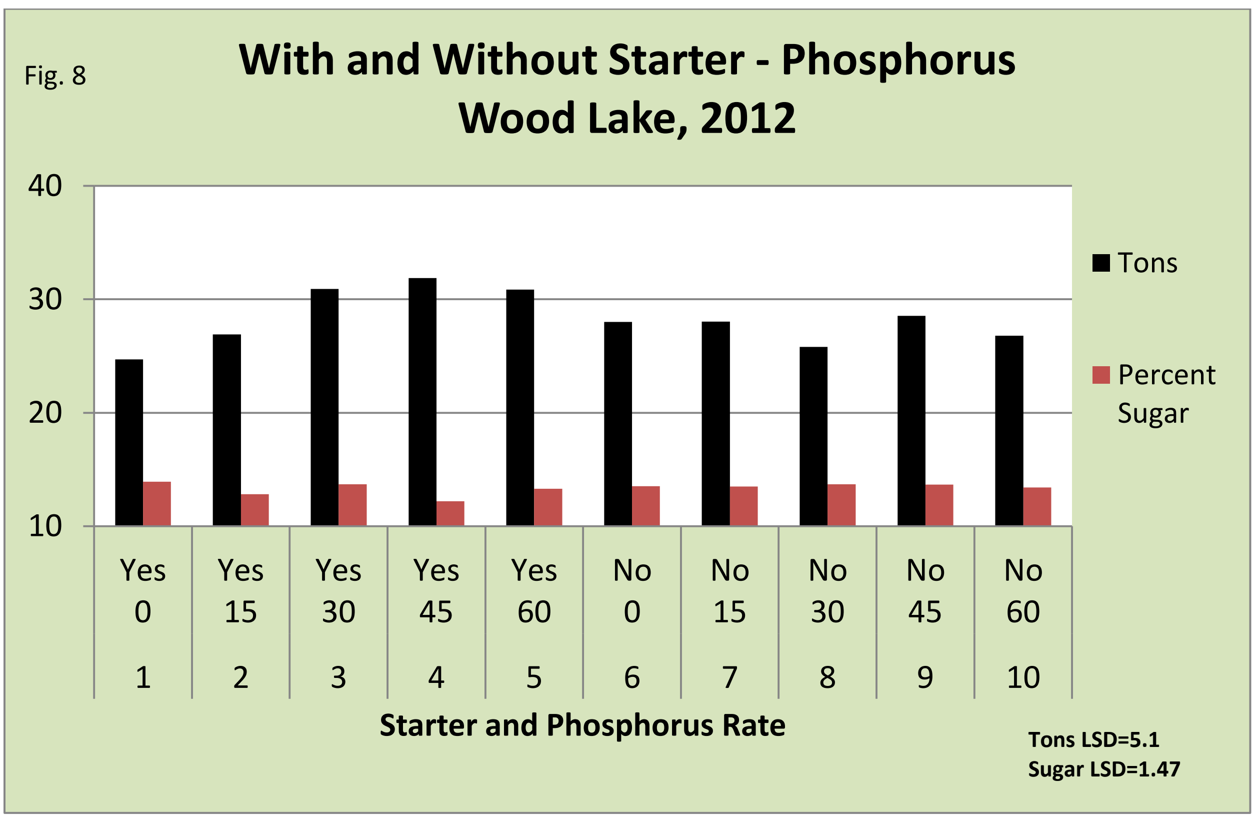


Fig. 8
With and Without Starter - Phosphorus
Wood Lake, 2012
40
30
20
10
Tons
Percent Sugar
Yes 0 1
Yes 15 2
Yes 30 3
Yes 45 4
Yes 60 5
No 0 6
No 15 7
No 30 8
No 45 9
No 60 10
Starter and Phosphorus Rate
Tons LSD=5.1
Sugar LSD=1.47

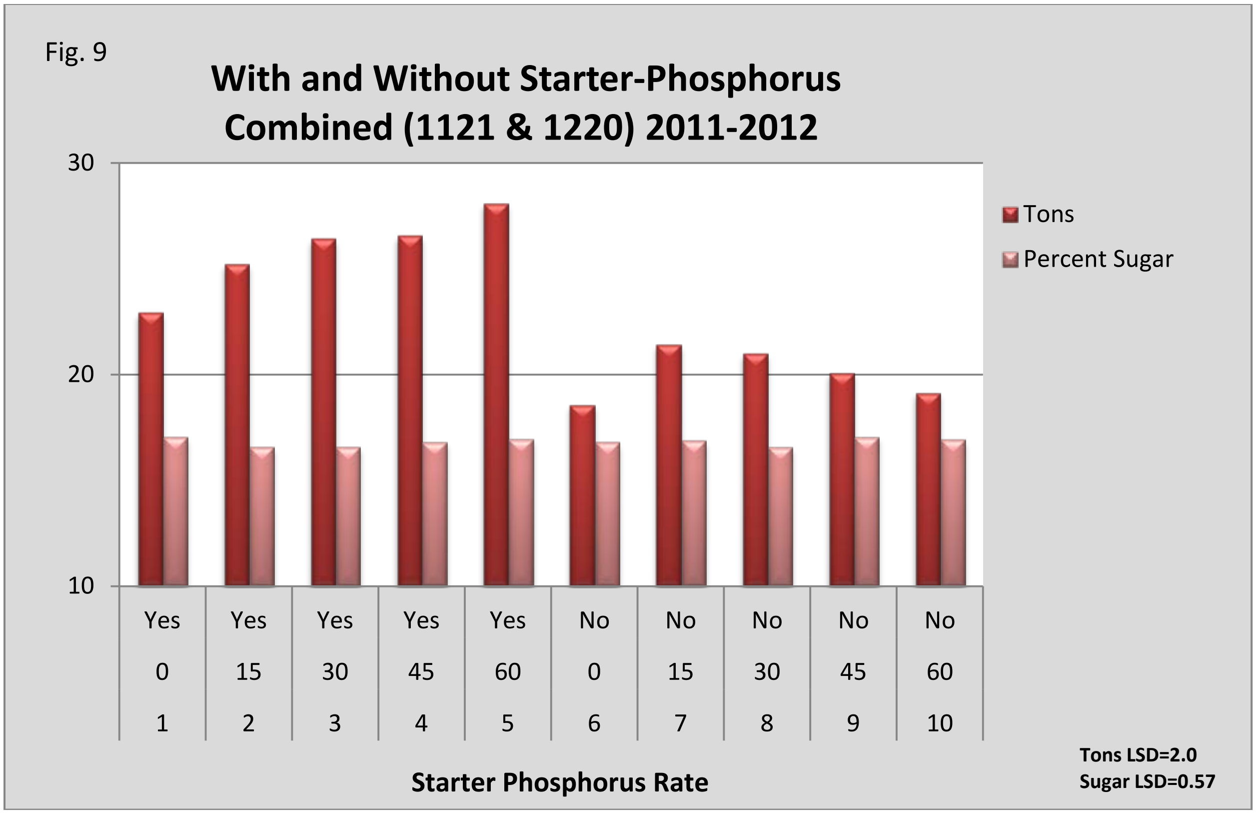


Fig. 9
With and Without Starter-Phosphorus Combined (1121 & 1220) 2011-2012
30
20
10
Tons
Percent Sugar
Yes Yes Yes Yes Yes No No No No No
0 15 30 45 60 0 15 30 45 60
1 2 3 4 5 6 7 8 9 10
Starter Phosphorus Rate
Tons LSD=2.0
Sugar LSD=0.57

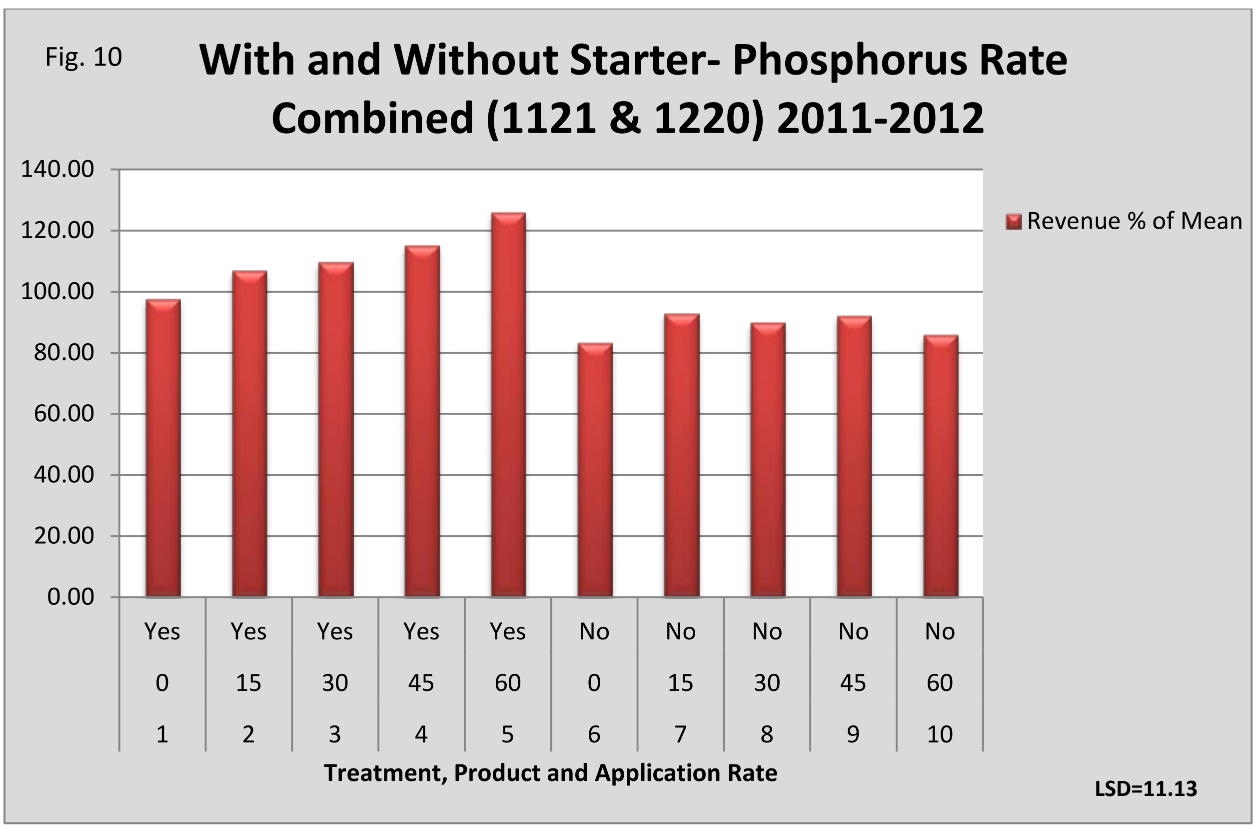


Fig. 10
With and Without Starter- Phosphorus Rate Combined (1121 & 1220) 2011-2012
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Revenue % of Mean
Yes Yes Yes Yes Yes No No No No No
0 15 30 45 60 0 15 30 45 60
1 2 3 4 5 6 7 8 9 10
Treatment, Product and Application Rate
LSD=11.13

Evaluation of Infurrow Products to Enhance Sugar Beet Production 2010-2012

Pop-up fertilizer testing by SMBSC Research has shown there is a benefit to using 10-34-0 starter fertilizer to enhance sugar beet production. A test was developed in 2010 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 two locations in 2010, one location in 2011, and two locations in 2012 to test the influence of pop-up fertilizer and in furrow products on sugar beet production. Planting of the treatments at the coarse textured site in 2012 was conducted at two timings. Treatments planted at separate timings are indicated in the table of treatments in table 5 and 6. The timings were not planned, but were a result of contaminated 10-34-0 in the first planting. At all other sites the planting was conducted one time. The foliar applied SRN and LCO products were applied July 2, 13 and 31, 2012 for the coarse texture soils and July 2, 7 and 27, 2012 for the fine texture soils. The site specific data for 2010 – 2012 is included in table 1. Fine textured soils are silt loam type soils and coarse textured soils are sandy type soils. The locations are specified as fine or coarse textured soils in table 1. Plots were 11 feet (6 rows) wide and 35 feet long. Pop-up fertilizers and in-furrow products were applied at planting time with a 6 row planter. Mixtures applied were a 3 gal per acre mix including the product being tested and water carrier.

In 2012 the fine textured research sites were harvested with a 1 row research harvester. Sugarbeets were collected from the 3rd row of 6 rows in each plot taking the full length of the plot and were analyzed for quality and weighed for yield calculation. All other sites 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. All test sites were replicated 4 times and conducted in a randomized complete block experimental design.

	Soil test results				
	2010	2010	2011	2012	2012
Task	Soil - Fine Textured 1	Soil - Fine Textured 2	Soil - Fine Textured	Soil -Coarse Textured	Soil - Fine Textured
Planting date	4/27/2010	4/29/2010	5/18/2011	4/23/2012	4/25/2012
Fertility					
Nitrogen	99	121	87	130	320
Phosphorus	7.7	7.5	8	15	8
Potassium	180	181	132	140	260
Om	4.7	5.5	4.2	2.6	5
Fertilizer Applied					
Nitrogen	30	0	20	20	0
Phosphorus					
Potassium				40	40
Harvest	10/19/2010	10/2/2010	9/30/2011	10/11/2012	10/5/2012

Materials

The evaluation of growth enhancement included the following products.

Product	Description
10-34-0	Liquid ammoniated phosphate
6-24-6	An in-furrow fertilizer derived from ammonium hydroxide, phosphoric acid, and potassium hydroxide
AgZyme	A complex of enzymes, trace elements, vitamins, and natural plant extracts
EB Mix	A product containing a blend of nitrogen, sulfur, boron, iron, manganese and zinc
Equasion	0-10-10 product that contains many nutrients for plant growth and development
Generate	Stimulates microorganisms that free up micro and macronutrients stored in the soil
LI6372	A Propietary product believed to enhance production
Lucrose	A foliar-applied product formulated with Boron for root development.
Mangro DF	A highly concentrated water soluble manganese powder designed for foliar application
Manron	A foliar-applied product designed to provide Manganese (Mn) and Sulfur (S)
Radiate	Contains two different plant growth regulators
Ratchet	With LCO Promoter Technology® enhances photosynthesis in plants
Redline	Contains nutrients necessary for plant growth as well as the technology in Soygreen®
Riser	7-17-3 with micronutrients and ACA® Technology
Soygreen	A dry water soluble powder 6% Iron ORTHO-ORTHO EDDHA chelate
SRN	One gallon provides .83 pounds of urea and 2.16 pounds of slow release water soluble nitrogen

Results and Discussion

The analysis of homogeneity for combinability was conducted and determined that the data could not be combined except for the 2010 testing presented in Table 2. The lack of combinability within the data is probably due to the consistency of product performance and testing over time. Thus, the data is presented separately for each site and year except for the data presented in table 2. The data presented is a compilation of trials conducted considering products that may enhance sugarbeet production. In general when 10-34-0 is applied in-furrow with or without another product, there was an advantage in revenue over the three years of testing. In 2010 the products applied alone that showed an advantage in revenue were Redline, EB-mix, EB-mix plus 10-34-0, Soygreen, Soygreen plus 10-34-0 ***(note: Soygreen mixing issues with Starter fertilizer explained above)*** and Man Gro DF (Table 2). The data from experiment 1028 in 2010 (Table 3) showed that Radiate plus Riser, Agzyme at 19.2 oz. /acre, Trifix at 1 qt./acre and Soygreen at 1 lb./acre gave an advantage considering the revenue percent of the mean at 100% as a gauge. The data from experiment 1029 in 2010 (Table 4) showed that Riser, Radiate plus Riser, and Soygreen at 1 lb. /acre at 19.2 oz. /acre gave an advantage considering the revenue percent of the mean at 100% as a gauge. In 2011 the products proving to be beneficial over the mean were 10-34-0, Nachurs 6-24-6, Soygreen plus 10-34-0 ***(note: Soygreen mixing issues with Starter fertilizer explained above)***, Redline, EB-mix, Riser and Riser plus Radiate (Table 5). In 2012 the testing of products for growth enhancement was expanded to consider more products and these products will be kept consistent in future research to allow for combining data over locations and years. Product performance in 2012 was different depending on soil types and planting time. The coarse textured soil site was planted at two different planting timings and as a result of the different planting dates there was a difference in sugarbeet yield, not related to the treatment. The different planting dates were not an original objective of this experiment. The fine textured soils will be discussed in greater detail. Table 6 shows the data from the fine textured site where the products showing an advantage over the mean were Redline, EB-mix, SRN applied on July 2nd, Agzyme applied at 19.2 oz. /acre, LCO applied on July 31st and Generate plus 10-34-0. A site was conducted on course textured soils in 2012 (Table 7 and 8). As described above the experiment had two planting dates and the treatments were not applied at both planting dates. The earlier planting date showed that none of the treatments gave sugarbeet revenue greater than the untreated. Treatments applied at the earlier planting date with revenue greater than the mean were Equation, Redline, EB-mix plus Redline, EB-mix plus 10-34-0 and Nachurs 6-24-6 plus Soygreen ***(note: Soygreen mixing issues with Starter fertilizer explained above).*** Treatments applied at the late planting with revenue greater than the mean were SRN applied July2 and July 13^{th,} Lucrose applied on July 27th, LCO applied on July 27th and Generate plus 10-34-0. As you can see the evaluation of this data is quite cumbersome. The objective of future testing is to build on this data over years and locations to add power and potential of repeatability to the data. The challenge with the product testing is to consider consistency over time and locations. The current data that shows consistency over time and location would include products such as Redline, EB-mix and starter fertilizers such as 10-

34-0 and Nachurs 6-24-6 applied alone or with Soygreen ***(note: Soygreen mixing issues with Starter fertilizer explained above).*** Consistency is defined as a product performing above the mean $\geq$ 66% of the time and performs in such way over multiple sites and years. The preferred time span would be 3 years and at multiple sites. Some of these products look good but have not been tested over multiple years or sites. As we gather more data we can discuss these products with greater confidence.

Table 2. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means Combined Data 2010, (2 sites, Fine textured soils 1)

Trt No.	**Product**	**Rate/Acre**	**Timing**	Tons/Acre	% Sugar	Purity	Ext. Suc Per Acre (Lbs.)	Revenue % of Mean
1	Soygreen	1 lbs.	at planting in furrow	20.9	16.11	90.54	5673	96.54
2	Broadcast P	45 lbs	at planting incorporated	19.5	16.22	90.75	5347	91.74
3	10-34-0	3 gal	at planting in furrow	20.1	16.22	90.56	5537	94.70
4	Soygreen+10-34-0	1 lb.+ 3 gal.	at planting in furrow	22.2	16.12	90.71	6033	**102.90**
5	Untreated	N/A	N/A	18.2	16.30	90.53	4981	85.73
6	Redline	2 gal	at planting in furrow	22.7	16.28	90.78	6246	**107.57**
7	Redline	3 gal	at planting in furrow	23.4	16.18	91.08	6428	**110.27**
8	EB Mix	1 qt	at planting in furrow	22.1	16.21	91.64	6113	**105.64**
9	EB Mix + 10-34-0	1 qt. + 3 gal.	at planting in furrow	24.1	16.07	90.77	6525	**110.58**
10	ManGro DF	3 lbs	at planting in furrow	24.3	16.01	90.59	6563	**110.81**
11	Boron	1.81 gal	at planting in furrow	20.3	16.30	91.02	5606	96.74
12	Untreated	N/A	N/A	18.5	16.22	90.70	5062	86.78
			C.V	8.6	2.63	1.12	9	9.79
			LSD (0.05)	1.6	NS	1.08	518	11.03

Table 3. In-furrow Starter Fertilizer Influence on Sugarbeet Production, 2010
Experiment 1028, Fine testured soils 1

Trt No.	Starter Product	Rate Per Acre	Stand Count	Tons/Acre	Percent Sugar	Purity	Ext. Suc Per Ton	Ext.Suc Per Acre (Lbs.)	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 (0.05)	**68**	**2.7**	**NS**	**NS**	**NS**	**964**	**20.11**

Table 4. In-furrow Starter Fertilizer Influence on Sugarbeet Production, 2010
Experiment 1029, Fine textured soils 2

Trt No.	Starter Product	Rate Per Acre	Stand Count	Tons/Acre	Percent Sugar	Purtiy	Ext.Suc Per Ton	Ext. Suc Per Acre (Lbs.)	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 (0.05)	**31**	**2.6**	**NS**	**1.73**	**NS**	**1168**	**24.58**

Table 5. Pop-up Fertilizer and its affects on Sugarbeet Quality and Revenue as a Percent of Means 2011

Trt #	Product	Rate	Timing	Stand	Tons/Acre	Percent Sugar	Purity	Ext. Suc Per Acre (Lbs.)	Revenue % of Mean
1	Untreated	N/A		185	14.9	15.5	90.0	3846	84.06
2	10-34-0	3 gal	at planting in furrow	194	20.6	14.9	89.3	5055	**105.70**
3	Nachurs 6-24-6	3 gal	at planting in furrow	180	20.5	14.9	88.7	4985	103.30
4	Soygreen	1 lbs.	at planting in furrow	203	20.5	15.0	89.0	5035	**105.30**
5	Soygreen +10-34-0	1 lbs. + 3 gal.	at planting in furrow	183	21.4	15.3	89.8	5433	**117.07**
6	Broadcast P	45 lbs	at planting incorporated	198	17.3	15.2	90.0	4373	93.91
7	Redline	2 gal	at planting in furrow	213	21.3	15.0	89.4	5263	**110.51**
8	Redline	3 gal	at planting in furrow	208	21.6	15.7	90.0	5631	**124.19**
9	EB Mix	1 qt	at planting in furrow	208	19.2	15.5	89.4	4925	**106.91**
10	EB Mix +10-34-0	1 qt. + 3 gal.	at planting in furrow	176	20.4	14.8	88.8	4918	101.38
11	ManGro DF	3 lbs	at planting in furrow	205	14.1	15.1	89.5	3516	74.59
12	Boron	1.81 gal	at planting in furrow	179	15.3	15.0	88.6	3740	77.81
13	Riser	2.5 gal	at planting in furrow	205	18.5	15.4	89.6	4724	102.30
14	Riser + Radiate	2.5 gal + 2 oz.	at planting in furrow	170	18.7	15.5	89.8	4840	**105.72**
15	LI 6372	3 pt.	at planting in furrow	191	18.1	15.3	89.5	4564	97.86
16	LI 6372	4 pt.	at planting in furrow	215	17.4	15.4	90.2	4473	97.45
			C.V	14	8.2	4.4	1.4	10	14.5
			LSD (0.05)	38	2.2	0.9	1.8	693	20.5

Table 6. Pop-up Fertilizers and its Affects on Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Fine Textured Soil Expt.1247, 2012

Trt	Product	Rate/Acre	Applied	Stand Avg	Tons/ Acre	Percent Sugar	Purity	Ext. Suc Acre (Lbs.)	Revenue % of Mean
1	Untreated	N/A	N/A	173	32.4	17.62	91.69	9832	94.09
2	Pop-up (10-34-0)	3 gal	In-furrow	191	36.5	17.57	91.38	10966	**104.55**
3	Nachurs 6-24-6	3 gal	at planting incorporated In-furrow	135	37.1	16.78	91.02	10569	98.38
4	Equation	1 qt/ac	In-furrow	141	33.5	17.27	91.00	9801	92.40
	Pop-up (10-34-0)	3 gal	In-furrow						
5	Soygreen	1 lb	In-furrow	139	35.5	16.81	90.95	10046	93.26
	Pop-up (10-34-0)	3 gal	In-furrow						
6	Redline	3 gal	In-furrow	162	33.1	17.24	91.48	9724	91.84
	Equation	1 qt/ac	In-furrow						
7	Redline	3 gal	In-furrow	185	37.7	17.22	91.21	11042	104.15
8	10-34-0	3 gal	In-furrow	189	35.2	16.85	91.76	10167	95.32
	EB Mix	1 qt/ac	In-furrow						
9	EB Mix	1 qt/ac	In-furrow	166	40.9	17.15	91.41	12005	**113.25**
	Redline	3 gal	In-furrow						
10	Nachurs 6-24-6	3 gal	In-furrow	177	36.4	17.50	91.44	10883	103.49
	Soygreen	1 lb	In-furrow						
11	SRN	3 gal	7/31/2012	204	36.7	16.89	90.82	10505	98.03
12	SRN	3 gal	7/13/2012	157	37.8	16.50	91.03	10606	98.00
13	SRN	3 gal	7/2/2012	175	40.3	16.79	91.80	11605	**108.58**
14	Agzyme	12.8 oz.	at planting In-furrow	121	34.8	16.84	91.39	10013	93.70
15	Agzyme	19.2 oz.	at planting In-furrow	126	39.9	16.99	91.14	11551	**108.33**
16	Lucrose	16 oz.	7/13/2012	238	35.4	17.07	91.01	10303	96.82
17	Lucrose	16 oz.	7/31/2012	189	37.6	16.86	91.10	10752	100.33
18	LCO (Rachet)	8 oz	7/13/2012	204	37.7	16.26	90.59	10345	94.61
19	LCO (Rachet)	8oz	7/31/2012	207	39.5	16.60	91.20	11144	103.32
20	Manron	1 qt/ac	In-furrow	123	38.1	16.64	91.53	10872	101.26
	Pop-up (10-34-0)	3 gal	In-furrow						
21	Generate	1 qt/ac	In-furrow	146	38.8	17.07	91.41	11299	**106.30**
	Pop-up (10-34-0)	3 gal	In-furrow						
	CV%			**4**	**5.0**	**3.59**	**0.80**	**6**	**7.30**
	LSD (0.05)			**4**	**2.6**	**0.86**	**1.03**	**924**	**10.33**

Table 7. Pop-up Fertlizer and its Affects on Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Course Textures Soil Site, Expt.1248, 2012 (Early Plant)

Trt	Product	Rate/Acre	Applied	Stand Avg	Tons/ Acre	Percent Sugar	Purity	Ext. Sucrose Acre (Lbs.)	Revenue % of Mean
1	Untreated	N/A	N/A	173	37.1	17.40	89.94	10817	107.22
3	Nachurs 6-24-6	3 gal	In-furrow	139	35.3	16.97	89.93	10019	98.03
4	Equation	1 qt/ac	In-furrow	41	34.5	17.57	89.84	10158	101.05
	Pop-up (10-34-0)	3 gal	In-furrow						
5	Soygreen	1 lb	In-furrow	139	34.6	17.17	89.70	9921	97.52
	Pop-up (10-34-0)	3 gal	In-furrow						
6	Redline	3 gal	In-furrow	162	36.3	16.97	89.52	10246	99.98
	Equation	1 qt/ac	In-furrow						
7	Redline	3 gal	In-furrow	185	33.7	17.23	89.98	9698	95.58
8	Redline	3 gal	In-furrow	189	37.8	17.10	89.17	10689	104.44
	EB Mix	1 qt/ac	In-furrow						
9	EB Mix	1 qt/ac	In-furrow	166	36.6	17.44	88.69	10483	103.02
	Pop-up (10-34-0)	3 gal	In-furrow						
10	Nachurs 6-24-6	3 gal	In-furrow	177	36.0	17.47	89.04	10405	102.68
	Soygreen	1 lb	In-furrow						
14	Agzyme	12.8 oz.	at planting In-furrow	121	35.2	17.29	88.90	10058	98.70
15	Agzyme	19.2 oz.	at planting In-furrow	126	34.4	17.25	89.21	9845	96.67
20	Manron	1 qt/ac	In-furrow	123	33.9	17.35	89.02	9685	95.11
	Pop-up (10-34-0)	3 gal	In-furrow						
	CV%			**14**	**11.1**	**4.33**	**0.89**	**13**	**13.72**
	LSD (0.05)			**34**	**5.6**	**1.08**	**1.15**	**1789**	**22.02**

Table 8. Pop-up Fertilizers and its Affects on Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Course Textured Site Expt 1248, 2012 (Late Plant)

Trt	Product	Rate/Acre	Applied	Stand Avg	Tons/ Acre	Percent Sugar	Purity	Ext. Sucrose Acre (Lbs.)	Revenue % of Mean
2	Pop-up (10-34-0)	3 gal	at planting In-furrow	191	21.3	17.50	89.90	6249	87.29
11	SRN	3 gal	7/27/2012	204	24.8	16.77	88.05	6744	90.84
12	SRN	3 gal	7/13/2012	157	25.2	17.56	89.64	7386	**103.14**
13	SRN	3 gal	7/2/2012	175	25.3	17.63	89.87	7400	**103.25**
16	Lucrose	16 oz.	7/13/2012	238	25.7	17.19	89.19	7340	**101.30**
17	Lucrose	16 oz.	7/27/2012	189	24.9	17.09	89.19	7048	96.86
18	LCO (Rachet)	8 oz	7/13/2012	204	25.4	16.97	89.41	7166	98.28
19	LCO (Rachet)	8oz	7/27/2012	207	26.7	17.49	89.28	7731	**107.34**
21	Generate	1 qt/ac	In-furrow	146	27.9	17.31	89.71	8050	**111.69**
	Pop-up (10-34-0)	3 gal	In-furrow						
	CV%			**15**	**10.3**	**3.99**	**0.98**	**10**	**10.26**
	LSD (0.05)			**44**	**4.0**	**1.01**	**1.28**	**1077**	**12.68**

SMBSC Nitrogen Rate and its Relationship to Organic Matter-2012

Sugarbeets were planted at two locations in 2012 to test nitrogen use efficiency (NUE) for sugarbeet production as influenced by organic matter (Om). In 2012 the tests were conducted in Bird Island and Elrosa, MN. The data will be presented combined over the two locations. Analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across environments or locations.

Methods:
Plots were 11 ft. (6 rows) wide and 40 feet long. Sugarbeets were planted by the grower-cooperator. Total nitrogen was adjusted to 70, 90, 110, 130 and 150 lbs. using 46-0-0 urea. Harvest data was collected from rows 3 or 4 of a 6 row plot. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested with a 1 row research harvester. Each sample was collected from 10 feet of row. Two quality sub-samples were collected from each plot. The subsamples were analyzed in the SMBSC quality lab.

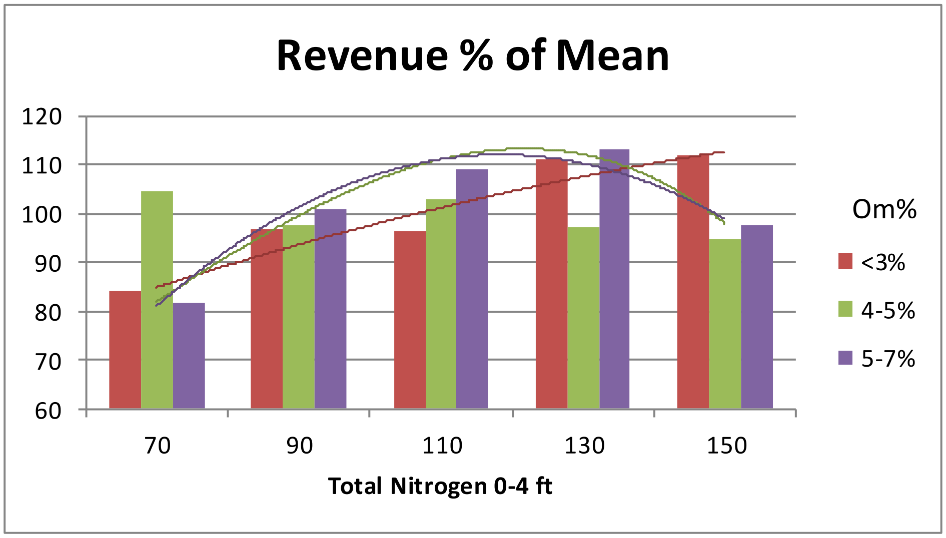
Results and Discussion:

The total nitrogen is the soil test or residual nitrogen to the 4 foot depth plus applied nitrogen. Residual nitrogen 0-4 ft. ranged from 55-72 lbs. There were no significant changes across treatments. The data did support what has been learned with the SMBSC Agronomic Practice Database (Table 1). When Om is below 4% 130 pounds provided maximum benefit to sugar and purity. When Om levels are above 5% sugar and purity decreased when total N was above 90 pounds. Chart (1) shows the Revenue Percent of Mean for each treatment combined across locations. The data suggests total N can be increased at low Om levels without negatively affecting quality. The test has been conducted for only one year at two sites and fertility management should not be adjusted based on the report. The test will be conducted in 2013 to substantiate the data.

Table 1: SMBSC Agronomic Database

		Sugar			Purity			Tons			Rev % of Mean		
		<3%	4-5%	5-7%	<3%	4-5%	5-7%	<3%	4-5%	5-7%	<3%	4-5%	5-7%
Total N	70	15.5	17.2	16.8	89.4	91.0	91.0	15.9	29.1	21.3	84.1	104.8	81.7
	90	15.5	17.0	17.0	89.6	90.8	91.1	18.1	27.5	25.2	96.8	97.6	100.8
	110	15.7	16.9	16.8	89.5	90.3	90.8	18.1	29.7	28.0	96.3	103.0	109.2
	130	15.5	17.2	16.8	90.0	90.5	91.4	20.6	27.5	28.8	110.9	97.1	113.3
	150	15.4	16.7	16.7	89.7	89.3	90.4	21.7	28.2	26.6	111.8	94.8	97.7

Chart 1:



Revenue % of Mean
120
110
100
90
80
70
60
70
90
110
130
150
Total Nitrogen 0-4 ft
Om%
<3%
4-5%
5-7%

Planting Population and its Effect on Revenue

The Southern Minnesota Beet Sugar Cooperative has been accumulating grower data and entering it into a database for a number of years. Current analysis of the SMBSC database shows as population increases, sugar, purity and tons also increase. Testing was initiated in 2011 to evaluate if variable seed population by organic matter (Om) can increase revenue.

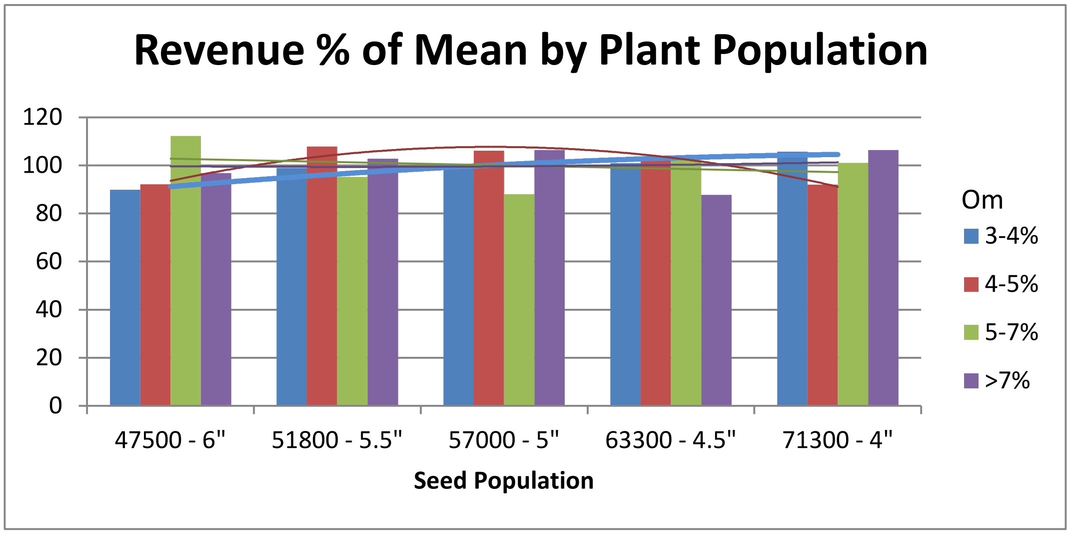
Methods:
In 2011 and 2012 seed populations were adjusted using planter controllers driven by maps generated by SMBSC Research. Seed spacing was adjusted in ½ inch increments from 4 – 6 inches. The test was conducted in each organic matter zone within fields generated by the SMBSC Om -mapper software. During the growing season 6 inch soil samples were taken to determine the Om for each spacing treatment. The soil was not sampled for nitrogen (N). The grower-cooperators managed the nitrogen using their preferred methods. At harvest two ten foot sugarbeet samples were collected from each treatment and analyzed for quality at the SMBSC Tare Lab.

Results and Discussion:
Table 1 shows the relationship between seed population at a given seed spacing. Chart 1 shows the combined revenue for the two years. In areas where Om is less than 4% the higher seed population had a positive effect in revenue. Variability in sampling in both 2011 and 2012 did not produce a definite result. The data shows 57000 (5”) may be the most beneficial where Om ranges from 4-7%. Where Om is less than 4% increased seed population may also benefit. The data suggests the optimum seed spacing at less than 4% Om is 4 - 4.5 inches. When Om is greater than 7% it may be beneficial to increase seed spacing. The data would indicate 4.5 inches may provide maximum revenue. In the two years the study has been conducted a seeding rate/revenue correlation was not produced. With increased populations satisfactory scalping may be an issue. The test will be continued in 2013 to refine the data.

Table 1:

Population	Spacing
47500	6"
51800	5.5"
57000	5"
63400	4.5"
72100	4"

Chart 1:


Revenue % of Mean by Plant Population
120
100
80
60
40
20
0
47500 - 6"
51800 - 5.5"
57000 - 5"
63300 - 4.5"
71300 - 4"
Seed Population
Om
3-4%
4-5%
5-7%
>7%

Zone Nitrogen Management using Organic Matter

Zones of varying soil characteristics in a given field can be identified using satellite imagery. These soil characteristics can be used to manage fertility for sugarbeets. A study has been implemented at Southern Minnesota Beet Sugar Cooperative (SMBSC) to test the viability of adjusting fertility within management 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.

Methods and Materials:
The zones are defined as management zones created using a model that uses bare soil imagery and elevation to estimate changes in soil characteristics. GIS software uses the model to generate a map of a field showing the management zones. SMBSC uses a program called OM Mapper to calculate and map the zones. Each zone is given a number to identify the areas. Generally, lighter soil with lower organic matter will be assigned a lower number whereas darker or higher organic matter soils will be assigned a higher number. Nitrogen (N) was adjusted based on the average organic matter within each zone. In each field two 140 foot wide test strips were added using conventional and grid nutrient management. 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 206 individual samples collected. Each sample was weighed and analyzed for quality at the SMBSC Tare Lab. 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. In 2012 there were 4 fields in the study. Each field was soil sampled to a depth of 4 feet and analyzed as described. All fertilizer methods were applied in the fall of 2011. All data from the four fields were combined. Table 2 shows the statistics for zones, grid and conventional, respectively. Average sample results for each zone are shown. Net Revenue is the gross beet payment minus the fertilizer, sampling, mapping and application costs. Variables showing statistical significance are indicated by LSD values in bold. The criterion for total adjusted N is shown in Table 1.

Table 1.

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

Results and Discussion:
Stand in the zones was significantly higher than the grid or conventional test strips. It is unknown why there was a difference. Hot and dry soils in late summer may have limited nitrogen mineralization which influenced available nitrogen for sugarbeet thus affecting the sugar production in the zones. The lack of mineralization very likely influenced the results of the 2012 testing.
Research using the Om Mapper has been conducted for three years. Data from 2010, 2011 and 2012 was combined and analyzed, (Table 3). A small advantage in net revenue is seen, however, it is not a stastical advantage. The goal of the OM fertility program is two sided. The first is to maximize sugarbeet yield and quality. The second is to manage the soil fertility using the four R's of nutrient stewardship which are; using the Right fertilizer source at the Right rate at the Right time and in the Right place. In 2010 the zone program had a 4.5% advantage in revenue over other management programs. In 2011 the zone program showed a minor advantage over other systems. In 2012 the conventional system showed a small advantage. Thus, 2 out of 3 years the zone fertility management program showed an advantage over the conventional and grid fertility management program, although not statistically significant.

Table 2: 2012 Sugarbeet yield and quality

Test	Stand	Nitrate	Sugar	PURITY	ESA	Tons	Revenue %	Net Rev %
Zone	167	30	17.9	90.1	8850	29.6	99.0	99.0
Grid	154	26	18.5	90.2	9075	29.3	103.1	103.2
Conventional	144	29	18.5	90.1	8631	27.9	97.9	97.8
cv	18	103	4.3	1.4	17	18.7	16.5	17.8
Lsd	**17**	18	**0.4**	0.7	876	3.2	9.6	10.4
206 samples								

Table 3: 2010, 2011, 2012 Sugarbeet yield and quality

Test	Stand	Nitrate	Sugar	PURITY	ESA	Tons	Revenue %	Net Rev %
Zone	156	28	16.8	90.5	7305	25.7	100.6	100.2
Grid	151	28	16.8	90.5	7336	25.9	99.9	100.0
Conventional	148	23	16.9	90.5	7229	25.5	99.5	99.9
cv	19.9	114.2	7.8	1.8	25.6	24.3	55.7	55.1
Lsd	8.1	7.3	0.3	0.4	479.7	1.6	14.7	14.5
764 samples								

Summary

In 2012, tests showed there was a minor disadvantage using zone nitrogen application in net revenue. However, over the three years of testing the zone fertility program has not been detrimental to production. There was no significant advantage or disadvantage in any of the tests. 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.

SMBSC Evaluation of Sulfur Influence on Sugarbeet Growth 2011-2012

Sugarbeets were planted at two locations in 2011 and three locations in 2012 to test sulfur application influence on sugarbeet production. The locations were at Glenwood and Clara City, MN in 2011 and Appleton, Clara City and Hector, MN in 2012.

Methods

Table 1 shows the specifics of activities. Plots were 11 ft. (6 rows) wide and 35 feet long. Shown in tables 2-6, sulfur was incorporated prior to planting, in-furrow and foliar applied in June, July, August and September. Sugarbeets were planted by SMBSC research with a 6 row planter at all locations. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested at Glenwood and Hector with a 1 row research harvester. At Clara City and Appleton were harvested with a 2 row research harvester. At Glenwood and Hector 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. At Clara City and Appleton the weights were collected and weighed on the harvester for yield calculation and a sub-sample was analyzed in the SMBSC quality lab. Analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across environments or locations.

Results and Discussion

Sugarbeet yield and quality were not statistically influenced by the addition of sulfur at the Clara City location. In 2011 tons per acre and extractable sucrose per acre were significantly influenced by the addition of sulfur at the Glenwood location. In 2012 there was a statistical advantage in revenue at Clara City and Appleton. The addition of sulfur significantly influenced sugarbeet productivity and revenue at the Glenwood and Appleton site in which the soil characteristics were light or course. A starter fertilizer was not used at any of the sites. 10-34-0 starter contains approximately 1.5% sulfur. It is not recommended starter fertilizer be replaced with in-furrow sulfur product

The data was analyzed for homogeneity for combinability and determined that the data from all sites could be combined. Tons per acre and sugar per acre was not significantly influenced by the addition of Sulfur applied infurrow or foliar, regardless of the treatment comparison. The addition of sulfur applied infurrow or foliar did not significantly enhance sugar %, purity, or revenue compared to untreated sugarbeets. However, Even though the data was not significant, it needs to be noted that in 2011 the application of 10 lbs. of sulfur infurrow increased revenue % of mean by 10% compared to the untreated. This was not observed in 2012.

Table 1. Site Specifics for Sulfur Micronutrient Products Testing Combined, 2011-2012

Location	Planting Date	Soil Condition	Total N	P ppm	K ppm	S1 lb	S2 lb
Glenwood, 2011	5/2/2011	Damp	95	8	127	13	33
Clara City, 2011	5/16/2011	Damp	66	10	293	57	360
Clara City, 2012	4/23/2012	Damp	284	8	169	47	230
Appleton, 2012	4/23/2012	Dry	110	16	166	30	99
Hector, 2012	4/30/2012	Dry	113	30	207	18	45

TABLE 2. Micronutrient, Sulfur, Influence on Sugarbeet Production
Glenwood, 2011

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			16.3	13.57	90.19	3652	89.92
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	18.9	13.41	89.79	4169	100.74
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	17.3	13.60	90.11	3893	95.96
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	20.5	13.50	89.65	4533	109.92
5	Urea	Broadcast incorporated	70 lb/ac	18.7	13.61	89.81	4200	102.95
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	20.0	13.30	89.52	4356	103.83
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	19.0	13.19	89.76	4122	107.10
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	20.9	13.56	90.13	4695	115.30
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	15.6	13.39	89.95	3448	82.91
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	19.3	13.54	89.77	4295	104.38
11	Ammonium Sulfate (AMS)	Foliar September 1	10 lb/ac	16.7	13.24	89.91	3647	86.97
		C.V		14.9	2.81	0.72	16	18.61
		LSD (0.05)		4.0	NS	NS	969	NS

TABLE 3. Micronutrient, Sulfur,Influence on Sugarbeet Production
Clara City, 2011

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			26.9	17.27	90.32	7824	97.68
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	27.8	17.32	90.19	8086	100.85
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	28.5	17.35	90.04	8304	103.88
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	28.3	17.27	90.10	8191	102.01
5	Urea	Broadcast incorporated	70 lb/ac	26.1	17.52	90.95	7781	98.79
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	26.9	17.35	90.91	7936	100.00
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	26.7	17.52	91.19	7974	101.46
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	26.4	17.27	90.58	7707	96.48
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	27.3	17.40	90.77	8044	101.61
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	26.5	17.32	90.54	7742	96.95
		C.V		5.8	2.18	0.74	6	6.30
		LSD (0.05)		NS	NS	NS	NS	NS

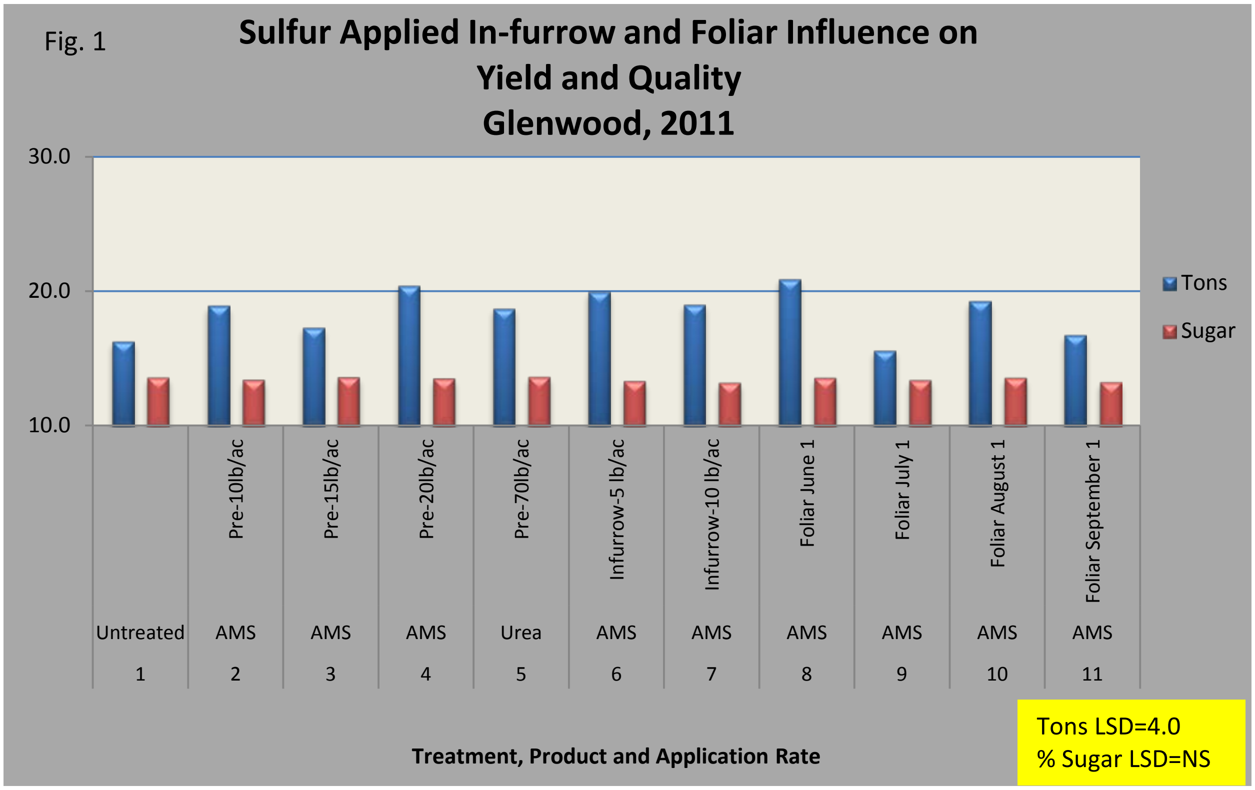


Fig. 1
Sulfur Applied In-furrow and Foliar Influence on
Yield and Quality
Glenwood, 2011
30.0
20.0
10.0
Tons
Sugar
Pre-10lb/ac
Pre-15lb/ac
Pre-20lb/ac
Pre-70lb/ac
Infurrow-5 lb/ac
Infurrow-10 lb/ac
Foliar June 1
Foliar July 1
Foliar August 1
Foliar September 1
Untreated
AMS
AMS
AMS
Urea
AMS
AMS
AMS
AMS
AMS
AMS
1
2
3
4
5
6
7
8
9
10
11
Treatment, Product and Application Rate
Tons LSD=4.0
% Sugar LSD=NS

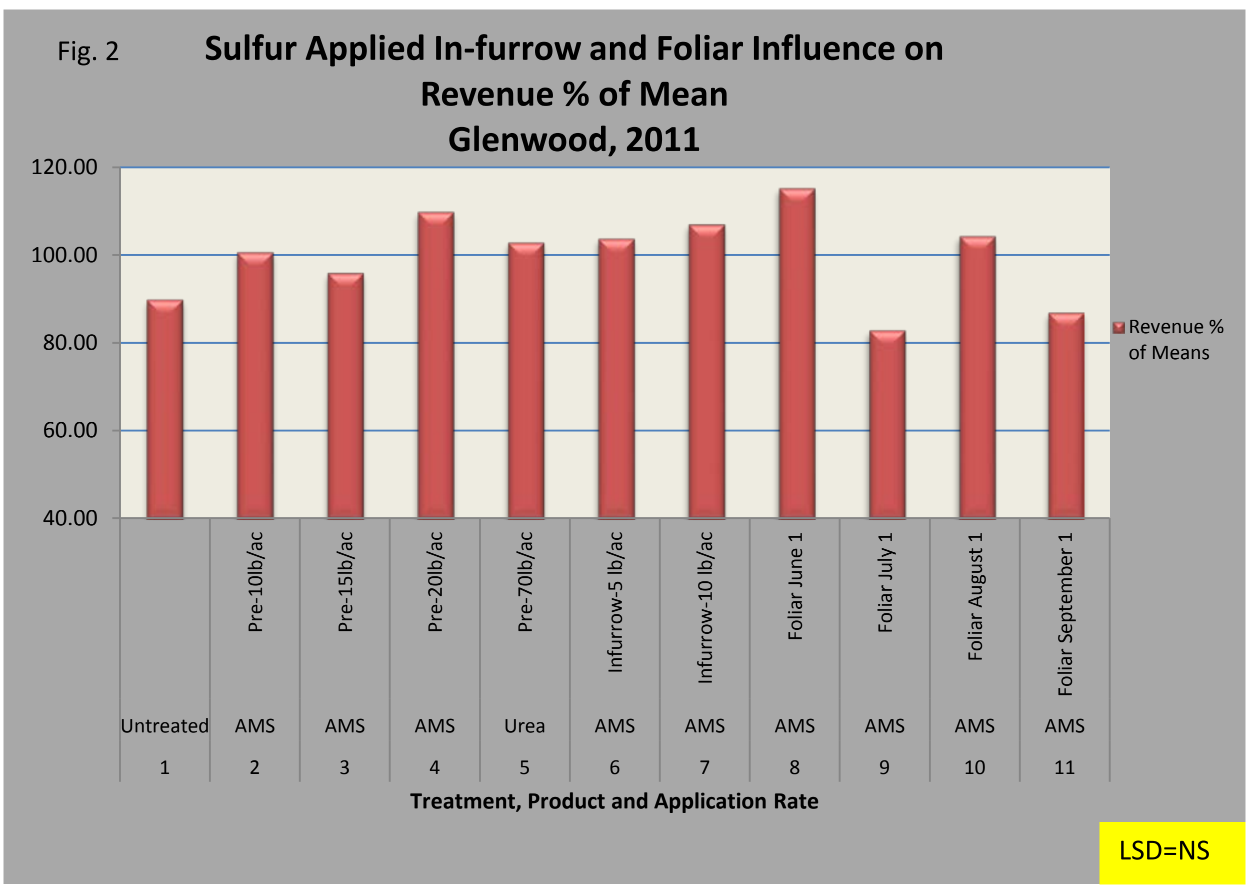


Fig. 2
Sulfur Applied In-furrow and Foliar Influence on
Revenue % of Mean
Glenwood, 2011
120.00
100.00
80.00
60.00
40.00
Revenue % of Means
Pre-10lb/ac
Pre-15lb/ac
Pre-20lb/ac
Pre-70lb/ac
Infurrow-5 lb/ac
Infurrow-10 lb/ac
Foliar June 1
Foliar July 1
Foliar August 1
Foliar September 1
Untreated
AMS
AMS
AMS
Urea
AMS
AMS
AMS
AMS
AMS
AMS
1
2
3
4
5
6
7
8
9
10
11
Treatment, Product and Application Rate
LSD=NS

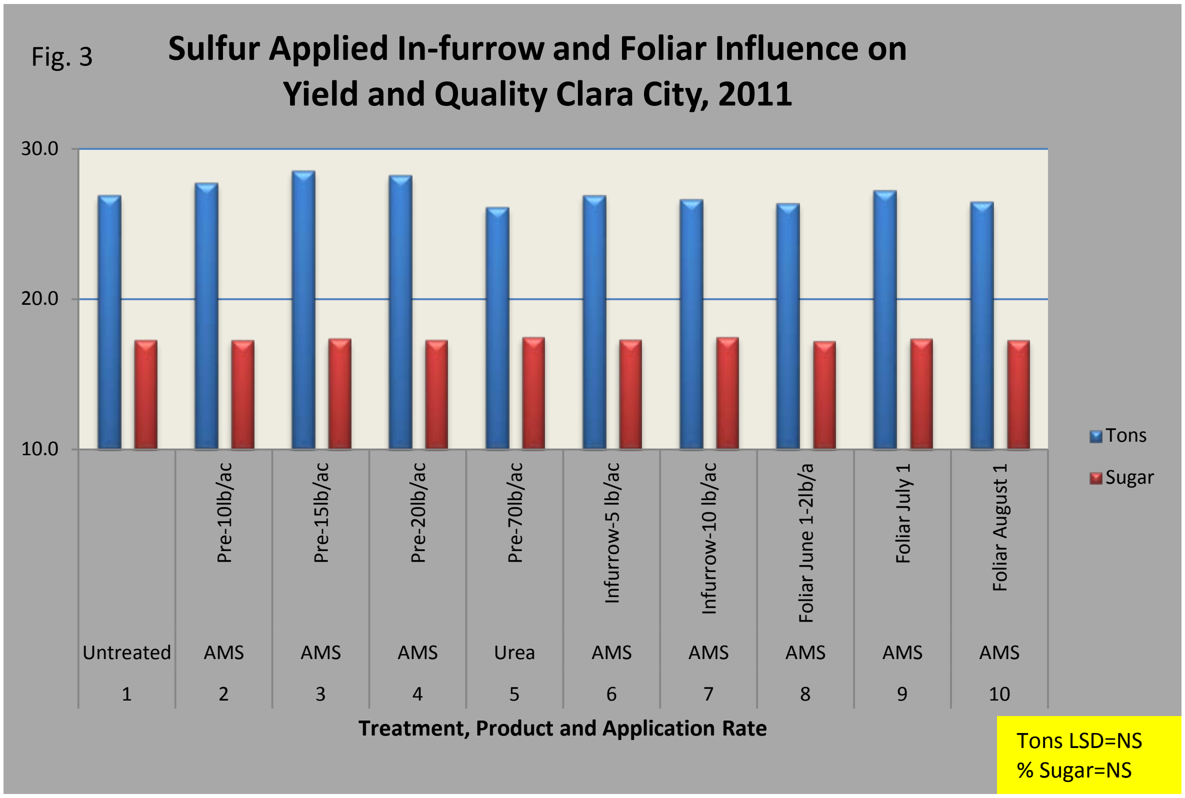


Fig. 3
Sulfur Applied In-furrow and Foliar Influence on Yield and Quality Clara City, 2011
30.0
20.0
10.0
Tons
Sugar
Pre-10lb/ac
Pre-15lb/ac
Pre-20lb/ac
Pre-70lb/ac
Infurrow-5 lb/ac
Infurrow-10 lb/ac
Foliar June 1-2lb/a
Foliar July 1
Foliar August 1
Untreated
AMS
AMS
AMS
Urea
AMS
AMS
AMS
AMS
AMS
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
Tons LSD=NS
% Sugar=NS

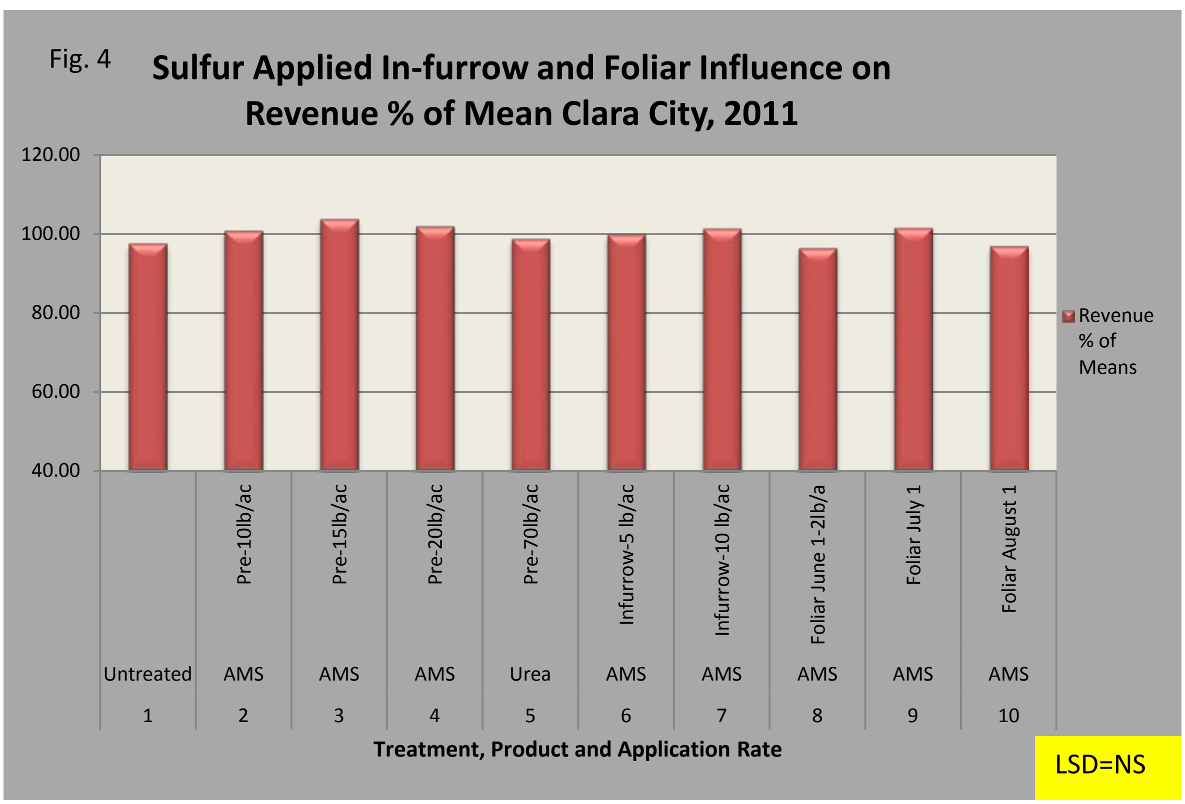


Fig. 4
Sulfur Applied In-furrow and Foliar Influence on Revenue % of Mean Clara City, 2011
120.00
100.00
80.00
60.00
40.00
Revenue % of Means
Pre-10lb/ac
Pre-15lb/ac
Pre-20lb/ac
Pre-70lb/ac
Infurrow-5 lb/ac
Infurrow-10 lb/ac
Foliar June 1-2lb/a
Foliar July 1
Foliar August 1
Untreated
AMS
AMS
AMS
Urea
AMS
AMS
AMS
AMS
AMS
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
LSD=NS

Table 4. Influence of Micronutrient Products with Sulfur for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Course Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			37.4	16.98	89.43	10562	91.95
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	39.7	17.15	89.79	11372	99.71
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	39.5	17.22	89.64	11363	99.80
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	37.0	17.43	89.27	10721	94.43
5	Urea	Broadcast incorporated	70 lb/ac	43.5	17.06	89.70	12337	107.66
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	29.9	16.70	89.94	8312	71.87
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	49.9	17.15	90.23	14700	**130.47**
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	42.2	17.14	89.93	12092	106.01
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	34.7	18.02	89.86	10459	93.77
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	42.1	17.32	89.70	12166	107.05
11	Ammonium Sulfate (AMS)	Foliar September 1	10 lb/ac	39.1	17.11	89.53	11129	97.28
CV%				**22.6**	**2.85**	**0.90**	**25**	**26.61**
LSD (0.05)				**12.9**	**0.71**	**1.17**	**4150**	**38.43**

Table 5. Influence of Micronutrient Products with Sulfur for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Fine Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			30.9	19.16	90.86	10097	95.93
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	33.2	18.25	89.81	10139	93.79
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	32.9	18.11	89.87	9984	92.06
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	34.1	18.97	91.03	11028	104.33
5	Urea	Broadcast incorporated	70 lb/ac	33.4	19.10	91.53	11012	104.90
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	38.5	18.57	90.20	12137	**113.65**
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	32.9	18.82	90.21	10439	98.08
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	34.5	18.86	90.46	11005	103.62
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	32.2	18.74	90.07	10183	95.47
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	33.0	18.59	90.00	10352	96.76
11	Ammonium Sulfate (AMS)	Foliar September 1	10 lb/ac	34.2	18.85	89.57	10818	101.41
CV%				**8.5**	**2.94**	**1.15**	**10**	**10.49**
LSD (0.05)				**4.1**	**0.80**	**1.50**	**1480**	**15.15**

Table 6. Influence of Micronutrient Products with Sulfur for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Fine Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			23.7	16.73	92.98	6882	106.62
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	22.4	16.96	93.18	6673	104.59
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	20.3	16.34	92.19	5693	86.96
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	21.4	17.31	93.13	6445	101.63
5	Urea	Broadcast incorporated	70 lb/ac	23.2	17.05	92.09	6833	106.59
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	21.4	17.09	92.80	6368	99.80
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	23.1	16.56	93.18	6730	104.41
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	21.4	16.47	92.34	6108	94.00
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	20.5	16.52	92.31	5869	90.37
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	22.7	17.31	93.06	6876	108.54
11	Ammonium Sulfate (AMS)	Foliar September 1	10 lb/ac	20.6	17.12	92.54	6104	95.60
CV%				**10.4**	**4.08**	**0.79**	**11**	**12.37**
LSD (0.05)				**3.3**	**0.99**	**1.05**	**1057**	**17.85**

Table 7. Influence of Micronutrient Products with Sulfur for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Combined, 2011-2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			29.7	17.54	90.89	8840	98.04
2	Ammonium Sulfate (AMS)	Broadcast incorporated	10 lb/ac	30.8	17.42	90.74	9064	99.73
3	Ammonium Sulfate (AMS)	Broadcast incorporated	15 lb/ac	30.3	17.26	90.43	8836	95.67
4	Ammonium Sulfate (AMS)	Broadcast incorporated	20 lb/ac	30.2	17.75	90.88	9094	100.60
5	Urea	Broadcast incorporated	70 lb/ac	31.6	17.68	91.07	9491	104.48
6	Ammonium Sulfate (AMS)	Infurrow	5 lb/ac	29.2	17.43	90.96	8688	96.33
7	Ammonium Sulfate (AMS)	Infurrow	10 lb/ac	33.2	17.51	91.20	9961	108.60
8	Ammonium Sulfate (AMS)	Foliar June 1	10 lb/ac	31.1	17.44	90.83	9227	100.03
9	Ammonium Sulfate (AMS)	Foliar July 1	10 lb/ac	28.7	17.67	90.75	8640	95.30
10	Ammonium Sulfate (AMS)	Foliar August 1	10 lb/ac	31.1	17.63	90.83	9281	102.33
11	Ammonium Sulfate (AMS)	Foliar September 1	10 lb/ac	31.3	17.69	90.55	9350	98.10
CV%				**16.52**	**3.11**	**0.94**	**18**	**15.87**
LSD (0.05)				**NS**	**0.46**	**0.75**	**NS**	**12.97**

Fig. 5 **Sulfur Applied In-furrow and Foliar Influence on Yield and Quality, Course Texture Soil Site, 2012**

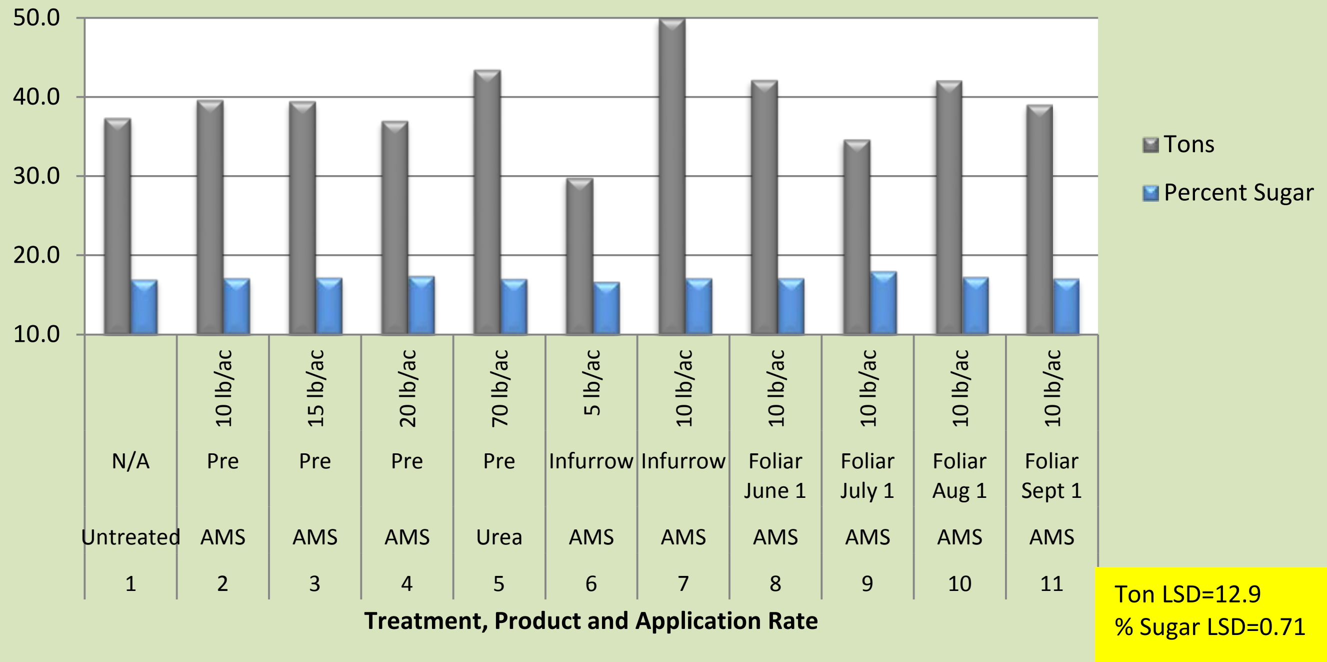
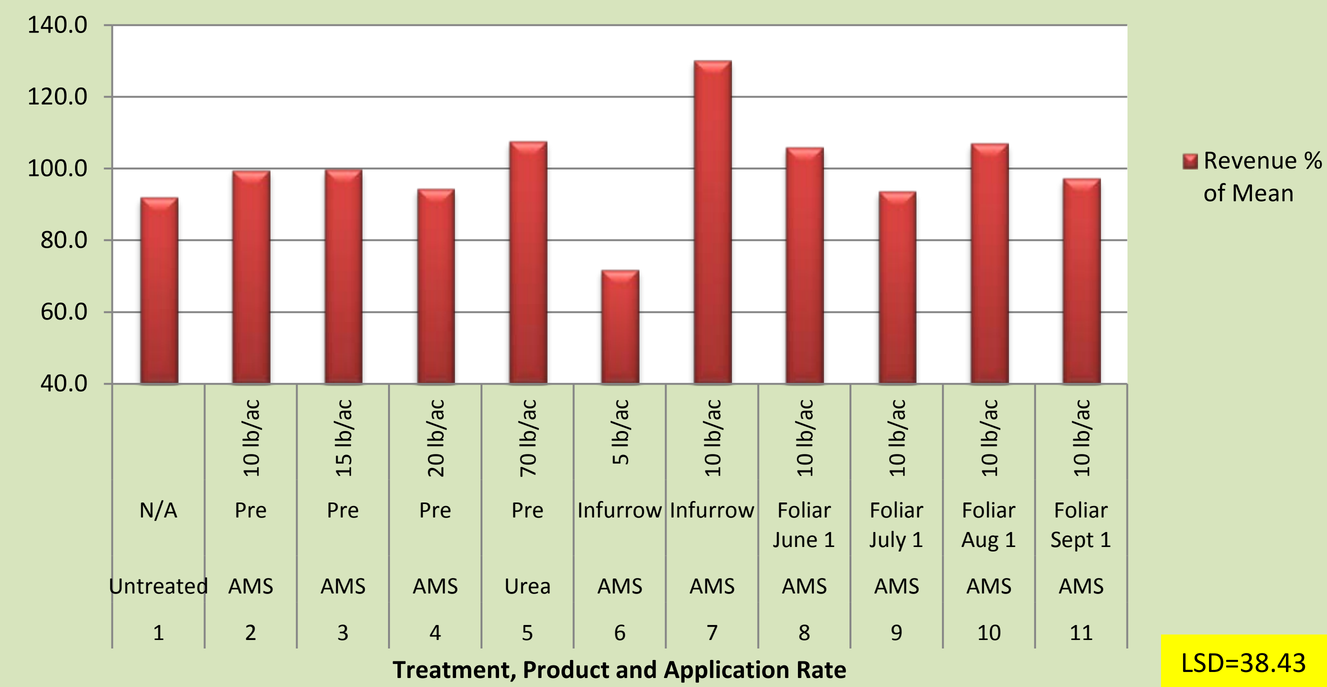


Fig. 6 **Sulfur Applied In-furrow and Foliar Influence on Revenue % of Mean, Course Texture Soil Site, 2012**



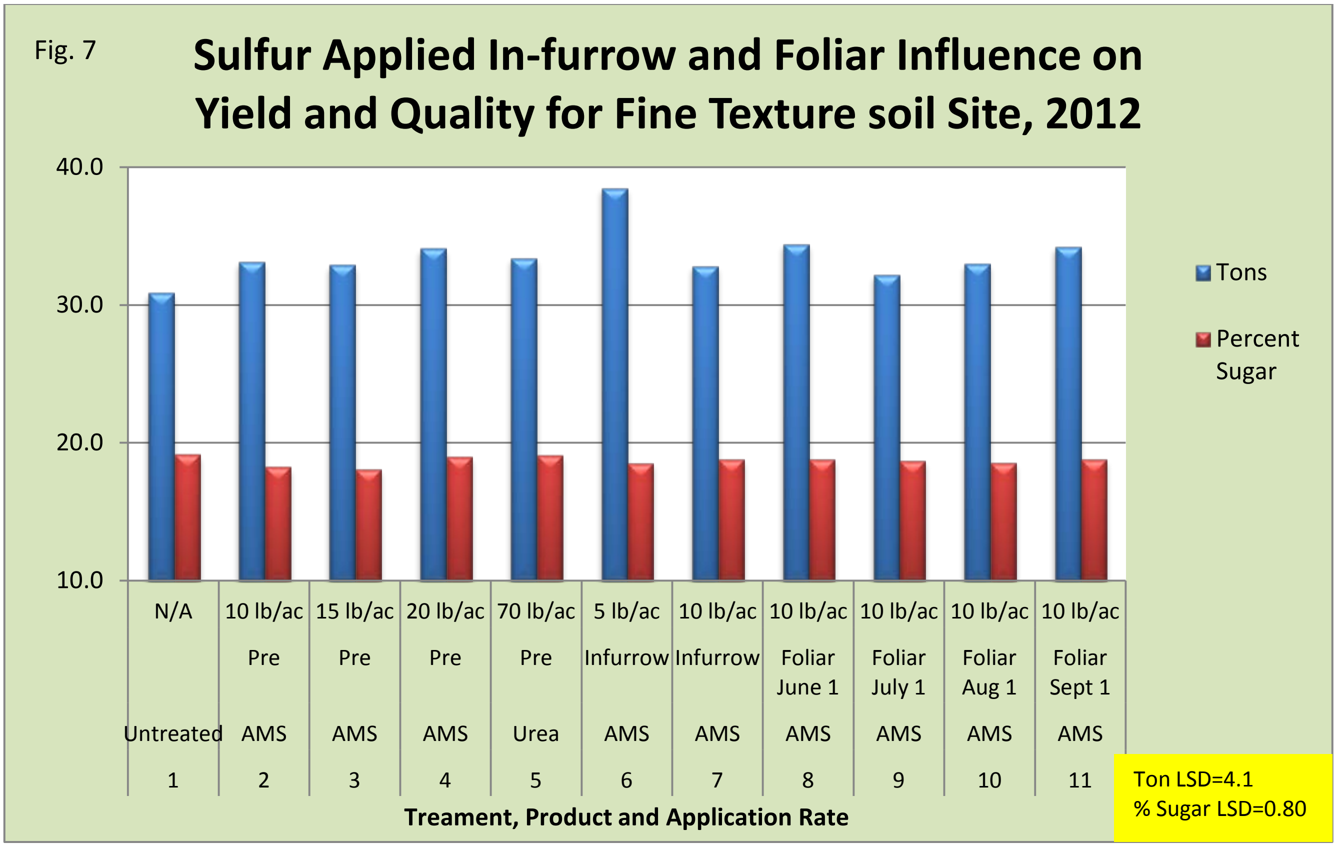


Fig. 7
Sulfur Applied In-furrow and Foliar Influence on Yield and Quality for Fine Texture soil Site, 2012
40.0
30.0
20.0
10.0
Tons
Percent Sugar
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treament, Product and Application Rate
Ton LSD=4.1
% Sugar LSD=0.80

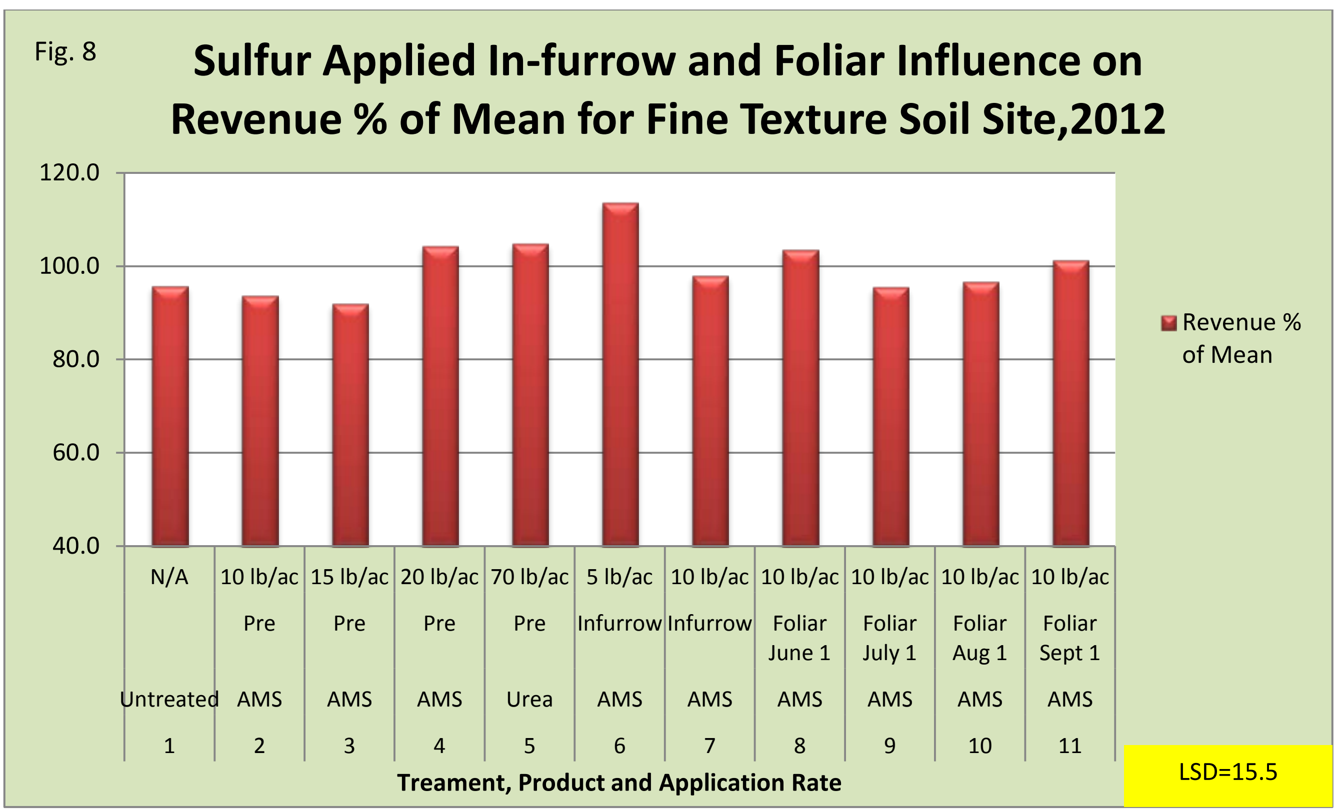


Fig. 8
Sulfur Applied In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site,2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treament, Product and Application Rate
LSD=15.5

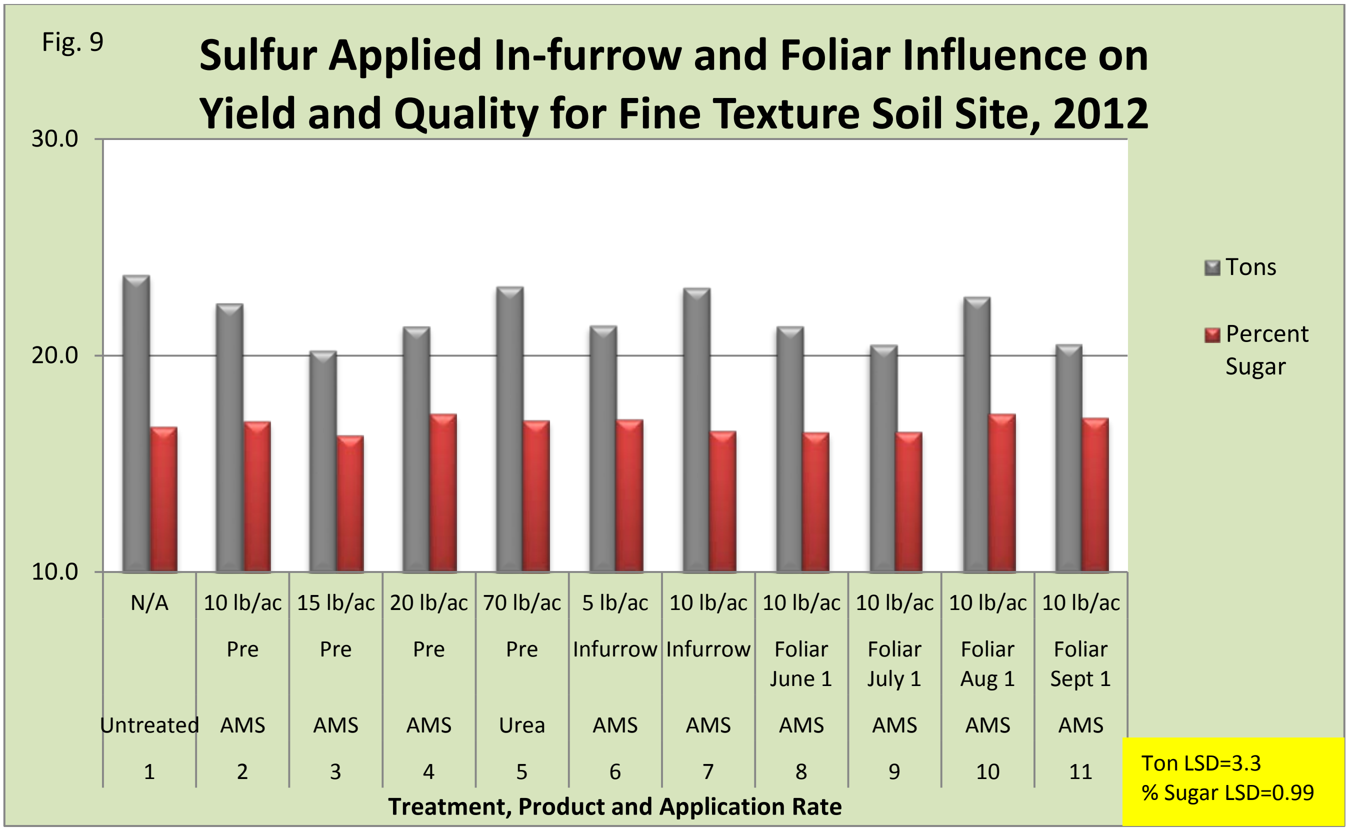


Fig. 9
Sulfur Applied In-furrow and Foliar Influence on Yield and Quality for Fine Texture Soil Site, 2012
30.0
20.0
10.0
Tons
Percent Sugar
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treatment, Product and Application Rate
Ton LSD=3.3
% Sugar LSD=0.99

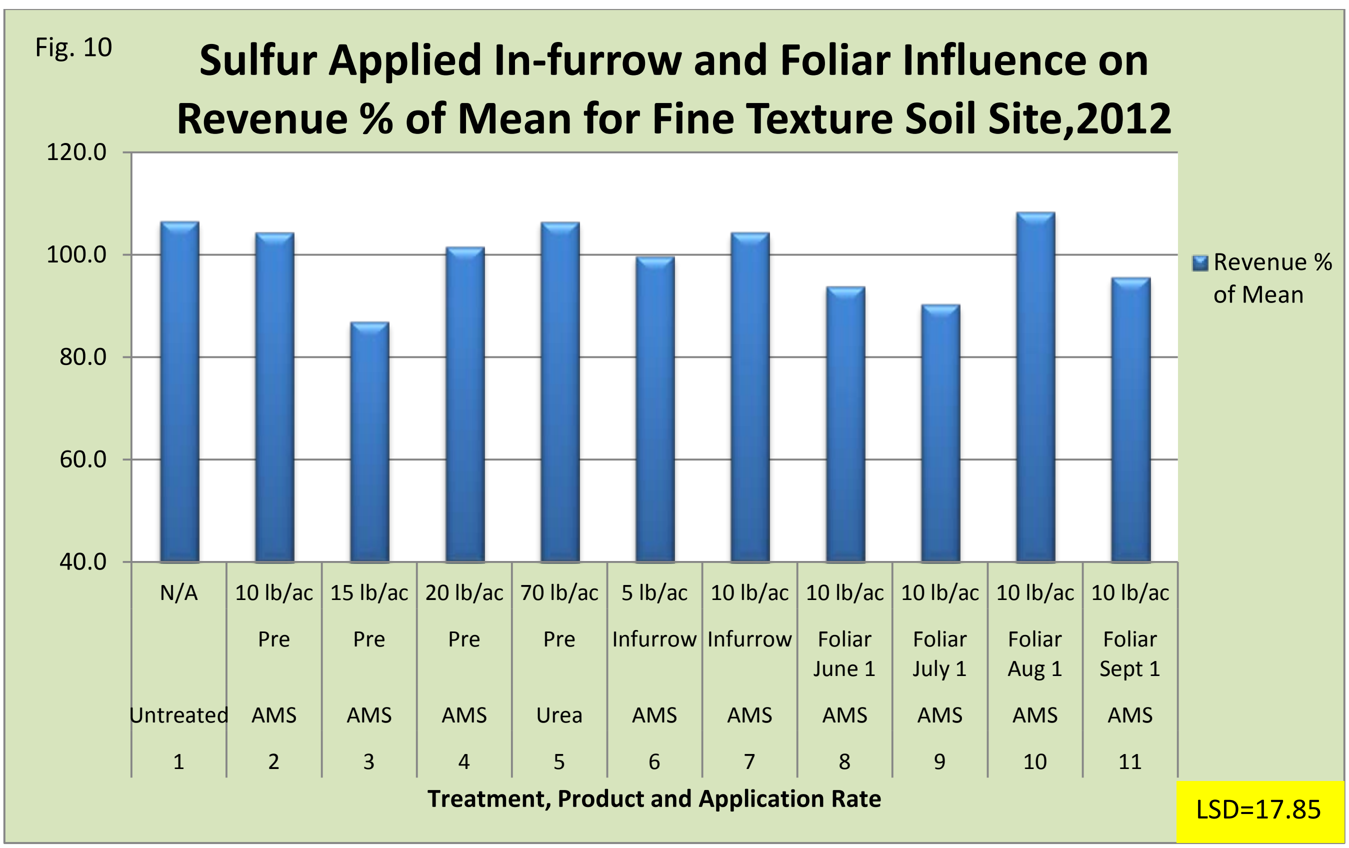


Fig. 10
Sulfur Applied In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site,2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treatment, Product and Application Rate
LSD=17.85

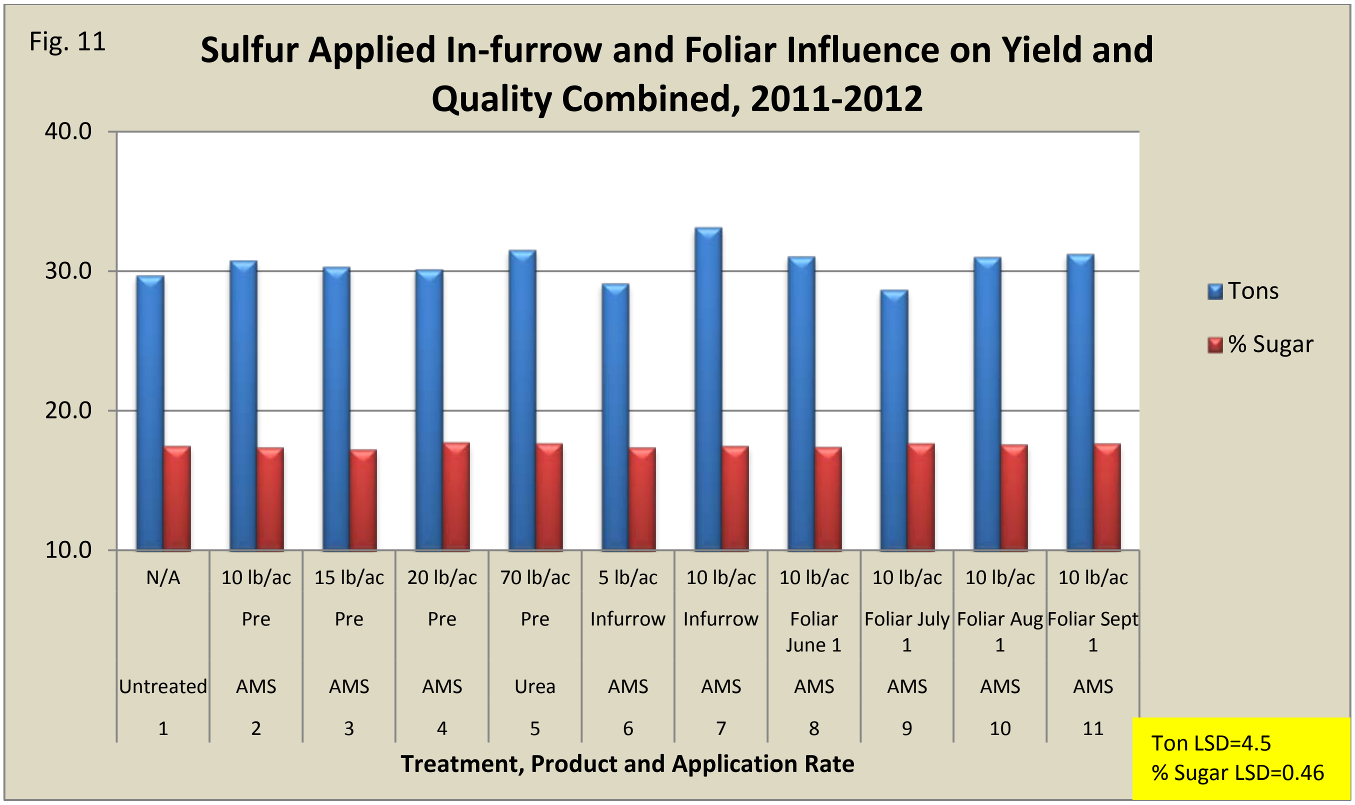


Fig. 11
Sulfur Applied In-furrow and Foliar Influence on Yield and Quality Combined, 2011-2012
40.0
30.0
20.0
10.0
Tons
% Sugar
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treatment, Product and Application Rate
Ton LSD=4.5
% Sugar LSD=0.46

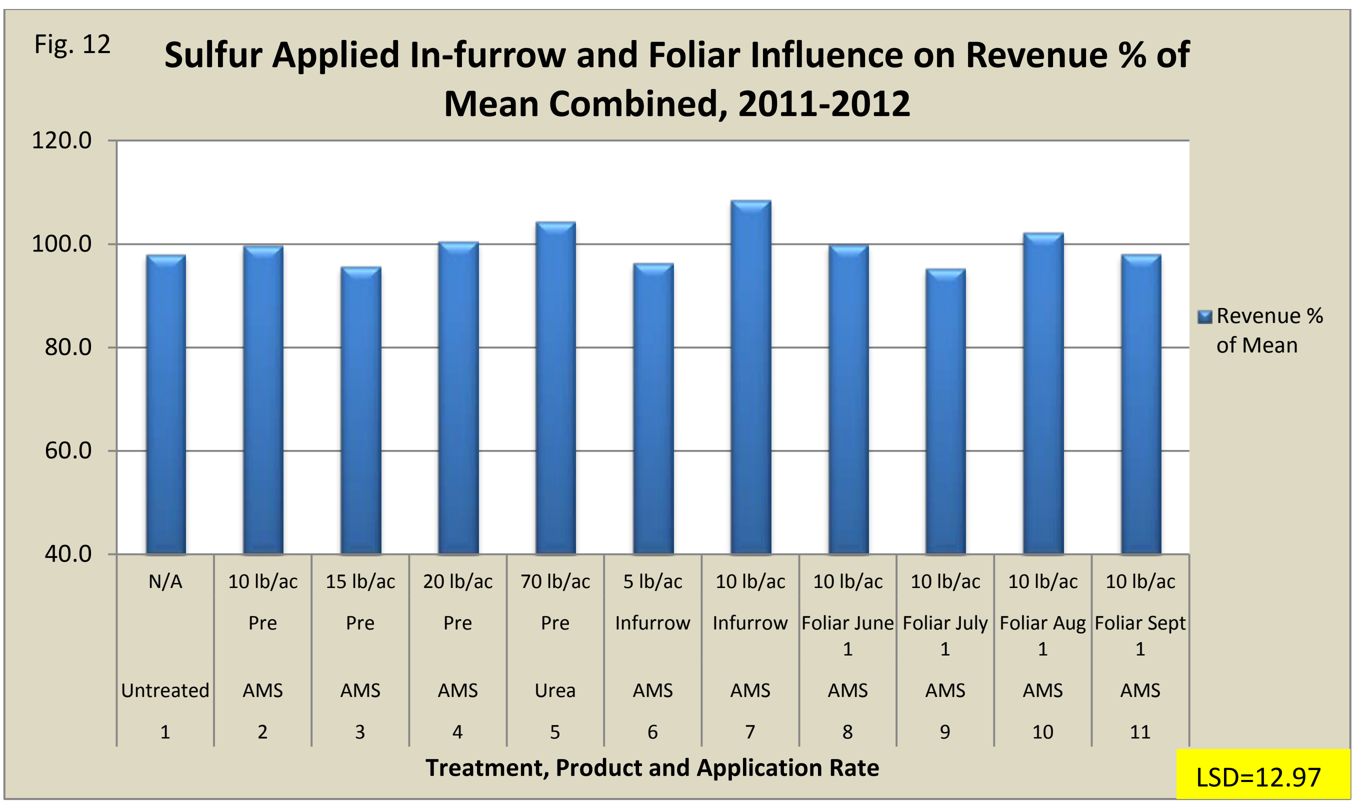


Fig. 12
Sulfur Applied In-furrow and Foliar Influence on Revenue % of Mean Combined, 2011-2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A Untreated 1
10 lb/ac Pre AMS 2
15 lb/ac Pre AMS 3
20 lb/ac Pre AMS 4
70 lb/ac Pre Urea 5
5 lb/ac Infurrow AMS 6
10 lb/ac Infurrow AMS 7
10 lb/ac Foliar June 1 AMS 8
10 lb/ac Foliar July 1 AMS 9
10 lb/ac Foliar Aug 1 AMS 10
10 lb/ac Foliar Sept 1 AMS 11
Treatment, Product and Application Rate
LSD=12.97

SMBSC Evaluation of Boron Influence on Sugarbeet Growth, 2011-2012

Sugarbeets were planted at three locations in 2011 and three locations in 2012 to test boron application influence on sugarbeet production. The locations were at Glenwood, Clara City and Bird Island, MN in 2011 and Appleton, Clara City and Hector MN in 2012.

Methods

Table 1 shows the specifics of activities conducted at all sites. Plots were 11 ft. (6 rows) wide and 35 feet long. Tables 2-6 show boron was incorporated prior to planting, in-furrow and foliar the 1st of June, July, August and September. Sugarbeets were planted by SMBSC research with a 6 row planter at all locations. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested at Glenwood, Bird Island and Hector with a 1 row research harvester and Appleton and Clara City with a 2 row research harvester. At Glenwood, Bird Island and Hector 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. At Clara City and Appleton the weights were collected and weighed on the harvester for yield calculation and a sub-sample was analyzed in the SMBSC quality lab. Statistical analysis of the data was conducted for homogeneity of combinability and determined that the data could be combined across locations.

Results and Discussion:

When a soil test shows low boron, the addition of boron enhanced production. Boron is an essential nutrient needed for sugar translocation. The tests show a small increase in sugar as the amount of boron increases. The increase is not statically significant. Where soil test shows boron is sufficient the addition of boron to enhance production is unpredictable. 2011 at Glenwood the 4 and 6 lb. incorporated and the July 1st foliar treatments had a significant advantage over other boron treatments (Table 2). All boron treatments at the Glenwood site showed a significant advantage over the untreated check. The addition of boron may compensate for natural losses. Boron is one of the most leachable micronutrients. Coarse textured soils that are low in organic matter naturally suffer from excessive leaching. At Clara City there was no significant advantage to boron applications when comparing boron applications (Table 3). However, Boron applied broadcast at 6 lbs. per acre enhanced sugarbeet production significantly greater than the untreated check and tended to give higher sugarbeet production than other boron applications. At Bird Island all foliar and 2 lb. incorporated treatments showed a significant advantage over the non-treated check. The boron tested in 2011 showed a benefit that varied across research locations. Figures 1-6 are presented for the reader to have a visual perspective of the results. In 2012 at Appleton the 1 pt. /ac had a significant advantage over the check. Most of the advantage was contributed to purity. The soils at Appleton are similar to the soils at the Glenwood site. At Clara City the 4 and 6 lb. /ac pre-plant incorporated showed an advantage over the other treatments. Tons were the leading factor in that test. At Hector the 6 lb. /ac pre-plant incorporated showed a slight advantage in tons over the other treatments. The combined data shows 6 lbs. boron preplant incorporated had the greatest production advantage. Purity and sugar were both increased while tomes were unaffected. When boron is applied foliar, the late applications had an advantage over the earlier applications. Lime does not supply a significant amount of boron. 4 ton/ac will supply approximately 0.25 lbs. of boron.

Table 1. Site Specifics for Boron Micronutrient Products Testing Combined, 2011-2012

Location	Planting Date	Soil Condition	Total N	P ppm	K ppm	B ppm
Glenwood, 2011	5/2/2011	Damp	95	8	127	
Clara City, 2011	5/16/2011	Damp	66	10	293	1.16
Bird Island, 2011	5/19/2011	Muddy	56	14	218	0.62
Clara City, 2012	4/23/2012	Damp	284	8	169	2.03
Appleton, 2012	4/23/2012	Dry	110	16	166	0.29
Hector, 2012	4/30/2012	Dry	113	30	207	1.27

TABLE 2. Boron Application Influence on Yield and Quality of Sugarbeets
Glenwood, 2011

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated None			11.9	12.96	89.36	2523	80.35
2	Boron	Preplant	2 lb/ac	18.9	13.29	89.58	4104	98.12
3	Boron	Preplant	4 lb/ac	21.7	13.32	90.98	4828	137.63
4	Boron	Preplant	6 lb/ac	19.4	13.17	90.11	4209	118.70
5	Boron	In-furrow	.5 pt/ac	17.2	13.32	89.83	3768	98.97
6	Boron	In-furrow	1 pt/ac	14.5	12.83	89.09	3008	76.43
7	Boron	Foliar June 1	1 pt/ac	14.5	12.33	88.15	2844	74.16
8	Boron	Foliar July 1	1 pt/ac	18.6	12.95	88.33	3870	119.33
9	Boron	Foliar August 1	1 pt/ac	14.6	12.82	89.59	3063	89.96
10	Boron	Foliar September 1	1 pt/ac	18.0	13.01	89.23	3803	106.35
		C.V		13.2	4.34	1.50	11	14.38
		LSD (0.05)		3.6	NS	NS	629	20.86

TABLE 3. Boron Application Influence on Yield and Quality of Sugarbeets
Clara City, 2011

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated None	none		24.3	17.78	90.69	7319	99.88
2	Boron (granular)	Broadcast incorporated	2 lb/ac	25.0	17.46	90.45	7376	99.18
3	Boron (granular)	Broadcast incorporated	4 lb/ac	25.6	17.50	90.54	7568	102.18
4	Boron (granular)	Broadcast incorporated	6 lb/ac	26.9	17.55	90.43	7972	106.95
5	Boron (Max-In)	In-furrow	.5 pt/ac	24.6	17.64	91.23	7402	101.20
6	Boron (Max-In)	In-furrow	1 pt/ac	24.8	17.84	90.49	7478	101.92
7	Boron (Max-In)	Foliar June 1	1 pt/ac	24.6	17.49	90.93	7312	98.92
8	Boron (Max-In)	Foliar July 1	1 pt/ac	23.8	17.61	91.08	7132	97.04
9	Boron (Max-In)	Foliar August 1	1 pt/ac	22.9	17.88	90.51	6909	94.98
10	Boron (Max-In)	Foliar September 1	1 pt/ac	24.3	17.60	90.59	7233	97.76
		C.V		6.7	2.34	0.65	8	8.78
		LSD (0.05)		2.4	NS	NS	NS	NS

TABLE 4. Boron Application on Yield and Quality of Sugarbeets
Bird Island, 2011

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated None			15.1	14.65	88.77	3616	78.62
2	Boron	Preplant	2 lb/ac	15.8	14.74	89.49	3827	108.32
3	Boron	Preplant	4 lb/ac	14.4	14.19	88.77	3319	90.51
4	Boron	Preplant	6 lb/ac	15.3	14.25	89.33	3582	96.27
5	Boron	In-furrow	.5 pt/ac	16.1	14.27	89.58	3784	90.01
6	Boron	In-furrow	1 pt/ac	16.7	14.41	88.58	3894	93.21
7	Boron	Foliar June 1	1 pt/ac	18.7	14.40	89.40	4417	106.18
8	Boron	Foliar July 1	1 pt/ac	19.9	15.08	90.27	5004	128.49
9	Boron	Foliar August 1	1 pt/ac	13.7	14.72	89.73	3343	107.50
10	Boron	Foliar September 1	1 pt/ac	18.1	14.16	89.49	4201	100.88
			C.V	14.5	5.01	1.38	15	17.77
			LSD (0.05)	3.7	NS	NS	874	25.78

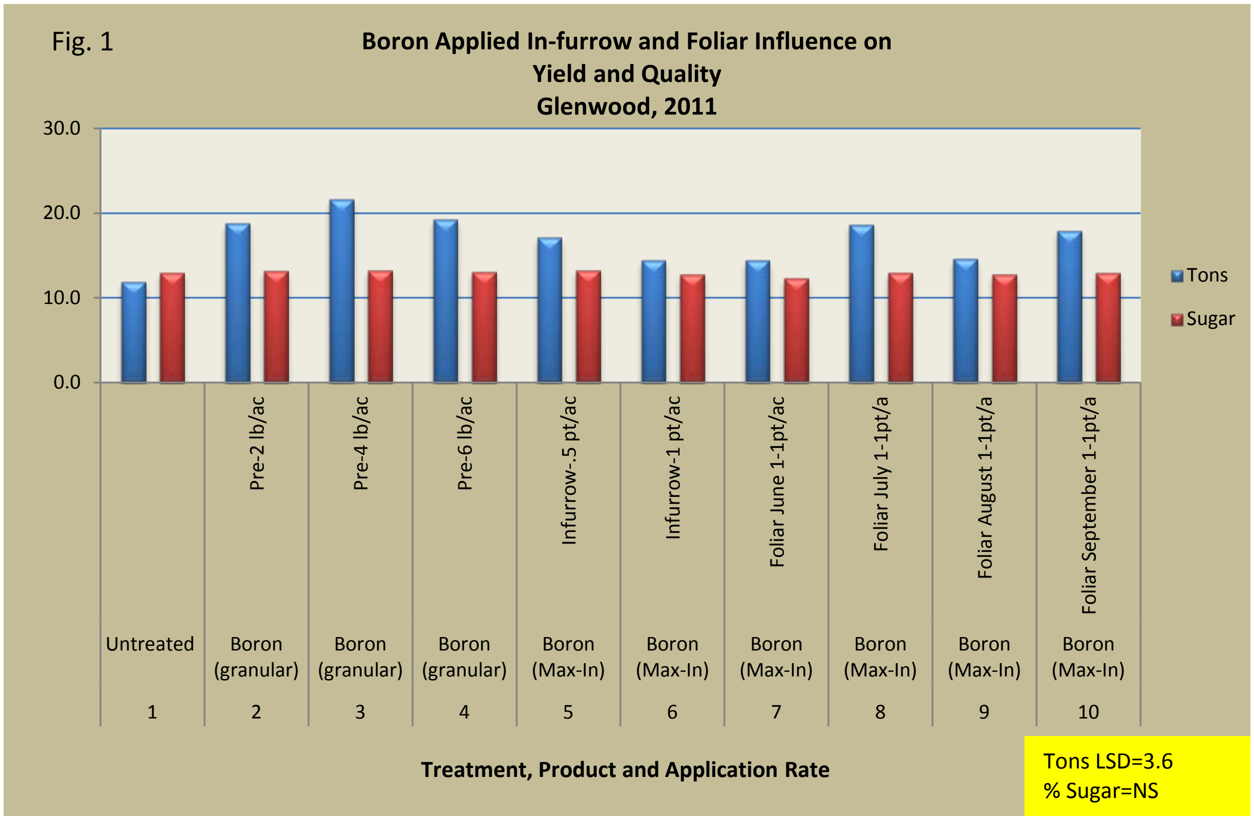


Fig. 1
Boron Applied In-furrow and Foliar Influence on
Yield and Quality
Glenwood, 2011
30.0
20.0
10.0
0.0
Tons
Sugar
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
Tons LSD=3.6
% Sugar=NS

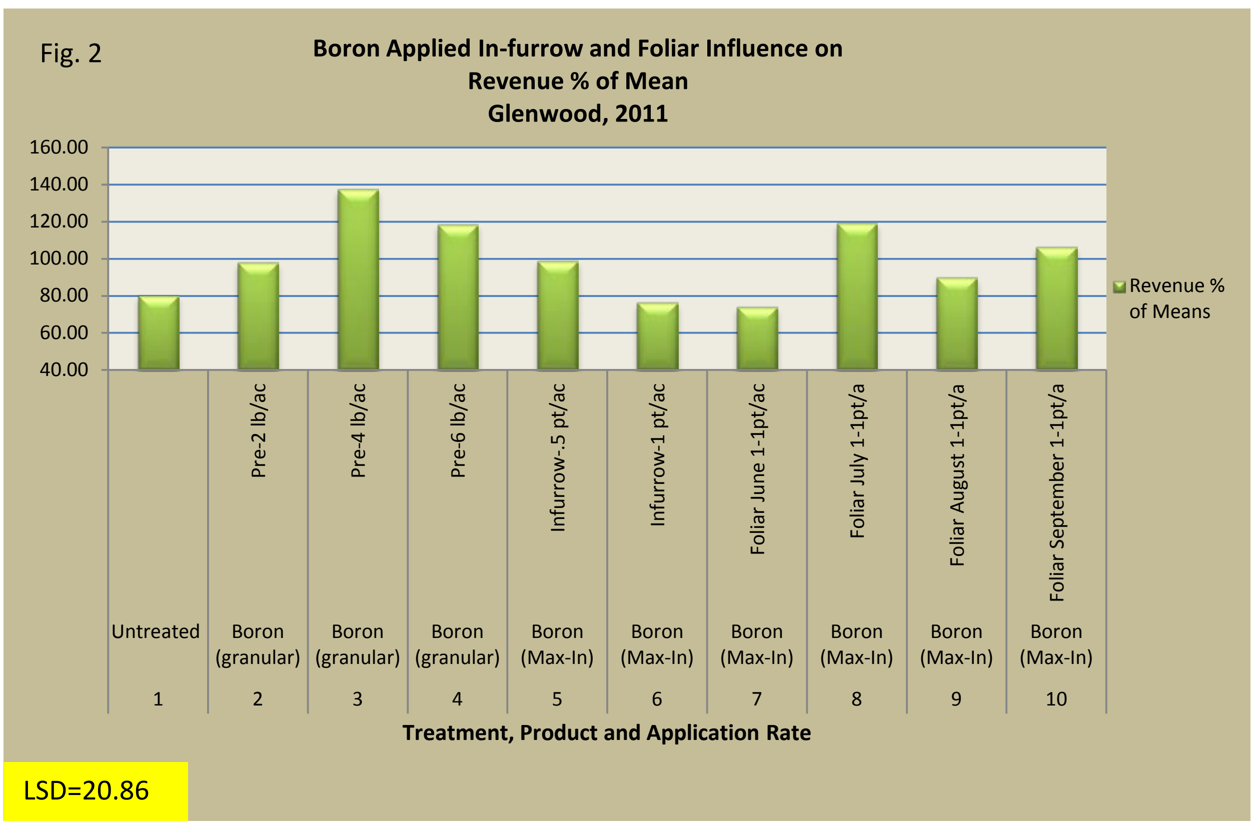


Fig. 2
Boron Applied In-furrow and Foliar Influence on
Revenue % of Mean
Glenwood, 2011
160.00
140.00
120.00
100.00
80.00
60.00
40.00
Revenue % of Means
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
LSD=20.86

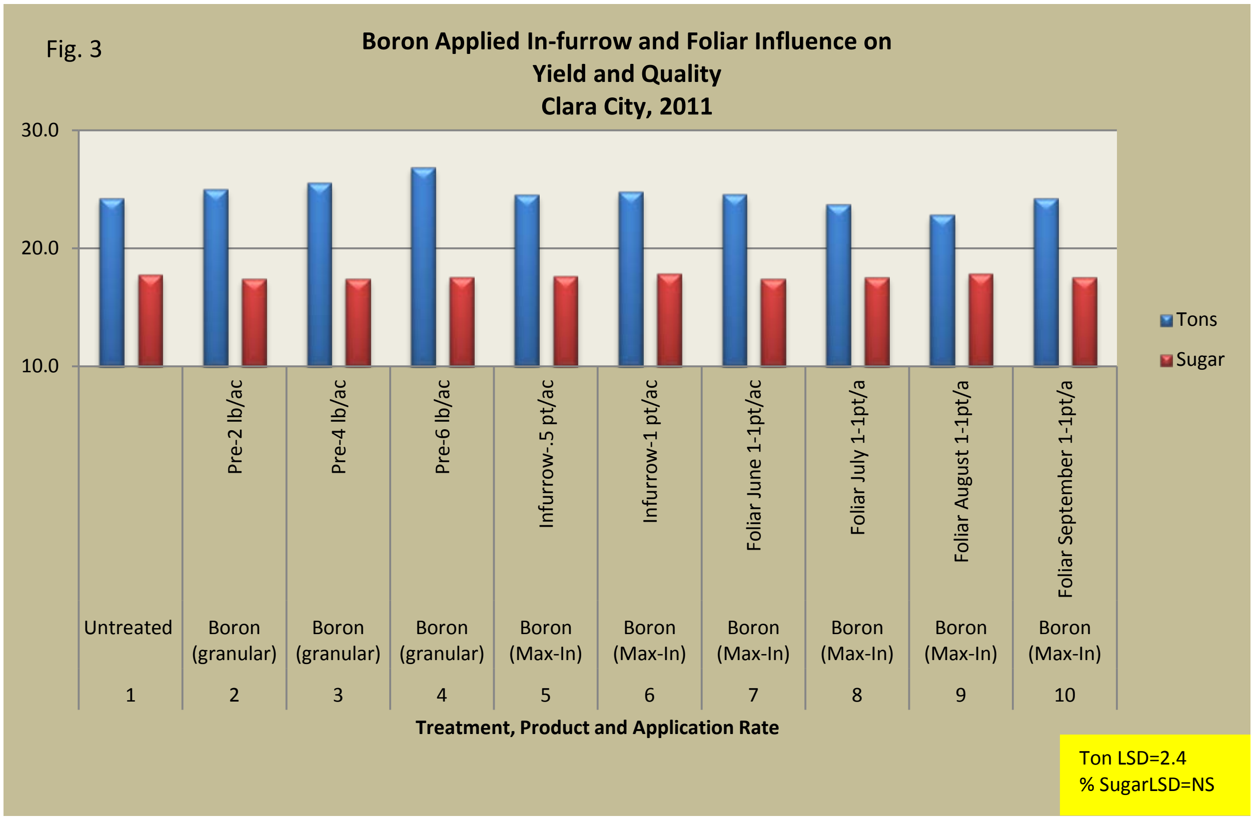


Fig. 3
Boron Applied In-furrow and Foliar Influence on
Yield and Quality
Clara City, 2011
30.0
20.0
10.0
Tons
Sugar
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
Ton LSD=2.4
% SugarLSD=NS

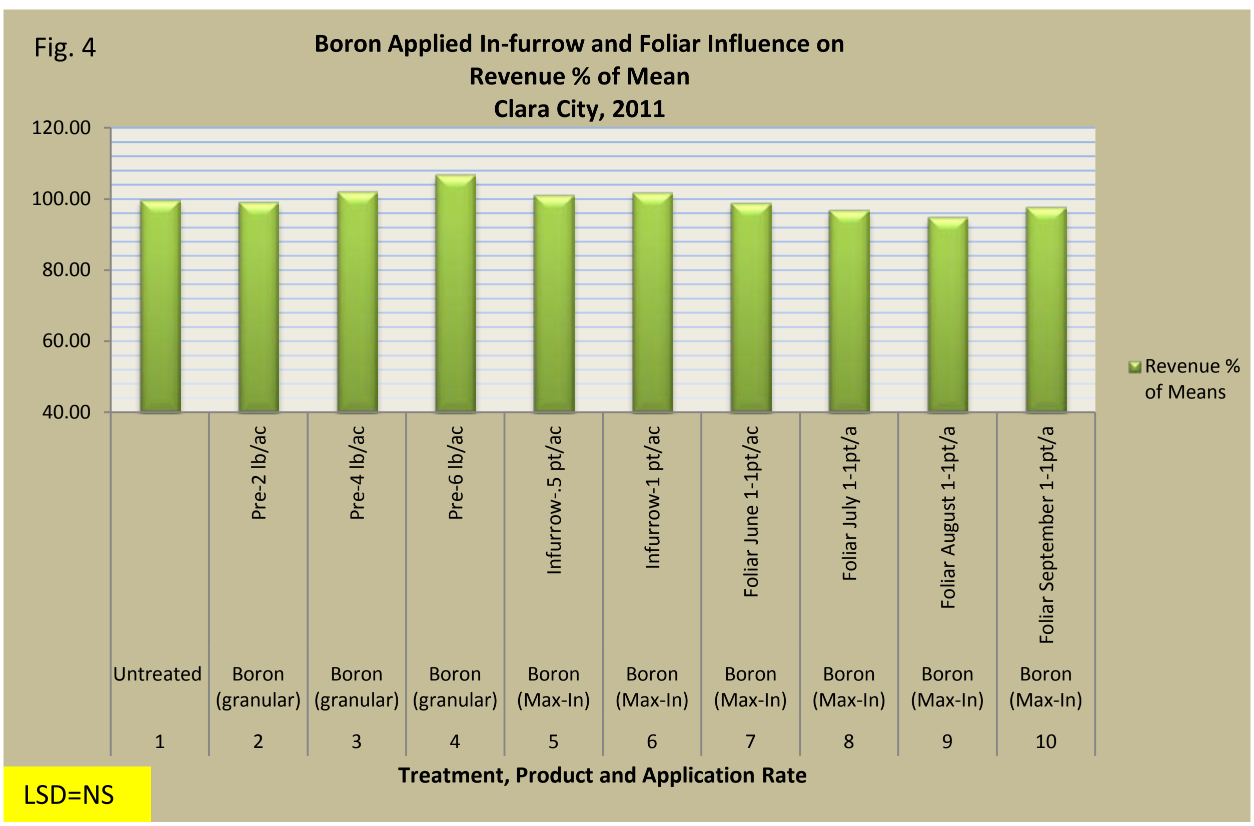


Fig. 4
Boron Applied In-furrow and Foliar Influence on
Revenue % of Mean
Clara City, 2011
120.00
100.00
80.00
60.00
40.00
Revenue % of Means
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
LSD=NS

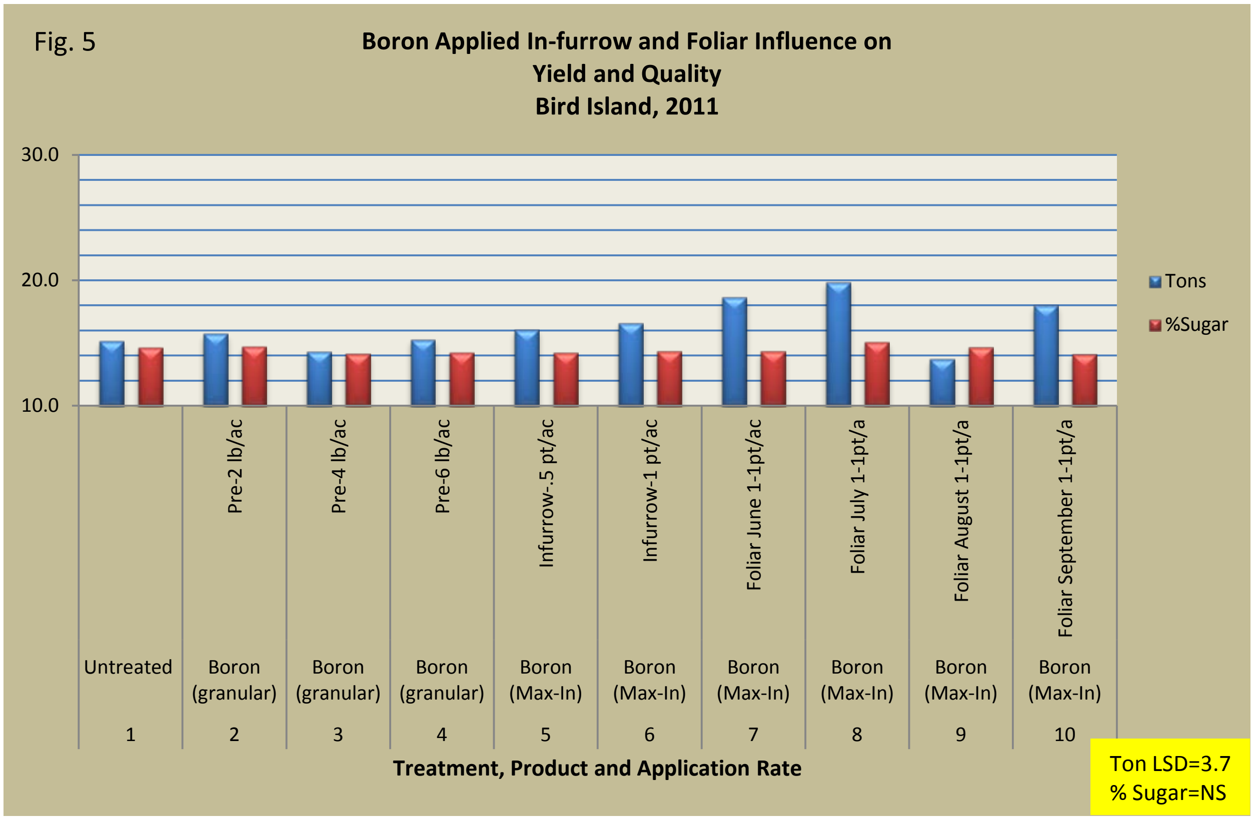


Fig. 5
Boron Applied In-furrow and Foliar Influence on
Yield and Quality
Bird Island, 2011
30.0
20.0
10.0
Tons
%Sugar
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
Ton LSD=3.7
% Sugar=NS

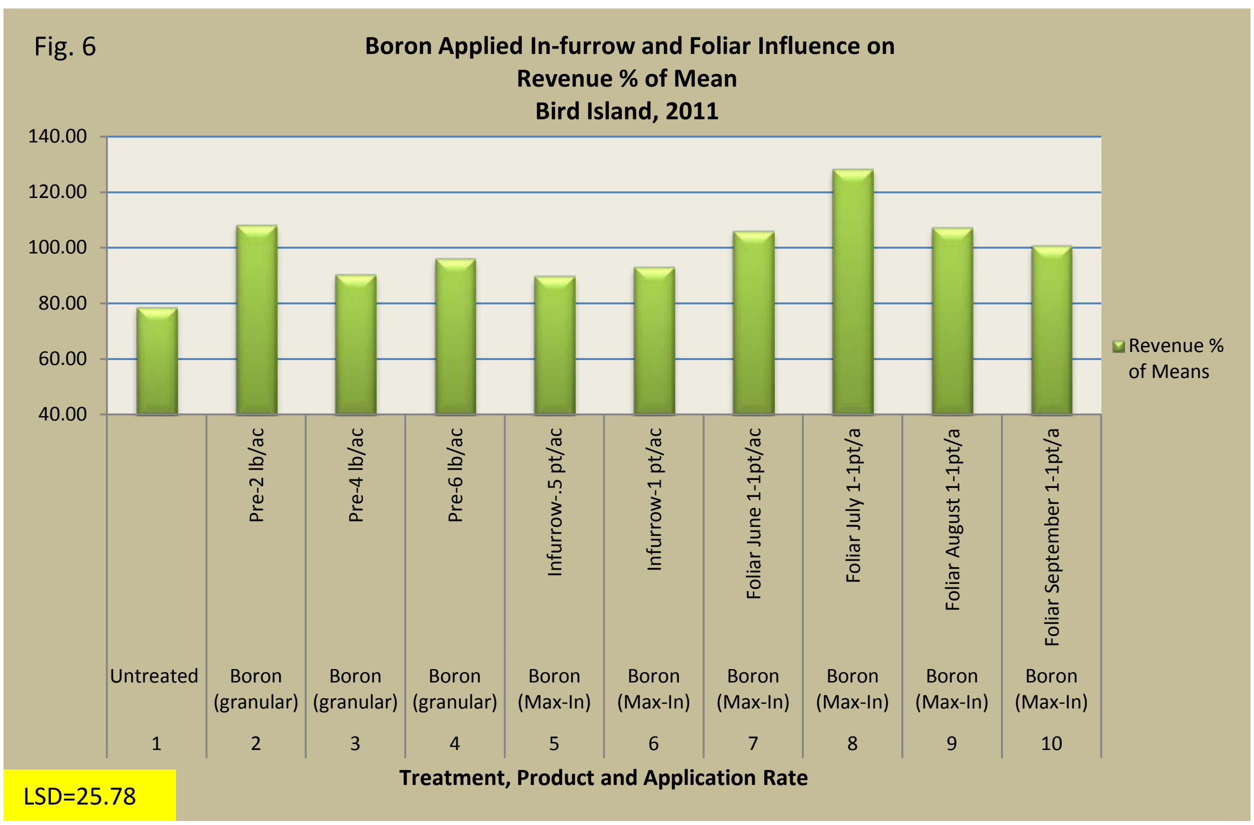


Fig. 6
Boron Applied In-furrow and Foliar Influence on
Revenue % of Mean
Bird Island, 2011
140.00
120.00
100.00
80.00
60.00
40.00
Revenue % of Means
Pre-2 lb/ac
Pre-4 lb/ac
Pre-6 lb/ac
Infurrow-.5 pt/ac
Infurrow-1 pt/ac
Foliar June 1-1pt/ac
Foliar July 1-1pt/a
Foliar August 1-1pt/a
Foliar September 1-1pt/a
Untreated
Boron (granular)
Boron (granular)
Boron (granular)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
Boron (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application Rate
LSD=25.78

Table 5. Influence of Micronutrient Products with Boron for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Course Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			34.9	17.31	88.76	9941	90.77
2	Boron	Preplant	2 lb/ac	36.1	17.72	89.38	10622	98.46
3	Boron	Preplant	4 lb/ac	35.4	18.42	90.05	10982	104.06
4	Boron	Preplant	6 lb/ac	38.6	17.65	89.69	11413	105.99
5	Boron	In-furrow	.5 pt/ac	37.1	17.95	89.68	11102	103.66
6	Boron	In-furrow	1 pt/ac	38.7	17.54	90.64	11521	**107.29**
7	Boron	Foliar June 1	1 pt/ac	35.6	17.65	89.56	10482	97.10
8	Boron	Foliar July 1	1 pt/ac	34.9	17.66	89.79	10303	95.61
9	Boron	Foliar August 1	1 pt/ac	34.4	17.58	89.25	10030	92.57
10	Boron	Foliar September 1	1 pt/ac	39.0	17.32	89.98	11335	104.47
CV%				**7.9**	**3.13**	**1.17**	**9.87**	**11.14**
LSD (0.05)				**4.2**	**0.80**	**1.53**	**1543**	**16.17**

Table 6. Influence of Micronutrient Products with Boron for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Fine Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			29.2	18.91	89.94	9233	104.32
2	Boron	Preplant	2 lb/ac	27.6	18.26	89.24	8377	93.10
3	Boron	Preplant	4 lb/ac	30.3	19.12	89.95	9757	110.98
4	Boron	Preplant	6 lb/ac	32.5	18.20	87.76	9613	105.54
5	Boron	In-furrow	.5 pt/ac	28.2	18.60	89.83	8832	99.31
6	Boron	In-furrow	1 pt/ac	28.5	18.86	89.49	8977	101.26
7	Boron	Foliar June 1	1 pt/ac	26.9	19.05	90.04	8649	98.27
8	Boron	Foliar July 1	1 pt/ac	26.3	18.76	89.52	8235	92.64
9	Boron	Foliar August 1	1 pt/ac	29.3	18.37	88.77	8865	98.35
10	Boron	Foliar September 1	1 pt/ac	29.5	18.03	88.50	8749	96.22
CV%				**9.7**	**3.19**	**1.51**	**11**	**11.85**
LSD (0.05)				**4.1**	**0.86**	**1.96**	**1402**	**17.19**

Table 7. Influence of Micronutrient Products with Boron for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Fine Texture Soil, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated		N/A	26.4	16.58	89.93	7304	101.07
2	Boron	Pre	2 lb/ac	28.0	16.89	89.63	7855	109.52
3	Boron	Pre	4 lb/ac	27.5	16.92	90.07	7801	109.20
4	Boron	Pre	6 lb/ac	30.7	16.39	89.69	8388	115.27
5	Boron	In-furrow	.5 pt/ac	27.4	16.74	89.85	7668	106.61
6	Boron	In-furrow	1 pt/ac	25.6	16.99	90.29	7308	102.63
7	Boron	Foliar June 1	1 pt/ac	26.2	16.99	90.43	7492	105.27
8	Boron	Foliar July 1	1 pt/ac	27.7	17.31	90.41	8113	115.22
9	Boron	Foliar Aug 1	1 pt/ac	23.6	16.86	89.77	6636	92.52
10	Boron	Foliar Sept 1	1 pt/ac	26.1	17.41	90.55	7672	109.22
CV%				5.9	2.69	0.73	7	7.90
LSD (0.05)				2.3	0.66	0.95	766	12.21

Table 8. Influence of Micronutrient Products with Boron for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Combined, All 2012 and 2011

Trt No.	Product	Application	Product Rate	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated		N/A	139	28.6	17.70	89.93	8466	99.50
2	Boron	Preplant	2 lb/ac	127	29.8	17.62	89.67	8774	102.66
3	Boron	Preplant	4 lb/ac	137	29.0	17.85	89.67	8643	101.49
4	Boron	Preplant	6 lb/ac	132	31.7	17.55	89.62	9266	108.15
5	Boron	In-furrow	.5 pt/ac	132	29.5	17.75	90.15	8816	103.51
6	Boron	In-furrow	1 pt/ac	134	29.6	17.74	90.12	8820	103.14
7	Boron	Foliar June 1	1 pt/ac	141	29.0	17.66	90.12	8612	101.02
8	Boron	Foliar July 1	1 pt/ac	138	28.0	17.67	90.17	8311	98.34
9	Boron	Foliar August 1	1 pt/ac	134	27.3	17.70	89.76	8073	94.39
10	Boron	Foliar September 1	1 pt/ac	130	29.7	17.79	90.13	8873	104.02
CV%				18	7.2	3.06	1.10	8	9.29
LSD (0.05)				17	1.5	NS	NS	499	6.65

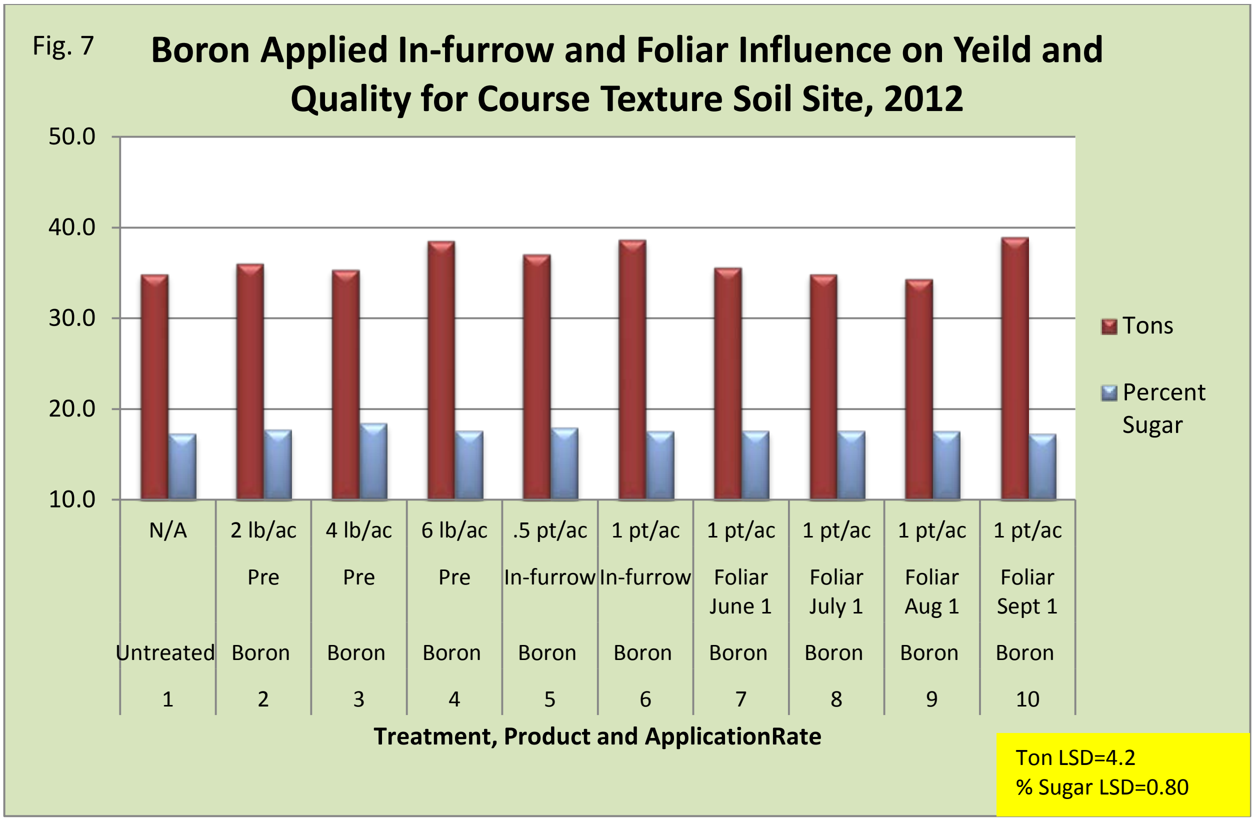


Fig. 7
Boron Applied In-furrow and Foliar Influence on Yeild and Quality for Course Texture Soil Site, 2012
50.0
40.0
30.0
20.0
10.0
Tons
Percent Sugar
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and ApplicationRate
Ton LSD=4.2
% Sugar LSD=0.80

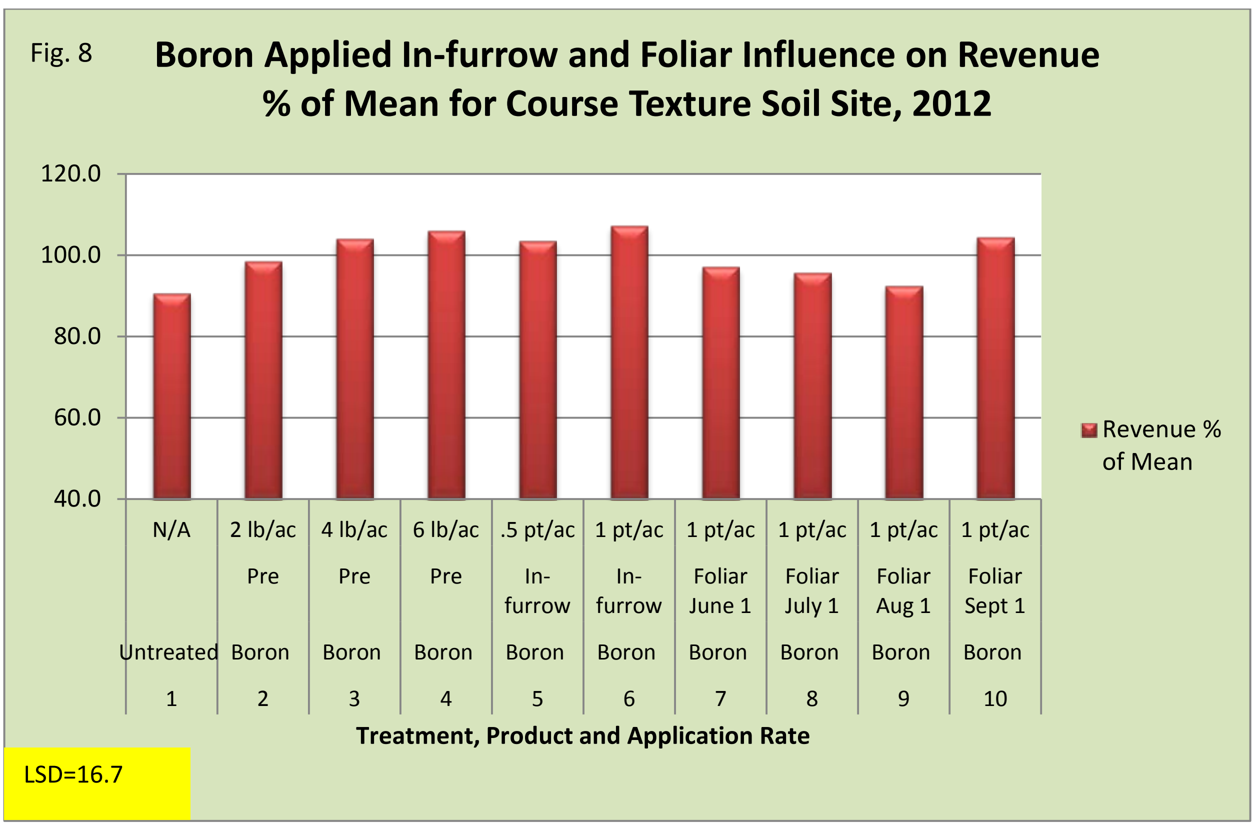


Fig. 8
Boron Applied In-furrow and Foliar Influence on Revenue % of Mean for Course Texture Soil Site, 2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and Application Rate
LSD=16.7

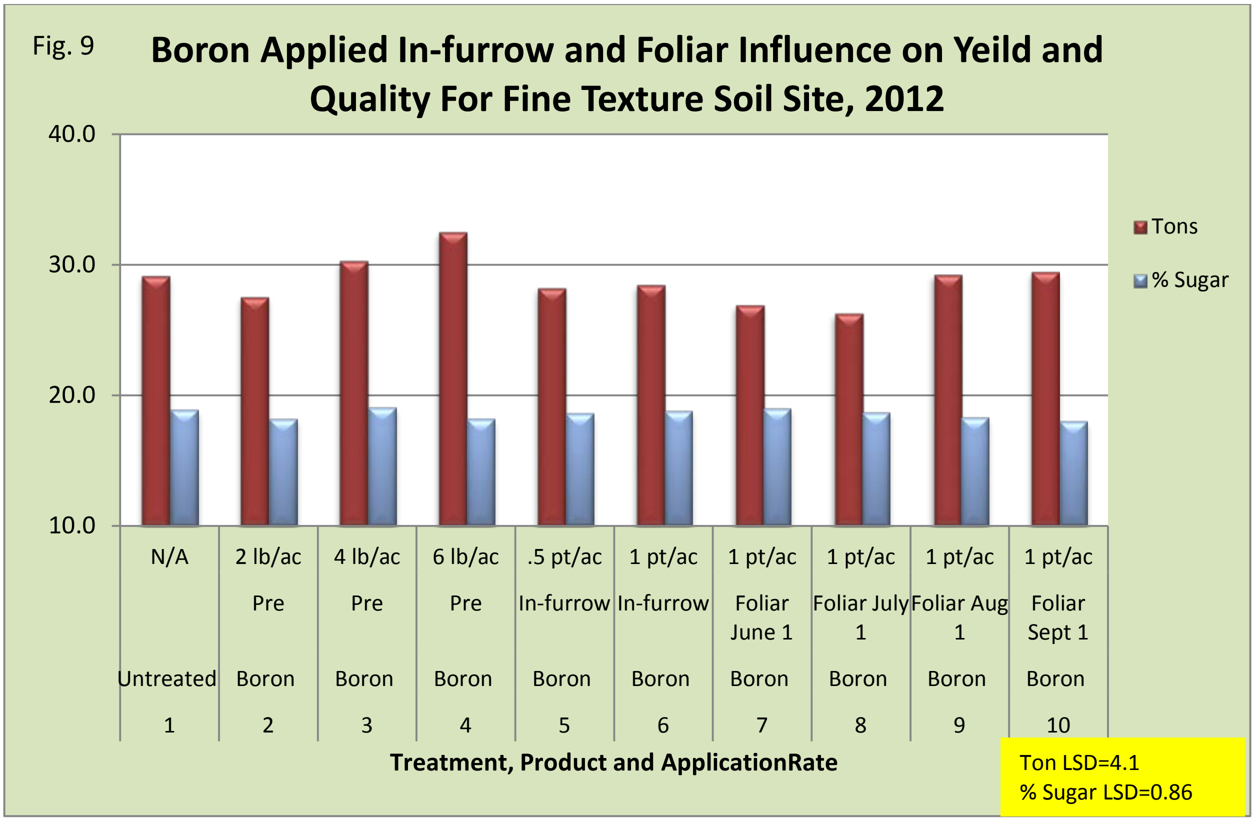


Fig. 9
Boron Applied In-furrow and Foliar Influence on Yeild and Quality For Fine Texture Soil Site, 2012
40.0
30.0
20.0
10.0
Tons
% Sugar
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and ApplicationRate
Ton LSD=4.1
% Sugar LSD=0.86

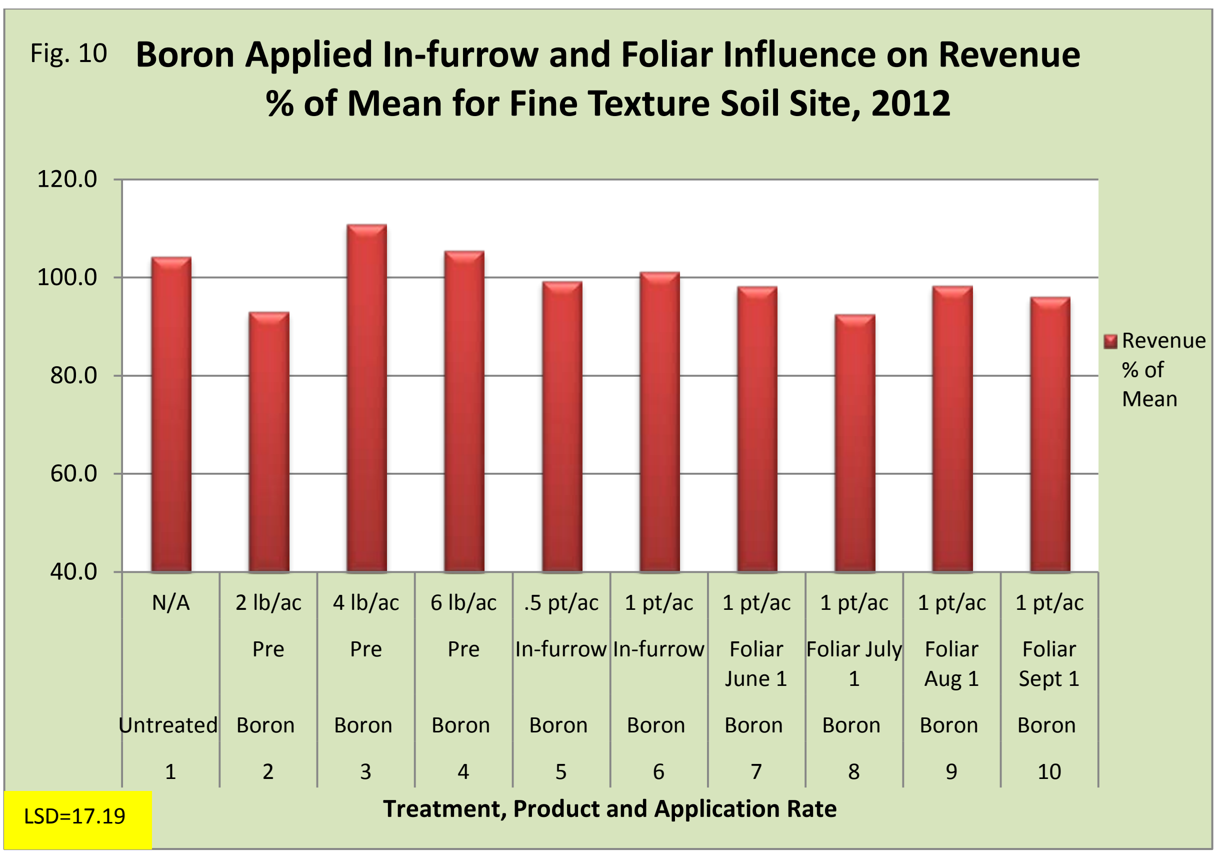


Fig. 10
Boron Applied In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site, 2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and Application Rate
LSD=17.19

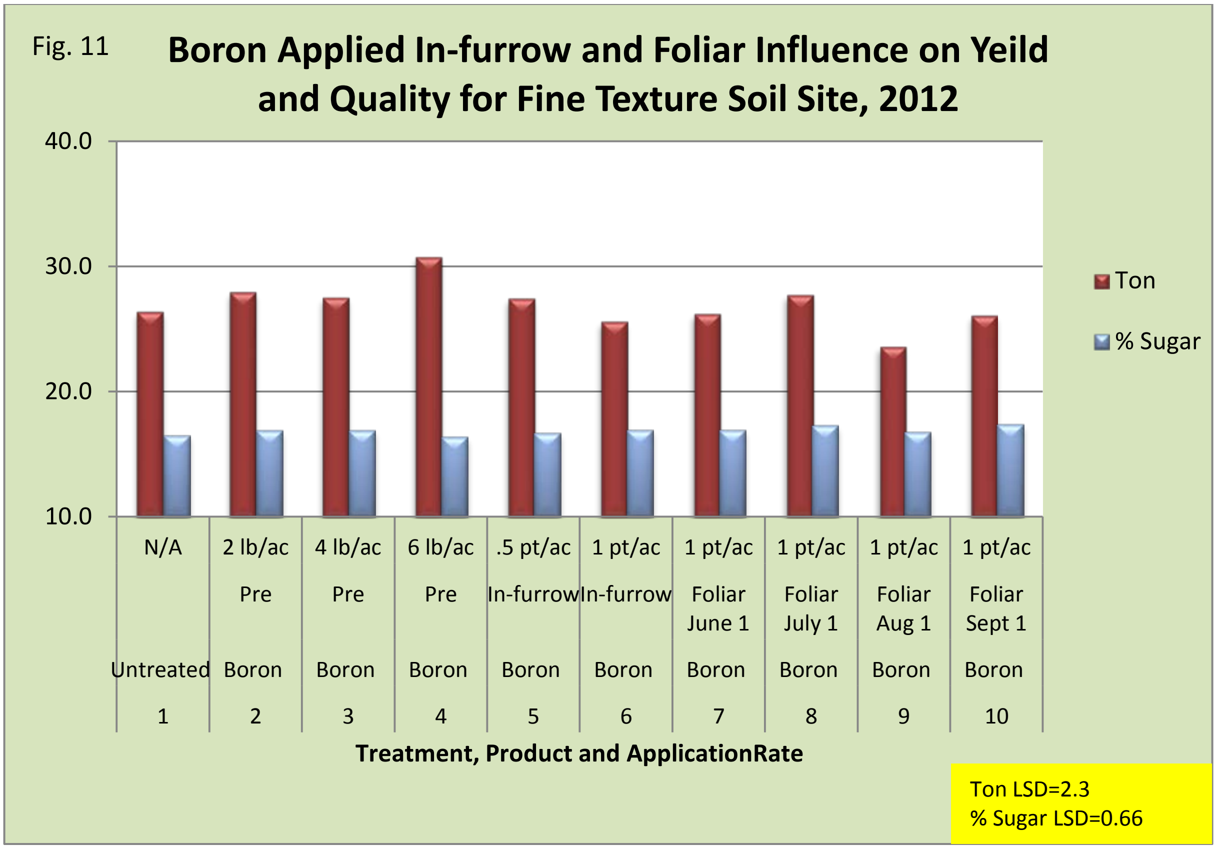


Fig. 11
Boron Applied In-furrow and Foliar Influence on Yeild and Quality for Fine Texture Soil Site, 2012
40.0
30.0
20.0
10.0
Ton
% Sugar
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar
June 1
Boron
7
1 pt/ac
Foliar
July 1
Boron
8
1 pt/ac
Foliar
Aug 1
Boron
9
1 pt/ac
Foliar
Sept 1
Boron
10
Treatment, Product and ApplicationRate
Ton LSD=2.3
% Sugar LSD=0.66

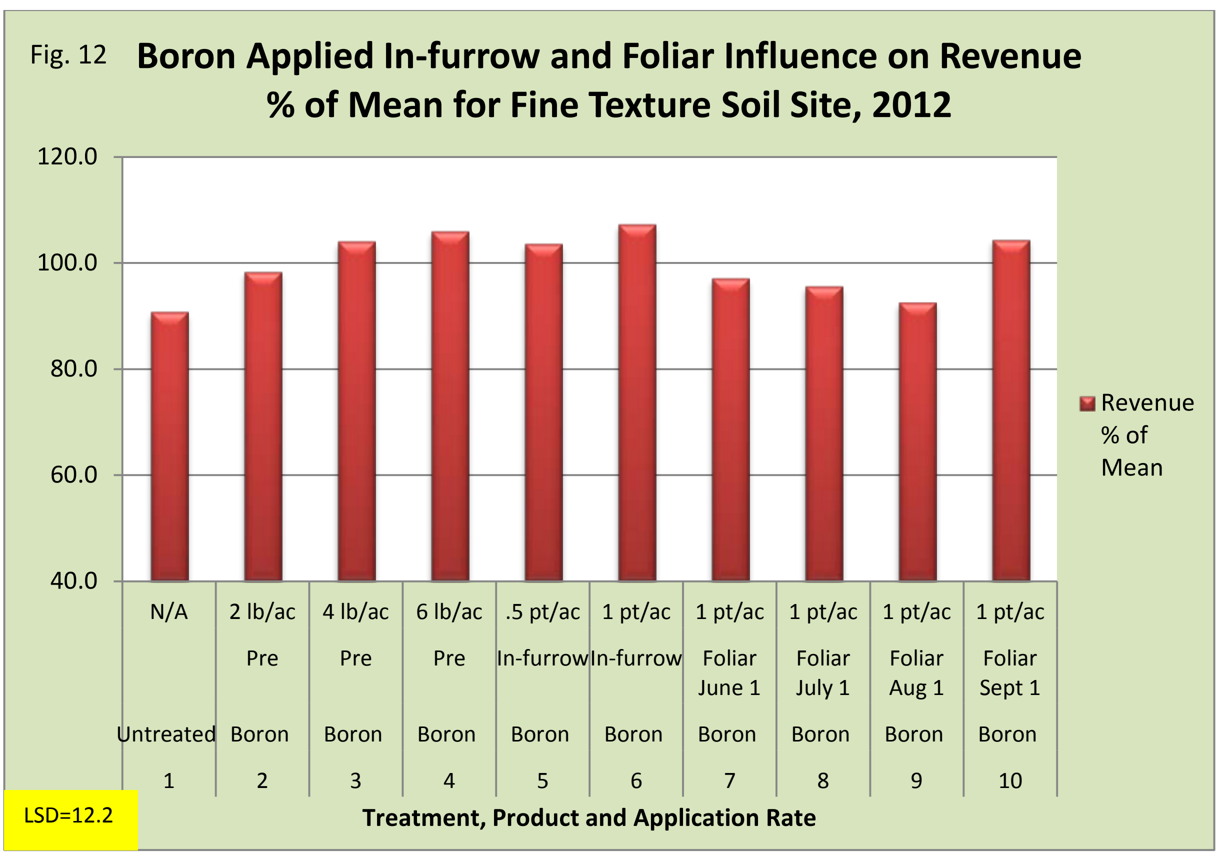


Fig. 12
Boron Applied In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site, 2012
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar
June 1
Boron
7
1 pt/ac
Foliar
July 1
Boron
8
1 pt/ac
Foliar
Aug 1
Boron
9
1 pt/ac
Foliar
Sept 1
Boron
10
LSD=12.2
Treatment, Product and Application Rate

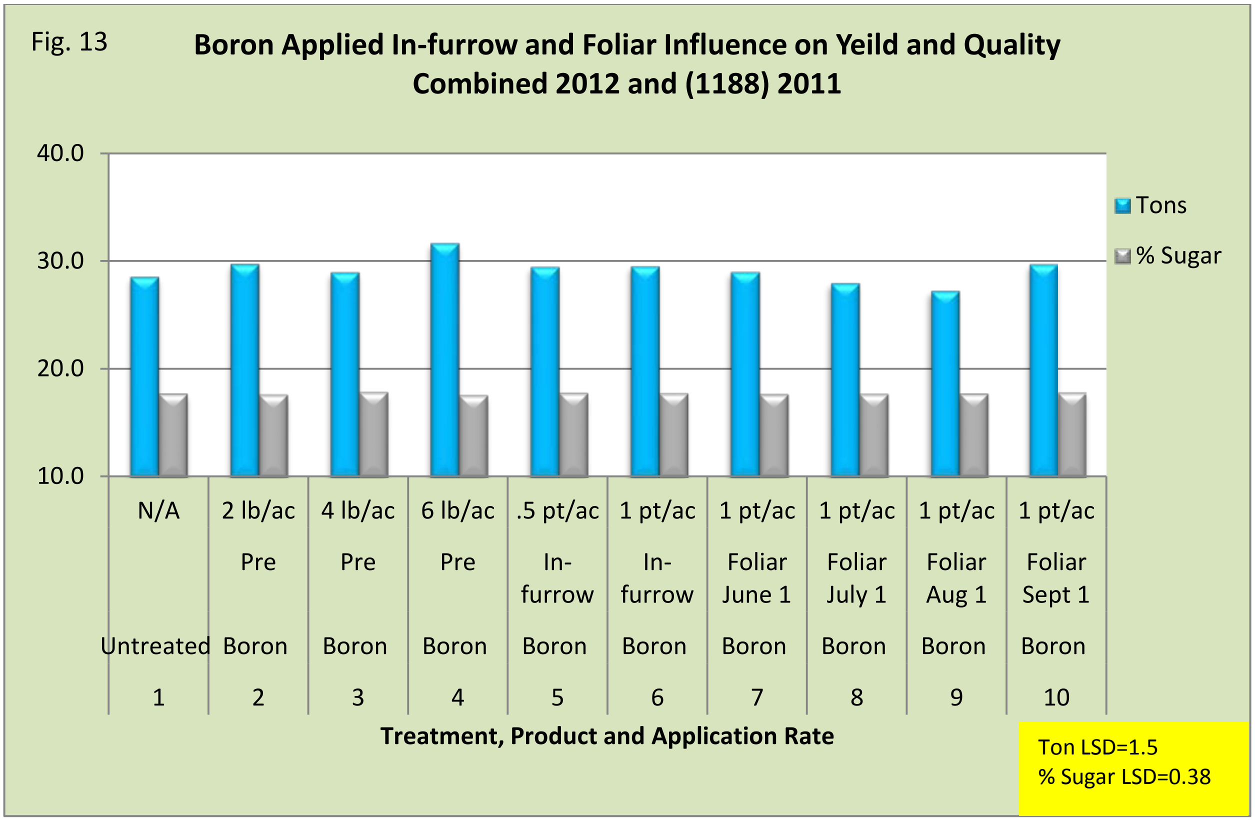


Fig. 13
Boron Applied In-furrow and Foliar Influence on Yeild and Quality
Combined 2012 and (1188) 2011
40.0
30.0
20.0
10.0
Tons
% Sugar
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and Application Rate
Ton LSD=1.5
% Sugar LSD=0.38

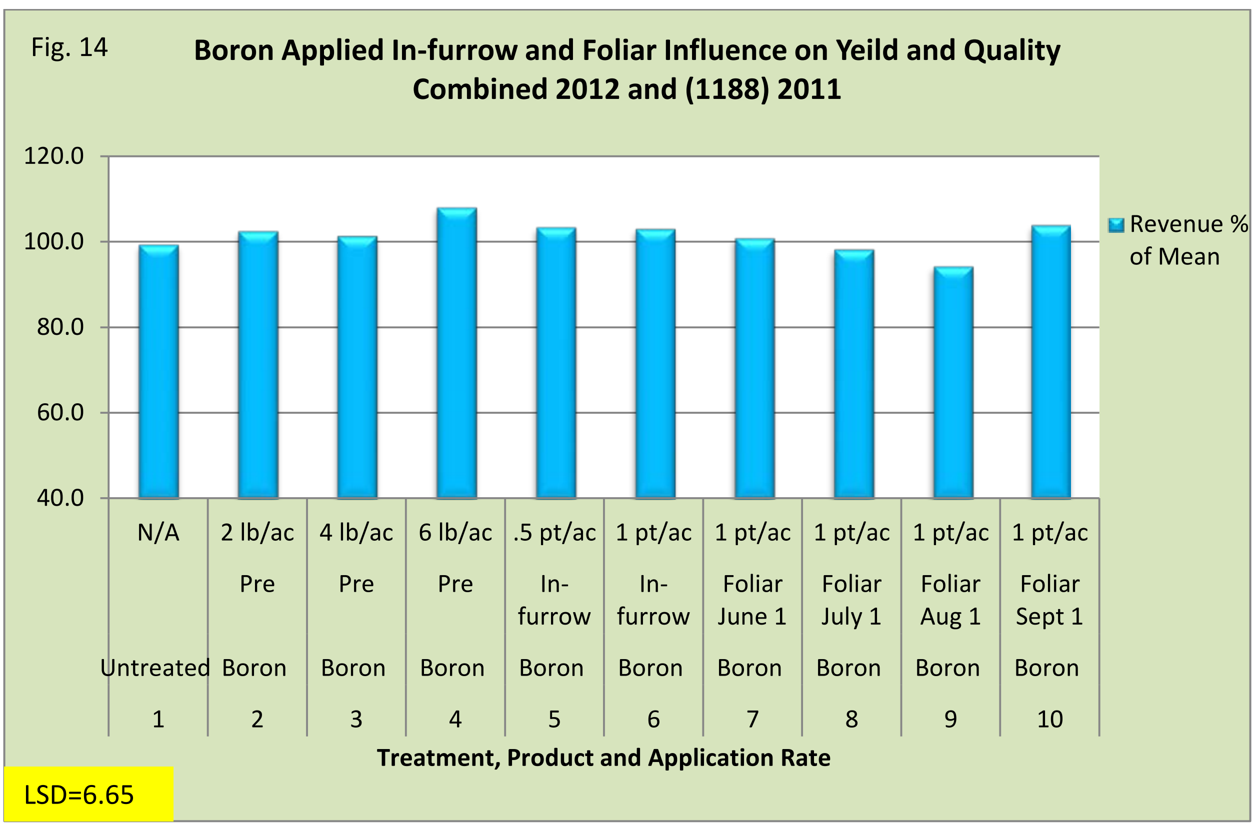


Fig. 14
Boron Applied In-furrow and Foliar Influence on Yeild and Quality
Combined 2012 and (1188) 2011
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
N/A
Untreated
1
2 lb/ac
Pre
Boron
2
4 lb/ac
Pre
Boron
3
6 lb/ac
Pre
Boron
4
.5 pt/ac
In-furrow
Boron
5
1 pt/ac
In-furrow
Boron
6
1 pt/ac
Foliar June 1
Boron
7
1 pt/ac
Foliar July 1
Boron
8
1 pt/ac
Foliar Aug 1
Boron
9
1 pt/ac
Foliar Sept 1
Boron
10
Treatment, Product and Application Rate
LSD=6.65

Results and Discussion:

When a soil test shows low boron, the addition of boron enhanced production. Where soil test shows boron is sufficient the addition of boron to enhance production is unpredictable. 2011 at Glenwood the 4 and 6 lb. incorporated and the July 1st foliar treatments had a significant advantage over other boron treatments (Table 2). All boron treatments at the Glenwood site showed a significant advantage over the untreated check. At Clara City there was no significant advantage to boron applications when comparing boron applications (Table 3). However, Boron applied broadcast at 6 lbs. per acre enhanced sugarbeet production significantly greater than the untreated check and tended to give higher sugarbeet production than other boron applications. At Bird Island all foliar and 2 lb. incorporated treatments showed a significant advantage over the non-treated check. The boron tested in 2011 showed a benefit that varied across research locations. Figures 1-6 are presented for the reader to have a visual perspective of the results. In 2012 at Appleton the 1 pt. /ac had a significant advantage over the check. Most of the advantage was contributed to purity. At Clara City the 4 and 6 lb. /ac pre-plant incorporated showed an advantage over the other treatments. Tons were the leading factor in that test. At Hector the 6 lb. /ac pre-plant incorporated showed a slight advantage in tons over the other treatments. The combined data shows 6 lbs. boron preplant incorporated had the greatest production advantage. Purity and sugar were both increased while tomes were unaffected. When boron is applied foliar, the late applications had an advantage over the earlier applications. Lime does not supply a significant amount of boron. 4 ton/ac will supply approximately 0.25 lbs. of boron.

SMBSC Evaluation of Manganese Influence on Sugarbeet Growth, 2011- 2012

Methods

Sugarbeets were planted at three locations in 2011 the locations were Glenwood, Clara City and Bird Island, MN in 2011 and Appleton, Clara City and Hector, MN in 2012, to test manganese application influence on sugarbeet production.

Table 1 shows the specifics of activities. Plots were 11 ft. (6 rows) wide and 35 feet long. In tables 2-7 manganese was incorporated prior to planting, in- furrow and then at the 1st of June, July, August and September. Sugarbeets were planted by SMBSC research with a 6 row planter at all locations. Plots were not thinned as the sugarbeet stands did not warrant thinning. Research trials were harvested at Glenwood, Bird Island and Hector with a 1 row research harvester and at Clara City and Appleton with a 2 row research harvester. At Glenwood, Bird Island and Hector 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. At Clara City and Appleton the weights were collected and weighed on the harvester for yield calculation and a subsample was analyzed in the SMBSC quality lab. Analysis of the data was conducted for homogeneity of combinability and determined that the data could not be combined across environments or locations.

Table 1. Site Specifics for Manganese Micronutrient Products Testing Combined, 2011-2012

Location	Planting Date	Soil Condition	Total N	P ppm	K ppm	Mn ppm
Glenwood, 2011	5/2/2011	Damp	95	8	127	3.4
Clara City, 2011	5/16/2011	Damp	66	10	293	1.8
Bird Island, 2011	5/19/2011	Damp	56	14	218	2.5
Clara City, 2012	4/23/2012	Damp	284	8	169	1.8
Appleton, 2012	4/23/2012	Dry	110	16	166	4.4
Hector, 2012	4/30/2012	Dry	113	30	207	2.2

TABLE 2. Micronutrient Product Testing for Manganese
Glenwood, 2011

Trt	Product	Application	Rate	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Suc Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			248	17.3	13.06	89.87	3701	100.06
2	Manganese	Broadcast incorporated	5 lb/ac	218	17.0	13.04	90.23	3653	99.05
3	Manganese	Broadcast incorporated	10 lb/ac	246	15.5	12.91	89.77	3290	87.30
4	Manganese	Broadcast incorporated	15 lb/ac	229	22.0	13.43	90.83	4928	**140.10**
5	Manganese (Mangrow)	In-furrow	3 lb/ac	243	15.2	13.18	90.01	3308	90.93
6	Manganese (Mangrow)	In-furrow	5 lb/ac	223	15.3	13.06	89.88	3277	88.35
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	223	15.6	12.71	89.38	3236	83.01
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	223	16.4	12.82	89.45	3425	89.71
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	229	19.8	13.58	90.55	4465	**127.38**
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	236	17.4	12.79	89.45	3628	94.13
		C.V		9	10.4	2.61	0.63	10	11.52
		LSD (0.05)		NS	2.6	0.49	0.82	553	16.72

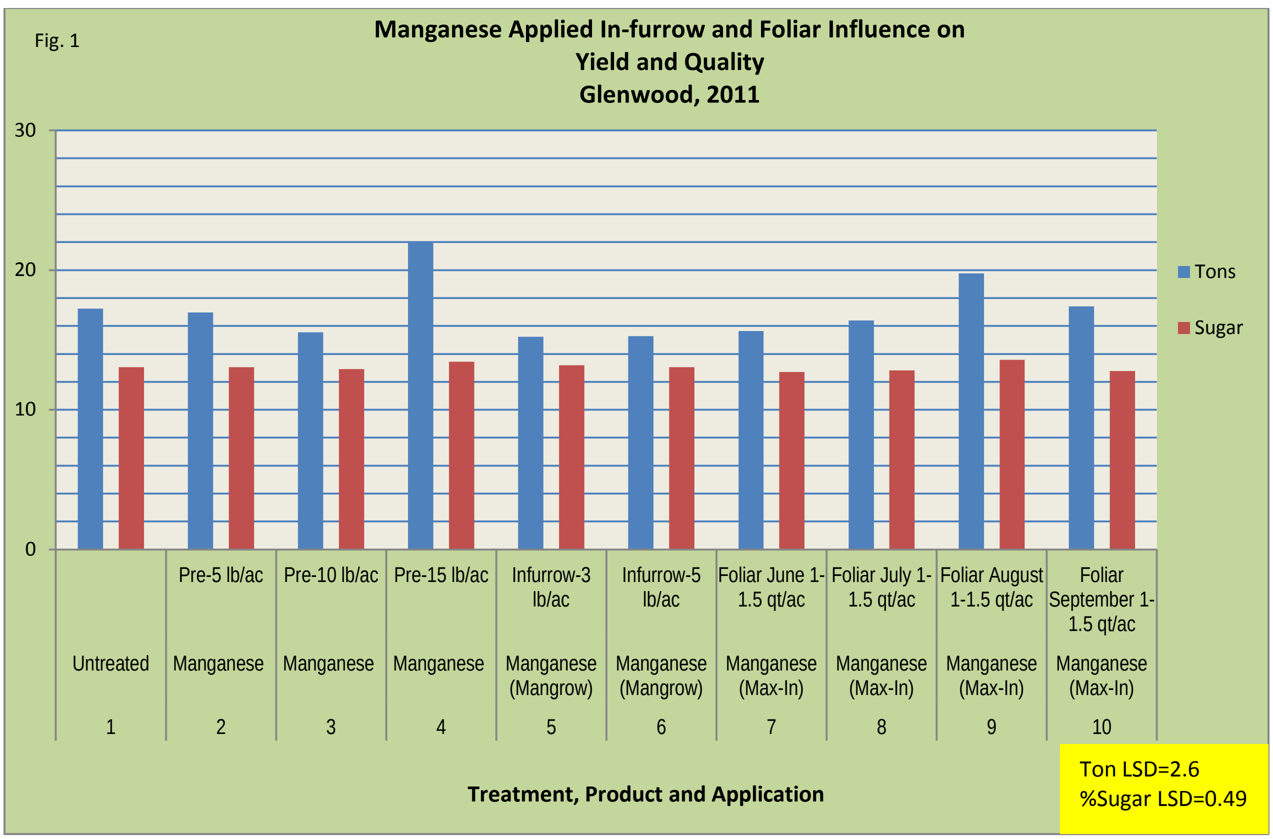
TABLE 3. Micronutrient Product Testing for Manganese
Clara City, 2011

Trt	Product	Application	Rate	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Suc Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			130	23.5	17.82	90.74	7093	104.24
2	Manganese	Broadcast incorporated	5 lb/ac	130	22.2	17.61	90.53	6616	96.12
3	Manganese	Broadcast incorporated	10 lb/ac	130	23.4	17.64	90.53	6978	101.91
4	Manganese	Broadcast incorporated	15 lb/ac	130	23.5	17.32	90.11	6839	97.78
5	Manganese (Mangrow)	In-furrow	3 lb/ac	133	24.7	16.91	90.47	7046	98.33
6	Manganese (Mangrow)	In-furrow	5 lb/ac	125	24.9	17.75	90.57	7473	109.09
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	130	23.9	17.52	90.40	7073	102.54
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	125	23.6	17.42	89.76	6879	98.28
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	135	23.0	17.35	90.57	6757	97.36
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	145	22.7	17.30	90.12	6594	94.34
		C.V		12	9.7	2.90	0.61	9	9.24
		LSD (0.05)		NS	NS	NS	NS	NS	NS

TABLE 4. Micronutrient Product Testing for Manganese
Bird Island, 2011

Trt	Product	Application	Rate	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Suc Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			128	17.8	14.59	89.04	4260	92.88
2	Manganese	Broadcast incorporated	5 lb/ac	146	17.9	14.72	89.99	4385	92.22
3	Manganese	Broadcast incorporated	10 lb/ac	140	18.4	15.03	90.06	4610	97.85
4	Manganese	Broadcast incorporated	15 lb/ac	135	19.0	15.00	90.12	4738	100.94
5	Manganese (Mangrow)	In-furrow	3 lb/ac	129	20.6	15.20	89.97	5202	112.02
6	Manganese (Mangrow)	In-furrow	5 lb/ac	133	21.2	14.84	89.83	5201	109.94
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	153	17.6	14.79	89.69	4309	89.08
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	146	18.4	15.04	90.02	4593	100.17
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	130	18.9	14.69	90.21	4629	96.83
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	116	19.8	15.21	89.94	5011	108.09
		C.V		29	15.4	3.25	0.82	15	15.54
		LSD (0.05)		NS	NS	NS	NS	NS	NS

Fig. 1



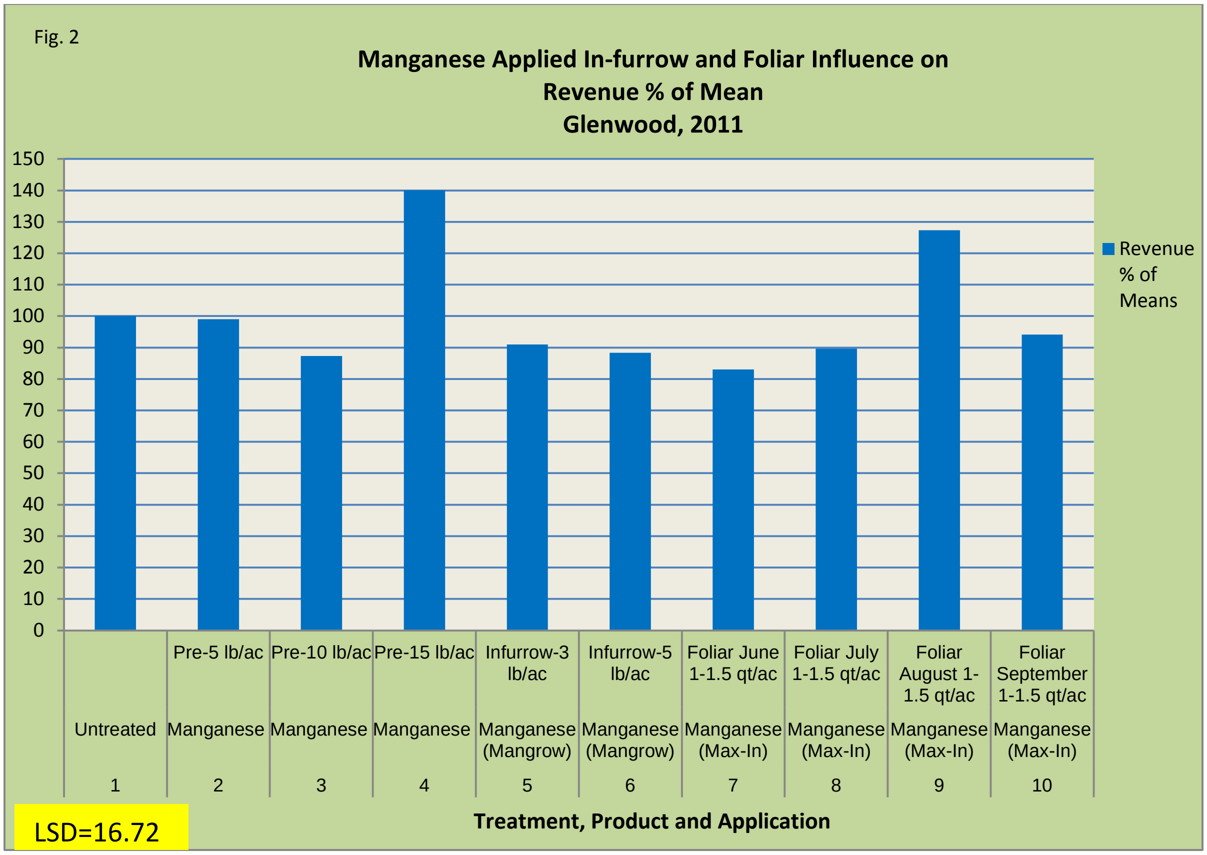


Fig. 2
Manganese Applied In-furrow and Foliar Influence on
Revenue % of Mean
Glenwood, 2011
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Revenue % of Means
Untreated
Pre-5 lb/ac
Pre-10 lb/ac
Pre-15 lb/ac
Infurrow-3 lb/ac
Infurrow-5 lb/ac
Foliar June 1-1.5 qt/ac
Foliar July 1-1.5 qt/ac
Foliar August 1-1.5 qt/ac
Foliar September 1-1.5 qt/ac
Manganese
Manganese (Mangrow)
Manganese (Max-In)
1
2
3
4
5
6
7
8
9
10
LSD=16.72
Treatment, Product and Application

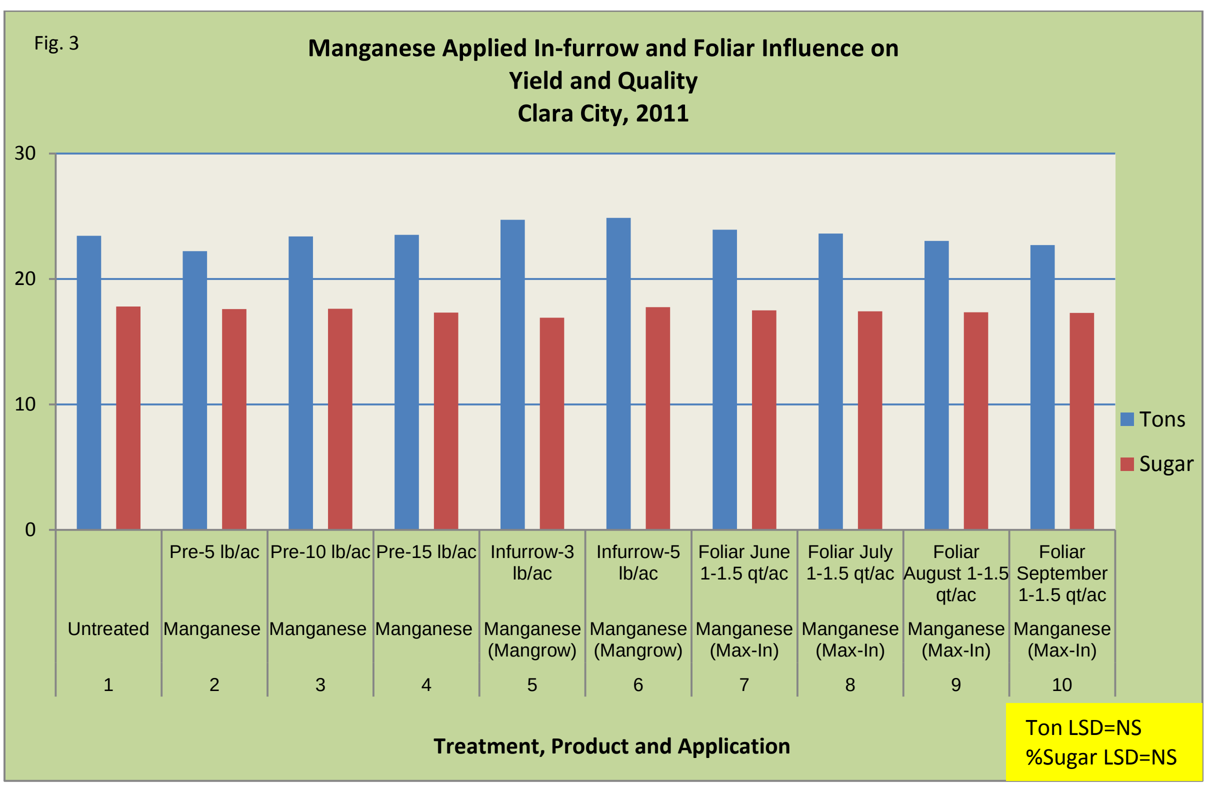


Fig. 3
Manganese Applied In-furrow and Foliar Influence on
Yield and Quality
Clara City, 2011
30
20
10
0
Tons
Sugar
Untreated
Pre-5 lb/ac
Pre-10 lb/ac
Pre-15 lb/ac
Infurrow-3 lb/ac
Infurrow-5 lb/ac
Foliar June 1-1.5 qt/ac
Foliar July 1-1.5 qt/ac
Foliar August 1-1.5 qt/ac
Foliar September 1-1.5 qt/ac
Manganese
Manganese (Mangrow)
Manganese (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application
Ton LSD=NS
%Sugar LSD=NS

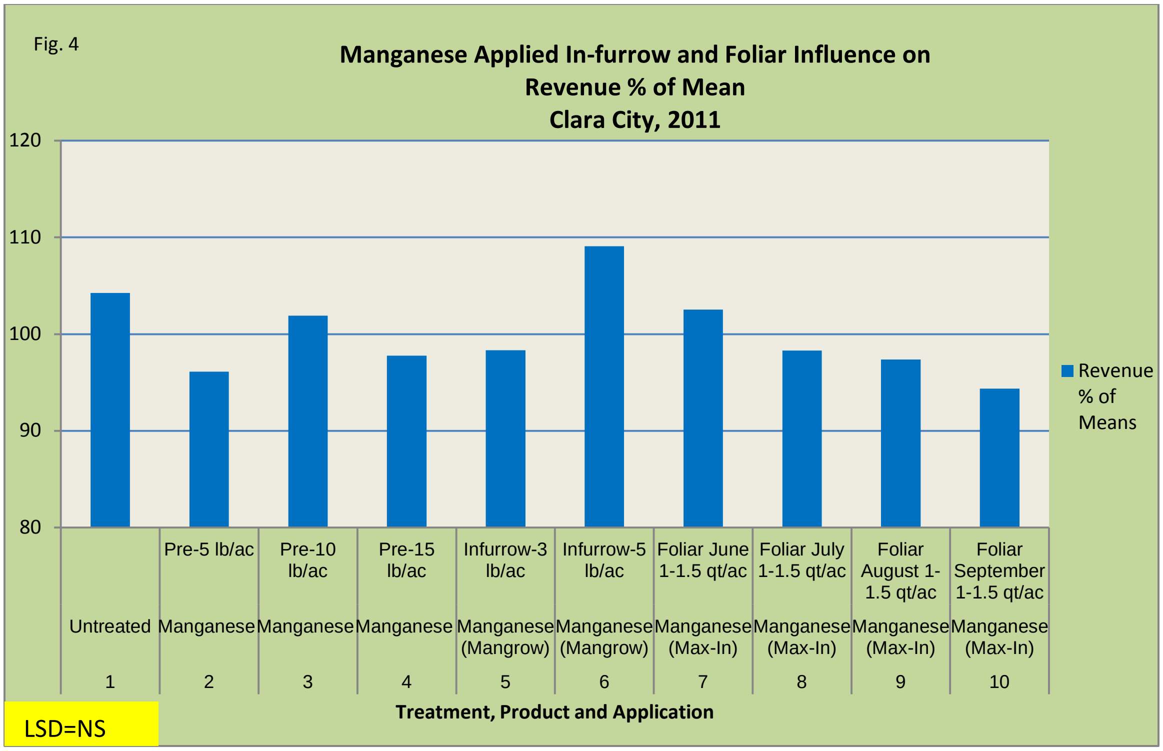


Fig. 4
Manganese Applied In-furrow and Foliar Influence on
Revenue % of Mean
Clara City, 2011
120
110
100
90
80
Revenue % of Means
Untreated
Pre-5 lb/ac Manganese
Pre-10 lb/ac Manganese
Pre-15 lb/ac Manganese
Infurrow-3 lb/ac Manganese (Mangrow)
Infurrow-5 lb/ac Manganese (Mangrow)
Foliar June 1-1.5 qt/ac Manganese (Max-In)
Foliar July 1-1.5 qt/ac Manganese (Max-In)
Foliar August 1-1.5 qt/ac Manganese (Max-In)
Foliar September 1-1.5 qt/ac Manganese (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application
LSD=NS

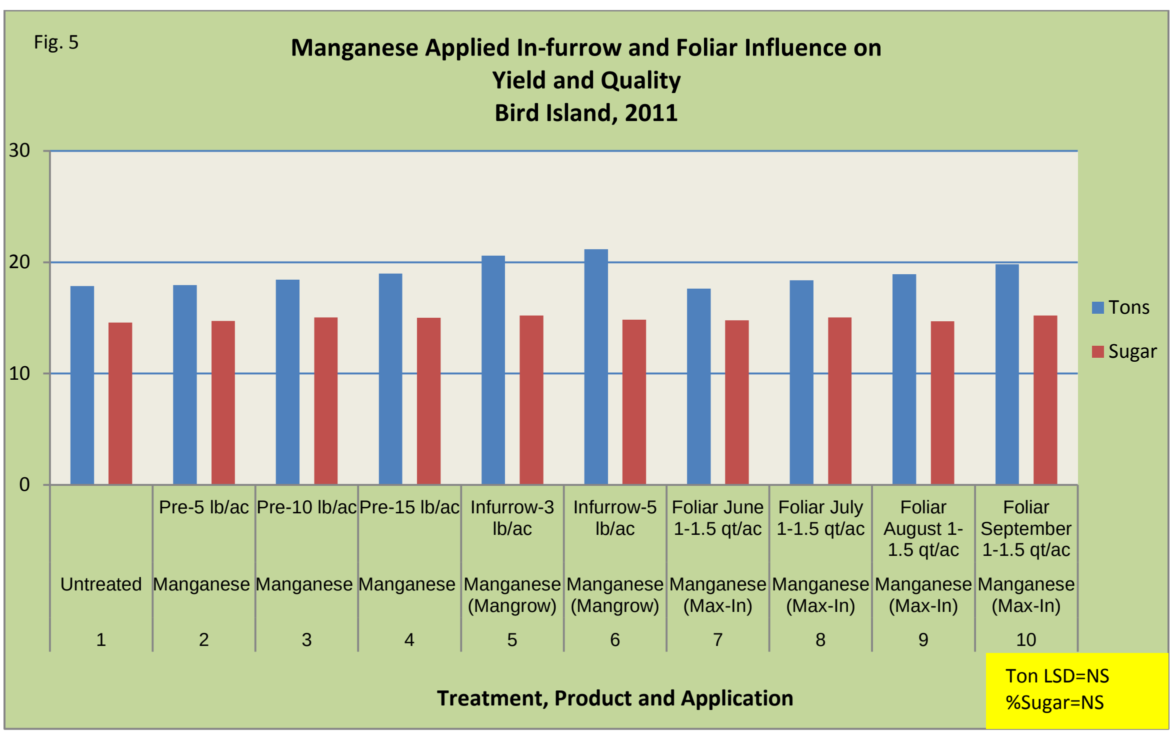


Fig. 5
Manganese Applied In-furrow and Foliar Influence on
Yield and Quality
Bird Island, 2011
30
20
10
0
Tons
Sugar
Untreated
Pre-5 lb/ac Manganese
Pre-10 lb/ac Manganese
Pre-15 lb/ac Manganese
Infurrow-3 lb/ac Manganese (Mangrow)
Infurrow-5 lb/ac Manganese (Mangrow)
Foliar June 1-1.5 qt/ac Manganese (Max-In)
Foliar July 1-1.5 qt/ac Manganese (Max-In)
Foliar August 1-1.5 qt/ac Manganese (Max-In)
Foliar September 1-1.5 qt/ac Manganese (Max-In)
1
2
3
4
5
6
7
8
9
10
Treatment, Product and Application
Ton LSD=NS
%Sugar=NS

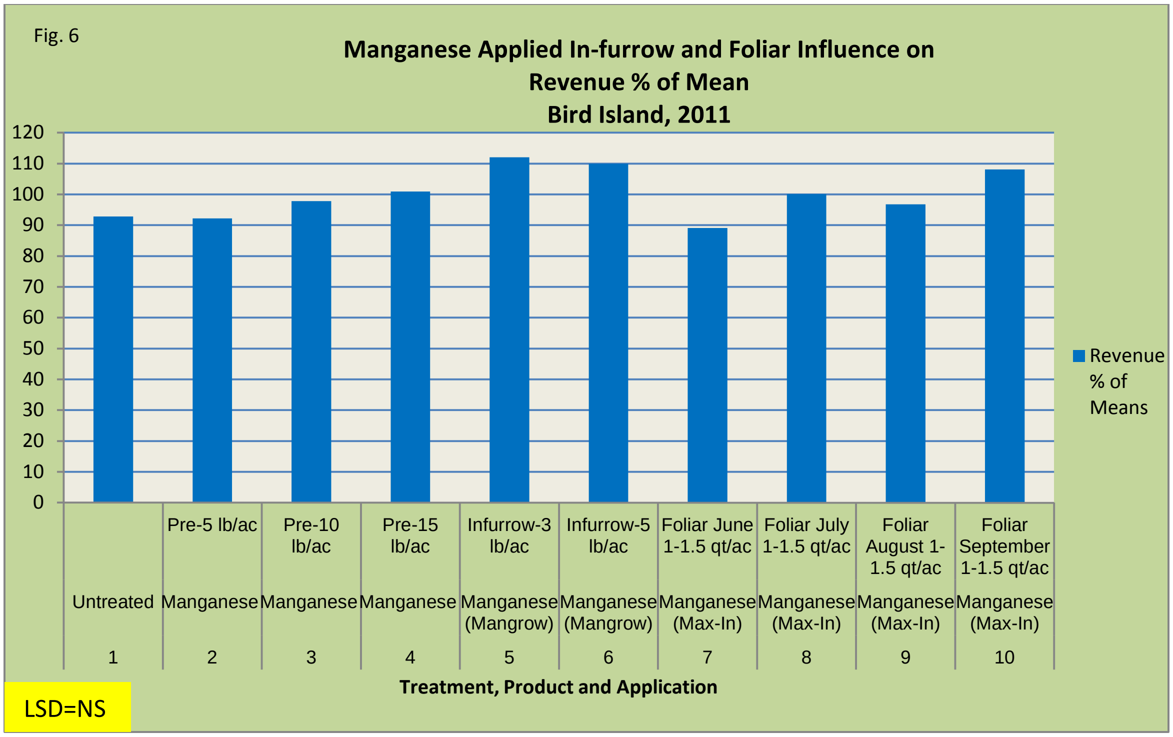


Table 5. Influence of Micronutrient Products with Manganese for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production for Course Texture Soil Site, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			30.7	17.06	89.20	8681	87.37
2	Manganese	Broadcast incorporated	5 lb/ac	35.9	17.98	89.91	10782	111.60
3	Manganese	Broadcast incorporated	10 lb/ac	39.1	17.65	89.39	11437	117.02
4	Manganese	Broadcast incorporated	15 lb/ac	38.7	17.45	90.03	11342	116.04
5	Manganese (Mangrow)	Infurrow	3 lb/ac	35.5	17.03	89.43	10025	100.88
6	Manganese (Mangrow)	Infurrow	5 lb/ac	36.8	17.32	89.83	10641	108.34
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	37.1	17.74	89.19	10902	111.77
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	38.2	16.94	89.86	10840	109.37
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	39.5	17.81	89.20	11675	119.95
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	39.4	17.46	89.85	11515	117.66
CV%				9.5	3.94	0.83	10	11.20
LSD (0.05)				5.1	1.00	1.08	1616	17.88

Table 6. Influence of Micronutrient Products with Manganese for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production for Fine Texture Soil Site, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			32.7	18.66	89.08	10130	98.24
2	Manganese	Broadcast incorporated	5 lb/ac	33.1	18.39	89.17	10090	97.20
3	Manganese	Broadcast incorporated	10 lb/ac	32.1	18.69	89.24	9984	96.94
4	Manganese	Broadcast incorporated	15 lb/ac	34.6	18.24	89.71	10571	101.88
5	Manganese (Mangrow)	Infurrow	3 lb/ac	34.3	18.13	89.46	10408	99.97
6	Manganese (Mangrow)	Infurrow	5 lb/ac	30.1	18.59	88.87	9234	89.19
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	32.7	18.90	89.83	10379	101.59
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	35.6	18.83	89.38	11221	109.47
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	31.1	19.81	90.35	10437	104.36
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	32.7	18.78	90.04	10350	101.16
CV%				**5.1**	**3.95**	**0.95**	**8**	**9.47**
LSD (0.05)				**2.4**	**1.07**	**1.23**	**1170**	**13.74**

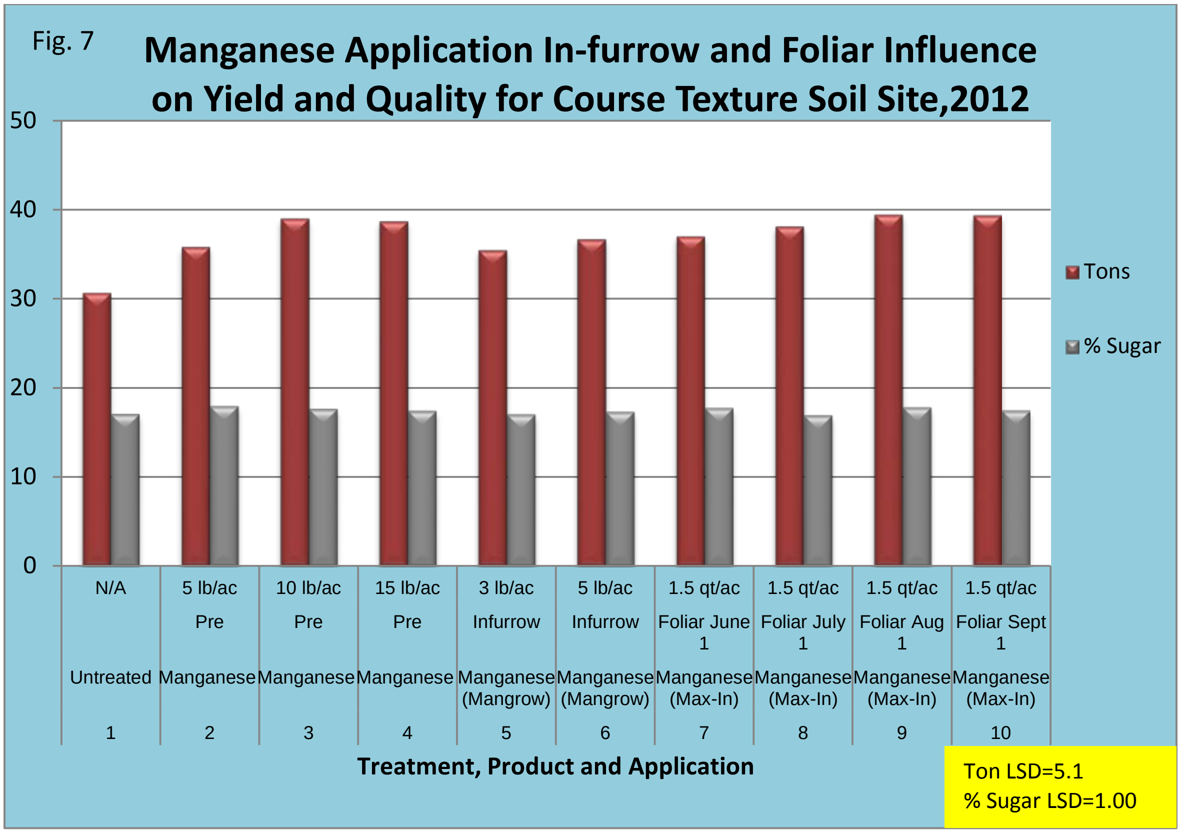
Table 7. Influence of Micronutrient Products with Manganese for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production for Fine Texture Soil Site, 2012

Trt No.	Product	Application	Product Rate	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			23.6	16.07	89.54	6281	95.01
2	Manganese	Broadcast incorporated	5 lb/ac	23.8	16.29	89.53	6425	97.90
3	Manganese	Broadcast incorporated	10 lb/ac	24.8	16.16	89.56	6625	100.33
4	Manganese	Broadcast incorporated	15 lb/ac	24.9	16.51	89.12	6769	103.49
5	Manganese (Mangrow)	Infurrow	3 lb/ac	26.9	16.62	89.95	7494	115.79
6	Manganese (Mangrow)	Infurrow	5 lb/ac	23.8	16.31	88.84	6357	96.25
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	22.6	15.99	88.69	5930	88.94
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	24.4	16.99	92.69	7282	116.28
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	25.1	16.35	89.26	6792	103.45
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	25.5	16.72	91.77	7326	115.02
CV%				**8.8**	**4.26**	**3.05**	**14**	**17.09**
LSD (0.05)				**3.1**	**1.01**	**3.98**	**1320**	**25.60**

Table 8. Influence of Micronutrient Products with Manganese for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Combined, (1282-1287) 2012

Trt No.	Product	Application	Product Rate	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated			104	27.2	16.57	89.37	7481	91.19
2	Manganese	Broadcast incorporated	5 lb/ac	106	29.8	17.13	89.72	8604	104.75
3	Manganese	Broadcast incorporated	10 lb/ac	95	31.9	16.90	89.47	9031	**108.67**
4	Manganese	Broadcast incorporated	15 lb/ac	100	31.8	16.98	89.58	9056	**109.77**
5	Manganese (Mangrow)	Infurrow	3 lb/ac	76	31.2	16.83	89.69	8759	**108.34**
6	Manganese (Mangrow)	Infurrow	5 lb/ac	80	30.3	16.81	89.33	8499	102.30
7	Manganese (Max-In)	Foliar June 1	1.5 qt/ac	105	29.8	16.87	88.94	8416	100.36
8	Manganese (Max-In)	Foliar July 1	1.5 qt/ac	103	31.3	16.97	91.28	9061	**112.82**
9	Manganese (Max-In)	Foliar August 1	1.5 qt/ac	107	32.3	17.08	89.23	9234	**111.70**
10	Manganese (Max-In)	Foliar September 1	1.5 qt/ac	111	32.4	17.09	90.81	9420	**116.34**
CV%				**19**	**9.9**	**4.52**	**2.15**	**10**	**12.43**
LSD (0.05)				**19**	**3.2**	**0.79**	**1.99**	**932**	**13.68**

Fig. 7



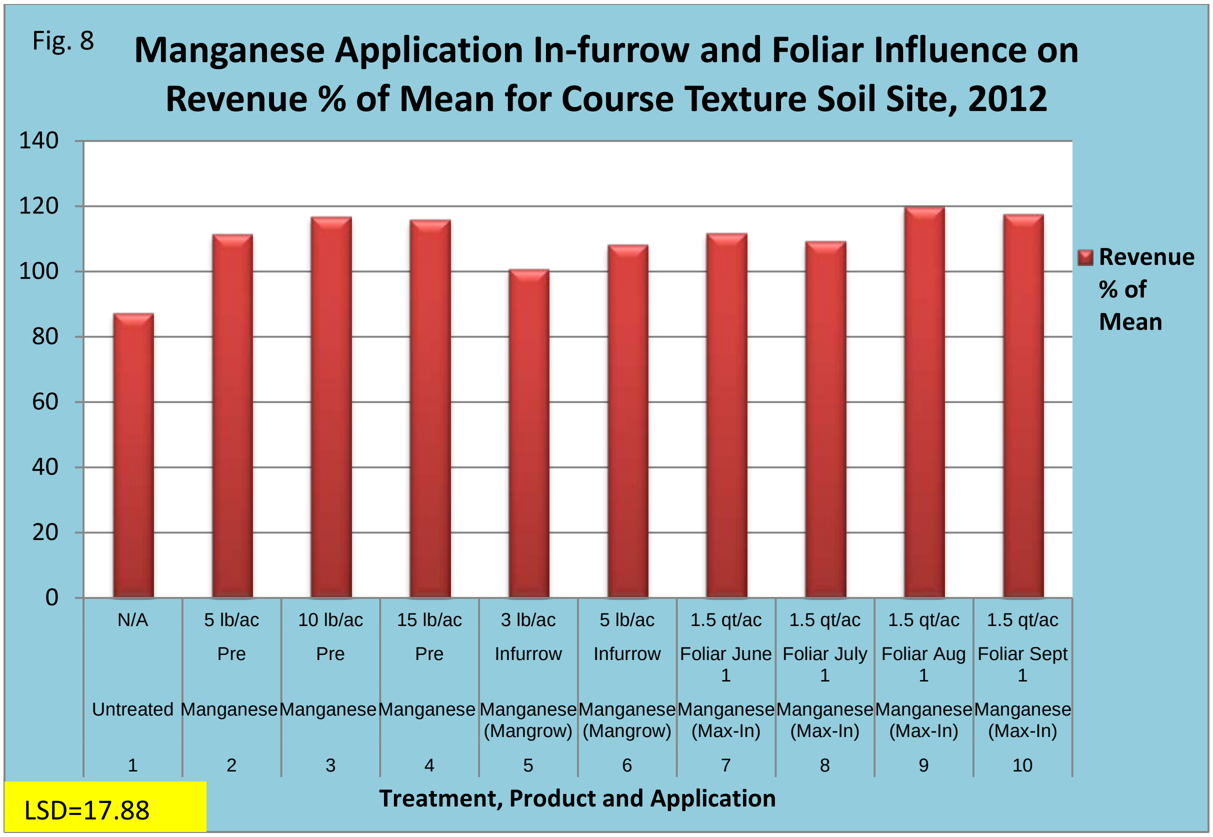


Fig. 8
Manganese Application In-furrow and Foliar Influence on Revenue % of Mean for Course Texture Soil Site, 2012
140
120
100
80
60
40
20
0
Revenue % of Mean
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
Treatment, Product and Application
LSD=17.88

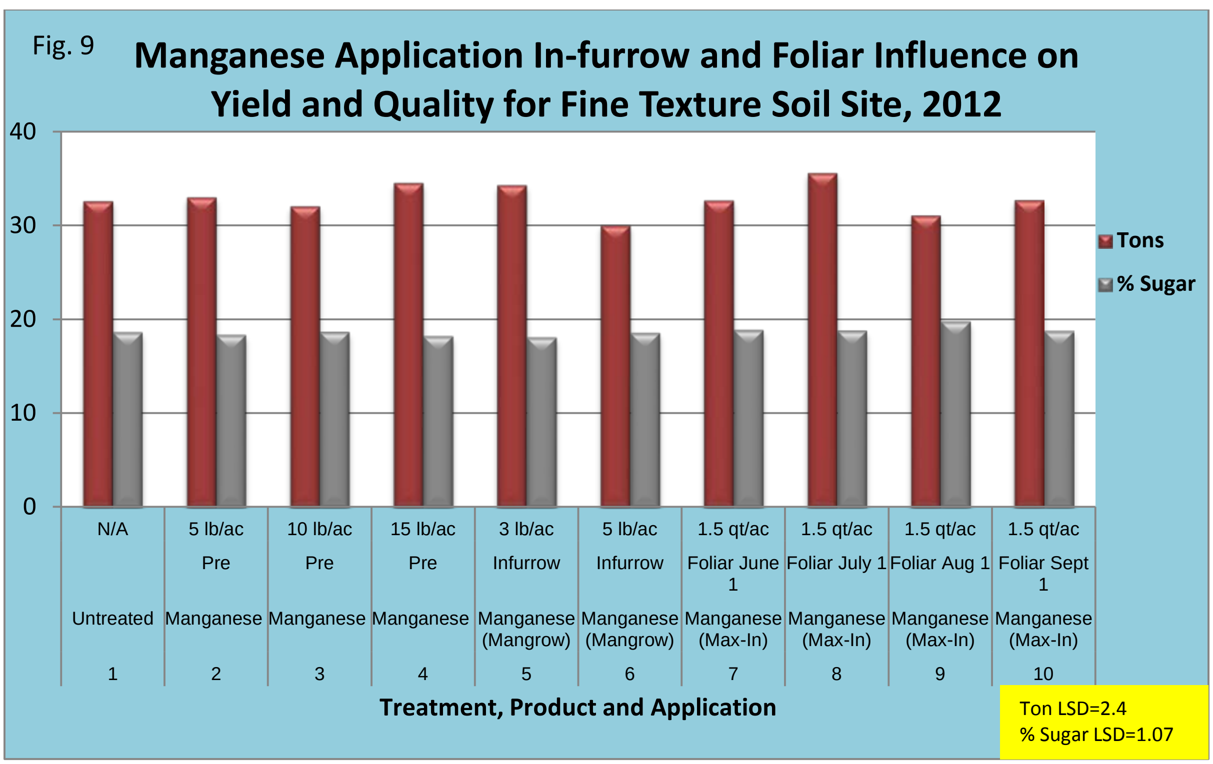


Fig. 9
Manganese Application In-furrow and Foliar Influence on Yield and Quality for Fine Texture Soil Site, 2012
40
30
20
10
0
Tons
% Sugar
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
Treatment, Product and Application
Ton LSD=2.4
% Sugar LSD=1.07

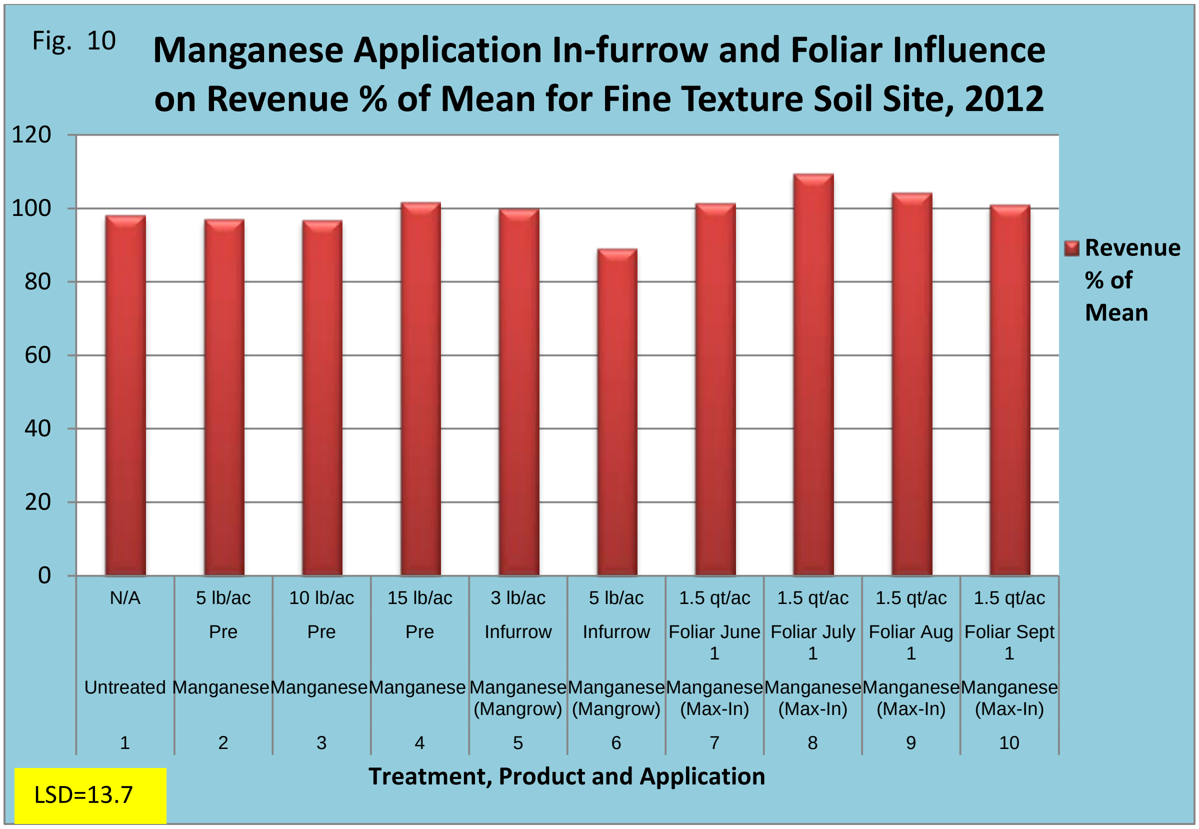


Fig. 10
Manganese Application In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site, 2012
120
100
80
60
40
20
0
Revenue % of Mean
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
Treatment, Product and Application
LSD=13.7

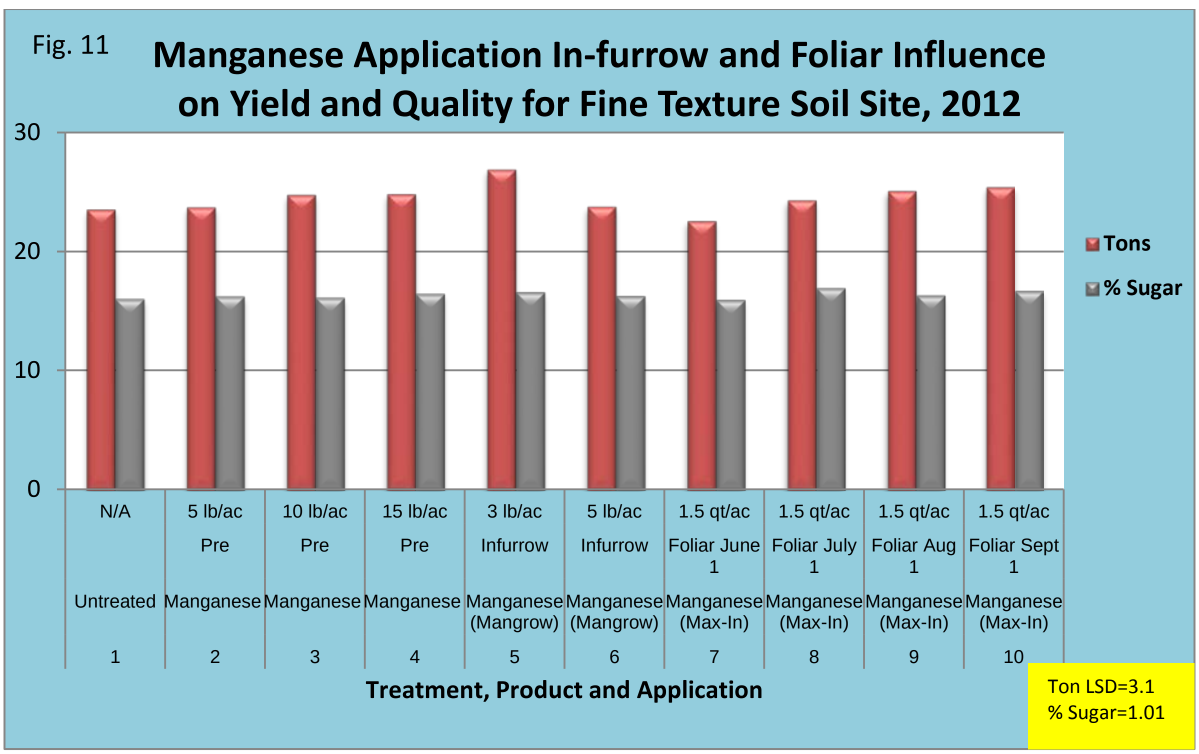


Fig. 11
Manganese Application In-furrow and Foliar Influence on Yield and Quality for Fine Texture Soil Site, 2012
30
20
10
0
Tons
% Sugar
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
Treatment, Product and Application
Ton LSD=3.1
% Sugar=1.01

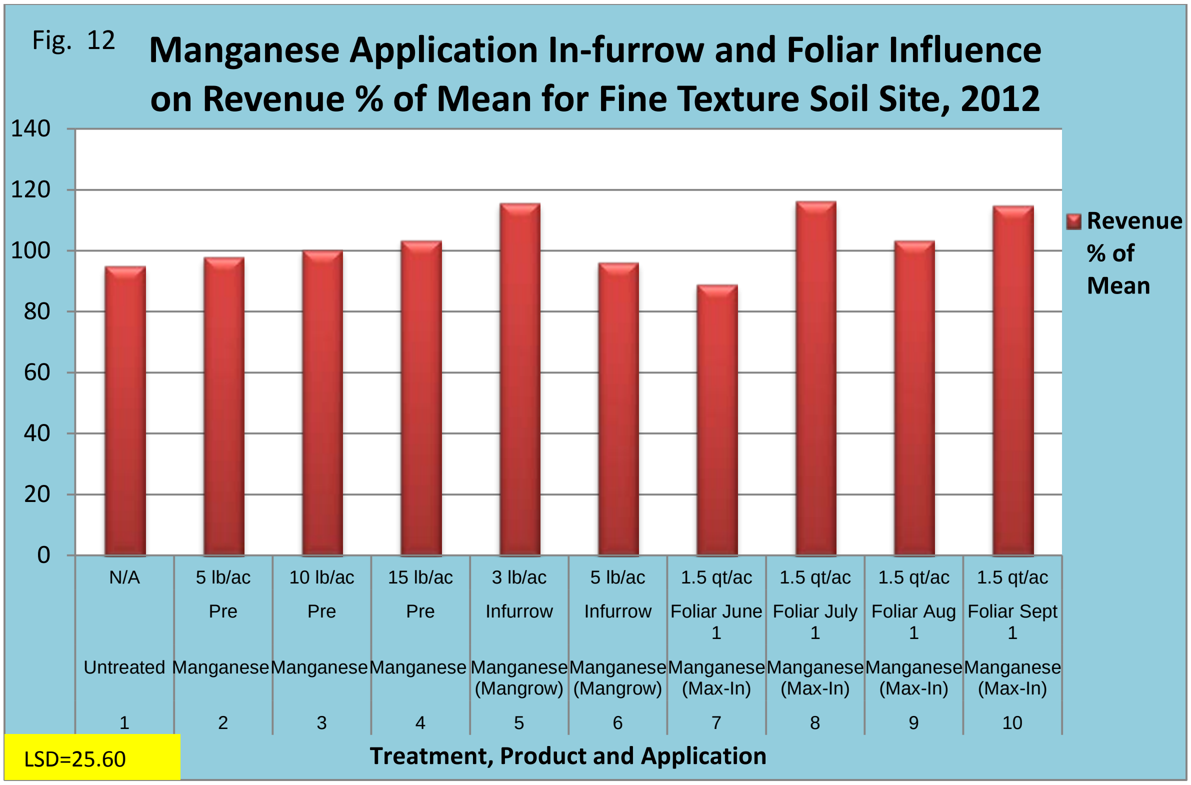


Fig. 12
Manganese Application In-furrow and Foliar Influence on Revenue % of Mean for Fine Texture Soil Site, 2012
140
120
100
80
60
40
20
0
Revenue % of Mean
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
LSD=25.60
Treatment, Product and Application

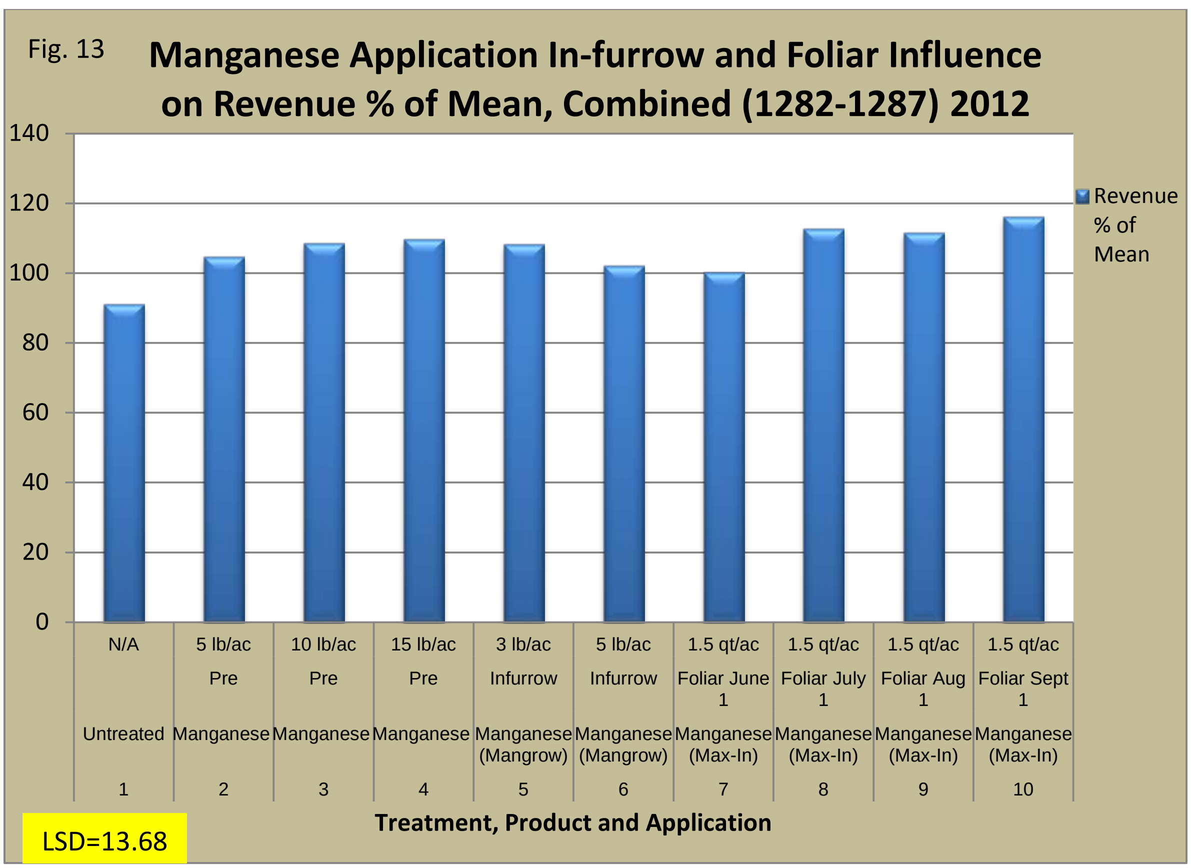


Fig. 13
Manganese Application In-furrow and Foliar Influence on Revenue % of Mean, Combined (1282-1287) 2012
140
120
100
80
60
40
20
0
Revenue % of Mean
N/A
Untreated
1
5 lb/ac
Pre
Manganese
2
10 lb/ac
Pre
Manganese
3
15 lb/ac
Pre
Manganese
4
3 lb/ac
Infurrow
Manganese (Mangrow)
5
5 lb/ac
Infurrow
Manganese (Mangrow)
6
1.5 qt/ac
Foliar June 1
Manganese (Max-In)
7
1.5 qt/ac
Foliar July 1
Manganese (Max-In)
8
1.5 qt/ac
Foliar Aug 1
Manganese (Max-In)
9
1.5 qt/ac
Foliar Sept 1
Manganese (Max-In)
10
LSD=13.68
Treatment, Product and Application

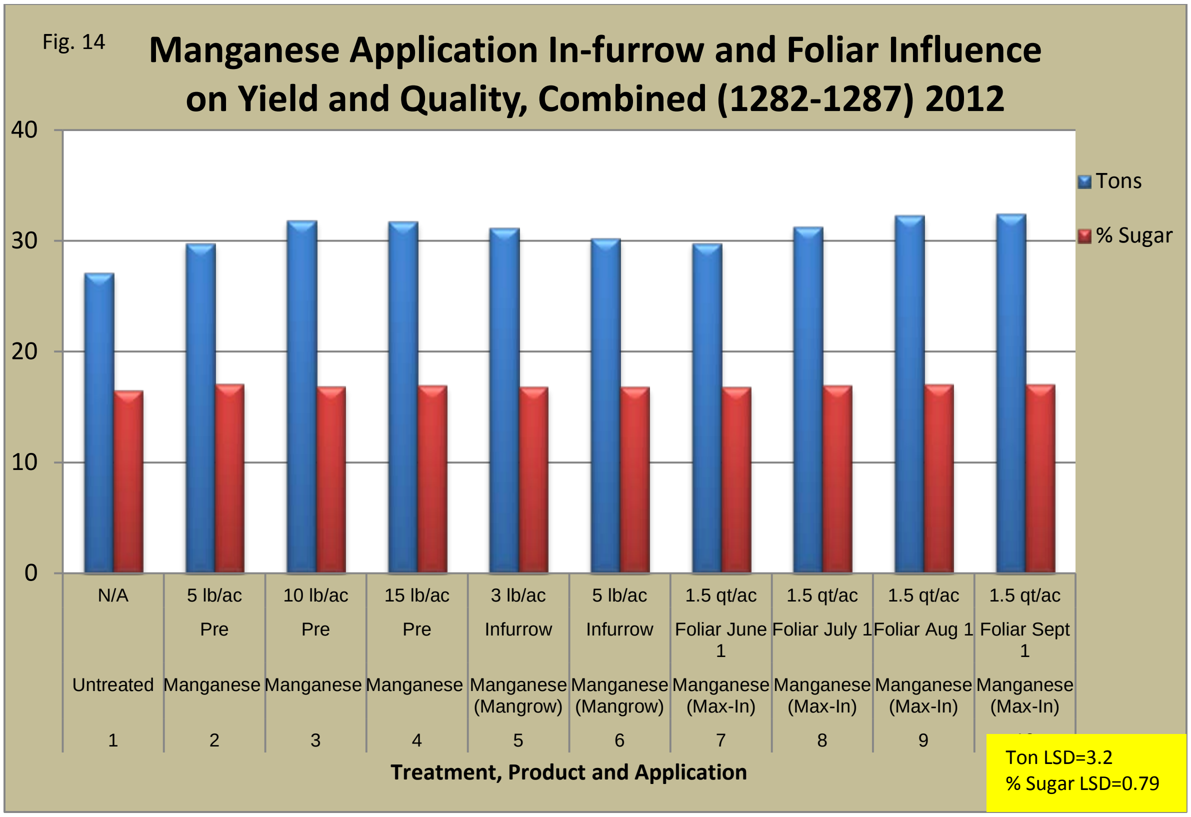


Fig. 14 Manganese Application In-furrow and Foliar Influence on Yield and Quality, Combined (1282-1287) 2012

Results and Discussion

In 2011 at the Clara City and Bird Island locations sugarbeet yield and quality were not influenced by the soil incorporated or foliar applied manganese treatments. Manganese applications at the Glenwood location influenced the yield and quality at the 15 lb. /acre broadcast incorporated rate and the August 1st foliar application in 2012 at Appleton all manganese treatments performed better than the untreated. The increase was in tons per acre. The sugar and purity were not affected. At Clara City none of the treatments were significant, However, the foliar treatments showed an improvement over the incorporated and infurrow treatments. At Hector there was no significance in any treatment. When all locations were combined for the 2012 tests the 10 and 15 lb. pre-plant incorporated, the 3 lb. Infurrow treatments and all foliar treatments with the exception of June 1st were significantly better than the untreated. These data indicate that the addition of manganese may be advantageous to sugarbeet production on sandy soils and not advantageous in heavy soils. However, there were tendencies for the manganese to influence the tons per acre at the heavier textured soil sites. The difference in how the manganese influenced sugarbeet production at the sites with different soil characteristics indicates that there might be a tie up of the manganese in the heavier soil. The inability of the foliar applications to enhance production could be due to the inability of the sugarbeet plant to properly absorb and translocate the manganese in a Round-up ready variety. Testing will be replicated in 2012.

SMBSC Evaluation of Fungicides Programs for Control of Cercospora Leaf Spot in Sugarbeets, 2012

The use of fungicides for control of cercospora leaf spot in sugarbeets is an ongoing researchable production practice. The ongoing concern of resistance has enhanced the need to consider the efficacy of multiple fungicidal modes of action within a Cercospora leaf spot control program. The research has been the basis for fungicide recommendations for cercospora leaf spot control. The past recommendations have emphasized the rotation of alternate modes of action, 3 applications or more per season and more recently the inclusion of multiple modes of action to manage resistance,

Objectives

The objectives of this test were to evaluate fungicide for control of Cercospora leaf spot using fungicide programs 0f multiple modes of action. The test measures both the efficacy and the influence on sugarbeet production.

Methods

Table 1 shows the specifics of activities conducted at the test site in 2012. Plots were 11 ft. (6 rows) wide and 25 ft. long. The tests were replicated 4 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 15th 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 cercospora leaf spot control evaluations and sugarbeet production data are included in tables 2 and 3, respectively. The EthylBisDiCarbmate application is generalized as an EBDC since all past research would indicate there was no difference in EBDC products.

Results and Discussion

Cercospora leaf spot rating taken on 8/6/2013, 8/13/2013 and 8/22/2013 were not significantly different when comparing all treatments. The dry conditions during the latter part of the 2013 summer influenced the rate of development of Cercospora leaf spot. Cercospora leaf spot control evaluated on 9/13/2013 showed that the untreated check gave significant higher cercospora leaf spot (Table 2) and significantly lower sugarbeet production compared to all other treatments. This indicates the development of cercospora leaf spot can progress at a rapid rate and the effect of Cercospora leaf spot on sugarbeet production can be drastic in a short period of time. This emphasizes the importance of fungicide programs and continuing that spray program even in relatively dry conditions. Cercospora leaf spot has shown to develop with dew alone and light intermittent precipitation events. Separation in treatment did occur in cercospora leaf spot control by fungicide programs. Fungicide program with Cercospora leaf spot control on 8/13/2013 grouped less than KWS rating of 3 were populated by applications with 4 and 5 applications.

Tons per acre were high at this site with even the untreated check giving 29.4 tons per acre although the untreated check was significantly lower than all other treatments. The influence of fungicide programs on sugar percent and purity was variable in reference to fungicide application with similarity. The end result tons per acre, sugar percent and purity on sugar production per acre and revenue showed that only treatment 22 was statistically similar to the untreated check. Treatment 11, 25 and 27 gave sugar per acre greater than 13,000 lbs. per acre and 113.01, 116.57 and 115.89 percent of the mean, respectively. Treatment 25, which gave the highest revenue as a percent of the mean (although not significantly greater than all other treatments) was the SMBSC recommended treatment including a triazole with an EBDC product, Supertin and strobilurin with an EBDC product in the first, second and third application, respectively.

Table 1. Site Specifics for Cercospora Leaf Spot Program Testing Clara City, 2012

DATE	PLANTED	SPACING	SOIL	SPRAYED	PRODUCT	RATE	WEATHER
4/26/2012	X	4.5"	Dry		10-34-0	3 GPA	
5/15/2012				**X**	Roundup PowerMax	32 oz.	63' Sunny S-3
					Quadris	14 oz.	
6/12/2012				**X**	Roundup PowerMax	32 oz.	65' Sunny NW-5
6/27/2012				**Innoculated**			90' Humid
6/28/2012					Pre-Canopy		75' Sunny Calm
7/5/2012				**Innoculated**			95' Humid
7/11/2012				**X**	1st Application		
7/26/2012				**X**	2nd Application		
8/7/2012				**X**	3rd Application		85' Sunny Calm
8/22/2012				**X**	4th Application		

Table. 2 Fungicides Applied Influence on Control of Cercospora Leaf Spot Program Cercospora Ratings, Clara City 2012

Trt No.	Product	Rate oz./Acre	Interval Days/ Spray	8/6/12RR Rating Avg	8/13/22RR Rating Avg	8/22/22RR Rating Avg	9/13/22RR Rating Avg
1	UNTREATED CHECK		14	4.3	4.3	6.1	7.4
2	PROLINE SC +PREFERENCE	5oz /A+0.125% V/V	first appl.	1.0	1.7	1.7	3.9
	SUPER-TIN 4L	8 oz/A	14				
	GEM 500 SC	3.5oz/A	14				
3	PROLINCE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	1.1	1.6	1.8	3.9
	SUPER-TIN 4L	8 oz/A	14				
	HEADLINE	7oz /A	14				
4	PROLINE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	1.0	1.7	1.7	3.9
	SUPER-TIN 4L	8oz/A	14				
	PRIAXOR	6.5 oz /A	14				
5	EMINENT	13 oz/A	first appl.	1.0	1.8	1.6	3.7
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
6	EMINENT + TOPSIN	13oz/A + 10 oz/A	first appl.	1.0	2.2	1.4	3.2
	SUPER-TIN 4L	8 oz/A	14				
	HEADLINE	7oz /A	14				
7	EMINENT+SUPERTIN	13 oz/A + 8 oz/A	first appl.	1.0	1.5	1.2	2.6
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
	HEADLINE	9.2 oz/A	14				
8	Inspire XT	7 oz./A	first appl.	1.1	1.8	1.3	3.0
	Supertin 4L	8 oz/A	14				
	Headline	9.2 oz/A	14				
9	EMINENT+SUPERTIN	13 oz/A + 8 oz/A		1.0	1.3	1.3	3.0
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
10	PROLINE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	1.1	1.9	1.7	3.7
	SUPER-TIN 4L	8oz/A	14				
	PRIAXOR+AG850	6.5 oz /A	14				
11	EMINENT	13oz/A + 10 oz/A	first appl.	1.0	1.6	1.3	2.9
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
	HEADLINE	9.2 oz /A	14				
12	SUPER TIN 4L	8oz/A	first appl.	1.1	1.5	1.2	2.7
	PROLINCE SC+ INDUCE XL	5oz /A+0.125% V/V	first appl.				
	SUPER-TIN 4L	8oz/A	14				
	HEADLINE	9.2 oz/A	14				
13	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	first appl.	1.0	1.6	1.3	2.8
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
	SUPER TIN 4L	8 oz/A	14				
14	EMINENT + TOPSIN	13oz/A + 10 oz/A	first appl.	1.1	1.4	1.5	3.3
	HEADLINE	9.2 oz/A	14				
	SUPER TIN 4L	8oz/A	14				
15	EMINENT	13 oz/A	first appl.	1.0	1.6	1.4	3.2
	SUPER TIN 4L	8 oz/A	as needed				
	HEADLINE	9.2 oz/A	as needed				
	CV%			29	19	17	15
	LSD (0.05)			NS	NS	NS	1

Table. 2 (Continued) Fungicides Applied Influence on Control of Cercospora Leaf Spot Program Cercospora Ratings, Clara City 2012

Trt No.	Product	Rate oz./Acre	Interval Days/ Spray	8/6/12RR Rating Avg	8/13/22RR Rating Avg	8/22/22RR Rating Avg	9/13/22RR Rating Avg
16	EMINENT+SUPERTIN 4L	13 oz/A + 8 oz/A	first appl.	1.1	1.3	1.5	3.3
	HEADLINE	9.2 oz/A	14				
	SUPER TIN 4L	8oz/A	14				
17	EMINENT+SUPERTIN 4L	13 oz/A + 8 oz/A	first appl.	1.0	1.2	1.4	3.2
	HEADLINE	9.2 oz/A	14				
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
18	ECHO 720 + EMINENET	16oz/A + 13oz/A	first appl.	1.0	1.4	1.8	4.1
	ECHO 720	16oz/A					
	HEADLINE	9.2 oz/A	14				
19	ECHO 720 + EMINENET	24oz/A + 13oz/A	first appl.	1.0	1.4	1.7	3.7
	ECHO 720	16oz/A					
	HEADLINE	9.2 oz/A	14				
20	ECHO 720 + EMINENET	16oz/A + 13oz/A	first appl.	1.0	1.3	1.7	3.9
	ECHO 720+ Topsin	16oz/A +10oz/A					
	HEADLINE	9.2 oz/A	14				
21	SA-0040302	32oz/A	first appl.	1.1	1.5	1.3	2.9
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
	SUPER TIN 4L	8oz/A	14				
22	SA-0040401	14oz/A	first appl.	1.0	1.4	2.2	5.0
	SUPER TIN 4L	8oz/A	14				
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
23	SA-0040401	17oz/A	first appl.	1.0	1.5	1.7	3.9
	SUPER TIN 4L	8oz/A	14				
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14				
24	SA-0040501	22oz/A	first appl.	1.1	1.5	1.9	4.2
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
25	PROLINCE SC+ PREFERENCE+EBDC	7 oz./A+2lbs	first appl.	1.0	1.6	1.4	3.1
	Supertin	5 oz/A	14				
	Headline+EBDC	9.2 oz/A+2lbs	14				
26	PROLINCE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	1.1	1.5	1.9	4.2
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
	VERTISAN	16 oz/A	14				
27	PROLINE SC+PREFERENCE+EBDC	oz /A+0.125% V/V+2lb	first appl.	1.1	1.7	1.3	2.9
	SUPER TIN 4L+TOPSIN	8 oz/A+10oz/A	14				
	HEADLINE+EBDC	9.2 oz/A+2lbs	14				
	SUPER TIN 4L	8 oz/A	14				
28	PROLINCE SC+PREFERENCE+EBDC	oz /A+0.125% V/V+2lb	first appl.	1.0	1.7	2.0	4.4
	SUPER TIN 4L+TOPSIN	8 oz/A+10oz/A	14				
	HEADLINE+EBDC	9.2 oz/A+2lbs	14				
	VERTISAN	16 oz/A	14				
29	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	pre canopy	1.0	1.6	1.4	3.0
	SUPER TIN 4L	8 oz/A	first appl.				
	GEM 500 SC	3.5oz/A	14				
	SUPER TIN 4L	8 oz/A	14				
	HEADLINE	9.2 oz/A	14				
30	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	pre canopy	1.0	1.6	1.3	2.9
	SUPER TIN 4L	8 oz/A	first appl.				
	GEM 500 SC	3.5oz/A	14				
	SUPER TIN 4L	8 oz/A	14				
	VERTISAN	16 oz/A	14				
	CV%			29	19	17	15
	LSD (0.05)			NS	NS	NS	1

Table. 3 Fungicides Applied Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality Production in Sugarbeets, Clara City 2012

Trt No.	Product	Rate oz./Acre	Interval Days/ Spray	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	UNTREATED CHECK		14	29.4	16.41	88.93	7877	65.34
2	PROLINE SC +PREFERENCE	5oz /A+0.125% V/V	first appl.	41.3	17.28	90.32	11939	102.73
	SUPER-TIN 4L	8 oz/A	14					
	GEM 500 SC	3.5oz/A	14					
3	PROLINCE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	38.3	17.53	90.65	11382	99.12
	SUPER-TIN 4L	8 oz/A	14					
	HEADLINE	7oz /A	14					
4	PROLINE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	41.0	17.90	90.88	12457	109.56
	SUPER-TIN 4L	8oz/A	14					
	PRIAXOR	6.5 oz /A	14					
5	EMINENT	13 oz/A	first appl.	38.8	16.89	89.69	11201	96.38
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
6	EMINENT + TOPSIN	13oz/A + 10 oz/A	first appl.	38.4	17.39	90.39	11328	98.34
	SUPER-TIN 4L	8 oz/A	14					
	HEADLINE	7oz /A	14					
7	EMINENT+SUPERTIN	13 oz/A + 8 oz/A	first appl.	44.0	16.96	90.09	12458	106.23
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
	HEADLINE	9.2 oz/A	14					
8	Inspire XT	7 oz./A	first appl.	45.1	16.46	89.48	12209	101.84
	Supertin 4L	8 oz/A	14					
	Headline	9.2 oz/A	14					
9	EMINENT+SUPERTIN	13 oz/A + 8 oz/A		42.0	16.91	90.49	11940	102.01
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
10	PROLINE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	41.1	16.85	90.48	11688	99.85
	SUPER-TIN 4L	8oz/A	14					
	PRIAXOR+AG850	6.5 oz /A	14					
11	EMINENT	13oz/A + 10 oz/A	first appl.	45.0	17.26	90.29	13092	113.01
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
	HEADLINE	9.2 oz /A	14					
12	SUPER TIN 4L	8oz/A	first appl.	46.4	16.56	90.43	12864	108.57
	PROLINCE SC+ INDUCE XL	5oz /A+0.125% V/V	first appl.					
	SUPER-TIN 4L	8oz/A	14					
	HEADLINE	9.2 oz/A	14					
13	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	first appl.	40.3	16.41	89.77	11000	92.11
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
	SUPER TIN 4L	8 oz/A	14					
14	EMINENT + TOPSIN	13oz/A + 10 oz/A	first appl.	41.5	17.24	90.28	12044	103.79
	HEADLINE	9.2 oz/A	14					
	SUPER TIN 4L	8oz/A	14					
15	EMINENT	13 oz/A	first appl.	37.7	17.01	89.66	10670	90.92
	SUPER TIN 4L	8 oz/A	as needed					
	HEADLINE	9.2 oz/A	as needed					
	CV%			12.4	5.12	0.94	12	13.02
	LSD (0.05)			7.1	1.22	1.19	1997	18.31

Table. 3 (Continued) Fungicides Applied Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality Production in Sugarbeets, Clara City 2012

Trt No.	Product	Rate oz./Acre	Interval Days/ Spray	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
16	EMINENT+SUPERTIN 4L	13 oz/A + 8 oz/A	first appl.	44.5	16.93	89.84	12993	112.35
	HEADLINE	9.2 oz/A	14					
	SUPER TIN 4L	8oz/A	14					
17	EMINENT+SUPERTIN 4L	13 oz/A + 8 oz/A	first appl.	40.5	17.16	90.20	11673	100.36
	HEADLINE	9.2 oz/A	14					
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
18	ECHO 720 + EMINENET	16oz/A + 13oz/A	first appl.	39.7	17.12	89.99	11364	97.40
	ECHO 720	16oz/A						
	HEADLINE	9.2 oz/A	14					
19	ECHO 720 + EMINENET	24oz/A + 13oz/A	first appl.	38.0	17.45	90.95	11193	97.15
	ECHO 720	16oz/A						
	HEADLINE	9.2 oz/A	14					
20	ECHO 720 + EMINENET	16oz/A + 13oz/A	first appl.	38.6	16.32	91.44	10721	90.50
	ECHO 720+ Topsin	16oz/A +10oz/A						
	HEADLINE	9.2 oz/A	14					
21	SA-0040302	32oz/A	first appl.	41.8	16.81	89.96	11737	99.69
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
	SUPER TIN 4L	8oz/A	14					
22	SA-0040401	14oz/A	first appl.	33.6	17.09	90.18	9650	82.83
	SUPER TIN 4L	8oz/A	14					
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
23	SA-0040401	17oz/A	first appl.	38.8	17.06	90.13	11080	94.79
	SUPER TIN 4L	8oz/A	14					
	SUPER-TIN 4L +TOPSIN 4.5F	8 oz/A+10 oz./A	14					
24	SA-0040501	22oz/A	first appl.	40.1	17.54	90.44	12174	107.01
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
25	PROLINCE SC+ PREFERENCE+EBDC	7 oz./A+2lbs	first appl.	45.1	17.29	90.81	13385	116.57
	Supertin	5 oz/A	14					
	Headline+EBDC	9.2 oz/A+2lbs	14					
26	PROLINCE SC+PREFERENCE	5oz /A+0.125% V/V	first appl.	38.9	16.93	90.49	11101	94.96
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
	VERTISAN	16 oz/A	14					
27	PROLINE SC+PREFERENCE+EBDC	oz /A+0.125% V/V+2lb	first appl.	45.7	17.43	90.12	13390	115.89
	SUPER TIN 4L+TOPSIN	8 oz/A+10oz/A	14					
	HEADLINE+EBDC	9.2 oz/A+2lbs	14					
	SUPER TIN 4L	8 oz/A	14					
28	PROLINCE SC+PREFERENCE+EBDC	oz /A+0.125% V/V+2lb	first appl.	40.5	16.87	90.30	11678	100.41
	SUPER TIN 4L+TOPSIN	8 oz/A+10oz/A	14					
	HEADLINE+EBDC	9.2 oz/A+2lbs	14					
	VERTISAN	16 oz/A	14					
29	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	pre canopy	44.0	16.28	90.11	11977	100.17
	SUPER TIN 4L	8 oz/A	first appl.					
	GEM 500 SC	3.5oz/A	14					
	SUPER TIN 4L	8 oz/A	14					
	HEADLINE	9.2 oz/A	14					
30	PROLINCE SC+ PREFERENCE	5oz /A+0.125% V/V	pre canopy	43.1	16.42	89.98	11892	100.11
	SUPER TIN 4L	8 oz/A	first appl.					
	GEM 500 SC	3.5oz/A	14					
	SUPER TIN 4L	8 oz/A	14					
	VERTISAN	16 oz/A	14					
	CV%			12.4	5.12	0.94	12	13.02
	LSD (0.05)			7.1	1.22	1.19	1997	18.31

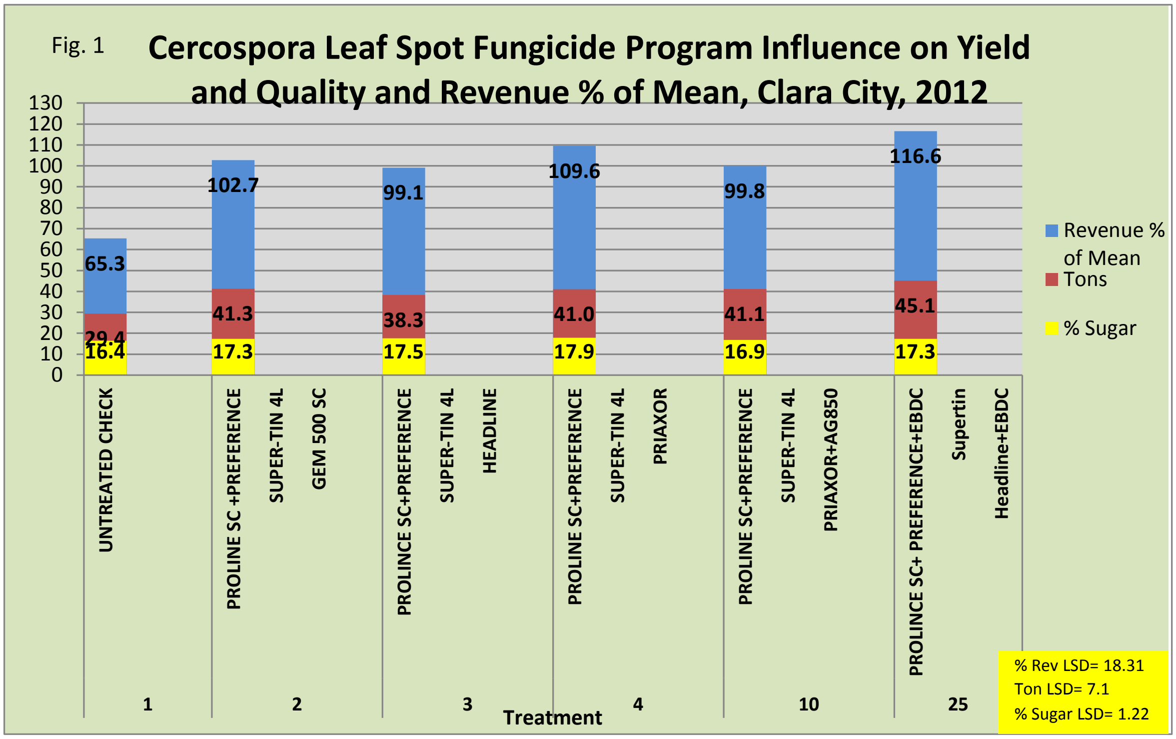


Fig. 1 Cercospora Leaf Spot Fungicide Program Influence on Yield and Quality and Revenue % of Mean, Clara City, 2012

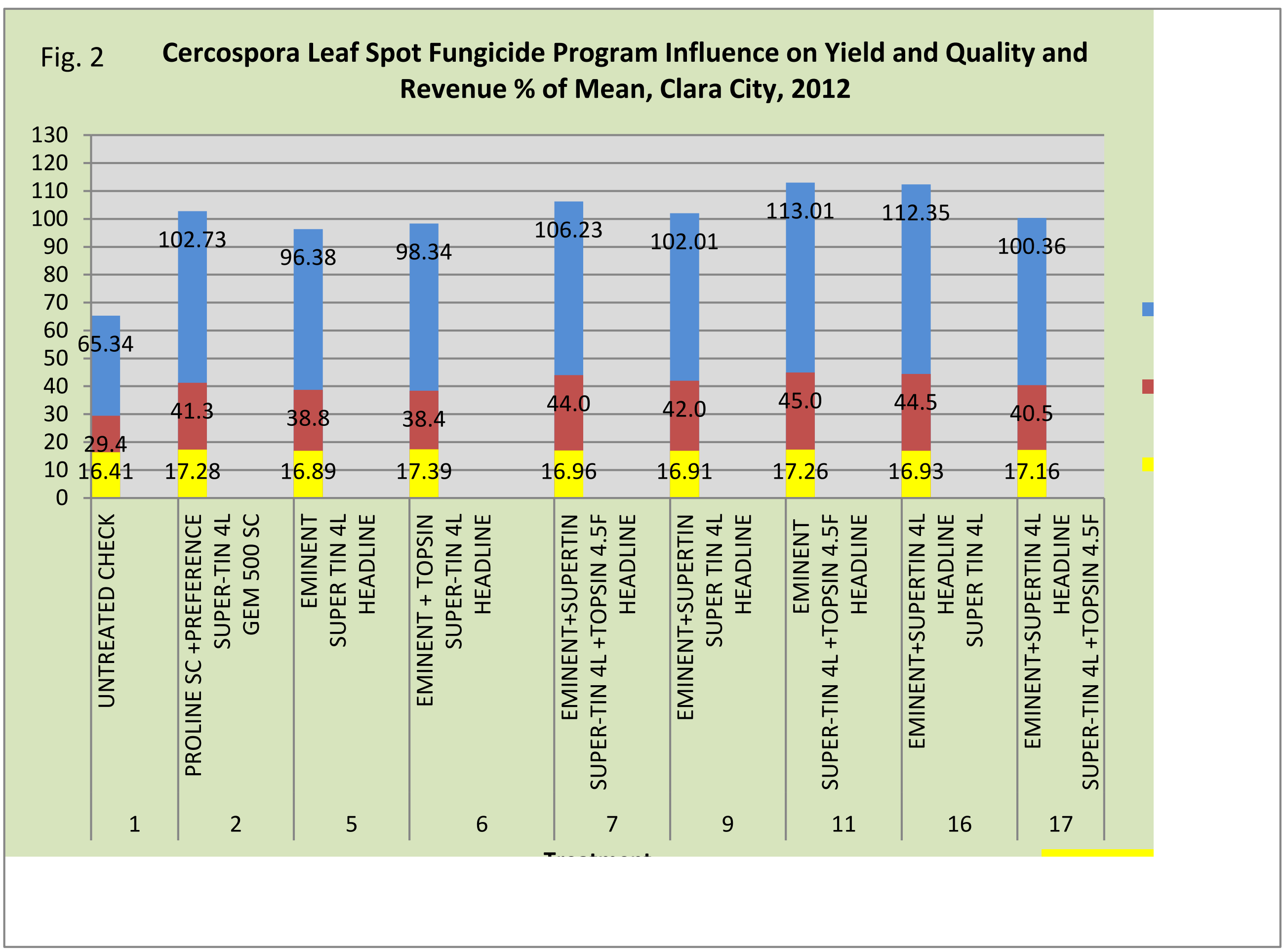


Fig. 2 Cercospora Leaf Spot Fungicide Program Influence on Yield and Quality and Revenue % of Mean, Clara City, 2012

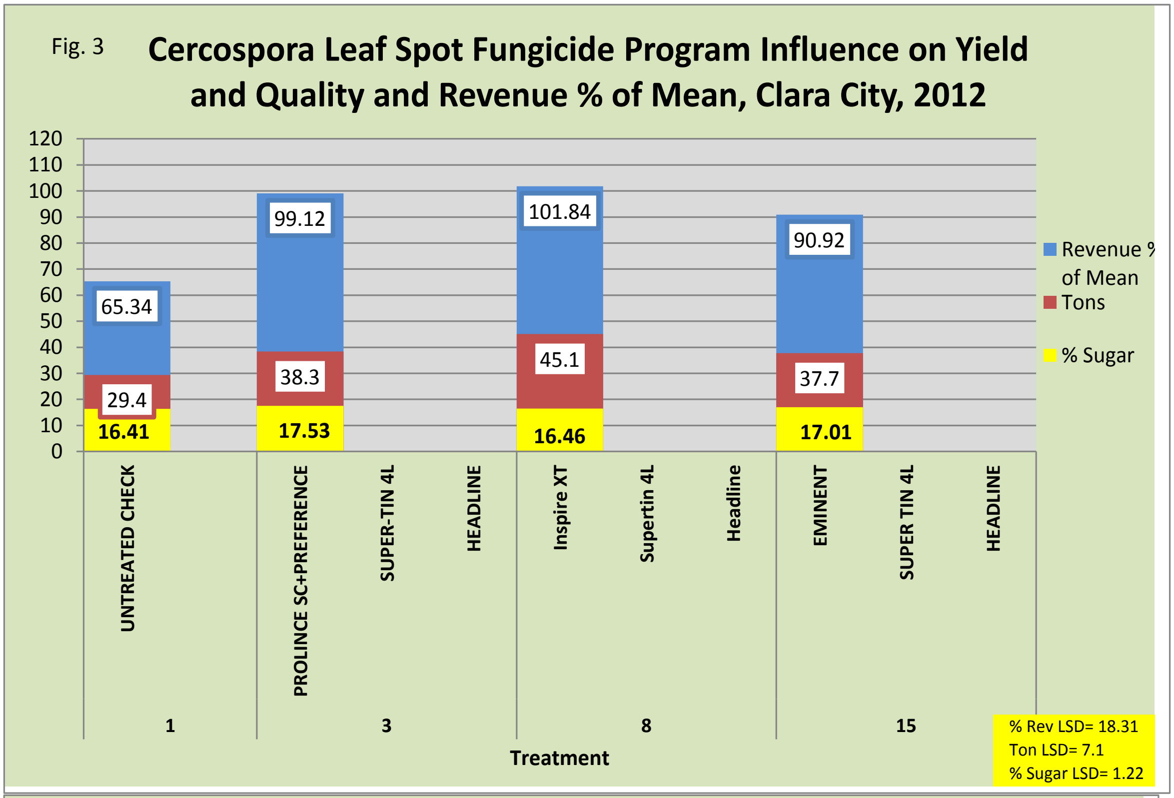


Fig. 3
Cercospora Leaf Spot Fungicide Program Influence on Yield and Quality and Revenue % of Mean, Clara City, 2012
65.34
29.4
16.41
99.12
38.3
17.53
101.84
45.1
16.46
90.92
37.7
17.01
UNTREATED CHECK
PROLINCE SC+PREFERENCE
SUPER-TIN 4L
HEADLINE
Inspire XT
Supertin 4L
Headline
EMINENT
SUPER TIN 4L
HEADLINE
1
3
8
15
Treatment
Revenue % of Mean
Tons
% Sugar
% Rev LSD= 18.31
Ton LSD= 7.1
% Sugar LSD= 1.22

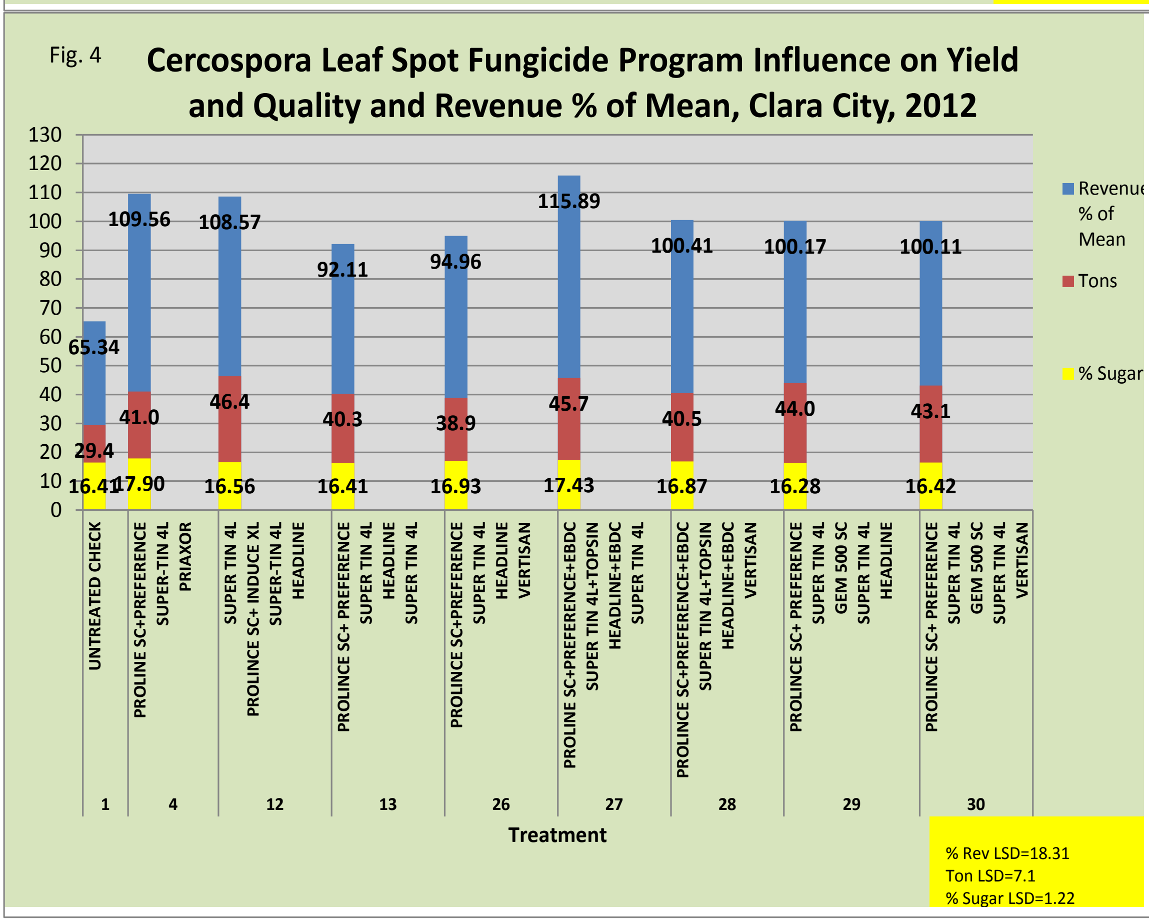


Fig. 4
Cercospora Leaf Spot Fungicide Program Influence on Yield and Quality and Revenue % of Mean, Clara City, 2012
65.34
29.4
16.41
109.56
41.0
17.90
108.57
46.4
16.56
92.11
40.3
16.41
94.96
38.9
16.93
115.89
45.7
17.43
100.41
40.5
16.87
100.17
44.0
16.28
100.11
43.1
16.42
UNTREATED CHECK
PROLINE SC+PREFERENCE
SUPER-TIN 4L
PRIAXOR
SUPER TIN 4L
PROLINCE SC+ INDUCE XL
SUPER-TIN 4L
HEADLINE
PROLINCE SC+ PREFERENCE
SUPER TIN 4L
HEADLINE
SUPER TIN 4L
PROLINCE SC+PREFERENCE
SUPER TIN 4L
HEADLINE
VERTISAN
PROLINE SC+PREFERENCE+EBDC
SUPER TIN 4L+TOPSIN
HEADLINE+EBDC
SUPER TIN 4L
PROLINCE SC+PREFERENCE+EBDC
SUPER TIN 4L+TOPSIN
HEADLINE+EBDC
VERTISAN
PROLINCE SC+ PREFERENCE
SUPER TIN 4L
GEM 500 SC
SUPER TIN 4L
HEADLINE
PROLINCE SC+ PREFERENCE
SUPER TIN 4L
GEM 500 SC
SUPER TIN 4L
VERTISAN
1
4
12
13
26
27
28
29
30
Treatment
Revenue % of Mean
Tons
% Sugar
% Rev LSD=18.31
Ton LSD=7.1
% Sugar LSD=1.22

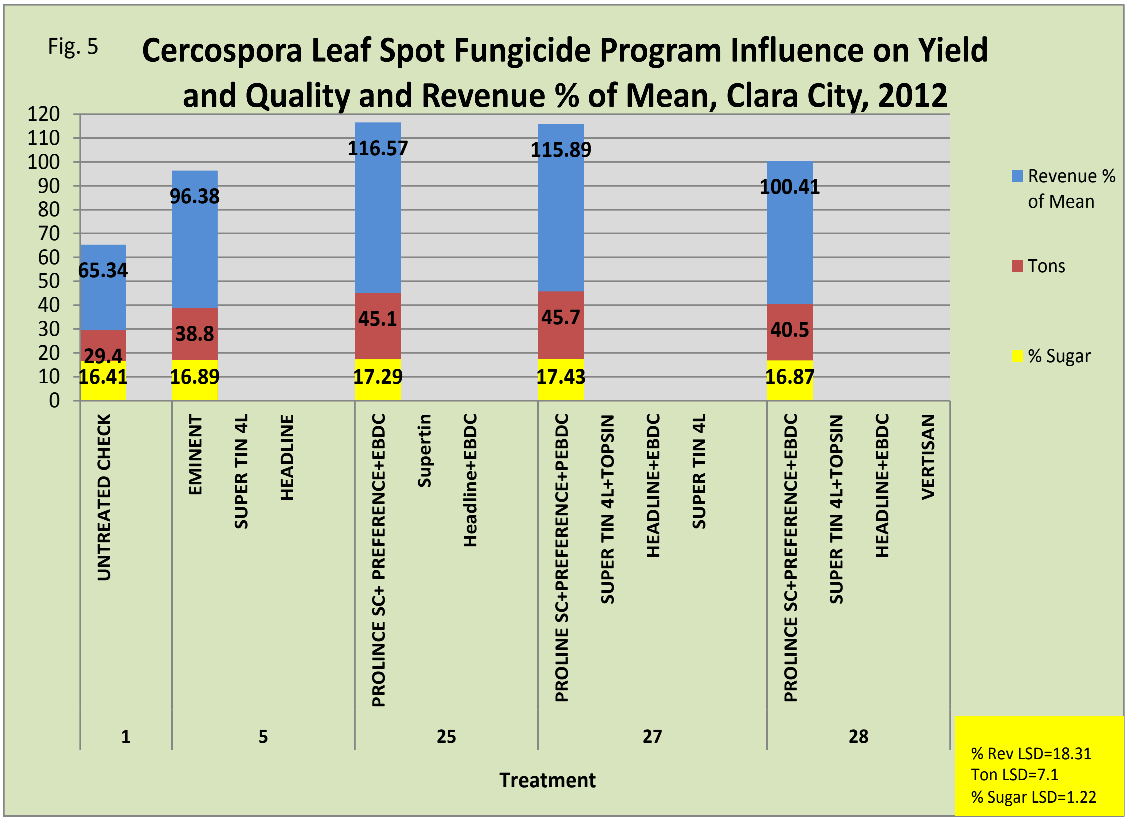


Fig. 5
Cercospora Leaf Spot Fungicide Program Influence on Yield and Quality and Revenue % of Mean, Clara City, 2012
120
110
100
90
80
70
60
50
40
30
20
10
0
65.34
29.4
16.41
96.38
38.8
16.89
116.57
45.1
17.29
115.89
45.7
17.43
100.41
40.5
16.87
Revenue % of Mean
Tons
% Sugar
UNTREATED CHECK
EMINENT
SUPER TIN 4L
HEADLINE
PROLINCE SC+ PREFERENCE+EBDC
Supertin
Headline+EBDC
PROLINE SC+PREFERENCE+PEBDC
SUPER TIN 4L+TOPSIN
HEADLINE+EBDC
SUPER TIN 4L
PROLINCE SC+PREFERENCE+EBDC
SUPER TIN 4L+TOPSIN
HEADLINE+EBDC
VERTISAN
1
5
25
27
28
Treatment
% Rev LSD=18.31
Ton LSD=7.1
% Sugar LSD=1.22

Resistant Waterhemp Management for Sugarbeet Production 2012

Objectives

The objective of the testing was to evaluate weed control programs for control of glyphosate resistant waterhemp and other susceptible weeds.

Methods

Table 1 shows the specifics of activities conducted at the weed control program site in 2012 at Bird Island. Table 2 shows the specifics of activities conducted at the weed control program site in 2012 at Clara City, MN. The tests were replicated 4 times and conducted in a randomized complete block experimental design. Plots were 11 ft. (6 rows) wide and 35 ft. long. Sugarbeet were not thinned. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. Sugarbeets were harvested with a 2 row research harvester at Bird Island and Clara City, MN. The sugarbeets were weighed on the two row harvester at Bird Island and Clara City for yield and a sub-sample was collected to be analyzed for quality in the SMBSC quality lab.

The treatments were initiated by weed stage and subsequent applications were in accordance with treatment description in data tables. Treatments were applied in 14 GPA mix at 40 psi. Glyphosate was applied as Roundup Power Max (indicated in the tables as Roundup PM) which was applied as a standard treatment with Destiny HC oil adjuvant and N-tense (Ammonium sulfate source).

Weed control was evaluated on a scale of 0-99 percent. The weed control labeled as amaranth was redroot pigweed.

Results and Discussion

General comments

Weed density and characteristics were different at Bird Island and Clara City. The Bird Island site had a low weed density and the waterhemp present was not resistant. The Clara City site had high weed pressure and the waterhemp expressed a level of resistance to glyphosate. Therefore, data from Bird Island and Clara City will be discussed separately.

Bird Island

The untreated check gave significantly lower tons per acre, sugar percent, sugar per acre and revenue compared to all other treatments (Table 3). There were no clear trends in reference to herbicide timings, sequence or combinations influence on sugarbeet production or control of waterhemp, amaranth and smartweed (Table 4).

Lambsquarter control was similar for all herbicide combination except for when Roundup was applied alone. The only herbicide combination with Roundup Power Max plus other herbicides in which lambsquarter control was significantly lower than the other herbicide combination was in treatment 18. There is no explainable reason why this treatment should give a lower control of lambsquarter and in this authors opinion is highly probable to be attributed to experimental error.

Clara City

The untreated check gave significantly lower tons per acre, sugar per acre and revenue compared to all other treatments (Table 5). As mentioned above the waterhemp at the Clara City site was resistant to glyphosate. The treatments in this test were separated into four groups in which the treatments were applied at the two inch weed height stage and the treatment s were applied alone, with Dual Magnum, and with ethofumesate applied as Nortron. The treatments were also grouped by application at the cotyledon stage of the weeds.

Sugarbeet production with the standard treatment of glyphosate applied at the 2 leaf sugarbeet stage, which was also at the 1-2 inch weed stage, statistically was not significantly increased by treatments where other products were added such as Dual Magnum applied preemergence or Betamix, Outlook or ehtofumesate (applied at 4 oz. /acre) applied postemergence. Application of treatments at the cotyledon stage of the weeds also did not significantly increase sugarbeet production. However, the addition of the previously mentioned products or applying treatments at the cotyledon stage of the weeds did tend to increase sugarbeet production which indicated an advantage

Significant increases in sugarbeet production occurred when application of ethofumesate applied as Nortron were applied preemergence at rates of 5, 6 and 7.5 pt. /acre. This shows the advantage of ethofumesate applied preemergence in the presence of glyphosate resistant Waterhemp.

Most of the treatment controlled the lambsquarter and the amaranth (redroot pigweed) to an acceptable level (Table 6). The treatments that did not control lambs quarter and Amaranth to an optimal level were when the treatments were applied to the cotyledon stage of the weeds. These treatments were stopped when the number of applications reached three and this would have been early in the weed control season since the applications were made each time that lambsquarter and amaranth were at the cotyledon stage. This would have been too early in the growth pattern for lambsquarter and amaranth was still germinating. The other point to consider in this situation was that the weed population at this site was high which increase the potential for continued germination and emergence of weeds. The control of water Waterhemp however was enhanced by application at the cotyledon stage because the control of glyphosate resistant waterhemp outweighed the continuance of emerging Waterhemp. The control of glyphosate tolerant waterhemp was offset by stopping the applications early in the weed germination season as was apparent with the susceptible lambsquarter and amaranth.

The control of Waterhemp was significantly enhanced by the addition of ethofumesate applied as Nortron or Dual Magnum applied preemergence or Betamix or Outlook applied postemergence with the standard glyphosate treatment compared with the standard glyphosate treatment applied alone. The results showed the advantage of adding ethofumesate or Dual Magnum preemergence or Betamix or Outlook postemergence with the standard glyphosate treatment for control of glyphosate resistant Waterhemp.

Table 1. Site Specifics for Resistant Waterhemp Testing Bird Island, 2012

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/17/2012					X	PPI		50' Sunny SE-9
4/24/2012	X	98RR08	4.8"	Damp				
4/25/2012					X	Pre-emergence		47' Pcloudy NE-15
5/14/2012						Cotyledon (Trt 15-22)		87' Sunny S-5
5/21/2012						2 Lf SB (Trt 1-14)		75' Sunny SW-5
6/4/2012						2 Lf SB (Trt 23-30)		78' Sunny SW-6
6/15/2012						14 DAT 2 Lf SB (Trt 1-14)		69' Pcloudy calm
6/28/2012						14 DAT 2 Lf SB (Trt 15-22)		80' Cloudy NW-5
6/30/2012						14 DAT 2 Lf SB (Trt 23-30)		77' Sunny S-5-10
7/2/2012						Eminent	13 oz.	82' Sunny S-8
						Manzate	1.5 qt.	
7/17/2012						Supertin Wp	8 oz.	77' Pcloudy ENE-14
						Roundup PowerMax	44 oz.	
						Gem	3.5 oz.	77' Sunny SSE-4
9/4/2012						Roundup PowerMax	32 oz.	86' Sunny WNW-7

Table 2. Site Specifics for Resistant Waterhemp Testing Clara City, 2012

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/18/2012					X	PPI		50' Pcloudy NNW-5
4/20/2012	X	SV36091RR	4 3/8"	Damp		Quadris In furrow	9.6 oz.	
4/25/2012					X	Pre-emergence		70' Sunny SW-6
5/10/2012						Cotyledon (Trt 15-22)		63' Sunny SSE-12
5/30/2012						2 Lf SB (Trt 1-14)		62' Pcloudy NW-5
5/31/2012						2 Lf SB (Trt 23-30)		78' Pcloudy SW-5
6/15/2012						14 DAT 2 Lf SB (Trt 1-14)		73' Pcloudy calm
6/28/2012						14 DAT 2 Lf SB (Trt 15-22)		80' Sunny NW-5
6/30/2012						14 DAT 2 Lf SB (Trt 23-30)		77' Sunny S-5-10
7/3/2012						Eminent	13 oz.	81' Sunny S-6
						Manzate	1.5 qt.	
7/17/2012						Supertin Wp	8 oz.	82' Pcloudy SE-11
						Roundup PowerMax	44 oz.	
7/31/2012						Gem	3.5 oz.	81' Sunny SSE-9

Table 3. Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
1	Untreat Check		N/A	17.8	11.13	87.84	3191	50.01	54.03
2	Weed-Free Check	Pull by hand	N/A	27.3	13.35	87.30	5750	103.47	111.79
3	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB	29.7	13.22	87.80	6266	113.07	117.61
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
4	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB	25.9	13.45	88.61	5623	103.43	106.59
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
5	Betamix + Nortron + PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	28.9	12.87	85.62	5683	96.76	96.73
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
6	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	29.3	13.03	87.39	5989	105.41	104.34
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
7	Dual Magnum	1.0pt/A	PRE	27.4	12.72	87.35	5490	94.96	97.15
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
			CV%	12.07	5.3	1.83	13	16.08	23.11
			LSD (0.05)	4.6	0.97	2.25	1027	22.6	36.31

Table 3 (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
8	Dual Magnum	1.0pt/A	PRE	27.7	13.50	88.37	6020	110.97	113.83
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
9	Dual Magnum	1.0pt/A	PRE	27.5	13.24	87.95	5828	105.40	105.17
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
10	Dual Magnum	1.0pt/A	PRE	30.5	12.49	87.40	6010	102.63	100.43
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
11	Dual Magnum	1.5pt/A	PRE	30.0	12.82	88.53	6164	108.87	111.72
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
12	Dual Magnum	1.5pt/A	PRE	29.0	13.10	88.10	6062	108.64	110.86
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
13	Dual Magnum	1.5pt/A	PRE	26.9	13.53	88.17	5884	108.83	108.42
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
14	Dual Magnum	1.5pt/A	PRE	29.3	12.64	85.87	5687	95.96	92.77
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
15	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB	31.4	12.93	88.08	6463	114.34	118.99
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
			CV%	**12.07**	**5.3**	**1.83**	**13**	**16.08**	**23.11**
			LSD (0.05)	**4.6**	**0.97**	**2.25**	**1027**	**22.60**	**36.31**

Table 3. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
16	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB	25.1	13.33	88.21	5359	97.45	100.13
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
17	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	25.4	13.15	88.04	5300	94.72	94.53
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
18	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	26.6	13.21	87.16	5539	99.01	97.42
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
19	Nortron	5.0pt/A	PPI	28.5	13.50	87.93	6180	113.62	118.21
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
20	Nortron	5.0pt/A	PPI	26.9	13.25	88.80	5793	105.93	109.29
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
21	Nortron	5.0pt/A	PPI	25.7	12.7	87.6	5187	90.34	89.80
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
22	Nortron	5.0pt/A	PPI	27.1	13.13	87.71	5694	102.41	101.10
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
23	Nortron	6.0pt/A	PPI	24.8	13.15	87.98	5238	94.56	92.72
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
			CV%	12.07	5.3	1.83	13	16.08	23.11
			LSD (0.05)	4.6	0.97	2.25	1027	22.6	36.31

Table 3. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
24	Nortron	6.0pt/A	PPI	28.8	12.87	87.12	5915	104.38	102.73
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
25	Nortron	6.0pt/A	PPI	25.9	13.44	87.98	5542	100.94	96.35
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Pak	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
26	Nortron	6.0pt/A	PPI	24.1	12.99	88.02	4969	88.17	80.82
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
27	Nortron	7.5pt/A	PPI	26.9	13.38	88.93	5851	107.83	105.84
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
28	Nortron	7.5pt/A	PPI	26.6	12.93	88.74	5542	98.92	95.60
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
29	Nortron	7.5pt/A	PPI	24.5	12.57	87.16	4849	83.03	75.79
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
30	Nortron	7.5pt/A	PPI	27.4	12.87	86.67	5515	95.95	89.22
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
			CV%	12.07	5.3	1.83	13	16.08	23.11
			LSD (0.05)	4.6	0.97	2.25	1027	22.6	36.31

Table 4. Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth	Smart-weed
1	Untreat Check		**N/A**	10	25	23	25
2	Weed-Free Check	Pull by hand	**N/A**	98	99	93	98
3	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**	84	99	99	99
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**				
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**				
4	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**2 LF SB**	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**				
5	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**	99	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**				
6	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**				
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**				
7	Dual Magnum	1.0pt/A	**PRE**	99	99	99	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**				
	Roundup PM+Destiny HC+N-Tense	.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**				
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**				
			CV%	**8**	**9**	**9**	**9**
			LSD (0.05)	**10**	**13**	**12**	**13**

Table 4. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth	Smart-weed
8	Dual Magnum	1.0pt/A	PRE	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
9	Dual Magnum	1.0pt/A	PRE	99	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
10	Dual Magnum	1.0pt/A	PRE	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix+Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
11	Dual Magnum	1.5pt/A	PRE	99	99	99	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
12	Dual Magnum	1.5pt/A	PRE	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
13	Dual Magnum	1.5pt/A	PRE	99	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
14	Dual Magnum	1.5pt/A	PRE	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty				
	Betamix+Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
15	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB	96	99	94	99
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty				
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
			CV%	8	9	9	9
			LSD (0.05)	10	13	12	13

Table 4.(Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth	Smart-weed
16	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB	96	99	94	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
17	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	97	99	87	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
18	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	88	99	98	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty				
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
19	Nortron	5.0pt/A	PPI	99	99	98	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB				
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty				
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
20	Nortron	5.0pt/A	PPI	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
21	Nortron	5.0pt/A	PPI	98	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
22	Nortron	5.0pt/A	PPI	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB				
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty				
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
23	Nortron	6.0pt/A	PPI	99	99	99	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
			CV%	8	9	9	9
			LSD (0.05)	10	13	12	13

Table 4.(Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth	Smart-weed
24	Nortron	6.0pt/A	PPI	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
25	Nortron	6.0pt/A	PPI	99	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
26	Nortron	6.0pt/A	PPI	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
27	Nortron	7.5pt/A	PPI	99	99	99	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
28	Nortron	7.5pt/A	PPI	99	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF				
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF				
29	Nortron	7.5pt/A	PPI	99	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
30	Nortron	7.5pt/A	PPI	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
			CV%	8	9	9	9
			LSD (0.05)	10	13	12	13

Table 5. Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
1	Untreat Check		**N/A**	7.1	14.24	90.73	1691	40.07	44.02
2	Weed-Free Check	Pull by hand	**N/A**	16.9	13.47	91.29	3814	87.16	95.76
3	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**	15.4	13.46	90.43	3433	77.75	79.84
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**						
4	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**2 LF SB**	14.4	14.21	91.22	3497	83.70	85.63
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**						
5	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**	17.3	14.28	90.98	4139	98.12	98.22
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**						
6	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**	17.4	14.52	89.42	4158	98.23	96.21
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**						
7	Dual Magnum	1.0pt/A	**PRE**	17.5	14.64	90.38	4291	103.25	106.75
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**						
	Roundup PM+Destiny HC+N-Tense	.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**						
			CV%	14.8	5.60	1.55	16	18.63	20.46
			LSD (0.05)	3.8	1.02	1.98	984	26.16	28.43

Table 5.(Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
8	Dual Magnum	1.0pt/A	PRE	19.1	14.33	90.94	4550	107.55	110.72
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
9	Dual Magnum	1.0pt/A	PRE	21.8	14.55	91.22	5332	128.11	130.06
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
10	Dual Magnum	1.0pt/A	PRE	18.1	14.19	90.82	4309	101.69	98.90
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
11	Dual Magnum	1.5pt/A	PRE	18.1	14.20	91.28	4322	102.36	105.22
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
12	Dual Magnum	1.5pt/A	PRE	21.9	14.01	90.88	5129	119.91	123.75
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
13	Dual Magnum	1.5pt/A	PRE	15.0	14.27	91.58	3626	86.55	83.85
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
14	Dual Magnum	1.5pt/A	PRE	17.4	14.33	91.49	4249	102.00	98.69
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
15	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB	14.1	14.11	89.85	3273	76.16	78.10
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
			CV%	14.8	5.60	1.55	16	18.63	20.46
			LSD (0.05)	3.8	1.02	1.98	984	26.16	28.43

Table 5. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
16	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB	13.8	14.40	91.96	3373	80.80	82.45
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
17	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	16.9	13.25	91.48	3759	85.08	83.90
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
18	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	18.9	13.11	90.95	4143	92.57	89.99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
19	Nortron	5.0 pt/A	PPI	19.6	14.18	91.07	4678	110.65	115.99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
20	Nortron	5.0 pt/A	PPI	19.3	12.91	90.50	4121	90.42	93.01
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
21	Nortron	5.0 pt/A	PPI	21.7	14.25	92.20	5285	126.35	129.23
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
22	Nortron	5.0 pt/A	PPI	21.1	14.48	90.02	5067	120.23	120.38
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
23	Nortron	6.0pt/A	PPI	20.5	14.65	91.60	5112	124.02	124.67
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
			CV%	14.8	5.60	1.55	16	18.63	20.46
			LSD (0.05)	3.8	1.02	1.98	984	26.16	28.43

Table 5. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
24	Nortron	6.0pt/A	PPI	18.2	13.74	91.15	4183	96.74	93.96
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
25	Nortron	6.0pt/A	PPI	18.7	13.97	90.88	4379	102.36	96.88
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Pak	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
26	Nortron	6.0pt/A	PPI	21.1	14.13	91.83	5079	120.62	114.80
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
27	Nortron	7.5pt/A	PPI	21.4	13.29	91.59	4777	108.22	105.82
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
28	Nortron	7.5pt/A	PPI	21.0	14.19	91.72	5111	122.19	120.42
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF						
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF						
29	Nortron	7.5pt/A	PPI	18.3	14.58	90.17	4423	105.24	98.54
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
30	Nortron	7.5pt/A	PPI	18.4	14.08	90.62	4343	101.90	94.24
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF						
			CV%	14.8	5.60	1.55	16	18.63	20.46
			LSD (0.05)	3.8	1.02	1.98	984	26.16	28.43

Table 6. Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth
1	Untreat Check		N/A	0	0	0
2	Weed-Free Check	Pull by hand	N/A	78	84	99
3	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB	99	36	98
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
4	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB	98	40	97
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
5	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	98	80	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
6	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	98	81	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
7	Dual Magnum	1.0pt/A	PRE	99	97	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB			
	Roundup PM+Destiny HC+N-Tense	.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
			CV%	12	9	11
			LSD (0.05)	15	11	14

Table 6.(Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-hemp	Amranth
8	Dual Magnum	1.0pt/A	**PRE**	99	95	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**2 LF SB**			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**			
9	Dual Magnum	1.0pt/A	**PRE**			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**	99	94	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**			
10	Dual Magnum	1.0pt/A	**PRE**	99	98	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**			
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**			
11	Dual Magnum	1.5pt/A	**PRE**	99	98	98
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**			
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**			
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**			
12	Dual Magnum	1.5pt/A	**PRE**	99	99	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**2 LF SB**			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**			
13	Dual Magnum	1.5pt/A	**PRE**	99	99	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**2 LF SB**			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**			
14	Dual Magnum	1.5pt/A	**PRE**	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT coty**			
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	**14 DAT 2 LF**			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	**28 DAT 2 LF**			
15	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**cotylen SB**	71	49	84
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT coty**			
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**			
			CV%	12	9	11
			LSD (0.05)	15	11	14

Table 6. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-Hemp	Amranth
16	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB	83	48	89
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
17	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	85	66	85
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
18	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB	98	82	98
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
19	Nortron	5.0 pt/A	PPI	98	92	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	cotylen SB			
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT coty			
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
20	Nortron	5.0 pt/A	PPI	78	83	94
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	cotylen SB			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT coty			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
21	Nortron	5.0 pt/A	PPI	94	94	97
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
22	Nortron	5.0 pt/A	PPI	96	96	95
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	cotylen SB			
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT coty			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
23	Nortron	6.0pt/A	PPI	99	97	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB			
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+Destiny HC+N-Tense	0.lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
			CV%	12	9	11
			LSD (0.05)	15	11	14

Table 6. (Continued) Influence of Resistant Waterhemp Management for Sugarbeet Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz./ Acre	Timing	Lambs-quarter	Water-Hemp	Amranth
24	Nortron	6.0pt/A	PPI	85	93	79
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
25	Nortron	6.0pt/A	PPI	99	96	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB			
	Betamix + Nortron + Roundup PM+Destiny+ N-Pak	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
26	Nortron	6.0pt/A	PPI	99	97	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB			
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
27	Nortron	7.5pt/A	PPI	99	98	99
	Roundup PM+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	2 LF SB			
	Roundup PM+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
28	Nortron	7.5pt/A	PPI	98	97	99
	Roundup PM+ Nortron + Destiny HC+N-Tense	1.125lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	2 LF SB			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.844lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	14 DAT 2 LF			
	Roundup PM+ Nortron + Destiny HC+N-Tense	0.75lb ae/A+4 oz/A+1.5pt/A +2.5%v/v	28 DAT 2 LF			
29	Nortron	7.5pt/A	PPI	98	97	99
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Nortron + Roundup PM+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
30	Nortron	7.5pt/A	PPI	99	97	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB			
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Nortron+Roundup PM+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
			CV%	12	9	11
			LSD (0.05)	15	11	14

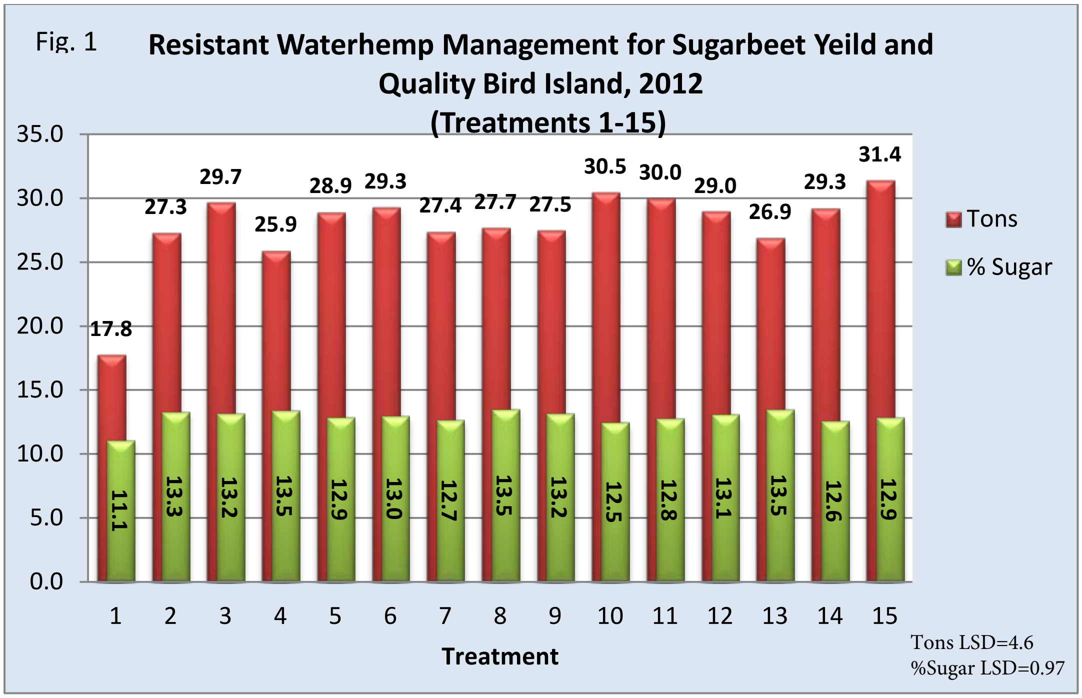


Fig. 1
Resistant Waterhemp Management for Sugarbeet Yeild and Quality Bird Island, 2012
(Treatments 1-15)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
17.8
27.3
29.7
25.9
28.9
29.3
27.4
27.7
27.5
30.5
30.0
29.0
26.9
29.3
31.4
11.1
13.3
13.2
13.5
12.9
13.0
12.7
13.5
13.2
12.5
12.8
13.1
13.5
12.6
12.9
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Treatment
Tons
% Sugar
Tons LSD=4.6
%Sugar LSD=0.97

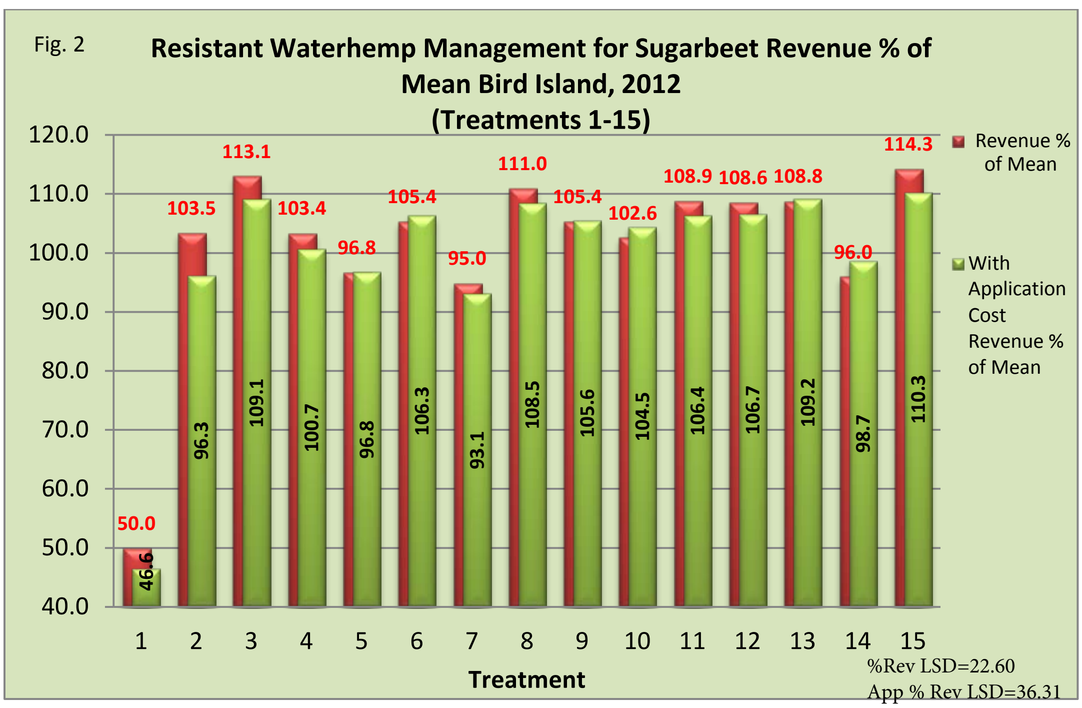


Fig. 2
Resistant Waterhemp Management for Sugarbeet Revenue % of Mean Bird Island, 2012
(Treatments 1-15)
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
50.0
103.5
113.1
103.4
96.8
105.4
95.0
111.0
105.4
102.6
108.9
108.6
108.8
96.0
114.3
46.6
96.3
109.1
100.7
96.8
106.3
93.1
108.5
105.6
104.5
106.4
106.7
109.2
98.7
110.3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Treatment
Revenue % of Mean
With Application Cost Revenue % of Mean
%Rev LSD=22.60
App % Rev LSD=36.31

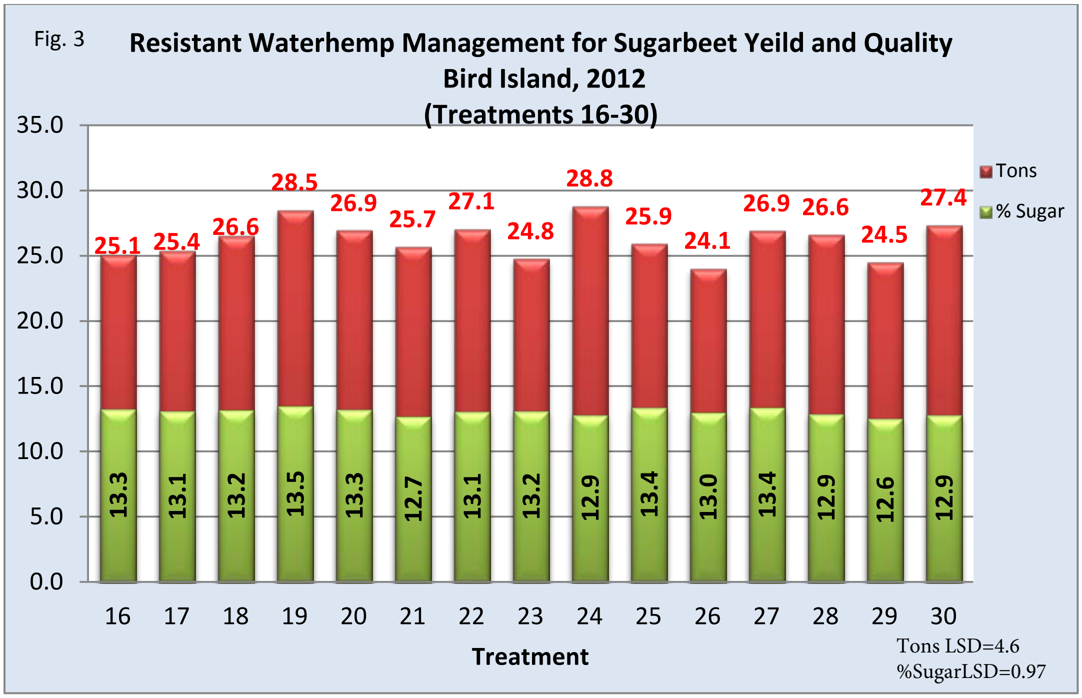


Fig. 3
Resistant Waterhemp Management for Sugarbeet Yeild and Quality
Bird Island, 2012
(Treatments 16-30)
Tons
% Sugar
25.1 25.4 26.6 28.5 26.9 25.7 27.1 24.8 28.8 25.9 24.1 26.9 26.6 24.5 27.4
13.3 13.1 13.2 13.5 13.3 12.7 13.1 13.2 12.9 13.4 13.0 13.4 12.9 12.6 12.9
35.0 30.0 25.0 20.0 15.0 10.0 5.0 0.0
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Treatment
Tons LSD=4.6
%SugarLSD=0.97

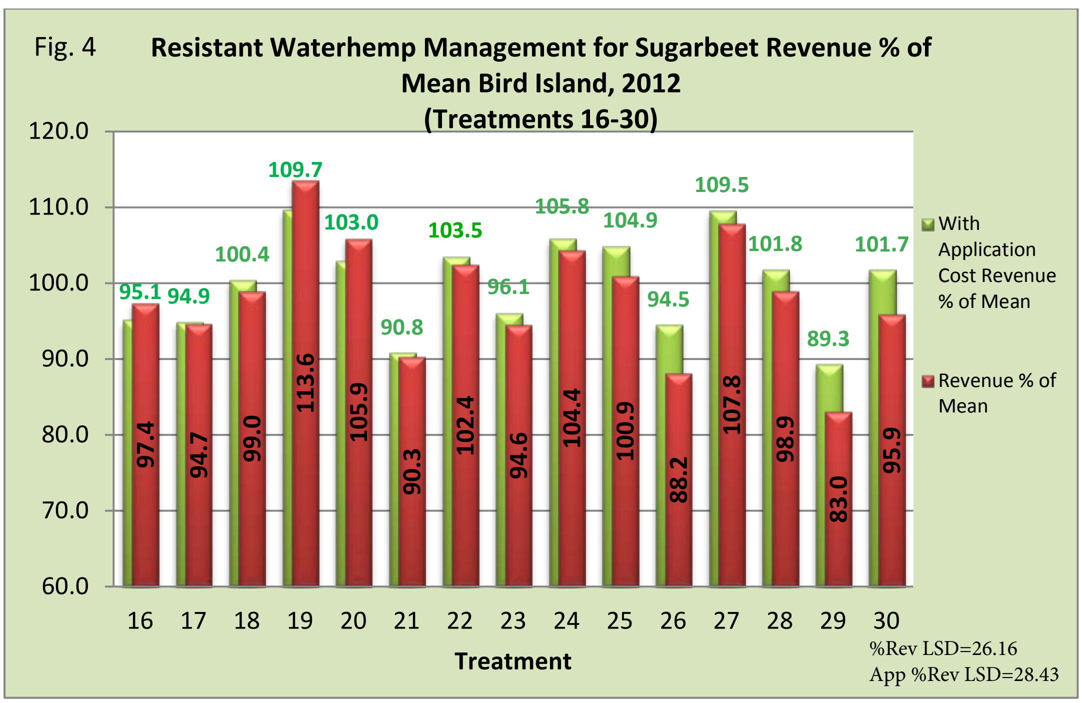


Fig. 4
Resistant Waterhemp Management for Sugarbeet Revenue % of
Mean Bird Island, 2012
(Treatments 16-30)
With Application Cost Revenue % of Mean
Revenue % of Mean
95.1 94.9 100.4 109.7 103.0 90.8 103.5 96.1 105.8 104.9 94.5 109.5 101.8 89.3 101.7
97.4 94.7 99.0 113.6 105.9 90.3 102.4 94.6 104.4 100.9 88.2 107.8 98.9 83.0 95.9
120.0 110.0 100.0 90.0 80.0 70.0 60.0
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Treatment
%Rev LSD=26.16
App %Rev LSD=28.43

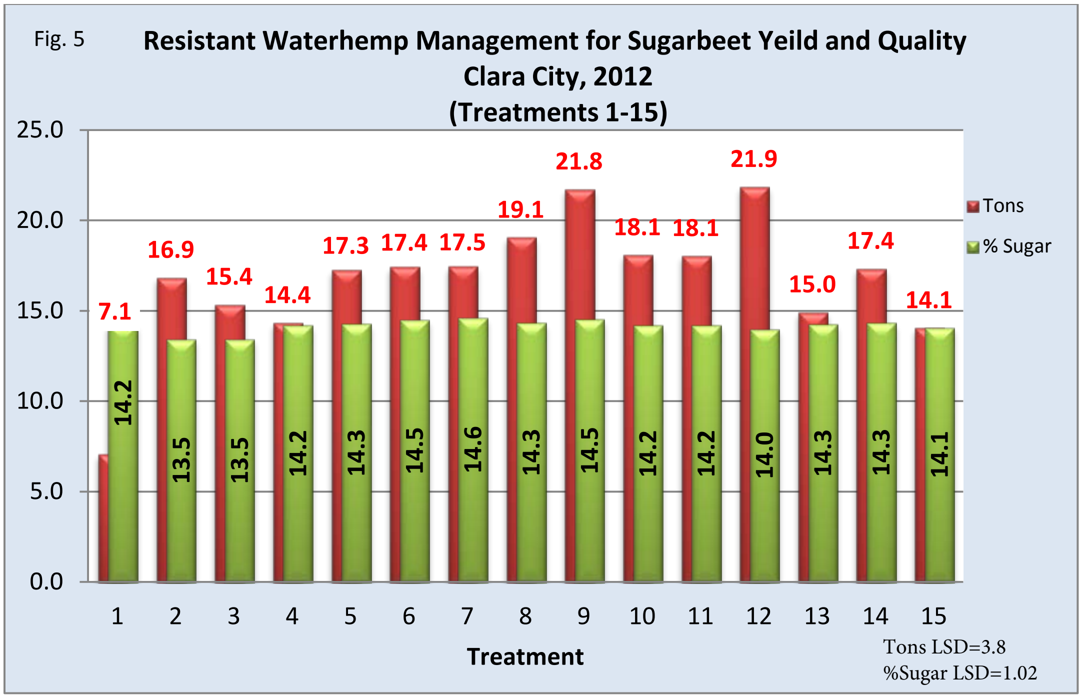


Fig. 5
Resistant Waterhemp Management for Sugarbeet Yeild and Quality
Clara City, 2012
(Treatments 1-15)
25.0
20.0
15.0
10.0
5.0
0.0
7.1
16.9
15.4
14.4
17.3
17.4
17.5
19.1
21.8
18.1
18.1
21.9
15.0
17.4
14.1
14.2
13.5
13.5
14.2
14.3
14.5
14.6
14.3
14.5
14.2
14.2
14.0
14.3
14.3
14.1
Tons
% Sugar
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Treatment
Tons LSD=3.8
%Sugar LSD=1.02

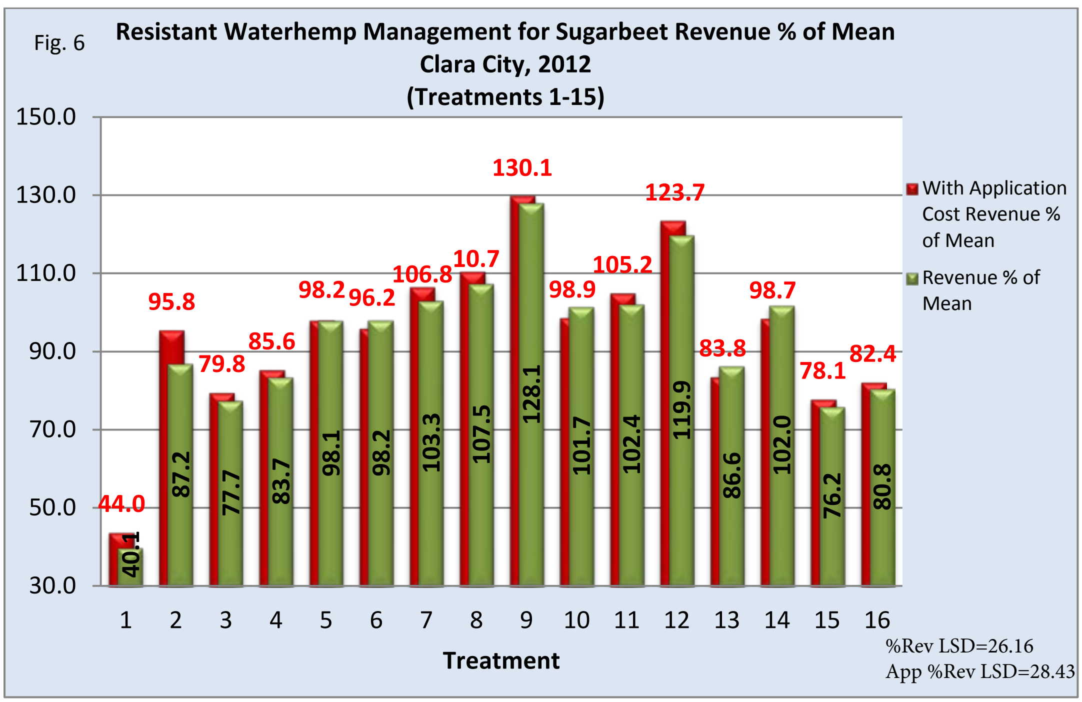


Fig. 6
Resistant Waterhemp Management for Sugarbeet Revenue % of Mean
Clara City, 2012
(Treatments 1-15)
150.0
130.0
110.0
90.0
70.0
50.0
30.0
44.0
95.8
79.8
85.6
98.2
96.2
106.8
10.7
130.1
98.9
105.2
123.7
83.8
98.7
78.1
82.4
40.1
87.2
77.7
83.7
98.1
98.2
103.3
107.5
128.1
101.7
102.4
119.9
86.6
102.0
76.2
80.8
With Application Cost Revenue % of Mean
Revenue % of Mean
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Treatment
%Rev LSD=26.16
App %Rev LSD=28.43

Fig. 7 **Resistant Waterhemp Management for Sugarbeet Yeild and Quality Clara City, 2012 (Treatments 16-30)**

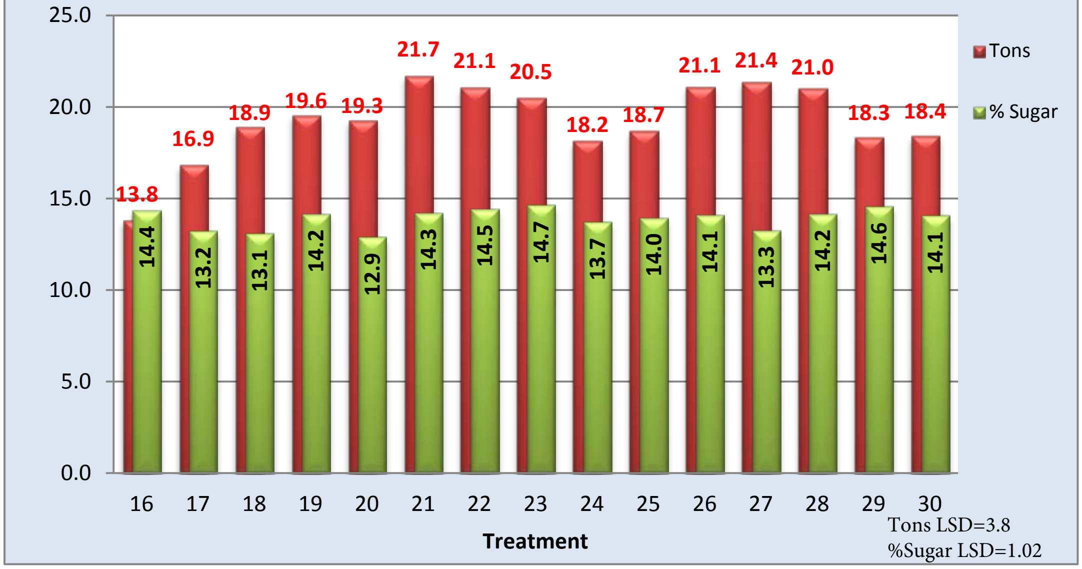
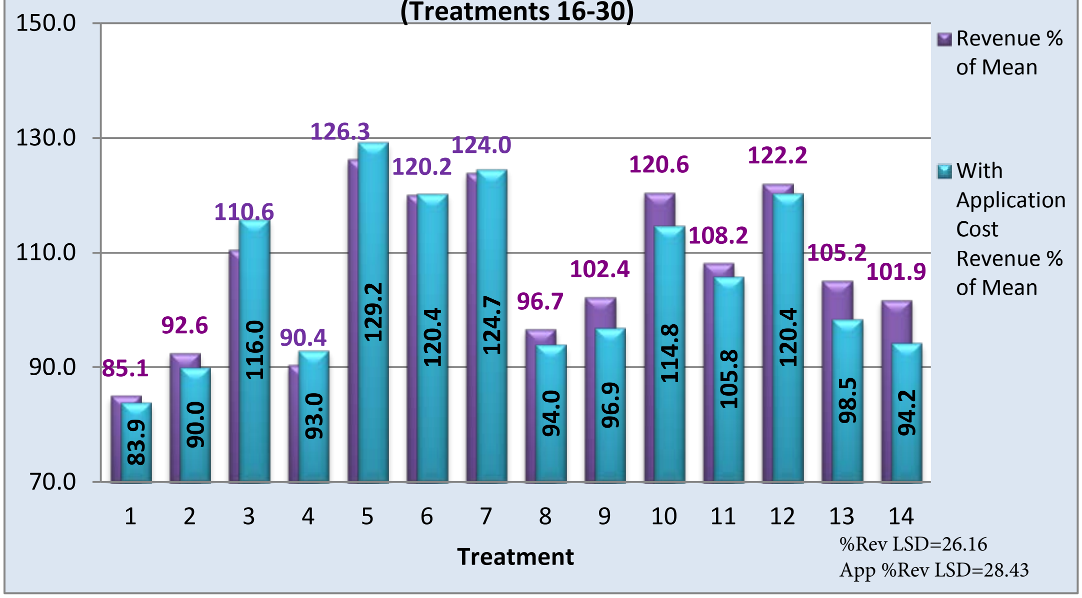


Fig. 8 **Resistant Waterhemp Management for Sugarbeet Revenue % of Mean Clara City, 2012 (Treatments 16-30)**



Fungicide Application Combined with Micronutrients for Enhancement of Sugarbeet Production 2010 - 2012

Objectives

The objective of this testing was to evaluate fungicides combined with micronutrient products for control of Cercospora leaf spot (Cls). The focus of the research was to test if micronutrients impacted the fungicide control of cercospora leaf spot and if the addition of micronutrients enhanced sugarbeet production.

Methods

Table 1 shows the specifics of activities conducted at Cercospora leaf spot fungicide screening research sites in 2010, 2011 and 2012. Plots were 11 ft. (6 rows) wide and 35 ft. long. Sugarbeet stands were not thinned. Sugarbeets were harvested with a 2 row research harvester at all three testing sites/year. 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 fungicide control was conducted at different timings and averaged upon completion of the test.

Results and Discussion

Data was analyzed for homogeneity and determined that the data could be combined. The data is presented showing individual site/years alone for the reader to reference. The discussion will concentrate on the combined data across site/years which are shown in bar graph format. All treatments gave significantly lower cercospora leaf spot than the untreated check showing the influence of the fungicides for control of cercospora leaf spot. Proline applied with Tetra Bor or Max In Manganese gave significantly better control of cercospora leaf spot compared to other fungicide and micronutrient combinations. Tons per acre, sugar percent and extractable sucrose per acre were significantly increased by the application of fungicides. Proline applied with Tetra Bor or Max In Manganese either tended to or did increase tons per acre more than the other fungicide and micronutrient mixes. This translated into an effect on revenue percent of mean as a result of the fungicide and micronutrient influence on tons per acre and sugar percent. A clear trend was observed when the micronutrient was applied with fungicides showing the effect on cercospora leaf spot control and sugarbeet production. The trend was for higher enhancement of sugarbeet production when the micronutrient was included in the spray mix at the first application with Proline compared to the last application with Supertin. Thus, if micronutrients are included in a fungicide program they are most effective when added to the first fungicide application.

Table 1. Site Specifics for Fungicide by Micronutrients Testing, 2010-2012

Location	Planting Date	Soil Condition
Renville, 2010	4/21/2010	Moist
Renville, 2011	5/11/2011	Wet
Clara City, 2012	4/26/2012	Dry

Table 2. Fungicide Applied with Micronutrients Influence on Control of Cercospora Leafspot and Sugarbeet Yield and Quality Renville, 2010

TRT	FUNGICIDE	Rate oz/acre	Interval Days	Appl Code	CLS Rating	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	UNTREATED CHECK 1st app		14	******	5.6	32.3	15.13	90.57	8189	76.59
2	PROLINE SC + Induce XL + Pro Zinc	5oz /A+0.125% V/V + 24 oz	first appl.	B	3.1	34.5	16.34	92.19	9717	106.64
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
3	PROLINE SC + Induce XL + EB Mix	5oz /A+0.125% V/V + 64 oz	first appl.	B	2.6	36.4	16.27	91.62	10125	110.27
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
4	PROLINE SC + Induce XL + Tetra Bor	5oz /A+0.125% V/V + 16 oz.	first appl.	B	2.7	37.0	16.44	91.97	10453	115.11
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
5	PROLINE SC + Induce XL + Max-In Manganeese	5oz /A+0.125% V/V + 96 oz.	first appl.	B	3.1	37.2	16.25	91.75	10348	106.27
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
6	PROLINE SC + Induce XL + Max In Ultra ZMB	5oz /A+0.125% V/V + 64 oz.	first appl.	B	4.3	35.1	16.35	90.48	9646	104.48
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
7	PROLINE SC + Induce XL + Max In Boron	5oz /A+0.125% V/V + 24 oz.	first appl.	B	3.5	37.8	15.97	90.59	10147	96.42
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
8	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	4.0	32.6	16.24	92.58	9159	100.46
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Pro Zinc	5 oz + 24 oz.	14	E						
9	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	4.4	34.8	15.39	92.44	9236	96.32
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ EB Mix	5 oz.+ 64 oz	14	E						
10	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	3.8	31.7	16.08	93.33	8918	98.30
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Tetra Bor	5 oz.+ 16 oz.	14	E						
11	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	4.2	34.7	15.99	92.16	9535	102.27
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Max-In Manganeese	5 oz.+ 96 oz.	14	E						
12	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	5oz/A	14	C	4.5	32.8	16.07	93.90	9289	88.06
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Max In Ultra ZMB	5 oz+ 64 oz.	14	E						
13	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D	4.6	34.0	16.27	93.21	9660	97.30
	SUPER-TIN 80WP + Max In Boron	5 oz.+ 24 oz.	14	E						
14	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	3.75oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D	4.3	35.6	15.81	91.49	9583	101.52
	SUPER-TIN 80WP	5 oz	14	E						
				C.V	20.9	9.3	3.02	2.29	12	15.86
				LSD (0.05)	1.2	4.6	0.69	2.99	1648	22.68

Table 3. Fungicide Applied with Micronutrients Influence on Control of Cercospora Leafspot and Sugarbeet Yield and Quality Renville, 2011

TRT	FUNGICIDE	Rate oz/acre	Interval Days	Appl Code	CLS Rating 8/30/11	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Means
1	UNTREATED CHECK 1st app		14	******	8.1	12.6	14.62	84.69	2781	57.99
2	PROLINE SC + Induce XL + Pro Zinc	5oz /A+0.125% V/V + 24 oz	first appl.	B	3.2	18.2	16.00	86.86	4648	111.01
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
3	PROLINE SC + Induce XL + EB Mix	5oz /A+0.125% V/V + 64 oz	first appl.	B	5.3	18.0	15.64	85.63	4383	100.69
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
4	PROLINE SC + Induce XL + Tetra Bor	5oz /A+0.125% V/V + 16 oz.	first appl.	B	3.0	18.1	16.06	86.43	4551	107.66
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
5	PROLINE SC + Induce XL + Max-In Manganeese	5oz /A+0.125% V/V + 96 oz.	first appl.	B	2.6	21.9	15.63	86.38	5374	124.26
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
6	PROLINE SC + Induce XL + Max In Ultra ZMB	5oz /A+0.125% V/V + 64 oz.	first appl.	B	4.3	18.2	16.02	87.58	4680	112.88
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
7	PROLINE SC + Induce XL + Max In Boron	5oz /A+0.125% V/V + 24 oz.	first appl.	B	3.1	18.9	15.88	86.11	4723	110.91
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
8	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	3.7	15.0	16.02	86.11	3742	87.90
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Pro Zinc	5 oz + 24 oz.	14	E						
9	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	4.5	17.3	15.64	85.98	4240	97.72
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ EB Mix	5 oz.+ 64 oz	14	E						
10	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	3.5	20.4	15.83	84.63	4931	112.27
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Tetra Bor	5 oz.+ 16 oz.	14	E						
11	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	4.7	16.3	15.64	85.64	3953	90.58
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Max-In Manganeese	5 oz.+ 96 oz.	14	E						
12	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	5oz/A	14	C	4.5	17.0	16.01	86.39	4281	101.34
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Max In Ultra ZMB	5 oz+ 64 oz.	14	E						
13	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D	3.2	17.3	15.76	85.43	4207	96.59
	SUPER-TIN 80WP + Max In Boron	5 oz.+ 24 oz.	14	E						
14	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B						
	SUPER-TIN 80WP	3.75oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D	4.3	16.7	15.27	85.48	3947	88.19
	SUPER-TIN 80WP	5 oz	14	E						
				C.V	39.6	16.4	4.35	1.60	17	19.54
				LSD (0.05)	2.4	4.1	0.98	1.96	1057	27.95

Table 4. Fungicide Applied with Micronutrients Influence on Control of Cercospora Leafspot and Sugarbeet Yield and Quality Clara City, 2012

Trt No.	Product	Rate	Interval Days	Appl Code	CLS Rating 8/22/12	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	UNTREATED CHECK		14	******	6.2	32.0	16.09	88.70	8418	68.47
2	PROLINE SC + Induce XL + Pro Zinc	5oz /A+0.125% V/V + 24 oz	first appl.	B	1.4	42.9	16.91	91.04	12325	104.66
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
3	PROLINE SC + Induce XL + EB Mix	5oz /A+0.125% V/V + 64 oz	first appl.	B	1.5	42.3	17.57	90.99	12684	109.79
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
4	PROLINE SC + Induce XL + Tetra Bor	5oz /A+0.125% V/V + 16 oz.	first appl.	B	2.0	36.4	17.41	90.29	10664	91.34
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
5	PROLINE SC + Induce XL + Max-In Manganee	5oz /A+0.125% V/V + 96 oz.	first appl.	B	1.7	43.1	16.55	89.78	11867	98.84
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
6	PROLINE SC + Induce XL + Max In Ultra ZMB	5oz /A+0.125% V/V + 64 oz.	first appl.	B	1.7	38.6	17.57	90.21	11441	98.59
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
7	PROLINE SC + Induce XL + Max In Boron	5oz /A+0.125% V/V + 24 oz.	first appl.	B	1.5	40.4	17.72	91.11	12229	106.25
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
8	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	1.7	44.4	17.76	90.47	13328	115.43
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Pro Zinc	5 oz + 24 oz.	14	E						
9	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	1.5	43.3	17.25	90.66	12631	108.03
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ EB Mix	5 oz.+ 64 oz	14	E						
10	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	2.3	39.6	17.48	90.66	11749	101.19
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Tetra Bor	5 oz.+ 16 oz.	14	E						
11	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	2.1	41.9	17.25	90.15	12111	103.14
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP+ Max-In Manganeese	5 oz.+ 96 oz.	14	E						
12	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	3.9	39.6	17.05	90.24	11480	97.32
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Max In Ultra ZMB	5 oz+ 64 oz.	14	E						
13	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	2.0	39.0	17.26	90.76	11397	97.51
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP + Max In Boron	5 oz.+ 24 oz.	14	E						
14	PROLINE SC + Induce XL	5oz /A+0.125% V/V	first appl.	B	3.5	41.1	17.02	90.14	11745	99.46
	SUPER-TIN 80WP	5oz/A	14	C						
	GEM 500 SC	3.5oz/A	14	D						
	SUPER-TIN 80WP	5oz/A	14	E						
				CV%	42.3	8.7	4.16	1.15	10	11.12
				LSD (0.05)	1.4	5.0	1.02	1.49	1668	15.90

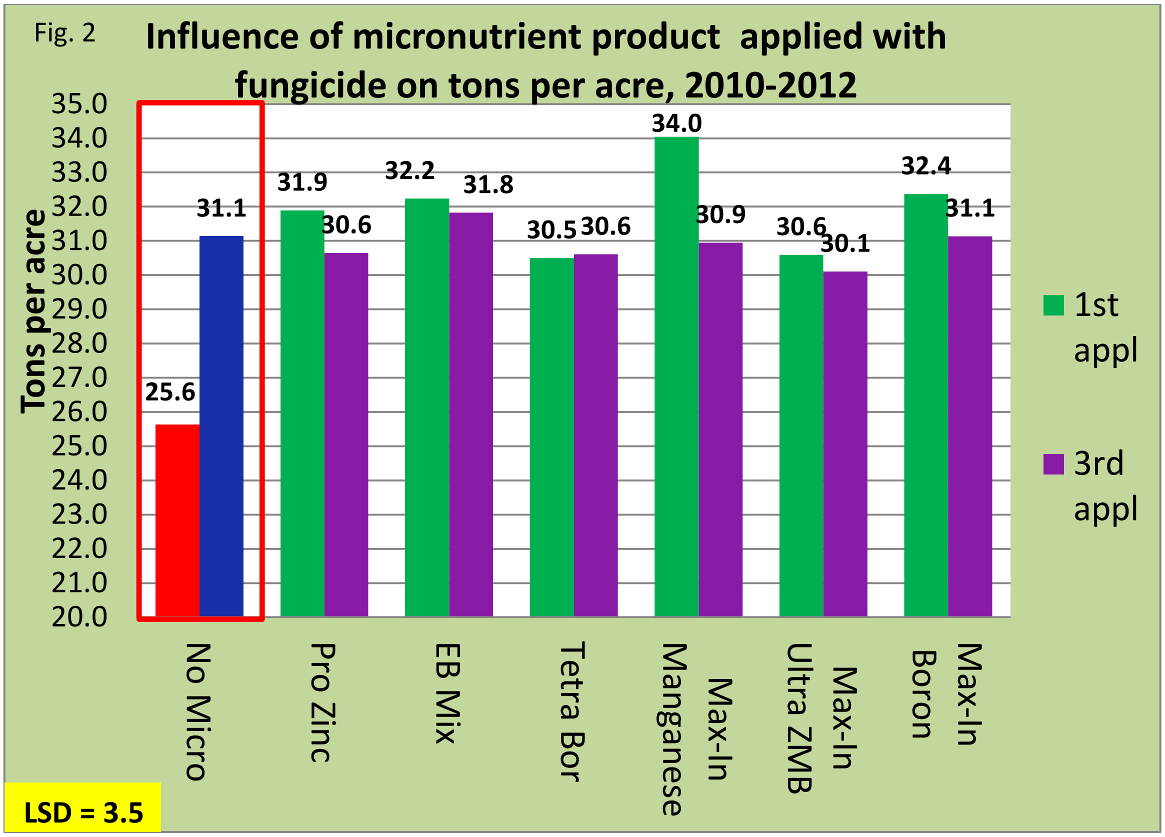


Fig. 2
Influence of micronutrient product applied with fungicide on tons per acre, 2010-2012
Tons per acre
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
25.6
31.1
31.9
30.6
32.2
31.8
30.5
30.6
34.0
30.9
30.6
30.1
32.4
31.1
No Micro
Pro Zinc
EB Mix
Tetra Bor
Manganese
Max-In
Ultra ZMB
Max-In
Boron
Max-In
1st appl
3rd appl
LSD = 3.5

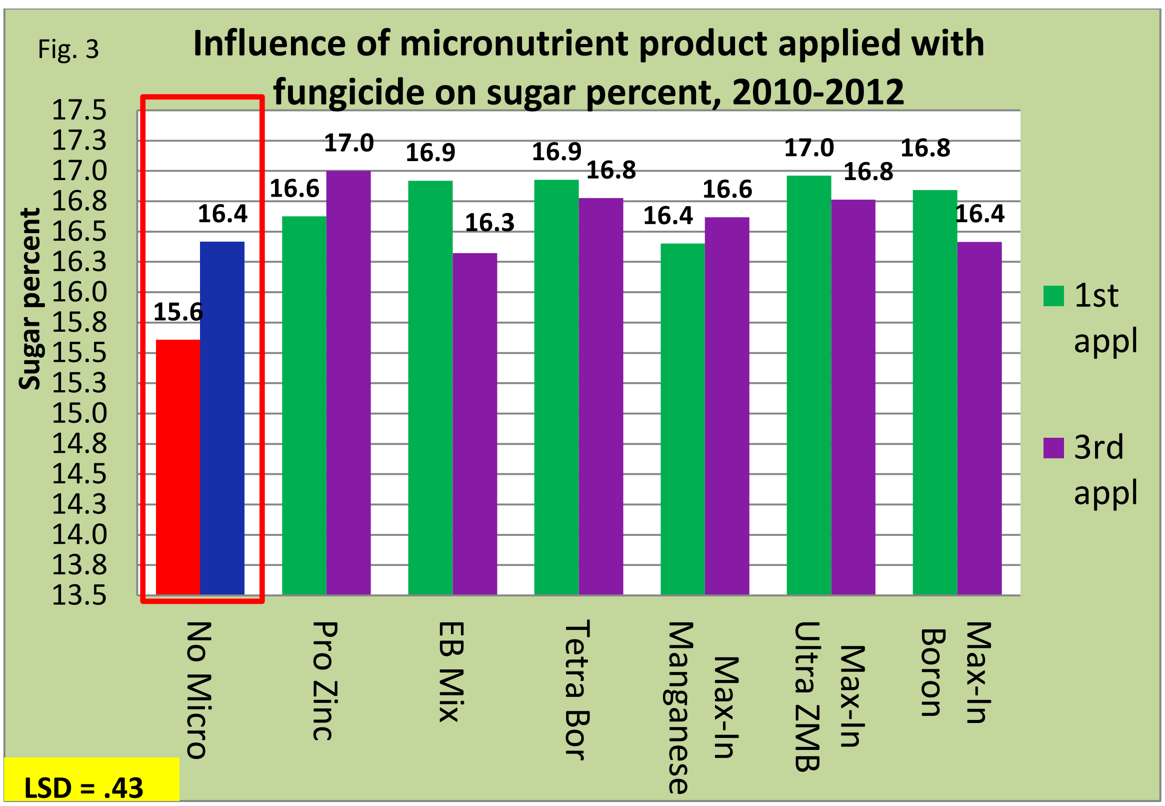


Fig. 3
Influence of micronutrient product applied with fungicide on sugar percent, 2010-2012
Sugar percent
17.5
17.3
17.0
16.8
16.5
16.3
16.0
15.8
15.5
15.3
15.0
14.8
14.5
14.3
14.0
13.8
13.5
15.6
16.4
16.6
17.0
16.9
16.3
16.9
16.8
16.4
16.6
17.0
16.8
16.8
16.4
No Micro
Pro Zinc
EB Mix
Tetra Bor
Manganese
Max-In
Ultra ZMB
Max-In
Boron
Max-In
1st appl
3rd appl
LSD = .43

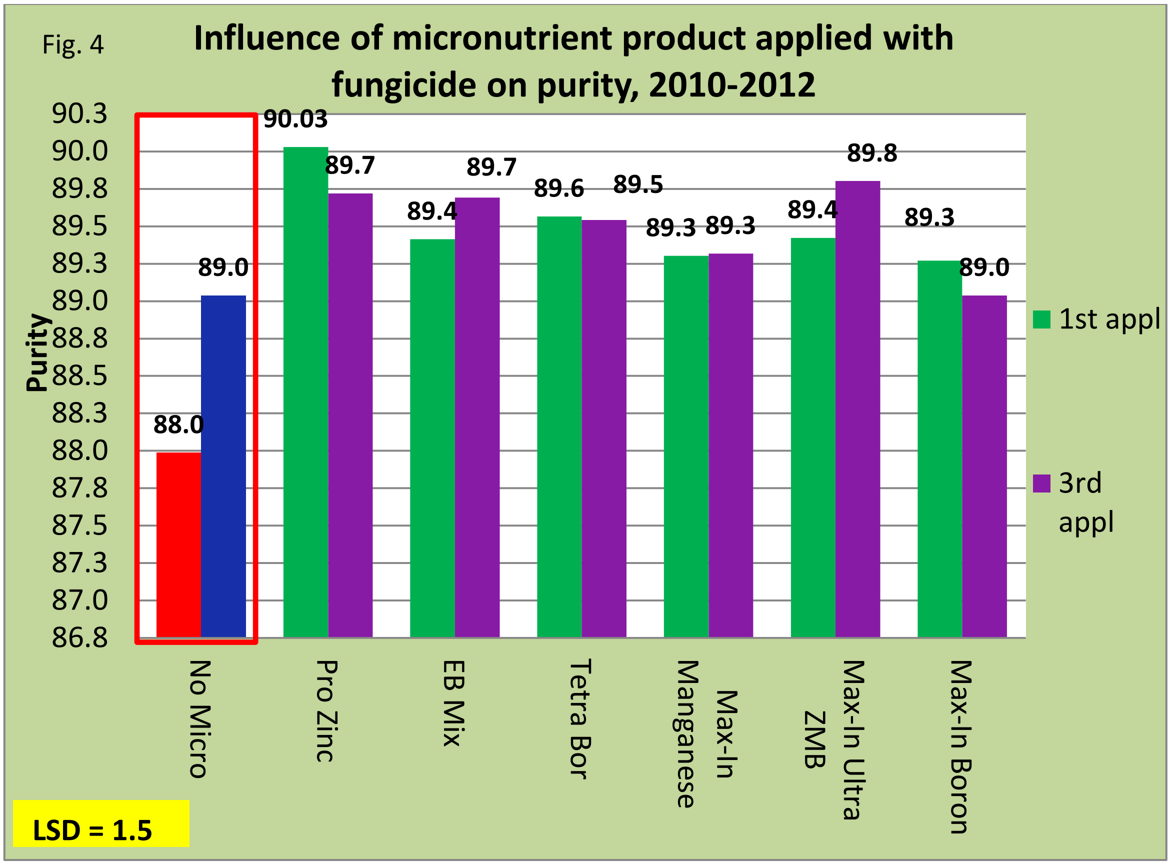


Fig. 4
Influence of micronutrient product applied with fungicide on purity, 2010-2012
Purity
90.3
90.0
89.8
89.5
89.3
89.0
88.8
88.5
88.3
88.0
87.8
87.5
87.3
87.0
86.8
88.0
89.0
90.03
89.7
89.4
89.7
89.6
89.5
89.3
89.3
89.4
89.8
89.3
89.0
1st appl
3rd appl
No Micro
Pro Zinc
EB Mix
Tetra Bor
Max-In Manganese
Max-In Ultra ZMB
Max-In Boron
LSD = 1.5

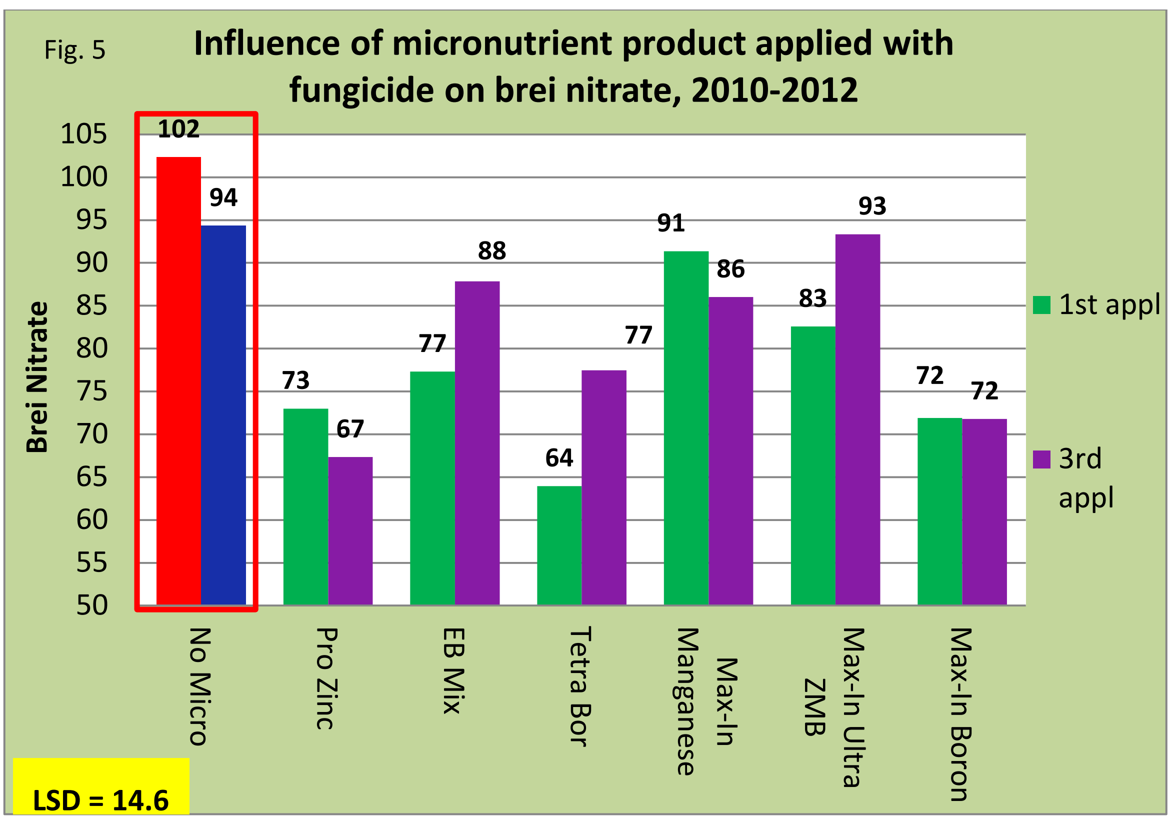


Fig. 5
Influence of micronutrient product applied with fungicide on brei nitrate, 2010-2012
Brei Nitrate
105
100
95
90
85
80
75
70
65
60
55
50
102
94
73
67
77
88
64
77
91
86
83
93
72
72
1st appl
3rd appl
No Micro
Pro Zinc
EB Mix
Tetra Bor
Max-In Manganese
Max-In Ultra ZMB
Max-In Boron
LSD = 14.6

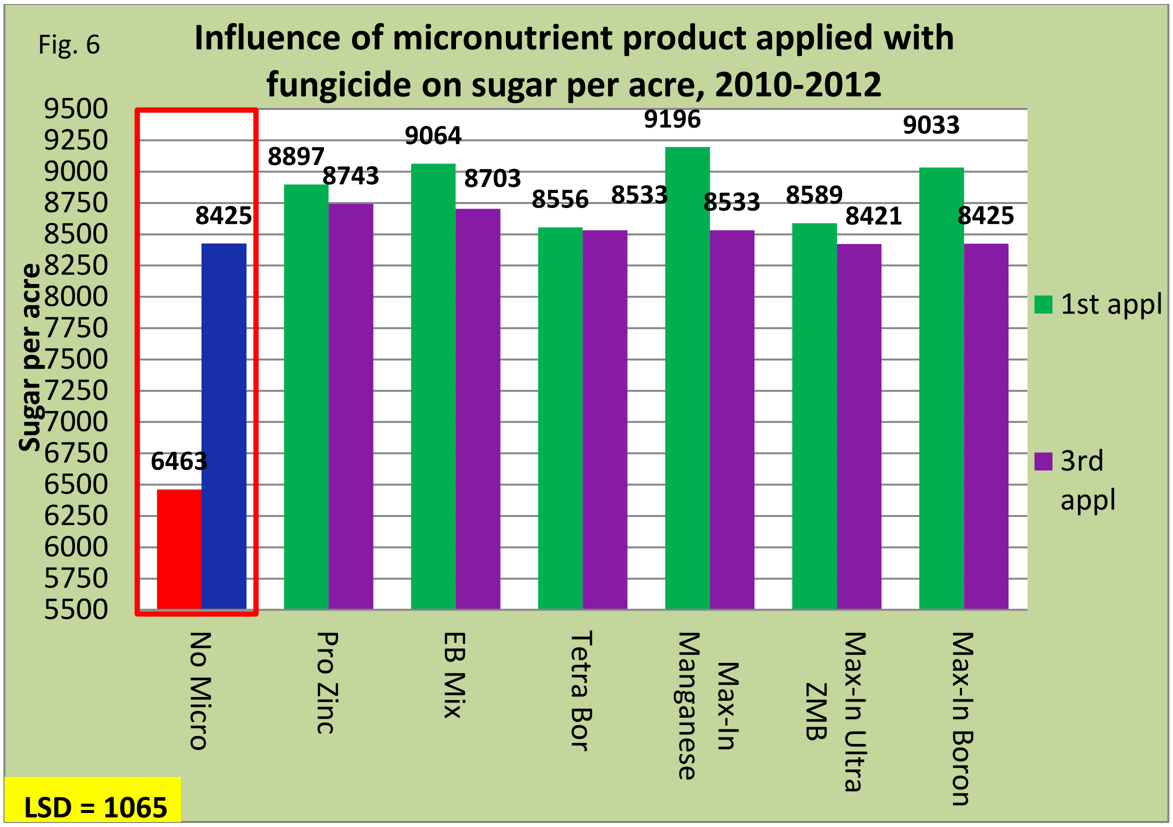


Fig. 6
Influence of micronutrient product applied with fungicide on sugar per acre, 2010-2012
Sugar per acre
9500
9250
9000
8750
8500
8250
8000
7750
7500
7250
7000
6750
6500
6250
6000
5750
5500
6463
8425
8897
8743
9064
8703
8556
8533
9196
8533
8589
8421
9033
8425
No Micro
Pro Zinc
EB Mix
Tetra Bor
Max-In Manganese
Max-In Ultra ZMB
Max-In Boron
1st appl
3rd appl
LSD = 1065

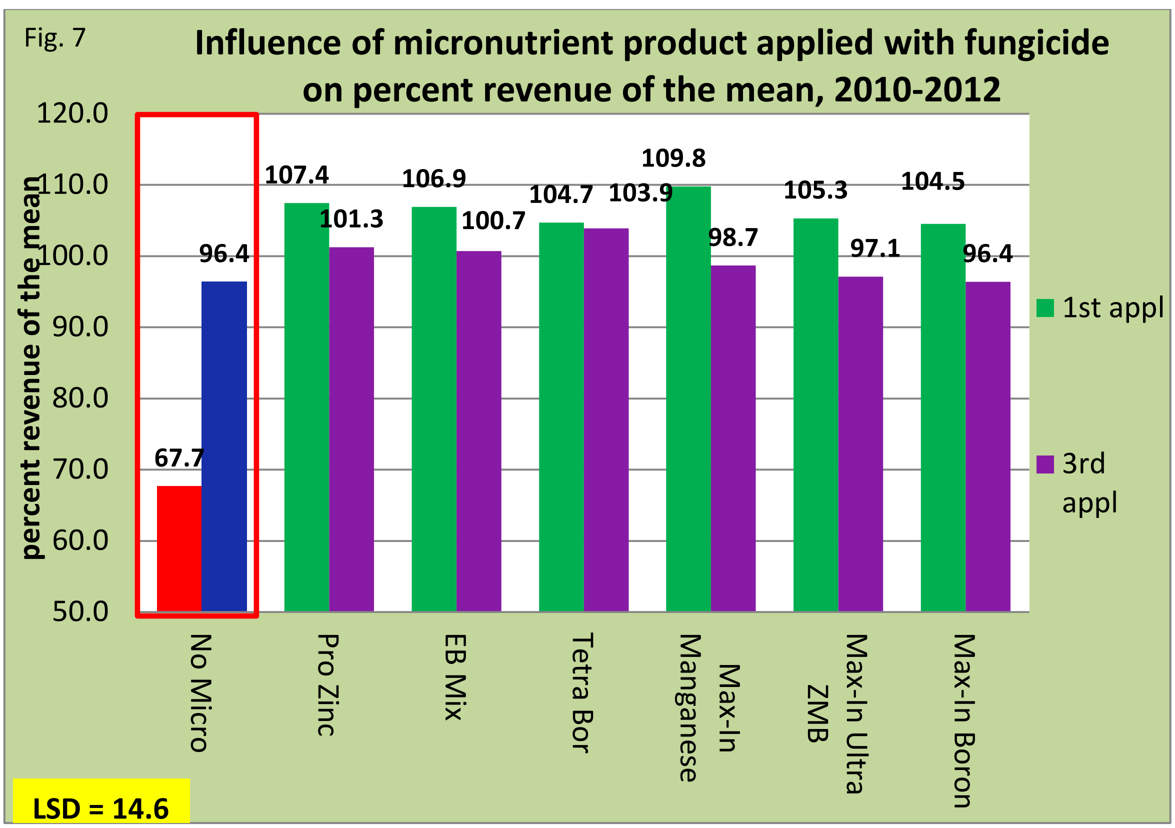


Fig. 7
Influence of micronutrient product applied with fungicide on percent revenue of the mean, 2010-2012
percent revenue of the mean
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
67.7
96.4
107.4
101.3
106.9
100.7
104.7
103.9
109.8
98.7
105.3
97.1
104.5
96.4
No Micro
Pro Zinc
EB Mix
Tetra Bor
Max-In Manganese
Max-In Ultra ZMB
Max-In Boron
1st appl
3rd appl
LSD = 14.6

SMBSC Evaluation of Fungicides for Control of Cercospora Leaf Spot Considering Single Mode of Action 2012

Objectives

The testing described in this report is an evaluation of single mode of action fungicides for control of Cercospora leaf spot in 2012. The 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. ***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 never be used as a sole control of cercospora leaf spot within a production season.***

Methods

Table 1 shows the specifics of activities conducted at the cercospora leaf spot sites in 2012. Plots were 11 ft. (6 rows) wide and 35 ft long. The tests were replicated 6 times. Sugarbeets were not thinned since the test did not require thinning. Normal production practices were conducted on the sugarbeets within the testing area. The target interval between fungicide applications was 14 days. Sugarbeets were harvested on October 13th 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. These tests were conducted as basic research to determine the value and efficacy of an individual fungicide. Table 2 shows the results of the treatments effects on cercospora leaf spot control and sugar beet production in 2012, respectively.

Results and Discussion

Due to the dry weather in 2012 the development of Cercospora leaf spot in the test area was slow. All treatments significantly reduced cercospora leaf spot in the sugar beets. Xemium fungicide gave significantly less control of Cercospora leaf spot at the 8/6 and 8/13 evaluations timings compared to the other fungicide treatments. At the 8/22 timing other fungicide treatments such as Vertisan and Echo 720 began to fail. By the final evaluation on 9/13 there were more products, such as Topsin that began to fail in comparison to the more effective fungicides. By the last evaluation a greater separation was observed for the products with lower early control of the Cercospora leaf spot compared to the more effective products. The most effective products were the strobilurin and triazole products. The addition of EBDC only tended to increase the control of Cercospora leaf spot when added to other fungicides.

Sugar beet production and revenue was significantly increased by most fungicide treatments compared to the treatments where no fungicide was applied (check). Fungicide treatments that did not give statistically greater sugarbeet production and revenue compared to the check were the treatment that also did not perform satisfactorily for control of Cercospora leaf spot. The treatments that were not significantly different from the check for production and revenue were Super Tin, Echo 720, Vertisan, Eminent (no EBDC), EBDC. Sugar beet production and revenue were statistically similar for Inspire XT, Proline and Gem when applied with or without an EBDC product. However, sugarbeet production and revenue was significantly reduced with Headline and significantly increased with Eminent when both products were applied with an EBDC. Though the EBDC products did not perform well in comparison to some other products in the tests it is important to use the product to aid in the prevention of resistance to fungicides. The addition of products such as EBDC’s and Topsin (Thiophanate methyl) products will be needed to reduce the potential for developing resistance with some of the more effective fungicides.

Future testing will include products which may enhance the effectiveness of fungicides used for Cercospora leaf spot control. These products may include System Acquired Resistant type products. The focus of this type of work will be to attempt top manage cercospora leaf spot resistance to the fungicides in concern.

Table 1. Site Specifics for Cercospora Leaf Spot Single Mode Testing Clara City, 2012

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	PRODUCT	RATE	WEATHER
4/26/2012	X	SV36938RR	4.5"	Dry		10-34-0	3 GPA	
5/15/2012					X	Roundup PowerMax	32 oz.	63' Sunny S-3
						Quadris	14 oz.	
6/12/2012					X	Roundup PowerMax	32 oz.	65' Sunny NW-5
6/27/2012					**Innoculated**			90' Humid
7/5/2012					**Innoculated**			95' Humid
7/11/2012					X	1st Application		
7/26/2012					X	2nd Application		
8/7/2012					X	3rd Application		85' Sunny calm

Table. 2 Fungicides Applied as Single Mode of Action, Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality Production in Sugarbeets, Clara City 2012

Trt No.	Product	Rate oz. Acre	Interval Days/ Spray	8/6/12 CLS Rating	8/13/12 CLS Rating	8/22/12 CLS Rating	9/13/12 CLS Rating	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Check	N/A	N/A	2.8	3.5	4.2	6.0	33.84	16.10	89.17	9023	78.26
2	Headline + EBDC	9.2	14	1.0	1.1	1.1	2.6	39.93	16.64	89.59	11019	97.24
	Headline + EBDC	9.2	14									
	Headline +EBDC	9.2	14									
3	GEM 500 SC +EBDC	3.5	14	1.0	1.2	1.1	2.8	43.53	15.91	89.23	11335	97.11
	GEM 500 SC +EBDC	3.5	14									
	GEM 500 SC +EBDC	3.5	14									
4	Proline +Induce + EBDC	5	14	1.0	1.1	1.1	2.5	41.27	16.24	89.88	11104	96.77
	Proline +Induce + EBDC	5	14									
	Proline +Induce + EBDC	5	14									
5	Inspire XT + EBDC	7	14	1.1	1.3	1.3	2.8	42.74	17.00	90.27	12244	109.98
	Inspire XT + EBDC	7	14									
	Inspire XT + EBDC	7	14									
6	EMINENT + EBDC	13	14	1.1	1.2	1.1	2.6	45.73	17.35	89.71	13259	119.74
	EMINENT + EBDC	13	14									
	EMINENT + EBDC	13	14									
7	HEADLINE	9.2	14	1.5	1.4	1.4	3.0	46.23	17.35	90.31	13460	121.79
	HEADLINE	9.2	14									
	HEADLINE	9.2	14									
8	Priaxor	6.5	14	1.0	1.2	1.2	2.6	39.85	17.02	89.66	11285	100.82
	Priaxor	6.5	14									
	Priaxor	6.5	14									
9	Proline +Induce	5	14	1.0	1.3	1.2	2.8	41.82	16.49	89.72	11466	100.87
	Proline +Induce	5	14									
	Proline +Induce	5	14									
10	GEM 500 SC	3.5	14	1.0	1.2	1.2	2.8	42.06	16.52	89.05	11414	99.89
	GEM 500 SC	3.5	14									
	GEM 500 SC	3.5	14									
11	INSPIRE-XT	7	14	1.0	1.3	1.4	2.7	42.65	15.61	90.98	11245	96.98
	INSPIRE-XT	7	14									
	INSPIRE-XT	7	14									
	CV%			**39.81**	**20.97**	**27.93**	**14.78**	**10.31**	5.89	**1.25**	**12.56**	**14.67**
	LSD (0.05)			**0.72**	**0.48**	**0.72**	**0.67**	**5.71**	1.38	**1.59**	**1926.2**	**20.73**

Table. 2 (Continued) Fungicides Applied as Single Mode of Action, Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality Production in Sugarbeets,

Trt No.	Product	Rate oz. Acre	Interval Days/ Spray	8/6/12 CLS Rating	8/13/12 CLS Rating	8/22/12 CLS Rating	9/13/12 CLS Rating	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
12	ECHO 720	16	14	1.2	1.4	2.0	4.0	38.88	16.57	89.69	10705	94.36
	ECHO 720	16	14									
	ECHO 720	16	14									
13	Priaxor+ AG 8050	6.5	14	1.1	1.4	1.6	2.9	42.32	16.66	89.18	11625	102.36
	Priaxor+ AG 8050	6.5	14									
	Priaxor+ AG 8050	6.5	14									
14	Vertisan	16	14	1.1	1.6	1.8	4.1	38.76	16.17	89.62	10403	90.54
	Vertisan	16	14									
	Vertisan	16	14									
15	Vertisan	24	14	1.6	1.7	2.1	4.1	43.16	16.77	89.74	12068	107.16
	Vertisan	24	14									
	Vertisan	24	14									
16	EMINENT	13	14	1.1	1.5	1.4	2.9	36.25	17.46	89.03	10500	94.80
	EMINENT	13	14									
	EMINENT	13	14									
17	XEMIUM			1.9	2.3	2.6	4.1	42.49	16.87	89.75	11943	106.33
	XEMIUM											
	XEMIUM											
18	AGRITIN + Topsin	8	14	1.0	1.2	1.2	2.6	44.78	16.49	89.41	12259	107.75
	AGRITIN + Topsin	8	14									
	AGRITIN + Topsin	8	14									
19	Topsin M4.5F	10	14	1.3	1.3	1.4	3.2	42.28	16.98	90.06	12017	107.54
	Topsin M4.5F	10	14									
	Topsin M4.5F	10	14									
20	Pencozeb	2 lbs	14	1.0	1.1	1.1	2.6	36.57	16.00	90.56	9925	86.87
	Pencozeb	2 lbs	14									
	Pencozeb	2 lbs	14									
21	SUPERTIN 4L	8	14	1.0	1.3	1.2	2.8	32.39	16.65	89.52	9124	81.31
	SUPERTIN 4L	8	14									
	SUPERTIN 4L	8	14									
22	AGRITIN 4L	8	14									
	AGRITIN 4L	8	14	1.5	1.8	2.1	3.5	40.63	16.91	89.55	11409	101.53
	AGRITIN 4L	8	14									
	CV%			**39.81**	**20.97**	**27.93**	**14.78**	**10.31**	5.89	**1.25**	**12.56**	**14.67**
	LSD (0.05)			**0.72**	**0.48**	**0.72**	**0.67**	**5.71**	1.38	**1.59**	**1926.2**	**20.73**

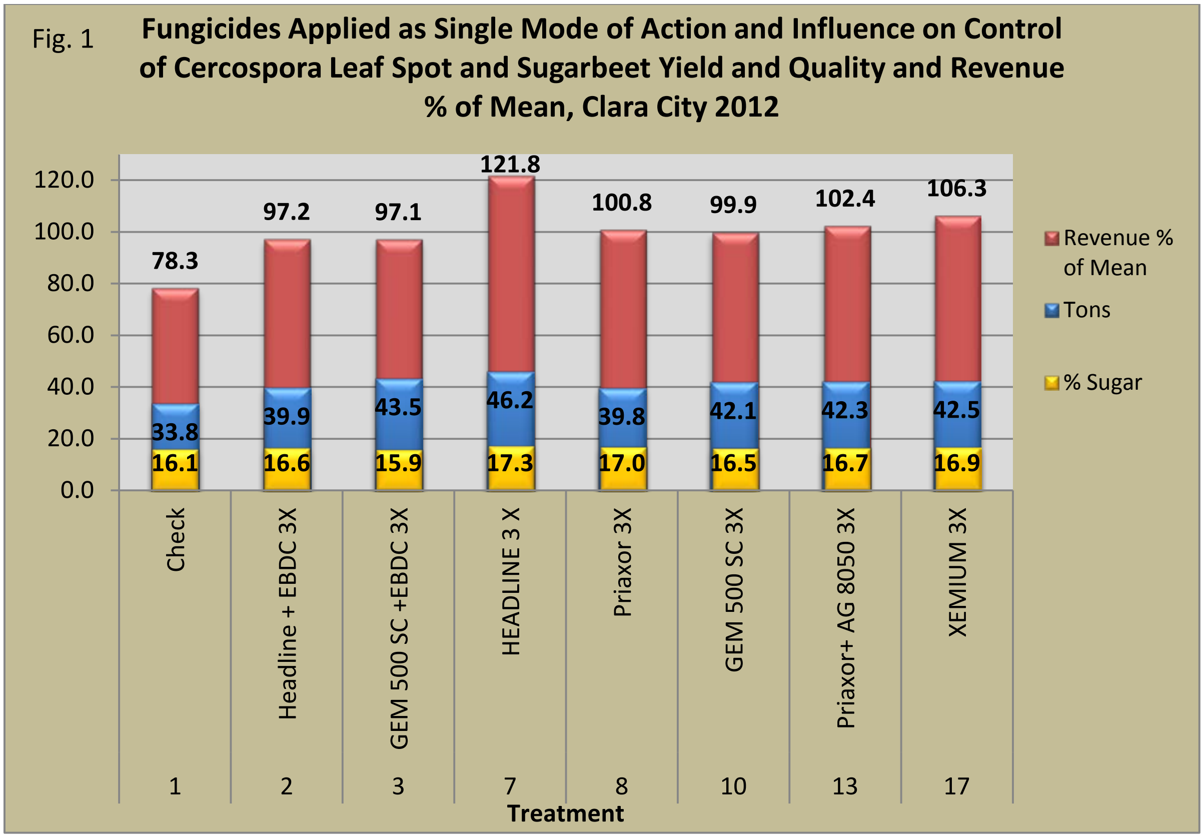


Fig. 1
Fungicides Applied as Single Mode of Action and Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality and Revenue % of Mean, Clara City 2012
120.0
100.0
80.0
60.0
40.0
20.0
0.0
78.3
97.2
97.1
121.8
100.8
99.9
102.4
106.3
33.8
39.9
43.5
46.2
39.8
42.1
42.3
42.5
16.1
16.6
15.9
17.3
17.0
16.5
16.7
16.9
Revenue % of Mean
Tons
% Sugar
Check
Headline + EBDC 3X
GEM 500 SC +EBDC 3X
HEADLINE 3 X
Priaxor 3X
GEM 500 SC 3X
Priaxor+ AG 8050 3X
XEMIUM 3X
1
2
3
7
8
10
13
17
Treatment

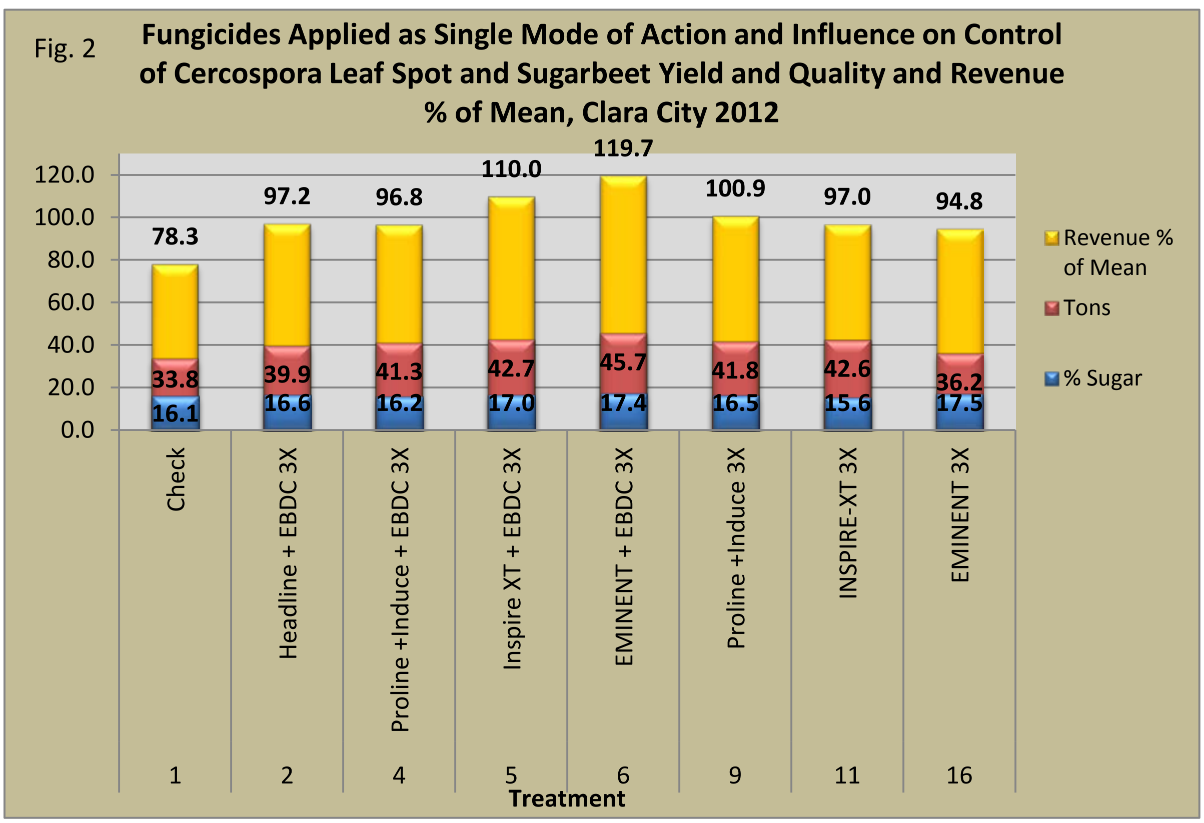


Fig. 2
Fungicides Applied as Single Mode of Action and Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality and Revenue % of Mean, Clara City 2012
120.0
100.0
80.0
60.0
40.0
20.0
0.0
78.3
97.2
96.8
110.0
119.7
100.9
97.0
94.8
33.8
39.9
41.3
42.7
45.7
41.8
42.6
36.2
16.1
16.6
16.2
17.0
17.4
16.5
15.6
17.5
Revenue % of Mean
Tons
% Sugar
Check
Headline + EBDC 3X
Proline +Induce + EBDC 3X
Inspire XT + EBDC 3X
EMINENT + EBDC 3X
Proline +Induce 3X
INSPIRE-XT 3X
EMINENT 3X
1
2
4
5
6
9
11
16
Treatment

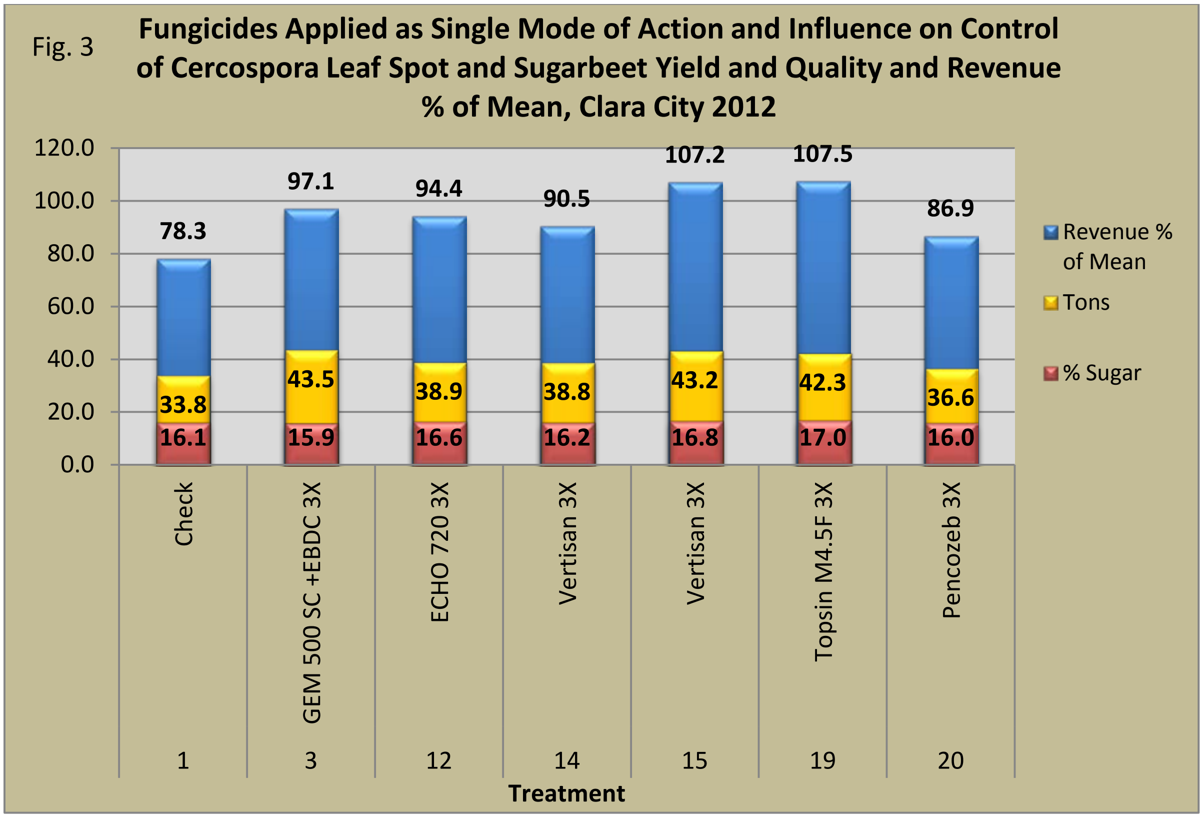


Fig. 3
Fungicides Applied as Single Mode of Action and Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality and Revenue % of Mean, Clara City 2012
120.0
100.0
80.0
60.0
40.0
20.0
0.0
78.3
97.1
94.4
90.5
107.2
107.5
86.9
33.8
43.5
38.9
38.8
43.2
42.3
36.6
16.1
15.9
16.6
16.2
16.8
17.0
16.0
Check
GEM 500 SC +EBDC 3X
ECHO 720 3X
Vertisan 3X
Vertisan 3X
Topsin M4.5F 3X
Pencozeb 3X
1
3
12
14
15
19
20
Treatment
Revenue % of Mean
Tons
% Sugar

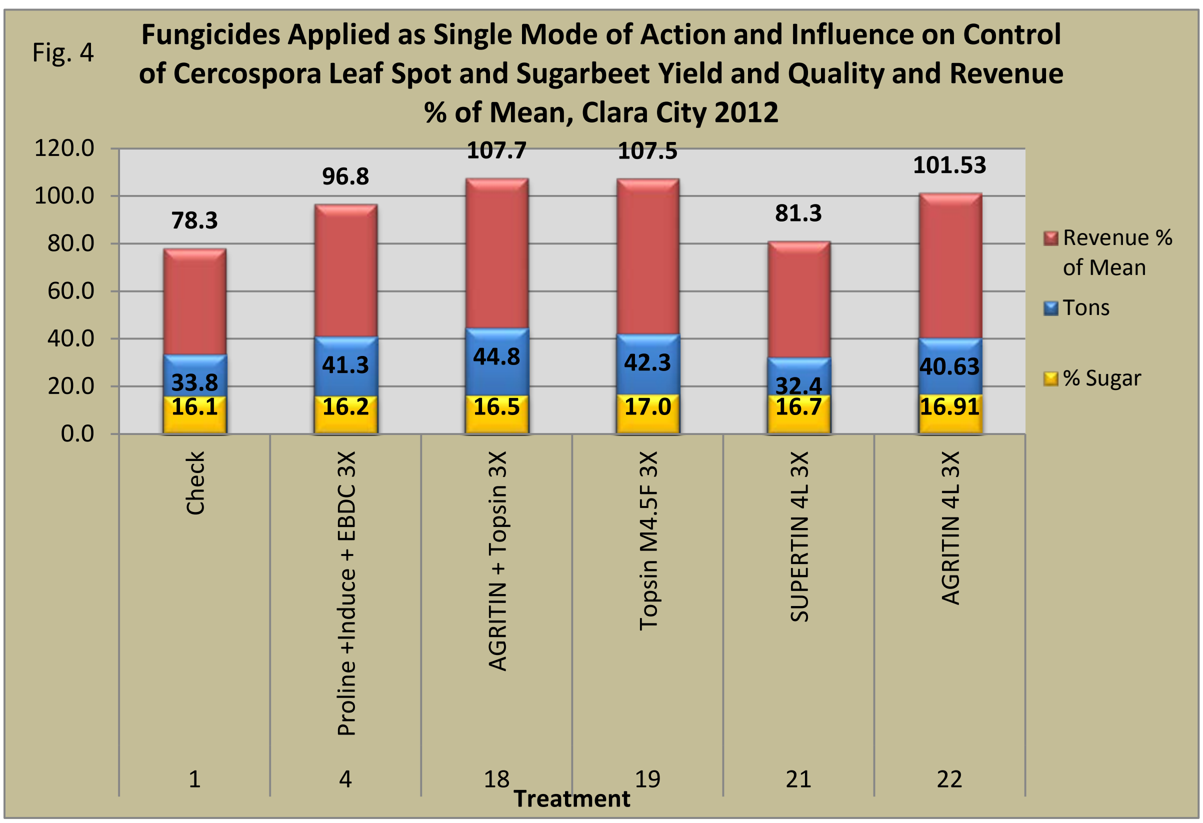


Fig. 4
Fungicides Applied as Single Mode of Action and Influence on Control of Cercospora Leaf Spot and Sugarbeet Yield and Quality and Revenue % of Mean, Clara City 2012
120.0
100.0
80.0
60.0
40.0
20.0
0.0
78.3
96.8
107.7
107.5
81.3
101.53
33.8
41.3
44.8
42.3
32.4
40.63
16.1
16.2
16.5
17.0
16.7
16.91
Check
Proline +Induce + EBDC 3X
AGRITIN + Topsin 3X
Topsin M4.5F 3X
SUPERTIN 4L 3X
AGRITIN 4L 3X
1
4
18
19
21
22
Treatment
Revenue % of Mean
Tons
% Sugar

Influence of Glyphosate Resistance with Lay by Herbicides 2012

Objectives

The objective of the testing was to evaluate layby herbicide programs for control of weed in a glyphosate tolerant system for control of susceptible and tolerant weeds to glyphosate.

Methods

Table 1 shows the specifics of activities conducted at the weed control program site in 2012 at Bird Island. Table 2 shows the specifics of activities conducted at the weed control program site in 2012 at Clara City, MN. Table 3, 4 show sugarbeet yield, quality and revenue (expressed as a percent of the mean) at Bird Island and Clara City, respectively. Table 5 shows the weed control data for the Clara City location. The weed control at the Bird Island location is not shown since there were no differences amongst treatments and all treatments gave maximum (99%) control of the weeds. The tests were replicated 4 times and conducted in a randomized complete block experimental design. Plots were 11 ft. (6 rows) wide and 35 ft. long. Sugarbeet were not thinned. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. Sugarbeets were harvested with a 2 row research harvester at Bird Island and Clara City, MN. The sugarbeets were weighed on the two row harvester at Bird Island and Clara City for yield and a sub-sample was collected to be analyzed for quality in the SMBSC quality lab.

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

The glyphosate product used in the testing was Roundup Power Max (indicated in tables as Roundup PM) and the ethofumesate product used in the testing was Nortron. There are other products that include the active ingredients of glyphosate and ethofumesate. The other products would be considered equivalent products if used in a manner in accordance to their label. The standard glyphosate treatment in these test are as follows.

Application 1	Roundup PowerMax+Destiny HC+N-Tense	1.125lb ae/A+1.5pt/A +2.5%v/v	**2 LF SB**
Application 2	Roundup PowerMax+Destiny HC+N-Tense	0.844lb ae/A+1.5pt/A +2.5%v/v	**14 DAT 2 LF**
Application 3	Roundup PowerMax+Destiny HC+N-Tense	0.75lb ae/A+1.5pt/A +2.5%v/v	**28 DAT 2 LF**

Results and Discussion

General comments

Weed density and characteristics were different at Bird Island and Clara City. The Bird Island site had a low weed density and the waterhemp present was not resistant. The Clara City site had high weed pressure and the waterhemp expressed a level of resistance to glyphosate. Therefore, these data from Bird Island and Clara City will be discussed separately.

Bird Island

All treatments influenced sugarbeet quality and yield similarly (Table 3). Weed control was similar for all treatments. Weed control was very good regardless of the treatment (data not presented). The results at this site were typical of testing treatments containing glyphosate in the presence of glyphosate susceptible weed population.

Clara City

All treatments will be compared to the standard glyphosate treatment (described in methods). The standard glyphosate treatment gave significantly lower sugarbeet production than most other treatments due to the presence of glyphosate resistant waterhemp. The addition of Betamix, Outlook, Warrant and ethofumesate (applied as Nortron at 4 oz. /acre) to the standard glyphosate treatment positively influenced sugarbeet production and the influence was statistically significant. The treatment were separated by applying the treatments with or without ethofumesate (applied as Nortron) applied preemergence at 7.5 pt. /acre. The application of ethofumesate to the weed control program significantly increased the sugarbeet production. The revenue percent of mean was above the mean in all cases where ethofumesate was applied preemergence in the weed control program. The revenue percent of mean was below the average in all cases except for one when ethofumesate was not included as a preemergence application in the weed control program. The one case was treatment 13 when Betamix, Norton and Warrant were applied with the standard glyphosate treatment. This indicated that overall, the addition of ethofumesate in the weed control program enhanced sugarbeet production.

All treatment gave a maximum control (99%) of the susceptible lambs quarter and amaranth at the last weed control evaluation on 7-13-2012. The standard glyphosate treatment showed very poor control of the glyphosate resistant waterhemp population. The data did show an advantage of adding an ammonium sulfate source to the spray solution. The addition of Betamix and ethofumesate with the standard glyphosate treatment only tended to increase the waterhemp control at the early weed control evaluation on 6-21-2012, but did significant increase the waterhemp control at the later weed control evaluation on 7-13-2012. The addition of Outlook or Dual Magnum appeared to antagonize the waterhemp control when mixed with the standard glyphosate treatment with Betamix and ethofumesate. Warrant applied with the standard glyphosate treatment gave poor control of waterhemp. The addition of Betamix with the Warrant + standard glyphosate treatment increased the control of waterhemp to a greater extent than the same treatment with Outlook or Dual Magnum. The addition of ethofumesate at 4oz/acre with the Betamix/Warrant/standard glyphosate treatment increased the control even more than the Betamix/Warrant/standard glyphosate treatment. Thus to achieve optimal control with Warrant and the standard glyphosate treatment you should also include Betamix and ethofumesate in the spray mix.

The best and most consistent control of the glyphosate resistant waterhemp occurred when ethofumesate was applied preemergence and a post emergence application of the standard glyphosate treatment. The waterhemp control remained excellent and consistent when other products such as Betamix, ethofumesate, Outlook, Dual Magnum and Warrant were applied with the standard glyphosate treatment. Since the control of waterhemp was excellent when ethofumesate was applied preemergence, a significant increase was not observed by adding the additional products to the spray mix. The advantage of adding ethofumesate preemergence to the weed control program was realized in both the waterhemp control and the sugarbeet production.

Table 1. Site Specifics for Glyphosate Resistant with Lay by Herbicide Testing Bird Island, 2012

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/17/2012					X	PPI		50' Sunny SE-9
4/24/2012	X	98RR08	4.8"					
4/25/2012					X	Pre-emergence		47' Pcloudy NE-15
5/21/2012					X	Application B		85' Sunny SW-5
6/8/2012					X	Application C		76' Sunny S-10
6/22/2012					X	Application D		75' Sunny Calm
7/2/2012					X	Eminent	13 oz.	82' Sunny S-8
						Manzate	1.5qt	
7/17/2012					X	Supertin Wp	8 oz.	77' Pcloudy ENE-14
						Roundup PowerMax	44 oz.	
7/31/2012					X	Gem	3.5 oz.	77' Sunny SSE-4
9/4/2012					X	Roundup PowerMax	32 oz.	86' Sunny WNW-7

Table 2. Site Specifics for Glyphosate Resistant with Lay by Herbicide Testing Clara City, 2012

DATE	PLANTED	VARIETY	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/20/2012	X	SV36091RR	4 3/8"	Damp		Quadris In furrow	9.6 oz.	
4/25/2012					X	Pre-emergence		74' Sunny SW-6
5/30/2012					X	Application B		85' Sunny SW-5
6/11/2012					X	Application C		62' Pcloudy SW-5
6/22/2012					X	Application D		67' Sunny calm
7/3/2012					X	Eminent	13 oz.	81' Sunny S-6
						Manzate	1.5qt	
7/17/2012					X	Supertin Wp	8 oz.	82' Pcloudy SE-11
						Roundup PowerMax	44 oz.	
7/31/2012					X	Gem	3.5 oz.	81' Sunny SSE-9

Table 3. Influence of Glyphosate Resistance with Lay by Herbicides in Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
1	**No ppi/pre**			80	27.1	13.62	87.76	5868	107.11	115.86
	Roundup PM+N-Pak	32+2.5%	**B=2 lf**							
	Roundup PM+N-Pak	32+2.5%	**C=14 dat**							
	Roundup PM+N-Pak	22+2.5%	**D=28 DAT**							
2	**No ppi/pre**			72	26.3	13.83	89.02	5930	111.46	118.72
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**B=2 lf**							
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
3	**No ppi/pre**			74	25.1	13.88	88.64	5653	106.20	110.28
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**							
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
4	**No ppi/pre**			71	23.4	13.33	88.85	5041	91.89	93.72
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
5	**No ppi/pre**			68	26.2	13.47	87.34	5595	101.10	105.56
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**							
	Outlook+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
6	**No ppi/pre**			78	26.8	13.13	88.45	5668	101.72	104.38
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5 %	**B=2 lf**							
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5 %	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**10.0**	**4.45**	**1.63**	**11**	**12.80**	**11.72**
			LSD (0.05)	**33**	**3.6**	**0.84**	**2.03**	**816**	**18.04**	**16.45**

Table 3. (Continued) Influence of Glyphosate Resistance with Lay by herbicides in Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
7	No ppi/pre			68	24.1	14.09	88.45	5496	103.98	105.43
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	B=2 lf							
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	C=14 dat							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT							
8	No ppi/pre			74	27.3	13.06	87.58	5649	99.90	103.69
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	B=2 lf							
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	C=14 dat							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT							
9	No ppi/pre			77	24.6	14.26	89.30	5705	109.17	111.26
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	B=2 lf							
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	C=14 dat							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT							
10	No ppi/pre			70	25.1	13.25	87.63	5238	93.13	92.87
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5%	B=2 lf							
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5%	C=14 dat							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT							
11	No ppi/pre			76	28.3	13.58	89.33	6268	116.30	122.74
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	B=2 lf							
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	C=14 dat							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT							
12	No ppi/pre			77	24.6	13.74	88.22	5447	101.14	103.24
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	B=2 lf							
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	C=14 dat							
	Betamix+Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT							
			CV%	12	10.0	4.45	1.63	11	12.80	11.72
			LSD (0.05)	33	3.6	0.84	2.03	816	18.04	16.45

Table 3. (Continued) Influence of Glyphosate Resistance with Lay by Herbicides in Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
13	**No ppi/pre**			77	22.5	13.82	89.02	5038	94.34	95.14
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
14	**Nortron**	7.5 pt./A	**pre**	72	27.3	13.73	89.26	6106	114.08	115.55
	Roundup PM+Destiny+N-Tense	32+24+2.5%	**B=2 lf**							
	Roundup PM+Destiny+N-Pak	22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny+N-Tense	22+24+2.5%	**D=28 DAT**							
15	**Nortron**	7.5 pt./A	**pre**	77	26.7	12.91	87.51	5461	95.51	92.21
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**							
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
16	**Nortron**	7.5 pt./A	**pre**	88	26.2	13.40	88.41	5641	102.70	99.55
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
17	**Nortron**	7.5 pt./A	**pre**	81	27.3	13.15	88.96	5812	105.01	103.67
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
18	**Nortron**	7.5 pt./A	**pre**	74	26.0	13.42	88.82	5645	103.46	99.24
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	**B=2 lf**							
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**10.0**	**4.45**	**1.63**	**11**	**12.80**	**11.72**
			LSD (0.05)	**33**	**3.6**	**0.84**	**2.03**	**816**	**18.04**	**16.45**

Table 3. (Continued) Influence of Glyphosate Resistance with Lay by Herbicides in Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
19	**Nortron**	7.5 pt./A	**pre**	75	23.7	12.90	88.08	4866	85.48	78.70
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
20	**Nortron**	7.5 pt./A	**pre**	84	27.5	13.49	88.48	5989	109.78	108.41
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	**B=2 lf**							
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
21	**Nortron**	7.5 pt./A	**pre**	75	23.1	13.27	88.77	4955	89.98	84.31
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	**B=2 lf**							
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
22	**Nortron**	7.5 pt./A	**pre**	86	23.9	13.47	88.43	5168	94.39	88.04
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC N-Pak	12+4+24+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC N-Pak	16+4+16+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
23	**Nortron**	7.5 pt./A	**pre**	71	24.3	13.01	87.14	4974	87.09	84.16
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	**B=2 lf**							
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
24	**Nortron**	7.5 pt./A	**pre**	81	25.0	13.05	87.25	5163	91.00	85.79
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	**B=2 lf**							
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	**C=14 dat**							
	Betamix+Roundup PM+Destiny HC+N-Pak	24+24+24+2.5%	**D=28 DAT**							
25	**Nortron**	7.5 pt./A	**pre**	73	23.6	13.20	86.51	4815	84.06	77.48
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**10.0**	**4.45**	**1.63**	**11**	**12.80**	**11.72**
			LSD (0.05)	**33**	**3.6**	**0.84**	**2.03**	**816**	**18.04**	**16.45**

Table 4. Influence of Glyphosate Resistance with Lay by herbicides for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
1	**No ppi/pre**			221	13.3	14.65	92.15	3321	85.42	93.91
	Roundup PM+N-Pak	32+2.5%	B=2 lf							
	Roundup PM+N-Pak	32+2.5%	C=14 dat							
	Roundup PM+N-Pak	22+2.5%	D=28 DAT							
2	**No ppi/pre**			214	13.2	14.21	90.91	3159	79.07	84.08
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	B=2 lf							
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	C=14 dat							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT							
3	**No ppi/pre**			229	16.9	14.24	92.49	4127	104.67	109.85
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	B=2 lf							
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	C=14 dat							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT							
4	**No ppi/pre**			235	18.1	14.31	90.96	4188	102.88	106.87
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	B=2 lf							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	C=14 dat							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT							
5	**No ppi/pre**			231	15.4	13.75	90.76	3554	86.97	90.86
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	B=2 lf							
	Outlook+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	C=14 dat							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT							
6	**No ppi/pre**			208	16.8	13.55	92.30	3893	95.44	98.06
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	B=2 lf							
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	C=14 dat							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT							
			CV%	12	1.7	0.81	1.36	514	15.63	12.51
			LSD (0.05)	36	1.7	0.81	1.36	514	15.63	17.63

Table 4.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
7	**No ppi/pre**			223	15.7	14.12	92.01	3769	94.73	94.27
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
8	**No ppi/pre**			204	14.8	14.26	91.51	3583	90.38	87.52
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	**B=2 lf**							
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
9	**No ppi/pre**			216	10.9	13.71	90.54	2494	60.65	63.87
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	**B=2 lf**							
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
10	**No ppi/pre**			211	15.4	13.40	91.63	3485	84.20	85.46
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC N-Pak	12+4+24+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC N-Pak	16+4+16+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
11	**No ppi/pre**			224	13.0	13.69	91.03	2976	72.64	70.85
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	**B=2 lf**							
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
12	**No ppi/pre**			228	17.1	13.74	90.19	3885	94.26	92.85
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	**B=2 lf**							
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	**C=14 dat**							
	Betamix+Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**9.74**
			LSD (0.05)	**36**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**13.72**

Table 4.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
13	**No ppi/pre**			214	18.9	14.13	92.00	4541	114.17	111.15
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
14	**Nortron**	7.5 pt./A	**pre**	213	18.5	14.35	90.72	4396	109.53	108.51
	Roundup PM+Destiny+N-Tense	32+24+2.5%	**B=2 lf**							
	Roundup PM+Destiny+N-Pak	22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny+N-Pak	22+24+2.5%	**D=28 DAT**							
15	**Nortron**	7.5 pt./A	**pre**	218	17.7	13.89	90.63	4096	100.57	103.41
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**							
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
16	**Nortron**	7.5 pt./A	**pre**	219	20.6	14.36	91.02	4983	125.51	126.23
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
17	**Nortron**	7.5 pt./A	**pre**	223	18.5	15.30	90.59	4758	124.93	124.10
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
18	**Nortron**	7.5 pt./A	**pre**	228	18.2	14.31	90.46	4341	108.70	112.47
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	**B=2 lf**							
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**9.74**
			LSD (0.05)	**36**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**13.72**

Table 4.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	Stand	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean	Revenue % of Mean Minus Application Cost
19	**Nortron**	7.5 pt./A	**pre**	224	18.4	14.21	91.12	4544	116.00	119.60
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+ N-Pak	12+4+14+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
20	**Nortron**	7.5 pt./A	**pre**	209	18.2	14.01	91.07	4285	106.45	108.23
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	**B=2 lf**							
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
21	**Nortron**	7.5 pt./A	**pre**	204	18.3	14.38	91.68	4477	113.50	116.74
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	**B=2 lf**							
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	**C=14 dat**							
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**							
22	**Nortron**	7.5 pt./A	**pre**	225	17.9	13.80	90.98	4213	104.42	109.85
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
23	**Nortron**	7.5 pt./A	**pre**	223	18.6	13.97	89.59	4279	104.43	105.54
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	**B=2 lf**							
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	**C=14 dat**							
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**							
24	**Nortron**	7.5 pt./A	**pre**	198	19.1	13.88	91.03	4463	110.11	113.37
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	**B=2 lf**							
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	**C=14 dat**							
	Betamix+Roundup PM+Destiny HC+N-Pak	24+24+24+2.5%	**D=28 DAT**							
25	**Nortron**	7.5 pt./A	**pre**	240	18.6	14.11	91.08	4427	110.39	114.26
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	**B=2 lf**							
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	**C=14 dat**							
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**							
			CV%	**12**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**9.74**
			LSD (0.05)	**36**	**1.7**	**0.81**	**1.36**	**514**	**15.63**	**13.72**

Table 5. Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
1	**No ppi/pre**			99	48	99	99	21	99
	Roundup PM+N-Pak	32+2.5%	**B=2 lf**						
	Roundup PM+N-Pak	32+2.5%	**C=14 dat**						
	Roundup PM+N-Pak	22+2.5%	**D=28 DAT**						
2	**No ppi/pre**			99	58	77	99	26	99
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**B=2 lf**						
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
3	**No ppi/pre**			99	80	99	99	79	99
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**						
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
4	**No ppi/pre**			99	72	87	99	73	99
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
5	**No ppi/pre**			99	53	79	99	59	99
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**						
	Outlook+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
6	**No ppi/pre**			99	83	87	99	70	99
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	**B=2 lf**						
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
			CV%	**NS**	**28**	**18**	**NS**	**29**	**NS**
			LSD (0.05)	**0**	**28**	**18**	**0**	**31**	**0**

Table 5.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
7	**No ppi/pre**			99	71	98	99	61	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
8	**No ppi/pre**			99	50	99	99	35	99
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	**B=2 lf**						
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
9	**No ppi/pre**			99	39	99	99	25	99
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	**B=2 lf**						
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
10	**No ppi/pre**			99	78	98	99	67	99
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
11	**No ppi/pre**			99	39	99	99	31	99
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	**B=2 lf**						
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
12	**No ppi/pre**			99	86	99	99	84	99
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	**B=2 lf**						
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	**C=14 dat**						
	Betamix+Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
			CV%	**NS**	**28**	**18**	**NS**	**29**	**NS**
			LSD (0.05)	**0**	**28**	**18**	**0**	**31**	**0**

Table 5.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
13	No ppi/pre			99	76	99	99	94	99
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
14	Nortron	7.5 pt./A	pre	99	98	99	99	98	99
	Roundup PM+Destiny+N-Tense	32+24+2.5%	B=2 lf						
	Roundup PM+Destiny+N-Pak	22+24+2.5%	C=14 dat						
	Roundup PM+Destiny+N-Pak	22+24+2.5%	D=28 DAT						
15	Nortron	7.5 pt./A	pre	99	98	99	99	98	99
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	B=2 lf						
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	C=14 dat						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT						
16	Nortron	7.5 pt./A	pre	99	93	99	99	93	99
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
17	Nortron	7.5 pt./A	pre	99	97	99	99	98	99
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	C=14 dat						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT						
18	Nortron	7.5 pt./A	pre	99	86	99	99	98	99
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	B=2 lf						
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	C=14 dat						
	Betamix +Roundup PowerMax+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT						
			CV%	NS	28	18	NS	29	NS
			LSD (0.05)	0	28	18	0	31	0

Table 5.(Continued) Influence of Glyphosate Resistance with Lay by herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
19	Nortron	7.5 pt./A	pre	99	99	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5 %	B=2 lf						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5 %	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
20	Nortron	7.5 pt./A	pre	99	94	99	99	98	99
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	B=2 lf						
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	C=14 dat						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT						
21	Nortron	7.5 pt./A	pre	99	98	99	99	98	99
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	B=2 lf						
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	C=14 dat						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT						
22	Nortron	7.5 pt./A	pre	99	99	99	99	97	99
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5 %	B=2 lf						
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5 %	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
23	Nortron	7.5 pt./A	pre	99	98	99	99	96	99
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	B=2 lf						
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	C=14 dat						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT						
24	Nortron	7.5 pt./A	pre	99	99	99	99	99	99
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	B=2 lf						
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	C=14 dat						
	Betamix+Roundup PM+Destiny HC+N-Pak	24+24+24+2.5%	D=28 DAT						
25	Nortron	7.5 pt./A	pre	99	99	99	99	99	99
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5 %	B=2 lf						
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5 %	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
			CV%	NS	28	18	NS	29	NS
			LSD (0.05)	0	28	18	0	31	0

Table 5. Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
1	**No ppi/pre**			99	48	99	99	21	99
	Roundup PM+N-Pak	32+2.5%	**B=2 lf**						
	Roundup PM+N-Pak	32+2.5%	**C=14 dat**						
	Roundup PM+N-Pak	22+2.5%	**D=28 DAT**						
2	**No ppi/pre**			99	58	77	99	26	99
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**B=2 lf**						
	Roundup PM+Destiny HC+N-Pak	32+24+2.5%+22	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
3	**No ppi/pre**			99	80	99	99	79	99
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**						
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
4	**No ppi/pre**			99	72	87	99	73	99
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
5	**No ppi/pre**			99	53	79	99	59	99
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**						
	Outlook+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
6	**No ppi/pre**			99	83	87	99	70	99
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	**B=2 lf**						
	Betamix +Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
			CV%	**NS**	**28**	**18**	**NS**	**29**	**NS**
			LSD (0.05)	**0**	**28**	**18**	**0**	**31**	**0**

Table 5.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
7	**No ppi/pre**			99	71	98	99	61	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
8	**No ppi/pre**			99	50	99	99	35	99
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	**B=2 lf**						
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
9	**No ppi/pre**			99	39	99	99	25	99
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	**B=2 lf**						
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
10	**No ppi/pre**			99	78	98	99	67	99
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
11	**No ppi/pre**			99	39	99	99	31	99
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	**B=2 lf**						
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
12	**No ppi/pre**			99	86	99	99	84	99
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	**B=2 lf**						
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	**C=14 dat**						
	Betamix+Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
			CV%	**NS**	**28**	**18**	**NS**	**29**	**NS**
			LSD (0.05)	**0**	**28**	**18**	**0**	**31**	**0**

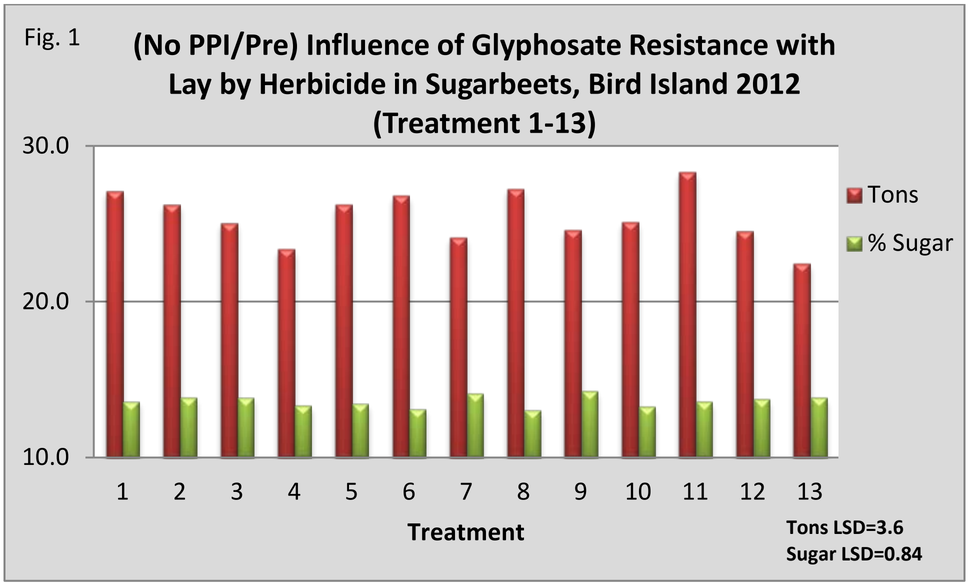
Table 5.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

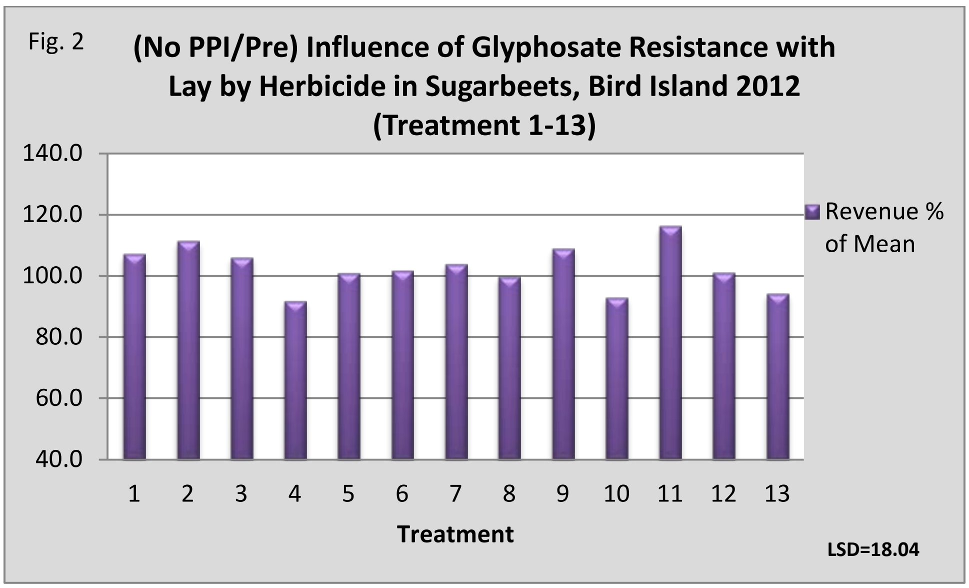
Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
13	**No ppi/pre**			99	76	99	99	94	99
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5 %	**B=2 lf**						
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5 %	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
14	**Nortron**	7.5 pt./A	**pre**	99	98	99	99	98	99
	Roundup PM+Destiny+N-Tense	32+24+2.5%	**B=2 lf**						
	Roundup PM+Destiny+N-Pak	22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny+N-Pak	22+24+2.5%	**D=28 DAT**						
15	**Nortron**	7.5 pt./A	**pre**	99	98	99	99	98	99
	Betamix +Roundup PM+Destiny HC+N-Pak	12+32+24+2.5%	**B=2 lf**						
	Betamix +Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
16	**Nortron**	7.5 pt./A	**pre**	99	93	99	99	93	99
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	12+4+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	16+4+22+24+2.5%	**C=14 dat**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	**D=28 DAT**						
17	**Nortron**	7.5 pt./A	**pre**	99	97	99	99	98	99
	Outlook+Roundup PM+Destiny HC+N-Pak	14+32+24+2.5%	**B=2 lf**						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	10+22+24+2.5%	**C=14 dat**						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	**D=28 DAT**						
18	**Nortron**	7.5 pt./A	**pre**	99	86	99	99	98	99
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	12+14+32+24+2.5%	**B=2 lf**						
	Betamix+Outlook+Roundup PM+Destiny HC+N-Pak	16+10+22+24+2.5%	**C=14 dat**						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	**D=28 DAT**						
			CV%	**NS**	**28**	**18**	**NS**	**29**	**NS**
			LSD (0.05)	**0**	**28**	**18**	**0**	**31**	**0**

Table 5.(Continued) Influence of Glyphosate Resistance with Lay by Herbicides for Weed Control in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate oz. Acre	Timing	6/21/12 Rating Lambs-quarter	6/21/12 Rating Water-Hemp	6/21/12 Rating Amranth	7/13/12 Rating Lambs-quarter	7/13/12 Rating Water-Hemp	7/13/12 Rating Amranth
19	Nortron	7.5 pt/A	pre	99	99	99	99	99	99
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	12+4+14+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Outlook+Roundup PM+Destiny HC+N-Pak	16+4+10+22+24+2.5%	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
20	Nortron	7.5 pt/A	pre	99	94	99	99	98	99
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	24+32+24+2.5%	B=2 lf						
	Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+22+24+2.5%	C=14 dat						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT						
21	Nortron	7.5 pt/A	pre	99	98	99	99	98	99
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+24+32+24+2.5%	B=2 lf						
	Betamix +Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+16+22+24+2.5%	C=14 dat						
	Betamix +Roundup PM+Destiny HC+N-Pak	24+22+24+2.5%	D=28 DAT						
22	Nortron	7.5 pt/A	pre	99	99	99	99	97	99
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	12+4+24+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Dual Magnum+Roundup PM+Destiny HC+N-Pak	16+4+16+22+24+2.5%	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
23	Nortron	7.5 pt/A	pre	99	98	99	99	96	99
	Warrant+Roundup PM+Destiny HC+N-Pak	48+32+24+2.5%	B=2 lf						
	Warrant+Roundup PM+Destiny HC+N-Pak	32+22+24+2.5%	C=14 dat						
	Roundup PM+Destiny HC+N-Pak	22+24+2.5%	D=28 DAT						
24	Nortron	7.5 pt/A	pre	99	99	99	99	99	99
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	12+48+32+24+2.5%	B=2 lf						
	Betamix+Warrant+Roundup PM+Destiny HC+N-Pak	16+32+22+24+2.5%	C=14 dat						
	Betamix+Roundup PM+Destiny HC+N-Pak	24+24+24+2.5%	D=28 DAT						
25	Nortron	7.5 pt/A	pre	99	99	99	99	99	99
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	12+4+48+32+24+2.5%	B=2 lf						
	Betamix +Nortron+Warrant+Roundup PM+Destiny HC+N-Pak	16+4+32+22+24+2.5%	C=14 dat						
	Betamix +Nortron+Roundup PM+Destiny HC+N-Pak	24+4+22+24+2.5%	D=28 DAT						
			CV%	NS	28	18	NS	29	NS
			LSD (0.05)	0	28	18	0	31	0

Note: Refer Back to the Tables for Treatment Reference





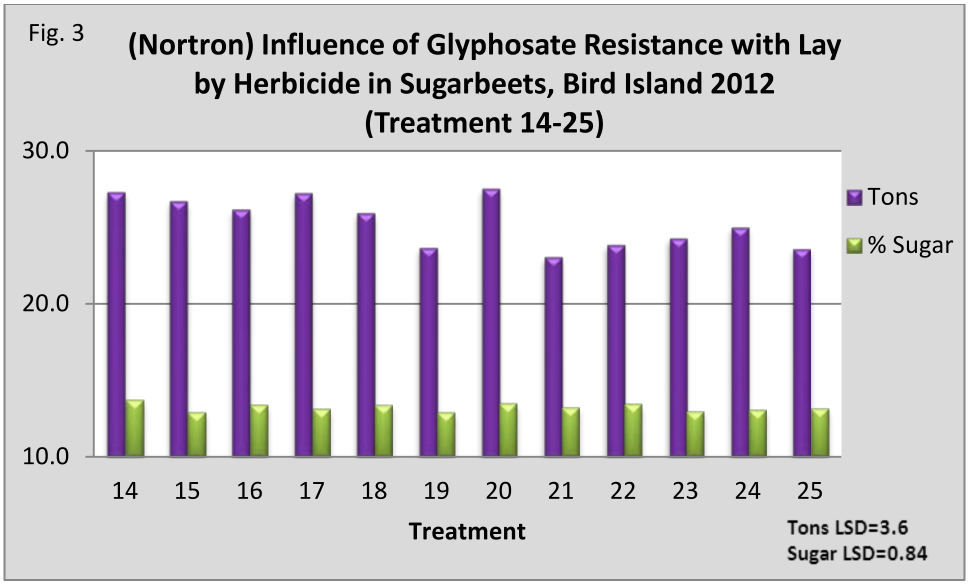


Fig. 3
(Nortron) Influence of Glyphosate Resistance with Lay by Herbicide in Sugarbeets, Bird Island 2012 (Treatment 14-25)
30.0
20.0
10.0
Tons
% Sugar
14
15
16
17
18
19
20
21
22
23
24
25
Treatment
Tons LSD=3.6
Sugar LSD=0.84

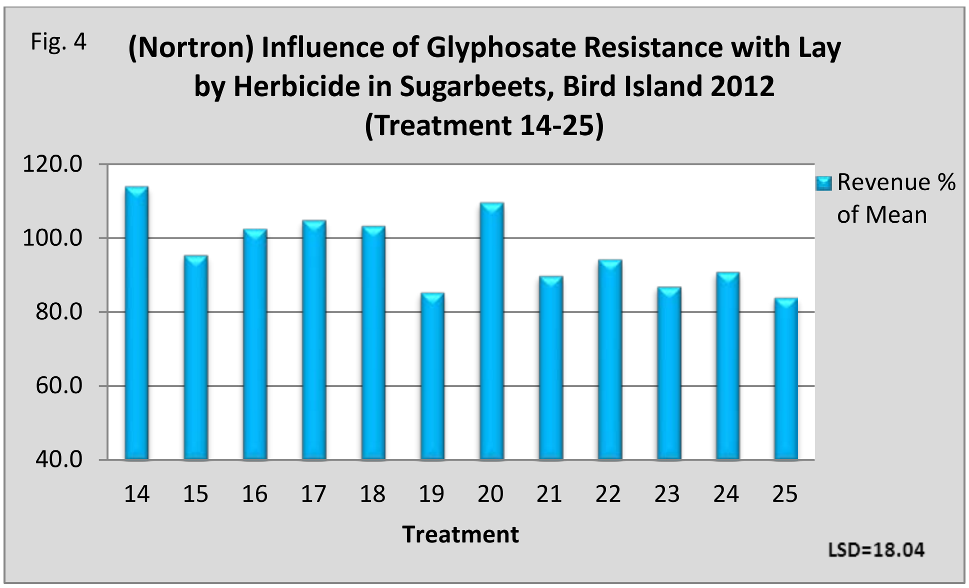


Fig. 4
(Nortron) Influence of Glyphosate Resistance with Lay by Herbicide in Sugarbeets, Bird Island 2012 (Treatment 14-25)
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
14
15
16
17
18
19
20
21
22
23
24
25
Treatment
LSD=18.04

Fig. 5

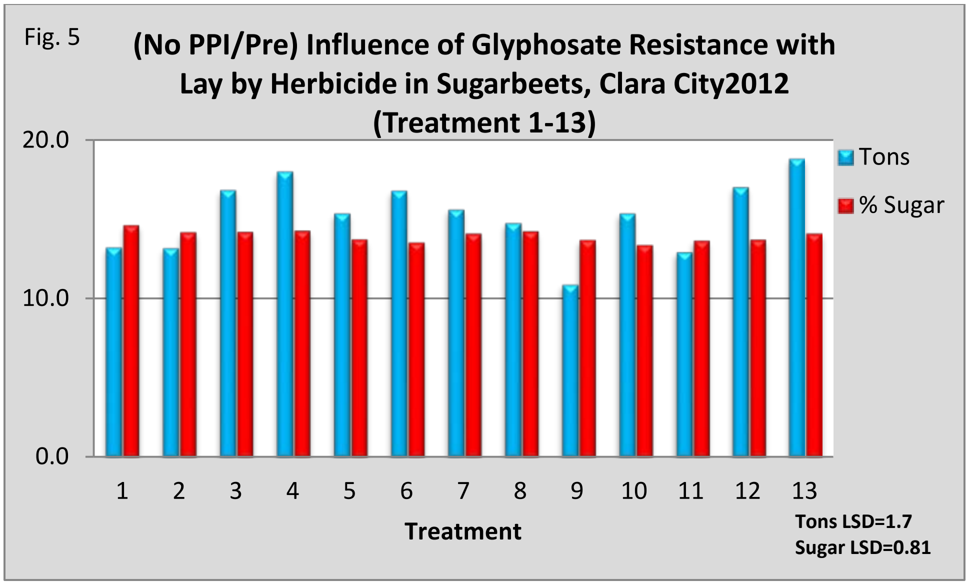
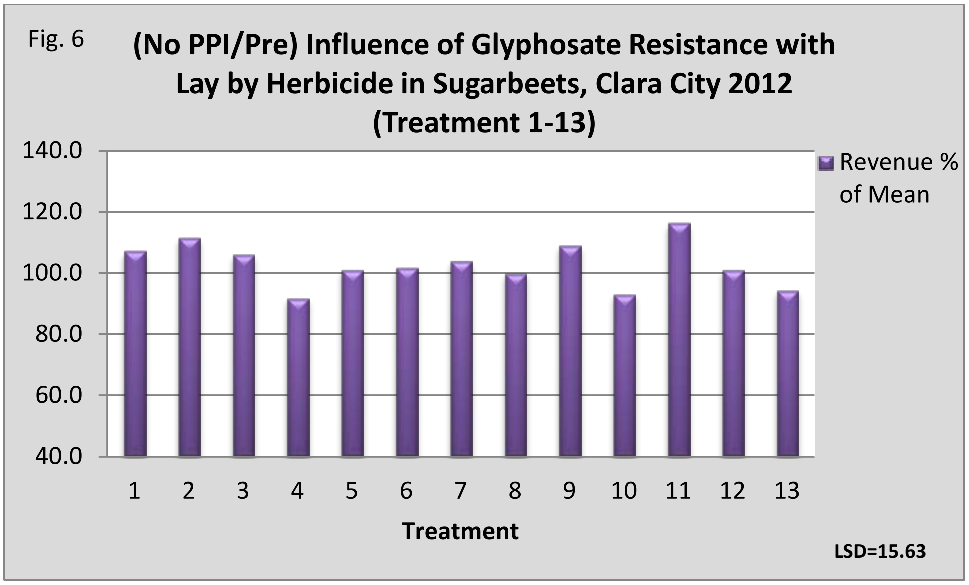

(No PPI/Pre) Influence of Glyphosate Resistance with
Lay by Herbicide in Sugarbeets, Clara City2012
(Treatment 1-13)
20.0
10.0
0.0
Tons
% Sugar
1
2
3
4
5
6
7
8
9
10
11
12
13
Treatment
Tons LSD=1.7
Sugar LSD=0.81

Fig. 6


(No PPI/Pre) Influence of Glyphosate Resistance with
Lay by Herbicide in Sugarbeets, Clara City 2012
(Treatment 1-13)
140.0
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
1
2
3
4
5
6
7
8
9
10
11
12
13
Treatment
LSD=15.63

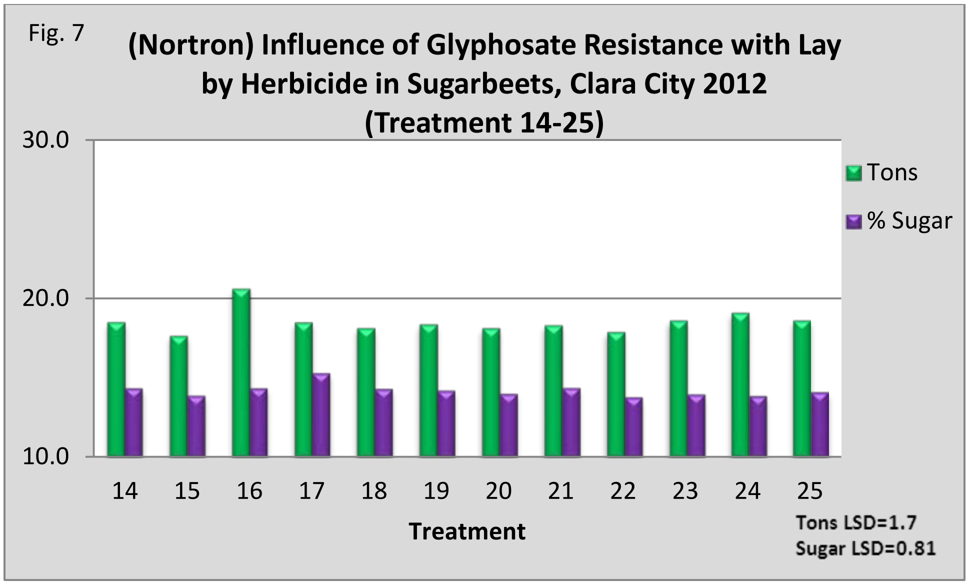


Fig. 7
(Nortron) Influence of Glyphosate Resistance with Lay by Herbicide in Sugarbeets, Clara City 2012
(Treatment 14-25)
30.0
20.0
10.0
Tons
% Sugar
14 15 16 17 18 19 20 21 22 23 24 25
Treatment
Tons LSD=1.7
Sugar LSD=0.81

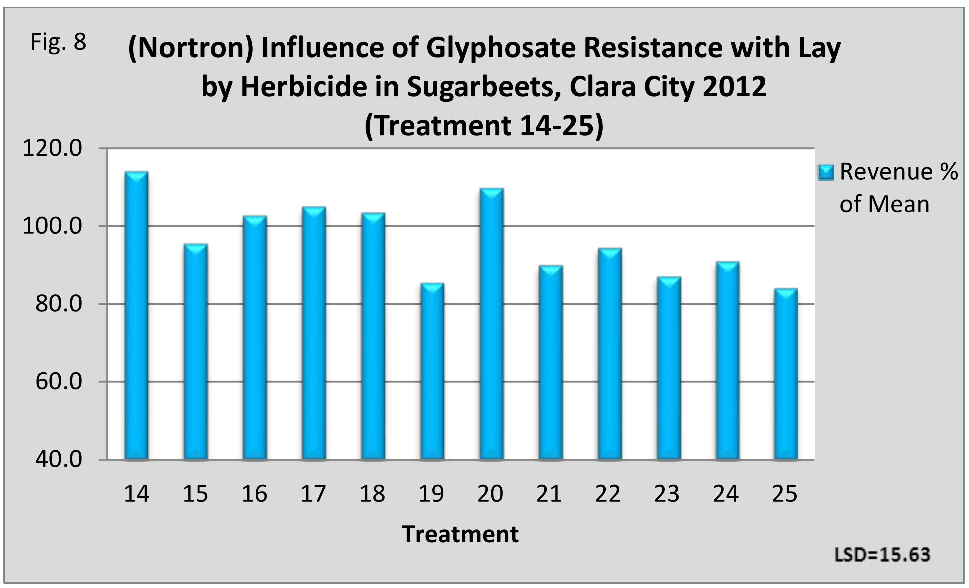


Fig. 8
(Nortron) Influence of Glyphosate Resistance with Lay by Herbicide in Sugarbeets, Clara City 2012
(Treatment 14-25)
120.0
100.0
80.0
60.0
40.0
Revenue % of Mean
14 15 16 17 18 19 20 21 22 23 24 25
Treatment
LSD=15.63

Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeets, 2012

Objectives

The objectives of the testing was to evaluate weed control in the presence of oat cover crop with conventional and Glyphosate weed control program.

Methods

The specifics of activities conducted at the weed control site in 2012 at Bird Island and Clara City are presented in Table 1 and 2, respectively. Table 3&4 show production and evaluations at Bird Island. Table 5&6 show production and evaluations at Clara City. The tests were replicated 4 times and conducted in a randomized complete block experimental design. Plots were 11 ft. (6 rows) wide and 35 ft. long. Sugarbeet were not thinned. Evaluation of weed control was conducted at different timings as indicated in the weed control evaluation data tables. Sugarbeets were harvested with a 2 row research harvester at Bird Island and Clara City, MN. The sugarbeets were weighed on the two row harvester for yield and a sub-sample was collected and analyzed for quality in the SMBSC quality lab.
The treatments were initiated by weed stage and subsequent applications were in accordance with treatment description in data tables. Treatments were applied in 14 GPA mix at 35 psi.

Results and Discussion

General comments
At Bird Island there was very little weed pressure. All herbicide treatments provided excellent control of oats and weeds. The weed control was not significantly different when comparing herbicide treatments. The yield and quality data showed a difference in treatments. The untreated check where the oats was not controlled only gave 10% of the mean for revenue. The untreated check with or without oats produced a significantly lower sugar percent than all other treatments. The Untreated check with the oats removed gave 17.9 tons/acre and the weed free treatments with oats removed gave 20.9 tons/acre. In contrast the untreated check without the oats removed resulted in 3.1 tons per acre. These results indicate the influence of oats left in the crop on the yield of the sugarbeets. The herbicide treatments did not show a clear trend in reference to herbicides used for the enhancement of sugarbeet quality or production.

At Clara City the weed pressure was high and the weed population had resistant water hemp present. The untreated check with and without oats indicated the influence of the weed populations on sugarbeet production. The data would indicate that there appeared to be a benefit using Outlook in the spray program. There was also a benefit when using Nortron as part of the mix in all applications. The 4 ounce rate of Nortron in the first two applications performed as well as the 5 and 8 ounce rate. When higher rates of Betamix were used (24 and 32 ounces) revenue was not negatively affected.

Table 1.Site Specific for Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeet Bird Island, 2012

DATE	PLANTED	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/24/2012	X	4.8"	Dry				
4/21/2012				X	Cotylens		60' Sunny SW-5
5/21/2012				X	Application 1		85' Sunny S-2
6/8/2012					Application 2		76' Sunny S-10
6/22/2012					Application 3		67' Sunny SW-5
7/2/2012					Eminent	13 oz.	82' Sunny S-8
					Manzate	1.5 qt.	
7/17/2012					Supertin Wp	8 oz.	77' Pcloudy ENE-14
					Roundup PowerMax	44 oz.	
7/31/2012					Gem	3.5 oz.	77' Sunny SSE-4
9/4/2012					Roundup PowerMax	32 oz.	86' Sunny WNW-7

Table 2.Site Specific for Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeet Clara City, 2012

DATE	PLANTED	SPACING	SOIL	SPRAYED	APPLIED	RATE	WEATHER
4/20/2012	X	4 3/8"	Damp		Quadris In furrow	9.6 oz.	
5/10/2012				X	Cotylens		63' Sunny SSE-12
5/13/2012				X	Application 1		62' Pcloudy S-15
5/30/2012					Application 2		62' Pcloudy NW-5
6/22/2012					Application 3		67' Sunny Calm
7/3/2012					Eminent	13 oz.	81' Sunny S-6
					Manzate	1.5 qt.	
7/17/2012					Supertin Wp	8 oz.	82' Pcloudy SE-11
					Roundup PowerMax	44 oz.	
					Gem	3.5 oz.	81' Sunny SSE-9

Table 3. Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated Check		N/A	17.9	11.63	86.12	3222	64.53
2	UntreatedCheck (with oats)		N/A	3.1	11.52	85.60	550	10.73
3	Weed-Free Check			20.9	12.30	86.62	3994	84.67
	Roundup PowerMax+Preference+N-Tense	1.125lb ae/A+0.25%v/v +2.5%v/v	cotyledon					
	Roundup PowerMax+Preference+N-Tense	0.844lb ae/A+0.25%v/v +2.5%v/v	14 DAT Cot					
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A +0.25%v/v+2.5%v/v	28 DAT 2 LF					
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A+0.25%v/v+2.5%v/v	as needed 42 to 49 DAT 2 lf					
4	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	24.6	12.92	87.42	5040	113.10
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
5	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	22.4	12.61	87.76	4501	99.55
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
6	Betamix + Nortron + Roundup Powermax+ N-Tense	24oz/A+4oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	24.9	13.48	87.64	5360	125.14
	Betamix + Nortron + Roundup Powermax+ N-Tense	32oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
7	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24ozpt/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	23.2	13.22	87.57	4878	111.61
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
8	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	22.3	12.82	87.89	4565	102.55
	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Roundup PowerMax+N-Tense	3pt/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
9	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	22.5	12.69	87.32	4530	100.46
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Roundup PowerMax+Destiny HC+N-Tense	48oz/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
10	Betamix + Nortron + Roundup Powermax+ N-Tense	2pt/A+5oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	24.0	12.91	87.63	4938	111.30
	Betamix + Nortron + Roundup Powermax+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
11	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	23.8	13.20	124.75	5898	150.62
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
12	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	22.2	13.02	87.10	4568	102.95
	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Roundup PowerMax+N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
13	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	23.1	13.23	87.80	4893	112.77
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Roundup PowerMax+Destiny HC+N-Tense	3pt/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
14	No oat-force rando to outside of trial area having oats			23.7	12.93	87.89	4879	110.03
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB					
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix +Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
			CV%	14.4	4.68	22.70	20	27.90
			LSD (0.05)	4.4	0.85	29.23	1264	39.86

Table 4. Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeet Evaluations in Sugarbeet Production Bird Island, 2012

Trt No.	Product	Rate	Timing	Lambs quarter	Water-hemp	Smart-weed	Amranth
1	Untreated Check		N/A	99	99	99	99
2	UntreatedCheck (with oats)		N/A	99	99	99	99
3	Weed-Free Check			99	99	99	99
	Roundup PowerMax+Preference+N-Tense	1.125lb ae/A+0.25%v/v +2.5%v/v	cotyledon				
	Roundup PowerMax+Preference+N-Tense	0.844lb ae/A+0.25%v/v +2.5%v/v	14 DAT Cot				
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A +0.25%v/v+2.5%v/v	28 DAT 2 LF				
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A+0.25%v/v+2.5%v/v	as needed 42 to 49 DAT 2 lf				
4	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
5	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
6	Betamix + Nortron + Roundup Powermax+ N-Tense	24oz/A+4oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix + Nortron + Roundup Powermax+ N-Tense	32oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF				
7	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24ozpt/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
8	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Roundup PowerMax+N-Tense	3pt/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF				
9	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Roundup PowerMax+Destiny HC+N-Tense	48oz/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
10	Betamix + Nortron + Roundup Powermax+ N-Tense	2pt/A+5oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix + Nortron + Roundup Powermax+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF				
11	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
12	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Roundup PowerMax+N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF				
13	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Roundup PowerMax+Destiny HC+N-Tense	3pt/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
14	No oat-force rando to outside of trial area having oats			99	99	99	99
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	25 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB				
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	44 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF				
	Betamix+Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF				
			LSD (0.05)	NS	NS	NS	NS

Table 5. Influence of Glyphsate Resistance with Postemergence herbicides in Oat Cover Crop for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate	Timing	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	Untreated Check		N/A	3.5	12.88	90.57	748	28.84
2	UntreatedCheck (with oats)		N/A	4.2	13.92	91.84	1001	41.35
3	Weed-Free Check			17.0	13.39	91.46	3880	156.38
	Roundup PowerMax+Preference+N-Tense	1.125lb ae/A+0.25%v/v +2.5%v/v	cotyledon					
	Roundup PowerMax+Preference+N-Tense	0.844lb ae/A+0.25%v/v +2.5%v/v	14 DAT Cot					
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A +0.25%v/v+2.5%v/v	28 DAT 2 LF					
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A+0.25%v/v+2.5%v/v	as needed 42 to 49 DAT 2 lf					
4	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	14.1	12.73	91.93	3000	115.49
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
5	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	12.6	14.09	89.85	2930	119.86
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
6	Betamix + Nortron + Roundup Powermax+ N-Tense	24oz/A+4oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	13.1	14.85	92.76	3399	147.72
	Betamix + Nortron + Roundup Powermax+ N-Tense	32oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
7	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24ozpt/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	10.8	13.16	91.86	2421	96.48
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
8	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	15.2	13.58	90.60	3438	137.89
	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Roundup PowerMax+N-Tense	3pt/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
9	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	16.0	13.09	90.66	3483	135.99
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Roundup PowerMax+Destiny HC+N-Tense	48oz/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
10	Betamix + Nortron + Roundup Powermax+ N-Tense	2pt/A+5oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	10.5	12.88	90.66	2252	86.79
	Betamix + Nortron + Roundup Powermax+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
11	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	16.4	14.15	89.88	3855	158.49
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
12	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	11.5	13.55	90.75	2632	106.23
	Betamix+Nortron+Outlook+Roundup PowerMax+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Roundup PowerMax+N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF					
13	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	10.8	13.17	89.72	2334	90.68
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Roundup PowerMax+Destiny HC+N-Tense	3pt/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
14	No oat-force rando to outside of trial area having oats			11.5	13.81	91.17	2674	109.13
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB					
	Betamix+Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF					
	Betamix+Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF					
			CV%	**22.0**	**5.55**	**2.34**	**26**	**28.65**
			LSD (0.05)	**3.5**	**1.07**	**3.03**	**917**	**41.15**

Table 6. Influence of Glyphsate Resistance with Postemergence Herbicides in Oat Cover Crop for Sugarbeet Evaluation for Sugarbeet Production Clara City, 2012

Trt No.	Product	Rate	Timing	7/13/12 Lambs quarter	7/13/12 Water-hemp	7/13/12 Amranth
1	Untreated Check		N/A	0	0	0
2	UntreatedCheck (with oats)		N/A	0	0	0
3	Weed Free			99	98	99
	Roundup PowerMax+Preference+N-Tense	1.125lb ae/A+0.25%v/v +2.5%v/v	cotyledon			
	Roundup PowerMax+Preference+N-Tense	0.844lb ae/A+0.25%v/v +2.5%v/v	14 DAT Cot			
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A +0.25%v/v+2.5%v/v	28 DAT 2 LF			
	Roundup PowerMax+Preference+N-Tense	0.75lb ae/A+0.25%v/v+2.5%v/v	as needed 42 to 49 DAT 2 lf			
4	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	12oz/A+4oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	93	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	16oz/A+4oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
5	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	96	99
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
6	Betamix + Nortron + Roundup Powermax+ N-Tense	24oz/A+4oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	58	99
	Betamix + Nortron + Roundup Powermax+ N-Tense	32oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF			
7	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	24ozpt/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	55	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
8	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	75	99
	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Roundup PowerMax+N-Tense	3pt/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF			
9	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	78	99
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	32oz/A+8oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Roundup PowerMax+Destiny HC+N-Tense	48oz/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
10	Betamix + Nortron + Roundup Powermax+ N-Tense	2pt/A+5oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	88	99
	Betamix + Nortron + Roundup Powermax+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Roundup Powermax+ N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF			
11	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	32oz/A+5oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	70	99
	Betamix + Nortron + Roundup Powermax+Destiny+ N-Tense	48oz/A+8oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix + Roundup Powermax+Destiny+ N-Tense	48oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
12	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	32oz/A+5oz/A+14oz/A+1.125 lb ae/A+2.5%v/v	2 LF SB	99	99	99
	Betamix +Nortron+Outlook+Roundup PowerMax+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Roundup PowerMax+N-Tense	48oz/A+0.75 lb ae/A+2.5%v/v	28 DAT 2 LF			
13	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+5oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB	99	84	99
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	48oz/A+8oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Roundup PowerMax+Destiny HC+N-Tense	3pt/A+/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
14	No oat-force rando to outside of trial area having oats			99	78	99
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	12oz/A+4oz/A+14oz/A+1.125 lb ae/A+1.5pt/A+2.5%v/v	2 LF SB			
	Betamix +Nortron+Outlook+Roundup PowerMax+Destiny HC+N-Tense	16oz/A+4oz/A+10oz/A+0.844 lb ae/A+1.5pt/A+2.5%v/v	14 DAT 2 LF			
	Betamix +Nortron+Roundup PowerMax+Destiny HC+N-Tense	24oz/A+4oz/A+0.75 lb ae/A+1.5pt/A+2.5%v/v	28 DAT 2 LF			
			LSD (0.05)	**23.1**	**NS**	**2.5**

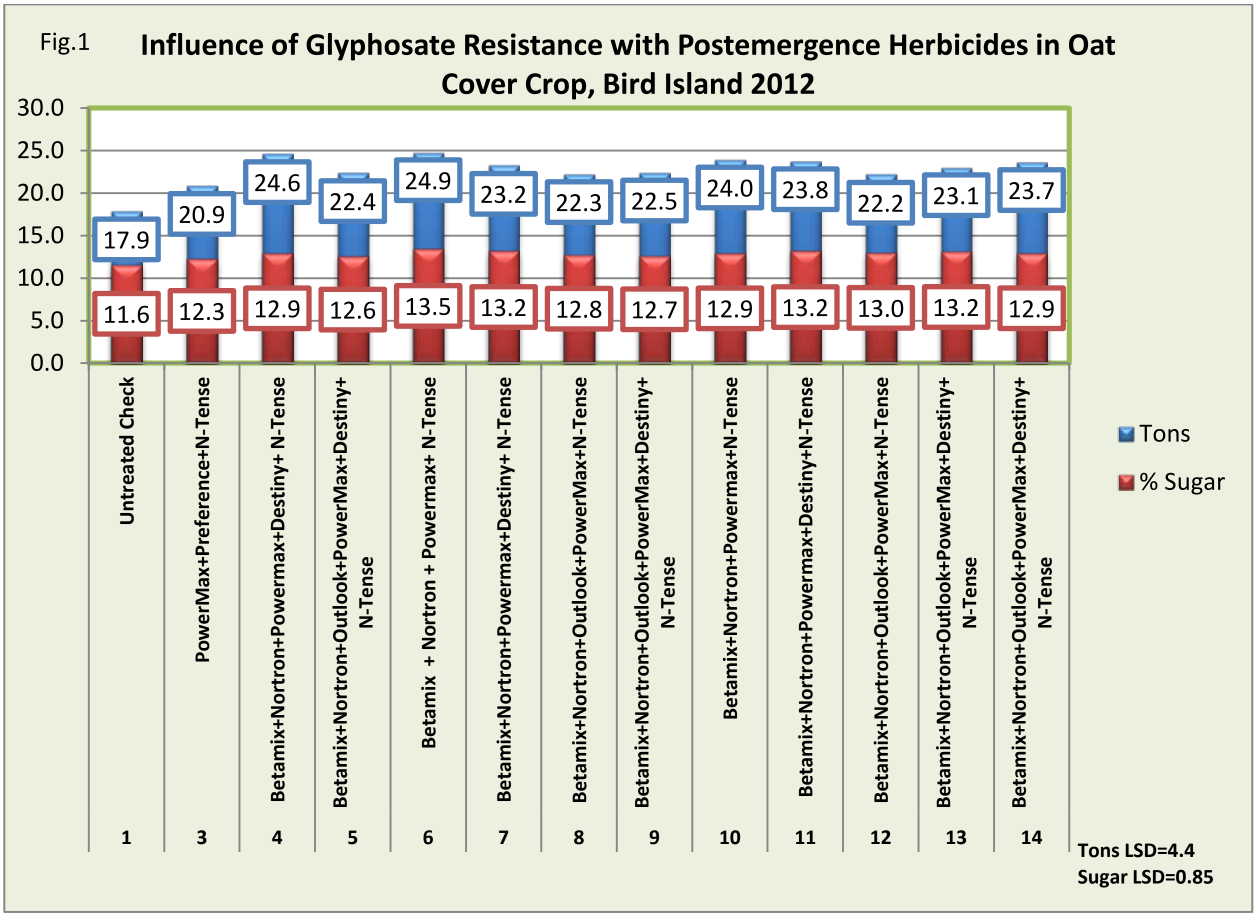


Fig.1
Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop, Bird Island 2012
30.0
25.0
20.0
15.0
10.0
5.0
0.0
17.9
20.9
24.6
22.4
24.9
23.2
22.3
22.5
24.0
23.8
22.2
23.1
23.7
11.6
12.3
12.9
12.6
13.5
13.2
12.8
12.7
12.9
13.2
13.0
13.2
12.9
Untreated Check
PowerMax+Preference+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+ N-Tense
Betamix + Nortron + Powermax+ N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+ N-Tense
Betamix+Nortron+Powermax+N-Tense
Betamix+Nortron+Powermax+Destiny+N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+ N-Tense
1
3
4
5
6
7
8
9
10
11
12
13
14
Tons
% Sugar
Tons LSD=4.4
Sugar LSD=0.85

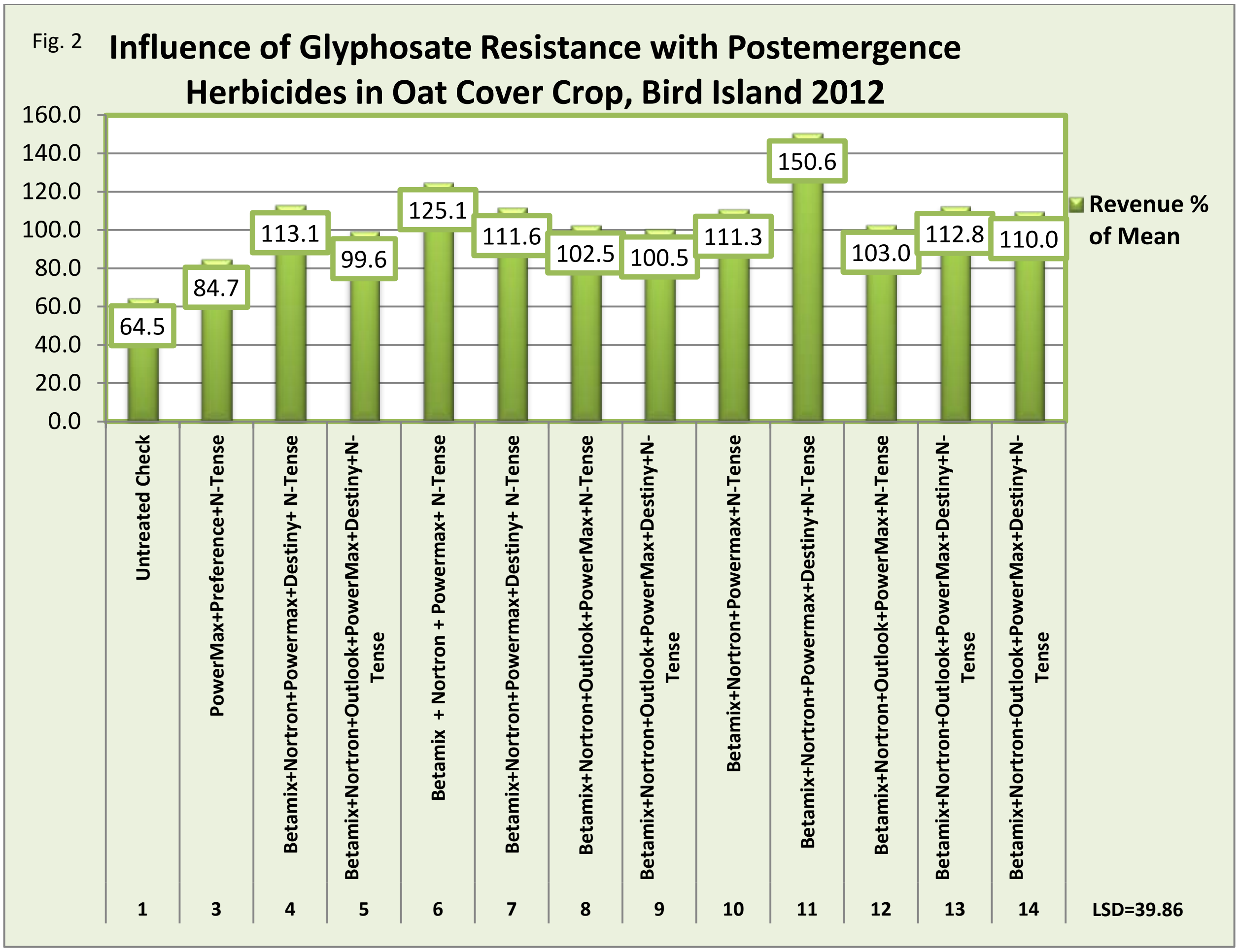


Fig. 2
Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop, Bird Island 2012
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
64.5
84.7
113.1
99.6
125.1
111.6
102.5
100.5
111.3
150.6
103.0
112.8
110.0
Revenue % of Mean
Untreated Check
PowerMax+Preference+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+N-Tense
Betamix + Nortron + Powermax+ N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+N-Tense
Betamix+Nortron+Powermax+N-Tense
Betamix+Nortron+Powermax+Destiny+N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny+N-Tense
1
3
4
5
6
7
8
9
10
11
12
13
14
LSD=39.86

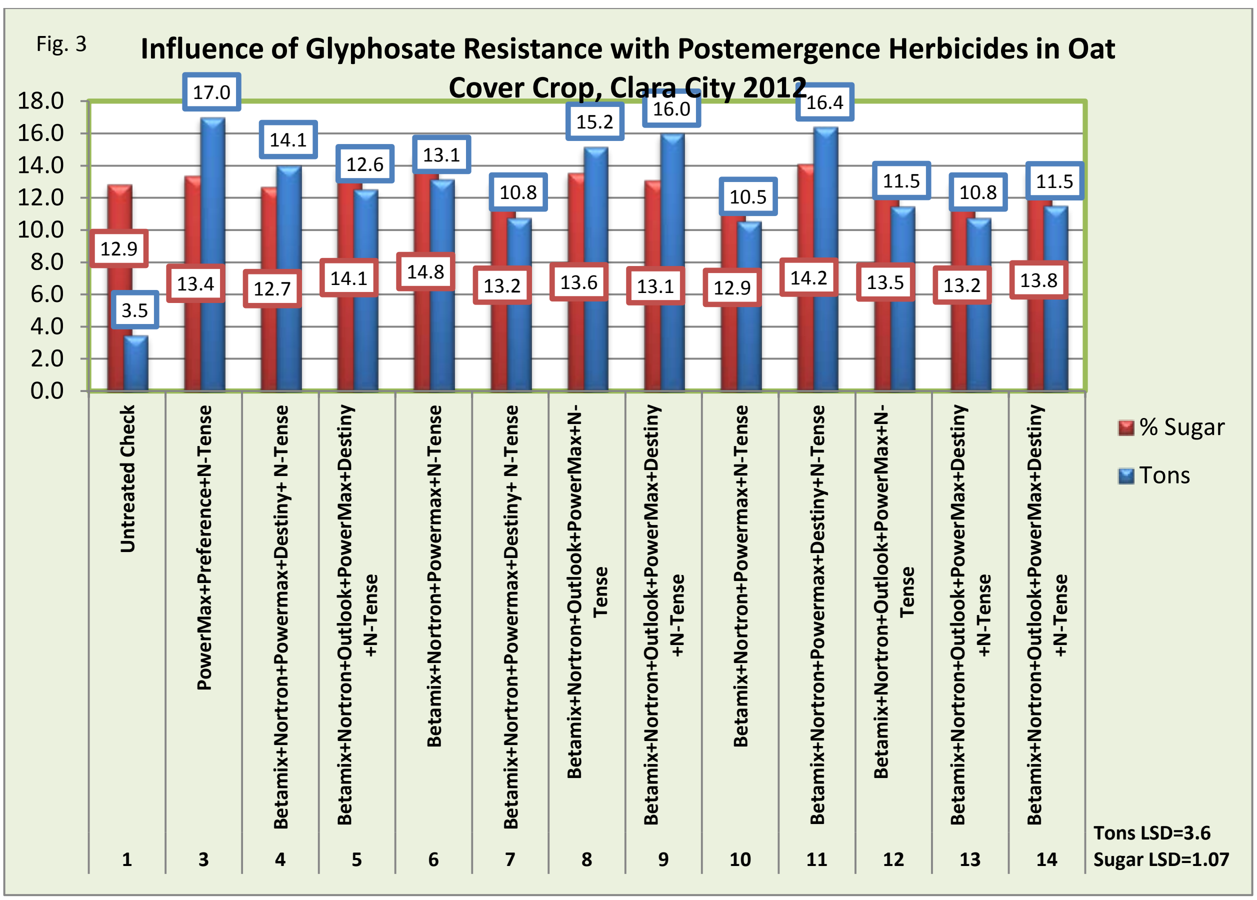


Fig. 3
Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop, Clara City 2012
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
17.0
14.1
12.6
13.1
10.8
15.2
16.0
10.5
16.4
11.5
10.8
11.5
12.9
3.5
13.4
12.7
14.1
14.8
13.2
13.6
13.1
12.9
14.2
13.5
13.2
13.8
% Sugar
Tons
Untreated Check
PowerMax+Preference+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny +N-Tense
Betamix+Nortron+Powermax+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny +N-Tense
Betamix+Nortron+Powermax+N-Tense
Betamix+Nortron+Powermax+Destiny+N-Tense
Betamix+Nortron+Outlook+PowerMax+N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny +N-Tense
Betamix+Nortron+Outlook+PowerMax+Destiny +N-Tense
1
3
4
5
6
7
8
9
10
11
12
13
14
Tons LSD=3.6
Sugar LSD=1.07

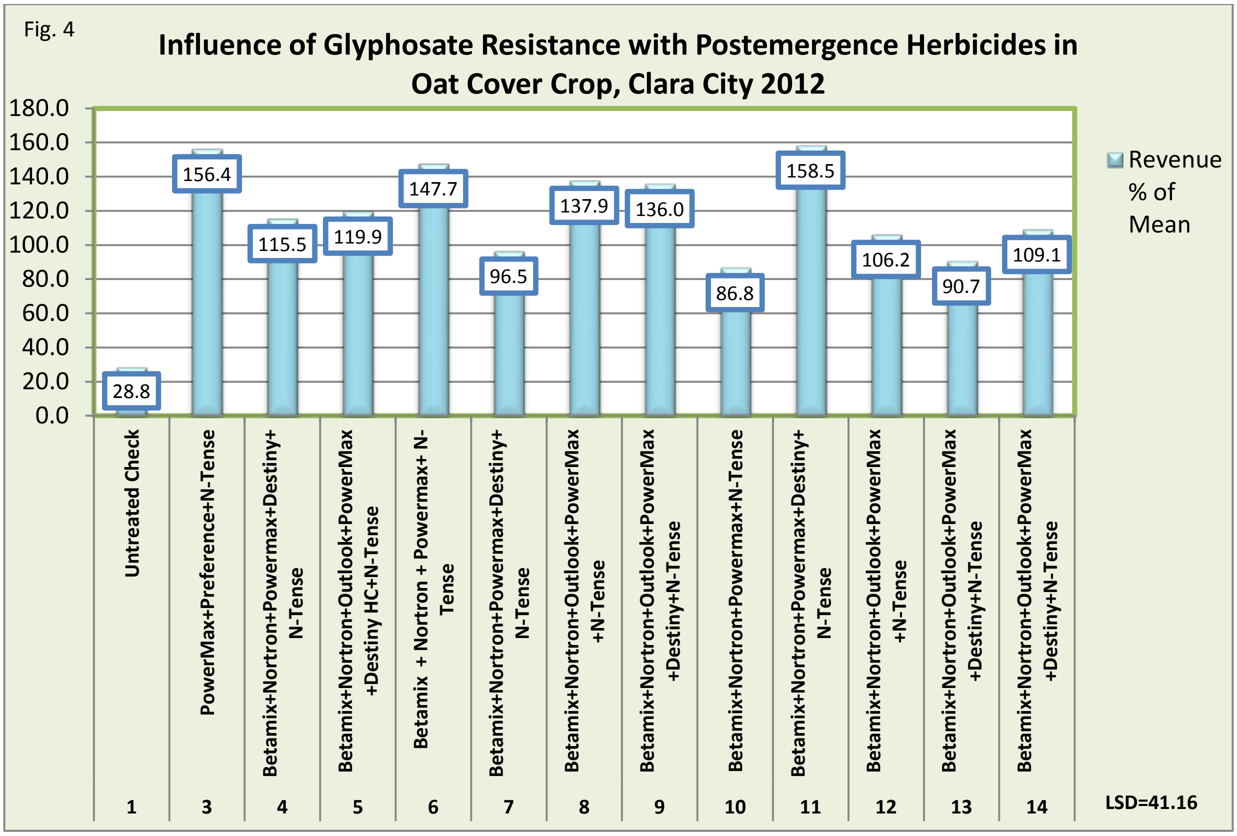


Fig. 4
Influence of Glyphosate Resistance with Postemergence Herbicides in Oat Cover Crop, Clara City 2012
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
28.8
156.4
115.5
119.9
147.7
96.5
137.9
136.0
86.8
158.5
106.2
90.7
109.1
Revenue % of Mean
Untreated Check
PowerMax+Preference+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax +Destiny HC+N-Tense
Betamix + Nortron + Powermax+ N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax +N-Tense
Betamix+Nortron+Outlook+PowerMax +Destiny+N-Tense
Betamix+Nortron+Powermax+N-Tense
Betamix+Nortron+Powermax+Destiny+ N-Tense
Betamix+Nortron+Outlook+PowerMax +N-Tense
Betamix+Nortron+Outlook+PowerMax +Destiny+N-Tense
Betamix+Nortron+Outlook+PowerMax +Destiny+N-Tense
1
3
4
5
6
7
8
9
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LSD=41.16

SMBSC Evaluation of Fungicides Seed Treatments for control of Rhizoctonia Solani in Sugarbeet Growth-2012

The following report is a summarization of testing fungicides applied as a seed treatment for controlling Rhizoctonia Solani during the growing seasons of 2012.

Objectives

The objective of these trials was to evaluate fungicides applied as a seed treatment for control of Rhizoctonia Solani (Rhizoctonia root rot) with a susceptible and resistant variety and supplemented with Quadris at a later plant stage.

Methods

Table 1 shows the specifics of activities conducted at the Rhizoctonia testing. The test is designated by one experiment (Clara City, MN). Plots were 11 ft. (6 rows) wide and 20 ft. long. Sugarbeets plots were inoculated with the Rhizoctonia Solani fungus applied to the soil prior to planting. The Rhizoctonia strain inoculated was the AG 2-2 IIIB. The inoculum was prepared on barley grain by personnel at the North West Research and Outreach Center. Sugarbeet stands were counted at 2 leaf, 8 leaf and harvest sugarbeet stages 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. The sugar beets are then placed in a row in each plot for evaluation. The evaluation scale is a 1-7 scale. The results are shown in table 3. 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 not be combined. The sugarbeets were collected and measured for yield and analyzed for quality at the SMBSC Tare Lab.

Results and Discussion

The sugarbeet stand tended to not change over time, thus the sugarbeet stand presented is the “harvest stand counts” shown in table 3. The data from the test sites are presented in tables 2. Even though the general results were similar it is not unusual for disease trials results to not test out for homogeneity due to magnitude or inherent variability with in the data.

Rhizoctonia root rating for Rhizoctonia root rot indicated a low level of disease pressure. The data showed a statistically significant difference among treatments for Rhizoctonia root ratings. However the ratings range from 2.3 to 4.1 on a scale 1-7, which indicates a moderate disease pressure regardless of treatment. Table 2 shows Tons per acre, sugar percent and extractable sugar per acre were significantly influenced by treatments. Seed treatments penthiopyriad, Metlock plus and Rizolex enhanced sugarbeet production more than the other seed treatments. Seed treatments applied with Quadris as a foliar treatment were beneficial for Rhizoctonia control and sugarbeet performance. The addition of starter fertilizer 10-34-0 applied infurrow was beneficial to the production of sugarbeets. This data showed the advantage of seed treatment along with Quadris applied foliar and 10-34-0 fertilizer applied infurrow. Treatments with Tachigaren performed better than the same treatments without Tachigaren. The seed treatment with Metlock plus Rizolex with and without Tachigaren showed the advantage of Tachigaren. This indicates that there was a level of Aphanomyces present at this location.

Table 1. Site Specific for Fungicide by Variety
Clara City, 2012

Location	Planting Date	Soil Conditions
Clara City, 2012	5/22/2012	Dry

Table 2. Influence of Seed Treatment Options in the Presence of Rhizoctonia for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Maynard 2012

Trt	split	Product	Tach 45	10-34-0	Quadris	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose PerAcre (Lbs.)	Revenue % of Mean
1	a	Standard	Yes	No	No	16.3	12.92	87.22	3306	86.37
1	b	Standard	Yes	Yes	No	17.5	13.24	88.09	3706	100.07
2	a	Standard	Yes	No	Yes	16.1	13.32	87.42	3401	91.26
2	b	Standard	Yes	Yes	Yes	18.9	13.43	87.85	4044	109.89
3	a	Vortex	Yes	No	No	14.1	13.44	88.24	3057	83.64
3	b	Vortex	Yes	Yes	No	15.9	13.57	88.06	3476	95.67
4	a	Vortex	Yes	No	Yes	16.1	13.27	87.63	3401	91.31
4	b	Vortex	Yes	Yes	Yes	17.0	13.24	88.19	3627	98.35
7	a	Penth	Yes	No	No	18.8	13.62	88.09	4110	113.53
7	b	Penth	Yes	Yes	No	20.5	13.15	86.56	4204	110.59
8	a	Penth	Yes	No	Yes	22.1	13.41	87.16	4652	124.96
8	b	Penth	Yes	Yes	Yes	23.0	13.41	88.18	4964	135.61
9	a	Stamina	Yes	No	No	16.2	13.36	87.52	3425	92.07
9	b	Stamina	Yes	Yes	No	19.0	13.04	87.51	3990	106.82
10	a	Stamina	Yes	No	Yes	15.6	13.30	87.42	3284	88.19
10	b	Stamina	Yes	Yes	Yes	16.4	13.04	87.46	3374	89.02
11	a	BAS700 03F	Yes	No	No	15.8	13.01	87.22	3221	84.42
11	b	BAS700 03F	Yes	Yes	No	14.9	13.15	87.42	3106	82.56
12	a	BAS700 03F	Yes	No	Yes	17.0	13.49	87.71	3677	100.63
12	b	BAS700 03F	Yes	Yes	Yes	21.0	13.65	88.03	4581	126.30
13	a	Metlock Suite + Rizolex(no Tachigaren)	No	No	No	16.3	13.57	87.60	3514	96.12
13	b	Metlock Suite + Rizolex(no Tachigaren)	No	Yes	No	18.3	13.09	87.97	3902	105.47
14	a	Metlock Suite + Rizolex(no Tachigaren)	No	No	Yes	18.8	13.30	87.12	3946	105.44
14	b	Metlock Suite + Rizolex(no Tachigaren)	No	Yes	Yes	19.2	13.13	86.87	3991	105.92
15	a	Metlock Suite + Rizolex+Tachigaren	Yes	No	No	20.4	13.47	87.26	4329	116.92
15	b	Metlock Suite + Rizolex+Tachigaren	Yes	Yes	No	23.4	13.21	87.67	4920	131.96
16	a	Metlock Suite + Rizolex+Tachigaren	Yes	No	Yes	22.1	13.35	87.95	4719	127.73
16	b	Metlock Suite + Rizolex+Tachigaren	Yes	Yes	Yes	23.3	13.44	87.95	5001	136.03
17	a	Metlock Suite + Rizolex +Valent Exp	No	No	No	15.1	12.92	86.06	3049	79.09
17	b	Metlock Suite + Rizolex +Valent Exp	No	Yes	No	15.3	12.98	86.67	3119	81.68
18	a	Metlock Suite + Rizolex +Valent Exp	No	No	Yes	16.6	12.53	86.06	3227	80.98
18	b	Metlock Suite + Rizolex +Valent Exp	No	Yes	Yes	18.6	12.73	86.27	3663	93.24
		CV%				16.3	4.20	1.22	19	21.61
		LSD (0.05)				2.73	0.64	1.01	664	19.12

Table 3. Influence of Seed Treatment Options in the Presence of Rhizoctonia on Disease Control and Sugarbeet Production Maynard, 2012

Trt	split	Product	Tach 45	10-34-0	Quadris	2 lf Stand	8 lf Stand	Harvest Stand	RR Avg
1	a	Standard	Yes	No	No	193	189	165	2.5
1	b	Standard	Yes	Yes	No	172	186	163	2.3
2	a	Standard	Yes	No	Yes	199	163	152	2.6
2	b	Standard	Yes	Yes	Yes	199	163	161	2.6
3	a	Vortex	Yes	No	No	216	196	144	2.6
3	b	Vortex	Yes	Yes	No	163	155	130	2.8
4	a	Vortex	Yes	No	Yes	225	209	168	2.3
4	b	Vortex	Yes	Yes	Yes	177	169	145	2.4
7	a	Penth	Yes	No	No	219	202	176	2.5
7	b	Penth	Yes	Yes	No	211	169	149	2.8
8	a	Penth	Yes	No	Yes	206	192	170	2.5
8	b	Penth	Yes	Yes	Yes	185	158	154	2.4
9	a	Stamina	Yes	No	No	208	213	165	2.4
9	b	Stamina	Yes	Yes	No	190	184	157	4.1
10	a	Stamina	Yes	No	Yes	216	200	176	2.5
10	b	Stamina	Yes	Yes	Yes	194	166	147	2.5
11	a	BAS700 03F	Yes	No	No	163	152	132	2.5
11	b	BAS700 03F	Yes	Yes	No	146	127	122	2.8
12	a	BAS700 03F	Yes	No	Yes	185	180	170	2.4
12	b	BAS700 03F	Yes	Yes	Yes	185	157	178	2.4
13	a	Metlock Suite + Rizolex(no Tachigaren)	No	No	No	168	154	126	2.5
13	b	Metlock Suite + Rizolex(no Tachigaren)	No	Yes	No	182	147	131	2.6
14	a	Metlock Suite + Rizolex(no Tachigaren)	No	No	Yes	169	182	138	2.6
14	b	Metlock Suite + Rizolex(no Tachigaren)	No	Yes	Yes	160	165	110	2.6
15	a	Metlock Suite + Rizolex+Tachigaren	Yes	No	No	194	197	170	2.4
15	b	Metlock Suite + Rizolex+Tachigaren	Yes	Yes	No	179	161	153	2.4
16	a	Metlock Suite + Rizolex+Tachigaren	Yes	No	Yes	192	195	179	2.3
16	b	Metlock Suite + Rizolex+Tachigaren	Yes	Yes	Yes	163	140	128	2.4
17	a	Metlock Suite + Rizolex +Valent Exp	No	No	No	123	115	99	3.0
17	b	Metlock Suite + Rizolex +Valent Exp	No	Yes	No	101	90	80	3.0
18	a	Metlock Suite + Rizolex +Valent Exp	No	No	Yes	112	140	95	3.1
18	b	Metlock Suite + Rizolex +Valent Exp	No	Yes	Yes	90	84	69	3.3
		CV%				0	0	0	14.4
		LSD (0.05)				44	40	34	0.4

SMBSC Evaluation of Fungicides for control of Rhizoctonia Solani in Sugarbeet Growth-2012

The following report is a summarization of testing fungicides for controlling Rhizoctonia Solani during the growing season of 2012.

Objectives

The objective of this trial was to evaluate fungicides for control of Rhizoctonia Solani (Rhizoctonia root rot) with a susceptible and resistant variety.

Methods

Table 1 shows the specifics of activities conducted at the Rhizoctonia testing. The test is designated by one experiment (Clara City, MN). Plots were 11 ft. (6 rows) wide and 20 ft. long. Sugarbeets plots were inoculated with the Rhizoctonia Solani fungus. The Rhizoctonia strain inoculated was the AG 2-2 IIIB. The inoculum was prepared on barley grain by personnel at the University of Minnesota Northwest Research and Outreach Center. The inoculum was applied via a Gandy band applicator. Sugarbeet stands were counted at 2 leaf sugarbeet stages 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 the sugar beets are then placed in a row for each plot in preparation of visual evaluation. The evaluation scale is a 1-7 scale. This scale is an industry standard used for Rhizoctonia root rot evaluation. Evaluation was conducted on 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 at the SMBSC Tare Lab.

Results and Discussion

The sugarbeet stand did not significantly change over time at the location, thus the sugar beet stand presented is the at harvest stand counts. The data from the test site are presented in Tables 2 and 3. It is not unusual for disease trials results to not test out for homogeneity due to magnitude or inherent variability with in the data.
Rhizoctonia rating in the untreated check was 4.0, which indicates a moderate level of disease pressure. The application of Quadris gave significantly better Rhizoctonia Solani control than Proline applied without NIS with the susceptible variety. Rhizoctonia Solani control was statistically similar when Proline was applied with NIS or Quadris applied alone. Priaxor or Quadris applied on a 7 inch band at the 2 or 8 leaf stage of sugar beet gave very good Rhizoctonia control and increased sugar beet production regardless of the varieties tolerance to Rhizoctonia Solani. Priaxor at the 8 ounce rate provided better control than the 6 ounce rate. Priaxor performed better when banded at the 2 leaf stage than when applied infurrow. Quadris performed better at the 14.3 ounce rate than at the 9.6 ounce rate. When Quadris and starter were applied together infurrow there was a reduction in stand. The remainder of the products did not appear to reduce stand. Vertisan applied at the 28.5 ounce rate at 4lf beets performed better than the other Vertisan treatments. Production was increased when 10-34-0 was used alone or with a fungicide

Table 1. Site Specific for Fungicide by Variety Clara City, 2012

Location	Planting Timing	Soil Conditions
Clara City, 2012	5/29/2012	Dry

Table 2. Influence of Fungicide by Starter for Sugarbeet Quality and Revenue as a % of Mean in Sugarbeet Production, Clara City 2012

Trt No.	Product	Application	Rate/ Acre	Starter 10-34-0	Tons Per Acre	Percent Sugar	Purity	Ext. Sucrose Per Acre (Lbs.)	Revenue % of Mean
1	ActinoGrow	Infurrow	6 oz.	N	15.2	10.52	83.55	2301	81.79
1	ActinoGrow	Infurrow	6 oz.	Y	17.3	10.06	82.41	2443	76.96
2	ActinoGrow	Infurrow	8 oz.	N	17.5	10.88	83.05	2743	101.83
2	ActinoGrow	Infurrow	8 oz.	Y	18.7	11.13	83.30	3013	116.37
3	Quadris	Infurow	9.2 oz.	N	19.3	10.19	82.86	2795	92.39
3	Quadris	Infurow	9.2 oz.	Y	19.6	10.54	83.50	2991	107.52
4	Quadris	Infurrow	14.3 oz.	N	19.8	10.34	82.99	2953	102.05
4	Quadris	Infurrow	14.3 oz.	Y	19.2	10.32	83.03	2900	102.10
5	Quadris	5" band at 2 lf	14.3 oz.	N	18.1	10.57	83.89	2805	102.65
5	Quadris	5" band at 2 lf	14.3 oz.	Y	20.9	10.80	83.26	3259	120.50
6	Quadris	5" band at 4 lf	14.3 oz.	N	20.7	9.87	82.67	2877	88.66
6	Quadris	5" band at 4 lf	14.3 oz.	Y	21.8	10.02	82.31	3204	108.24
7	Quadris	5" band at 8 lf	14.3 oz.	N	20.3	10.74	83.45	3154	116.24
7	Quadris	5" band at 8 lf	14.3 oz.	Y	21.1	10.75	83.88	3343	125.90
8	Priaxor	Infurow	6 oz.	N	18.0	9.87	82.51	2523	78.51
8	Priaxor	Infurow	6 oz.	Y	18.7	10.28	83.31	2780	95.95
9	Priaxor	5" band at 2 lf	6 oz.	N	19.0	10.09	82.59	2728	88.47
9	Priaxor	5" band at 2 lf	6 oz.	Y	20.4	10.09	82.62	2926	95.02
10	Priaxor	Infurow	8 oz.	N	19.0	10.53	83.32	2909	104.66
10	Priaxor	Infurow	8 oz.	Y	18.2	10.44	82.12	2661	89.66
11	Priaxor	5" band at 2 lf	8 oz.	N	19.0	10.92	84.11	3069	118.69
11	Priaxor	5" band at 2 lf	8 oz.	Y	21.1	10.50	82.93	3156	109.91
12	Priaxor	Infurow	8 oz.	N	21.0	10.40	83.34	3285	122.29
		5" band at 2 lf							
12	Priaxor	Infurow	8 oz.	Y	16.6	10.75	83.52	2691	104.65
		5" band at 2 lf							
13	Vertisan	Infurow	8 oz.	N	18.8	10.14	82.23	2696	87.44
13	Vetisan	Infurow		Y	20.6	10.29	82.51	3018	101.53
14	Vertisan	5" band at 4 lf	28.5 oz	N	17.2	10.49	84.37	2661	97.06
14	Vertisan	5" band at 4 lf	28.5 oz.	Y	21.2	10.55	83.70	3270	118.95
15	PROLINE + NIS	5" band @ 4 lf SB	5.7 oz.	N	18.2	10.04	82.13	2572	81.74
15	PROLINE + NIS	5" band @ 4 lf SB	5.7 oz.	Y	19.5	9.89	82.39	2748	86.99
16	Untreated Check			N	13.5	10.57	83.54	2072	75.06
16	Untreated Check			Y	15.5	10.82	84.24	2489	95.63
17	Quadris	Infurow	9.2 oz.	N					
		5" band at 2 lf	14.3 oz.		23.7	10.66	82.98	3632	131.29
17	Quadris	Infurow	9.2 oz.	Y	21.9	10.63	83.10	3365	121.54
		5" band at 2 lf	14.3 oz.						
18	Proline+NIS	Infurow	5.7oz	N	17.6	10.57	83.32	2691	96.43
18	Proline+NIS	Infurow	5.7oz	Y	18.1	10.77	83.35	2830	104.84
19	Untreated Check			N	12.7	10.61	83.69	1964	71.43
19	Untreated Check			Y	15.3	10.39	82.73	2286	79.05
	CV%				**9.6**	**4.76**	**0.95**	**12**	**23.66**
	LSD (0.05)				**2.5**	**0.76**	**1.63**	**496**	**33.16**

Table 3. Influence of Fungicide by Starter for Sugarbeet Quality in Sugarbeet Production Clara City, 2012

Trt No.	Product	Application	Rate/ Acre	Starter 10-34-0	2 Lf Stand	Harvest Stand	Root Rating Avg
1	ActinoGrow	Infurrow	6 oz.	N	144	126	2.8
1	ActinoGrow	Infurrow	6 oz.	Y	155	120	3.2
2	ActinoGrow	Infurrow	8 oz.	N	151	144	2.9
2	ActinoGrow	Infurrow	8 oz.	Y	134	133	2.8
3	Quadris	Infurow	9.2 oz.	N	174	128	3.0
3	Quadris	Infurow	9.2 oz.	Y	155	139	2.9
4	Quadris	Infurrow	14.3 oz.	N	178	146	3.2
4	Quadris	Infurrow	14.3 oz.	Y	149	134	3.0
5	Quadris	5" band at 2 lf	14.3 oz.	N	163	138	2.7
5	Quadris	5" band at 2 lf	14.3 oz.	Y	154	99	3.3
6	Quadris	5" band at 4 lf	14.3 oz.	N	161	94	3.4
6	Quadris	5" band at 4 lf	14.3 oz.	Y	164	129	3.0
7	Quadris	5" band at 8 lf	14.3 oz.	N	163	133	3.0
7	Quadris	5" band at 8 lf	14.3 oz.	Y	153	118	3.0
8	Priaxor	Infurow	6 oz.	N	163	150	3.0
8	Priaxor	Infurow	6 oz.	Y	169	126	2.8
9	Priaxor	5" band at 2 lf	6 oz.	N	158	115	4.0
9	Priaxor	5" band at 2 lf	6 oz.	Y	149	100	2.8
10	Priaxor	Infurow	8 oz.	N	184	135	3.0
10	Priaxor	Infurow	8 oz.	Y	178	129	3.4
11	Priaxor	5" band at 2 lf	8 oz.	N	161	148	3.0
11	Priaxor	5" band at 2 lf	8 oz.	Y	168	129	3.1
12	Priaxor	Infurow	8 oz.	N	171	130	3.2
		5" band at 2 lf					
12	Priaxor	Infurow	8 oz.	Y	178	121	3.2
		5" band at 2 lf					
13	Vertisan	Infurow	8 oz.	N	160	108	3.3
13	Vetisan	Infurow		Y	156	129	3.1
14	Vertisan	5" band at 4 lf	28.5 oz	N	129	129	2.9
14	Vertisan	5" band at 4 lf	28.5 oz.	Y	139	119	3.0
15	PROLINE + NIS	5" band @ 4 lf SB	5.7 oz.	N	181	113	3.4
15	PROLINE + NIS	5" band @ 4 lf SB	5.7 oz.	Y	160	120	3.1
16	Untreated Check			N	124	119	4.0
16	Untreated Check			Y	135	114	4.0
17	Quadris	Infurow	9.2 oz.	N			
		5" band at 2 lf	14.3 oz.		171	149	3.0
17	Quadris	Infurow	9.2 oz.	Y	153	113	3.3
		5" band at 2 lf	14.3 oz.				
18	Proline+NIS	Infurow	5.7oz	N	160	113	3.1
18	Proline+NIS	Infurow	5.7oz	Y	170	125	3.1
19	Untreated Check			N	116	99	3.9
19	Untreated Check			Y	119	123	4.1
	CV%				**12**	**16**	**16.8**
	LSD (0.05)				**33**	**29**	**0.5**

SWEET CORN IN ROTATION WITH SUGARBEET AS A POTENTIAL HOST OF *RHIZOCTONIA SOLANI* AG 2-2

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Rhizoctonia crown and root rot (RCRR) is an increasing problem throughout sugarbeet-growing areas of Minnesota and North Dakota. The disease is caused by the soilborne fungus, *Rhizoctonia solani*, which is separated into different genetic populations called anastomosis groups (AGs) (5). The AG causing RCRR on sugarbeet is AG 2-2, which is further divided into the intraspecific groups (ISGs) AG 2-2 IV and AG 2-2 IIIB (5,7). Both ISGs cause RCRR on sugarbeet, but AG 2-2 IV is reported as the primary cause (7) while AG 2-2 IIIB is reported as the more aggressive population (6).

In Europe, *R. solani* AG 2-2 IIIB is an aggressive root pathogen on both corn and sugarbeet in rotation (4). In the southeastern U.S.A., *R. solani* AG 2-2 IIIB causes a crown and brace root rot on corn (8,9). Recent reports in Minnesota have demonstrated that corn is a host for *R. solani* AG 2-2 IIIB, and soybean for both ISGs, without any effects on yield or presence of aboveground symptoms (1,11,12,13). In southern Minnesota, sugarbeet follows corn on 75% acres, sweet corn (10%), soybean (10%), and other crops (5%). Information is not available on the relationship of sweet corn to *R. solani* AG 2-2 ISGs.

OBJECTIVES

A field trial was established in southern Minnesota to determine 1) pathogenicity and survival of *R. solani* AG 2-2 IV and AG 2-2 IIIB on sweet corn compared to field corn, soybean, and wheat and 2) effects on a subsequent sugarbeet crop.

MATERIALS AND METHODS

2011 Rotation crops. A field trial was established in a split plot design with six replicates in the spring of 2011 near Maynard, Minnesota. Main plots (88 ft wide by 20 ft long) consisted of a non-inoculated control, inoculation with *R. solani* AG 2-2 IV, and inoculation with *R. solani* AG 2-2 IIIB. Inoculum of *R. solani* was grown for 3 weeks on sterilized barley, air-dried in the greenhouse, and hand-spread in plots (at an equivalent of 31 lb A^{-1}) and incorporated into soil on May 18. There were 11 ft by 20 ft buffers between each main plot. Main plots were divided into eight, 11 ft by 20 ft subplots which were sown on May 19, June 8 and June 30, to an early-, mid-, and late-maturing sweet corn variety, respectively. Field corn and soybean were planted on May 18 and wheat on May 19. Field corn and soybean were Roundup Ready varieties. Within main plots, there were 11 ft buffers between sweet corn and each field crop and between wheat and each RoundUp Ready crop. On July 1, weeds were controlled in sweet corn and wheat with Curtail (16 oz $A^{-1)}$ and in field corn and soybean, with RoundUp Powermax (32 oz A^{-1}).

To obtain root disease ratings and plant samples to assay for *R. solani* AG 2-2, 10 plants of sweet corn and field corn and 20 plants of soybean and wheat were dug from each plot. Early-season sweet corn and wheat were collected on August 3 and mid- and late-maturing sweet corn, field corn, and soybean were collected on August 30. Roots were washed and rated for root rot. Sweet corn and field corn were rated on a 1-5 scale where 1 = less than 2% of roots discolored or decayed, 5 = entire root system rotted and plant dead or dying (8). Soybean basal stems and roots were rated on a 1-5 scale where 1 = no symptoms and 5 = shoot dead and more than 75% of stem girdled (3). Wheat subcrown internodes were rated on a 0-3 scale where 0 = clean and healthy and 3 = more than 50% of the surface with lesions and discoloration (10).

After roots were assessed for disease, they were assayed to isolate *R. solani* AG 2-2. Four, 1-inch root segments were excised from each sweet corn and field corn plant, surface-treated 15 seconds in 0.5% sodium hypochlorite (bleach solution), rinsed twice in sterile deionized water, and placed on modified tannic acid medium. After 1 week, *R. solani* cultures were transferred to acidified potato dextrose agar for further identification. One-inch soybean basal stem segments and wheat subcrown internodes were cultured in the same way.

Yields of sweet corn and field corn were made by hand-harvesting all ears within 10 feet of two center rows per plot on August 2 for early-, and on September 19, for mid-, and late-maturing sweet corn varieties, and in early October for field corn. Ears of field corn were shelled with a stationary corn sheller. Wheat and soybean data were not available.

Data was subjected to analysis of variance (ANOVA) and if significant (P = 0.05), means were separated by Least Significant Difference (LSD).

2012 Sugarbeet crop. Plots previously infested with *R. solani* and planted with rotation crops in 2011 as described above were fertilized to recommended levels and planted to a susceptible sugarbeet variety on May 22. Sugarbeet plots were 6 rows wide, spaced 22 inches apart, and were 20 feet long. Applications of RoundUp PowerMax + Select Max (32 and 4 oz A^{-1}, respectively on July 7 and August 1) were made for weed control using a tractor-mounted sprayer and TeeJet 8003 flat fan nozzles at 40 psi. Cercospora leafspot was controlled with applications of Eminent + Manzate (13 oz + 1.5 qt A^{-1}), Supertin WP (8 oz A^{-1}), and Gem (3.5 oz A^{-1}) on July 2, July 18, and August 1, respectively.

Stand counts were done on June 10 and 22 and the middle two rows of plots were harvested on October 21. Beets were lifted and laid in place. Twenty roots were arbitrarily selected from each plot and rated for RCRR with a 0 to 7 scale, where 0 = healthy and 7 = root completely rotted and foliage dead. Roots were analyzed for yield and quality by Southern Minnesota Beet Sugar Cooperative, Renville, MN.

Data were subjected to analysis of variance (ANOVA) for main effects of inoculum and previous crop and interactions between inoculum and previous crop. Where significant (P = 0.05), means were separated by Least Significant Difference (LSD).

RESULTS

2011 Rotation crops. Root rot ratings were not significantly different (P = 0.05) among *R. solani*-inoculated and control treatments for all crops except field corn, which had significantly higher ratings in non-inoculated plots (2.9) and plots inoculated with *R. solani* AG 2-2 IIIB (2.9) compared to plots inoculated with *R. solani* AG 2-2 IV (2.6) (Table 1). Root rot ratings averaged 2.6, 2.4, and 1.9 for early-, mid-, and late-maturing sweet corn, respectively, and 1.5, 2.8, and 2.2 for wheat, field corn, and soybean, respectively.

Recovery of *R. solani* AG 2-2 from all crops was very low (data not shown). The fungus was not recovered from roots of early-maturing sweet corn. In mid-maturing sweet corn *R. solani* was isolated from 10.0% of roots in non-inoculated plots and 1.7 and 8.3% of roots in plots inoculated with *R. solani* AG 2-2 IV and AG 2-2 IIB, respectively. In late-maturing sweet corn *R. solani* was isolated from 6.7% of roots in non-inoculated plots and 0 and 8.3% of roots in plots inoculated with *R. solani* AG 2-2 IV and AG 2-2 IIIB, respectively. The fungus was recovered from 0.8% of wheat roots in *R. solani* AG 2-2 IV-inoculated plots and was not isolated from roots in the non-inoculated or AG 2-2 IIIB-inoculated plots. In field corn, the fungus was not isolated from non-inoculated plots and plots inoculated with *R. solani* AG 2-2 IV, and were isolated from 3.3% of roots in plots inoculated with *R. solani* AG 2-2 IIIB. In soybean, *R. solani* was found in 5.8% of roots in the non-inoculated control and 19.2 and 5.0% of plants in AG 2-2 IV- and AG 2-2 IIIB-inoculated plots, respectively.

Inoculum treatment had no effect on yield for early-, mid-, and late-maturing varieties of sweet corn and field corn (Table 2). Late-maturing sweet corn had the highest yields (mean = 22.0 ton A^{-1}) compared to 15.6 and 18.9 ton A^{-1} for early- and mid-maturing varieties, respectively. Yield of field corn averaged 176 bu A^{-1} across inoculum treatments. Yields of wheat soybean were not available at the time of report submission.

Table 1. Root rot ratings of sweet corn, wheat, field corn, and soybean sown into soil inoculated (before crops were planted) with *Rhizoctonia. solani* AG 2-2 IV, AG 2-2 IIIB, or not inoculated in 2011.

	Root rot rating					
	Sweet corn (1-5)[X]			Wheat	Field corn	Soybean
Soil treatment [W]	Early	Middle	Late	(0-3)[Y]	(1-5)[X]	(1-5)[Z]
Non-inoculated	2.7	2.2	1.9	1.6	2.9	2.0
R. solani AG 2-2 IV	2.4	2.4	1.9	1.5	2.6	2.3
R. solani AG 2-2 IIIB	2.8	2.5	2.0	1.5	2.9	2.2
ANOVA *P*-value	0.217	0.680	0.748	0.755	0.050	0.173
LSD (*P* = 0.05)	NS	NS	NS	NS	0.3	NS

[W] Inoculum of *R. solani* was grown for 3 weeks on sterilized barley, air-dried in the greenhouse, and hand spread in plots on May 18 at an equivalent of 31 lb A^{-1}.

[X] Sweet corn and field corn were rated on a 1-5 scale where 1 = less than 2% of roots were discolored or decayed, 5 = entire root system rotted and plant dead or dying (8). Each number is an average of 60 plants (10 plants/plot x 6 replicates).

[Y] Wheat subcrown internodes were rated on a 0-3 scale where 0 = clean and healthy and 3 = more than 50% of the surface with lesions and discoloration (10). Each number is an average of 120 plants (20 plants/plot x 6 replicates).

[Z] Soybean basal stems and roots were rated on a 1-5 scale where 1 = no symptoms and 5 = shoot dead and more than 75% of stem girdled (3). Each number is an average of 120 plants (20 plants/plot x 6 replicates).

Table 2. Yield of sweet corn, field corn and soybean sown into soil inoculated (before crops were planted) with *Rhizoctonia solani* AG 2-2 IV, AG 2-2 IIIB, or not inoculated in 2011.

	Yield					
	Sweet corn (ton A^{-1})[X]			Wheat[Y]	Field corn[X]	Soybean[Z]
Soil treatment[W]	Early	Middle	Late	(Bu A^{-1})	(Bu A^{-1})	(Bu A^{-1})
Non-inoculated	14.8	16.8	23.7	-	164	-
R. solani AG 2-2 IV	17.3	20.8	21.4	-	172	-
R. solani AG 2-2 IIIB	14.8	19.0	21.1	-	194	-
ANOVA *P*-value	0.393	0.319	0.359	-	0.590	-
LSD (*P* = 0.05)	NS	NS	NS	-	NS	-

[W] Inoculum of *R. solani* was grown for 3 weeks on sterilized barley, air-dried in the greenhouse, and hand spread in plots on May 18 at an equivalent of 31 lb A^{-1}.

[X] Sweet corn and field corn yield estimates were made by hand-harvesting all ears within 20 feet of row per plot on August 2 for early-, and September 19, for mid-, and late-maturing sweet corn varieties, respectively, and in early October for field corn. Field corn ears were shelled with a stationary corn sheller.

[Y] Wheat yield was not available at the time of report submission.

[Z] Soybean yield was not available at the time of report submission.

2012 Sugarbeet crop. There were no significant (*P* = 0.05) interactions between inoculum treatment and previous crop, so main effects are shown separately in Table 3. There were no significant effects of inoculum on early season stands, yield, sucrose, and revenue. Rhizoctonia crown and root rot ratings were statistically (*P* = 0.05) higher in plots inoculated with *R. solani* AG 2-2 ISG IIIB compared to plots inoculated with *R. solani* AG 2-2 ISG IV; ratings in non-inoculated plots were intermediate (Table 3).

Table 3. Early season stand, root rot ratings, yield, and quality of sugarbeet sown May 22, 2012 in experiments inoculated in May, 2011 with *Rhizoctonia solani* AG 2-2 IV, AG 2-2 IIIB, or not inoculated and then planted to full-season crops of sweet corn, field corn, soybean, or wheat in a field near Maynard, MN.

Main effect	Stand/100 ft June 22 [z]	RCRR [z] (0-7)	Yield [z] T A^{-1}	Sucrose[z] %	lb/ton	lb recov. A^{-1}	Revenue \$ A^{-1}
Inoculum							
Non-inoculated control	169	0.2 ab	20.9	13.7	198	4159	970
R. solani AG 2-2 IV	137	0.2 b	22.8	13.7	199	4532	1059
R. solani AG 2-2 IIIB	161	0.3 a	20.4	13.8	203	4098	966
LSD (*P* = 0.05)	NS	0.09	NS	NS	NS	NS	NS
Previous crop							
Early sweet corn	150	0.2	23.1 a	13.6	198	4563	1059
Middle sweet corn	144	0.2	19.0 c	13.8	203	3874	922
Late sweet corn	174	0.2	21.6 abc	13.9	202	4338	1024
Field corn	158	0.3	19.4 bc	13.8	201	3888	913
Soybean	162	0.2	22.3 ab	13.7	199	4429	1031
Wheat	149	0.2	22.7 a	13.6	198	4487	1042
LSD (*P* = 0.05)[Z]	NS	NS	3.2	NS	NS	NS	NS

[z] For each column, numbers followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD, *P* = 0.05); NS = not significantly different.

There were no significant effects of previous crop on early season stands, RCRR, sucrose yields, or revenue. There was, however, a significant effect of previous crop on yield. Yields were significantly higher (*P* = 0.05) in plots following early sweet corn and wheat compared to plots following middle sweet corn and field corn; yields were intermediate in plots following soybean and late sweet corn (Table 3).

DISCUSSION

In this experiment, inoculation of soil with *R. solani* AG 2-2 IV or 2-2 IIIB did not affect root rot of rotation crops or yield of sweet corn or field corn compared to a non-inoculated control. Also, the fungus was infrequently recovered from roots of all crops, regardless of soil treatment. These results are consistent with a previous trial in 2010 (2), but not with earlier trials where root rot ratings of field corn were significantly higher in plots inoculated with *R. solani* AG 2-2 IIIB (12,13) and the fungus was isolated more frequently compared to non-inoculated plots. Previous trials also have shown consistent recovery of *R. solani* from soybean plants in plots inoculated with *R. solani* AG 2-2 IV and AG 2-2 IIIB compared to non-inoculated controls (1,13). As in previous trials, growing wheat in *Rhizoctonia*-inoculated soil did not affect yield and the fungus was infrequently recovered compared to the non-inoculated control (12,13). Differences in the 2010 and 2011 trials compared to previous trials may reflect different environmental factors including soil moisture, temperature, and other pathogens and microbes present in the soil.

Inoculation of soil with *R. solani* AG 2-2 IV or 2-2 IIIB also did not have much of an effect on a subsequent sugarbeet crop. Root rot ratings were statistically higher in plots inoculated with *R. solani* AG 2-2 IIIB compared to plots inoculated with *R. solani* AG 2-2 IV, but ratings in all plots were very low and differences were not biologically meaningful. All treatments resulted in a mean RCRR rating <1 which is 'superficial, scattered, scurfy, non-active lesions'. Yields were not affected by soil inoculation indicating that there was not enough pathogen population to cause damage to the sugarbeet crop. This is not surprising considering the lack of effect of inoculum treatments on the previous crops in 2011. This is the second year of this trial with similar results. Results from these trials are not consistent with results from earlier trials where inoculation of soil with *R. solani* AG 2-2 IIIB followed by full-season field corn (1,11,13) and inoculation of soil with *R. solani* AG 2-2 IIIB and AG 2-2 IV followed by full-season soybean crop (13) significantly affected a subsequent sugarbeet crop.

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