2014 Research Results

growing the best sugarbeets

MICHIGAN SUGARBEET REACh

Research & Education Advisory Council

REACh/SUGARBEET ADVANCEMENT COMMITTEE LIST
2014 Voting Membership

24 Voting Members

Company & Name	Terms	Expire
Michigan Sugar Company		
Paul Pfenninger (5th Member)	Permanent	
Greg Clark	Permanent	
Jim Stewart	Permanent	
Lee Hubbell	Permanent	
Dave Bailey	1	2015
Glenn Martus	3	2017
Dexter Auernhamer	4	2018
Michigan Sugar Company District Growers		
Chris Guza (Chairman)	1	2015
Mark Sylvester (Treasurer)	1	2015
Rick Leach	1	2015
Michigan Sugar Company At Large Growers		
Nathan Gulick	2	2016
Kurt Hrabal	1	2015
Scott Roggenbuck (Vice Chair)	3	2017
Andy Shaffner (Secretary)	2	2016
Michigan State University and University of Guelph		
Linda Hanson	3	2017
Laura Van Eerd	1	2015
Christy Sprague	2	2016
Sugar Beet Seed Company		
Dave Wishowski	1	2015
Agri-Business		
Steve Wendzel (Retail)	1	2015
Brian Devine (Manufacturing)	2	2016
Michigan Sugar Company Board of Directors		
Mark Richards	1	2015
Kent Houghtaling	1	2015
SBA Director		
Steve Poindexter	Permanent	

Ex-Officio Members

Company	Name
Chairman of Board of Directors Michigan Sugar Company	Rick Gerstenberger
CEO of Michigan Sugar Company	Mark Flegenheimer

2014 Research Results

MICHIGAN SUGARBEET REACh
Research Education Advisory Council

MISSION STATEMENT:

The mission of the ***Michigan Sugarbeet Research Education Advisory Council*** is to be the central trusted source of agronomic information for the sugarbeet industry.

The council will provide direction for the Michigan-Ontario sugarbeet researchers and assemble and distribute research/agronomy information.

Cooperative educational efforts will be conducted with the goal of improving productivity and profitability for all stakeholders.

Table of Contents

Rhizoctonia Root Rot

Evaluate Fungicides for Rhizoctonia Root Rot Control	MSC	1-2
Quadris IF Rates (Tolerant and Susceptible Varieties)	MSC	3-4
Quadris IF Rates and T-Band Widths	MSC	5-6
Applying Quadris with Different Water Volumes	MSC	7-8
Compare Quadris IF and Foliar Applications	MSC	9-10
Bayer Rhizoctonia Trial (Serenade Soil)	MSC	11
Control of Rhizoctonia Crown and Root Rot with Fungicides	MSU	12-13

Cercospora Leafspot

Cercospora Leafspot Rating Scale	MSC	14
Evaluate Fungicides for Control of Cercospora Leafspot		
Average Two Varieties	MSC	15-16
Susceptible Variety	MSC	17-18
Tolerant Variety	MSC	19-20
Compare Fungicides Alone and Tank Mixed	MSC	21-22
Leaf Injury With Copper + Roundup Tank Mixes	MSC	23
Evaluate EBDC's and Copper's for Cercospora Control	MSC	24-26
AGRI-LIFE Summary, for Cercospora Control	MSC	27
Cercospora Leafspot Control Using BEETcast		
Summary	MSC	28
All 3 Varieties	MSC	29-31
Susceptible Variety	MSC	32
Moderately Tolerant	MSC	33
Tolerant Variety	MSC	34
Ballad Plus (Biological Fungicide) for Cercospora Control		
Average of Five Locations, 2014	MSC	35
(Albee, Blumfield, Crumbaugh, Schuette, Kirkpatrick)	MSC	36-40
Bayer Cercospora Trial (Ballad Plus)		
Average of 2 locations, 2014	MSC	41
(Crumbaugh, Maust)	MSC	42-43
Nufarm Cercospora Trial (AgriTin and ChampION)		
Average of 2 Locations, 2014	MSC	44
(Blumfield, Schuette)	MSC	45-46
UPI Cercospora Trial (Manzate)	MSC	47
Cheminova Cercospora Trial (Topguard)	MSC	48-49
Gowan Cercospora Trial (Badge SC)	MSC	50
Ballad Fungicide (Spartan Acres Farms)	SBA	51
Ballad Fungicide (Mossner Farms)	SBA	52
Efficacy of Application of Foliar Fungicides for Control of Cercospora Leafspot in Sugarbeets, 2014	MSU	53-55
Efficacy of Application of Foliar Fungicides and Oxidate for Control of Cercospora Leafspot in Sugarbeets, 2014	MSU	56-57
Products for Management of Cercospora Leafspot In Sugarbeet in Ontario, 2014	U of G	58
Fungicide Application Timing and Water Volume for Cercospora Leafspot Management in Sugarbeet, 2014		
Pain Court Location	U of G	59
Ridgetown Location	U of G	60
Spore Activity of Cercospora Beticola, Causal Agent of Cercospora Leafspot of Sugarbeet		
Pain Court Location	U of G	61
Ridgetown Location	U of G	62
Rapid Methods for Detecting Cercospora Beticola Resistance to Fingicides Using Molecular Screening	USDA/MSU	63-64
Beta PIs from the USDA-ARS NPGS Evaluated for Resistance to Cercospora Beticola, 2014	USDA	65-66

Sugarbeet Seed Treatments

Summary of MSC Work	MSC	67
Clariva pn Nematode Seed Treatment (Meylan Farms)	SBA	68
Metlock & Kabina Seed Treatment (Spartan Acres Farm)	SBA	69
Kabina Seed Treatment (Spartan Acres Farm)	SBA	70
Kabina Seed Treatment (English Farms)	SBA	71
Kabina Seed Treatment (Stoneman Farms)	SBA	72
Quick Roots Seed Treatment (Stoneman Farms)	SBA	73
Quick Roots Seed Treatment (Schindler Farms)	SBA	74

MICHIGAN SUGARBEET REACH
Research Education Advisory Council

RESEARCH SPECIALISTS:

MICHIGAN SUGAR COMPANY

Jim Stewart, Director of Research
Cell 989.225.6720
Email .... james.stewart@michigansugar.com

Lee Hubbell, Research Specialist
Cell 989.225.6708
Email .... lee.hubbell@michigansugar.com

Greg Clark, Agronomist
Cell 989.891.6785
Email .... greg.clark@michigansugar.com

Brian Groulx, Research Technician
Cell 989.225.6709
Email .... brian.groulx@michigansugar.com

MICHIGAN STATE UNIVERSITY

Steven Poindexter, Senior Extension Educator
Cell 989.798.5848
Email .... poindex2@msu.edu

Tom Wenzel, Research Technician
Cell 989.737.9447
Email .... wenzelth@msu.edu

PIONEER • BIG CHIEF
MICHIGAN SUGAR

MICHIGAN SUGAR COMPANY
CORPORATE AGRICULTURAL OFFICE:
2600 South Euclid Avenue
Bay City, Michigan 48706
Tel: 989.686.0161

2014 Research Results

Table of Contents

Sugarbeet Cyst Nematode
Control of SBCN With Nimitz (Nematicide) .... MSC 75-76
Nematode Variety Strip Trial .... MSC 77
Evaluation of Oilseed Radish Cultivars and Other Cover/Rotational Crops as Hosts for the Beet Cyst Nematode .... MSU 78-80
Beet Cyst Nematode Research .... MSU 81-84
Effects of Rotation and Cover Crops on Harmful Nematodes and Soil Health in Loam and Silt Loam Sugarbeet Fields .... MSU 85-89

Fertilizer, Foliar Feed & Soil Additives
Nitrogen 2x2 Rates at Planting .... MSC 90
KTS (Potassium Thiosulfate) Fertilizer .... MSC 91-92
NutriPak (8-10-2) + Other Ingredients .... MSC 93
Gantac Pro (6-1-2) + BioActives .... MSC 94
Generate (Frees Up Nutrients in Soil) .... MSC 95-96
Redline (6-12-2) + Chelated Zn, Fe, Mn, Cu from West Central .... MSC 97-98
SumaGrow (Microbial Soil Conditioner) .... MSC 99-100
ProAct (Initiates Plant Defenses) .... MSC 101
Factory Lime Applied at Rates from 0-12 Tons/Acre
Average of 3 Years, 9 Locations .... MSC 102
Average of 3 Locations, 2014 .... MSC 103
(Crumbaugh, Helmreich, Spero) .... MSC 104-106
Black Label Zn (Reif Farms) .... SBA 107
Black Label Zn (Schindler Farms) .... SBA 108
Ag Zyme (Stoneman Farms) .... SBA 109
Gantec Pro (Bartle Farms) .... SBA 110
Sugarbeet Nitrogen Response Following Corn .... MSU 111-112
Polymer-Coated Urea Blending Ratios for Sugarbeet Production .... MSU 113
Organic Sources of Nitrogen in Sugarbeet Production .... MSU 114

Weed Control
Evaluate Alternatives to Roundup for Weed Control .... MSC 115-117
Management of Glyphosate (Group 9)-Resistant Horseweed .... MSU 118
Management of Glyphosate (Group 9)-Resistant Palmer Amaranth .... MSU 119

Planting Date and Sugarbeet Population
Effect of Planting Date and Population on Production
Average of 3 Years Data .... MSC 120-121
Average of 3 Years Graphs .... MSC 122-123
Shaffner - 2014 .... MSC 124-125
Replanting Guide .... MSC 126

Date of Harvest
Harvest Date Study, 5 Years Results .... MSC 127
2014 Average of 3 Locations (Blumfield, Shaffner, Vader) .... MSC 128-129

Sugarbeet Storage
Modeling Temperature and Heat Flux in Field Piles of Sugarbeets in Michigan .... MSU 130-133
Impact of Field Piling and Maus Transfer on Sugarbeet Sotrability .... MSU 134-137
Response of Sugarbeet Recombinant Inbred Lines to Post Harvest Rot Fungi .... USDA/MSU 138-140

Seedling Diseases
Seedling Diseases of Sugarbeet – Diversity and Host Interactions .... USDA 141-142

Evaluate Fungicides for Rhizoctonia Root Rot Control in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality:	Fair-Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	See Trts
Variety:	SX-1228RR		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Control:**	Good
Planted:	April 23		>Opt: P and K	**Problems:**	Some low spots
Harvested:	September 11		High: MN, Low: B		water ponding
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	125 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans	**Rainfall:**	17.7 inches

Application: In-Furrow on planter, 3.5” T-Band, 9.9 gpa; Foliar 7” band, 6502e, 30 psi, 15.3 gpa

Sugarbeet Yield and Quality

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Quadris	10 fl oz	IF T-Band	**$1,396**	**6101**	**224**	**27.3**	**15.1**	**95.6**
9	Proline	5.7 fl oz	IF T-Band	**$1,283**	**5660**	**230**	**24.5**	**15.4**	**95.8**
2	Quadris	14.25 fl oz	6-8 lf	**$1,246**	**5584**	**214**	**25.5**	**14.6**	**95.1**
16	Bravo SC	3 pt	6-8 lf	**$1,228**	**5379**	**234**	**22.8**	**15.7**	**95.9**
13	Headline	9 fl oz	IF T-Band	**$1,223**	**5402**	**213**	**25.1**	**14.5**	**95.6**
14	Headline	9 fl oz	6-8 lf	**$1,219**	**5384**	**219**	**24.4**	**14.9**	**95.5**
12	Gem	3.6 fl oz	6-8 lf	**$1,189**	**5253**	**214**	**24.5**	**14.7**	**94.9**
18	Topguard	12 fl oz	6-8 lf	**$1,157**	**5157**	**223**	**22.9**	**15.2**	**95.2**
6	Topsin	20 fl oz	6-8 lf	**$1,152**	**5093**	**223**	**22.6**	**15.1**	**95.5**
10	Proline	5.7 fl oz	6-8 lf	**$1,083**	**4799**	**214**	22.3	**14.7**	**94.8**
11	Gem	3.6 fl oz	IF T-Band	$1,007	4469	**219**	20.3	**14.8**	**95.8**
4	Vertisan	30 fl oz	6-8 lf	$953	4323	**224**	18.9	**15.3**	**95.1**
19	Eminent	13 fl oz	6-8 lf	$925	4161	**213**	19.6	**14.6**	**95.2**
3	Vertisan	30 fl oz	IF T-Band	$909	4132	**224**	18.4	**15.3**	**95.1**
7	Serenade	2.7 qt	IF T-Band	$814	3724	202	18.5	14.0	**94.7**
15	Bravo SC	3 pt	IF T-Band	$801	3540	199	17.6	14.0	**94.2**
5	Topsin	20 fl oz	IF T-Band	$782	3498	**226**	15.4	**15.2**	**95.9**
17	Inspire	7 fl oz	6-8 lf	$744	3381	202	16.6	14.0	**94.8**
8	Serenade	2.7 qt	6-8 lf	$709	3272	200	16.3	13.9	**94.9**
20	Untreated			$379	1634	202	8.1	14.0	**94.9**
Average				$1,010	4,497	216	20.6	14.8	95.2
LSD 5%				335.7	1447.0	31.2	4.7	1.6	ns(1.7)
CV %				23.5	22.8	10.2	16.2	7.5	1.3

$/A: Gross Payment unless noted as net. Calculated assuming an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicides for Rhizoctonia Root Rot Control in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Sugarbeet Stand, Dead Beets and Vigor Ratings

No	Treatment	Rate/A	Applic	$/A	Stand B/100'		Dead B/100'	Vigor (0-10)	
					May 23	July 17	Aug 22	June 10	Sept 10
1	Quadris	10 fl oz	IF T-Band	**$1,396**	224	**216**	**6**	**8.6**	**7.9**
9	Proline	5.7 fl oz	IF T-Band	**$1,283**	237	**215**	**11**	**8.5**	**7.3**
2	Quadris	14.25 fl oz	6-8 lf	**$1,246**	**261**	**216**	38	**8.5**	**7.5**
16	Bravo SC	3 pt	6-8 lf	**$1,228**	**260**	**208**	29	**8.5**	6.9
13	Headline	9 fl oz	IF T-Band	**$1,223**	232	**203**	28	**8.3**	6.9
14	Headline	9 fl oz	6-8 lf	**$1,219**	245	**206**	**26**	**8.5**	6.6
12	Gem	3.6 fl oz	6-8 lf	**$1,189**	**263**	**205**	41	**8.9**	6.5
18	Topguard	12 fl oz	6-8 lf	**$1,157**	**270**	**222**	37	**8.3**	6.5
6	Topsin	20 fl oz	6-8 lf	**$1,152**	**263**	**206**	36	**8.6**	6.3
10	Proline	5.7 fl oz	6-8 lf	**$1,083**	**264**	**208**	39	**8.8**	6.3
11	Gem	3.6 fl oz	IF T-Band	$1,007	218	187	36	8.1	6.8
4	Vertisan	30 fl oz	6-8 lf	$953	**262**	**198**	35	8.0	6.3
19	Eminent	13 fl oz	6-8 lf	$925	**259**	**207**	35	**8.3**	6.5
3	Vertisan	30 fl oz	IF T-Band	$909	**256**	**214**	**18**	**8.3**	**7.0**
7	Serenade	2.7 qt	IF T-Band	$814	232	177	42	7.8	5.9
15	Bravo SC	3 pt	IF T-Band	$801	244	**192**	45	8.1	5.6
5	Topsin	20 fl oz	IF T-Band	$782	**253**	171	61	8.0	5.8
17	Inspire	7 fl oz	6-8 lf	$744	**259**	**192**	52	7.9	5.4
8	Serenade	2.7 qt	6-8 lf	$709	**258**	**206**	45	**8.3**	6.3
20	Untreated			$379	**260**	146	91	8.0	3.8
Average				$1,010	251	200	37.6	8.3	6.4
LSD 5%				335.7	20.5	32.8	21.4	0.6	0.9
CV %				23.5	5.8	11.6	40.2	5.1	9.7

Vigor: a higher number is better.

Summary: Registered and experimental fungicides were applied to sugarbeets in-furrow at planting in a 3.5 inch T-Band and foliar at the 6-8 lf stage in a 7 inch band. Some of these fungicides do not claim to control Rhizoctonia. The disease level was high and was a natural infestation (not inoculated). Quadris at 10 fl oz/A applied in-furrow provided very good control and was the top treatment in the trial. Proline applied in-furrow also provided good disease control. All fungicide treatments provided some level of control compared to the untreated check which had 91 dead beets per 100 feet of row. Some of the treatments appeared to reduce the initial sugarbeet stand but final stands were significantly higher than the untreated check. Inspire, Topguard and Eminent were also applied in-furrow but caused significant stand loss and further data was not collected. The plot was planted somewhat late and was harvested early, which contributed to low yields and quality. Rainfall was plentiful, especially during the spring. Low areas and sugarbeet Cyst nematodes contributed to variations in yield.

$/A: Gross Payment unless noted as net. Calculated assuming an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Quadris In-Furrow Rates for Control of Rhizoctonia with a Tolerant and Susceptible Variety

Crumbaugh Farms, Breckenridge, MI - 2014 (Page 1 of 2)

Trial Quality: Fair-Good
Variety: C-RR074NT, C-RR059
Planted: April 23
Harvested: September 11
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: In-Furrow on planter, 3.5" T-Band, 9.9 gpa

Soil Info: Sandy Loam
2.8% OM, 7.2 pH, CEC: 8.2
> Opt: P and K
High: MN, Low: B
Added N: 125 lbs
Prev Crop: Soybeans

Rhizoc Level: Medium-High
Cerc Control: Good
Problems: Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 17.7 inches

Yield, Quality and Rhizoc Counts - Average of 2 Varieties

No	Quadris Rate/A	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets (Rhizoc) B/100'	
								July 16	Sept 8
2	7 fl oz	**$1,378**	**7662**	**239**	**32.1**	**16.1**	**95.8**	**3.1**	**3.7**
3	9 fl oz	**$1,336**	**7451**	**242**	**30.9**	**16.2**	**96.0**	**2.6**	**3.4**
4	11 fl oz	**$1,328**	**7425**	**244**	**30.5**	**16.3**	**95.8**	**2.2**	**4.0**
1	5 fl oz	**$1,319**	**7316**	**237**	**30.8**	**15.9**	**96.0**	**2.8**	**4.2**
6	15 fl oz	**$1,318**	**7410**	**244**	**30.4**	**16.3**	**96.0**	**2.6**	**3.7**
5	13 fl oz	**$1,298**	**7281**	**237**	**30.8**	**15.9**	**95.9**	**3.2**	**5.3**
7	Untreated	$1,034	5696	219	25.9	15.1	94.6	18.0	27.7
Average		$1,287	7177	237	30.2	16.0	95.7	4.9	7.4
LSD 5%		143.5	790.2	10.4	2.7	0.5	0.7	2.0	2.9
CV %		12.8	12.7	4.1	11.1	3.2	0.6	42.9	41.7

Stand Counts and Vigor Ratings - Average of 2 Varieties

No	Quadris Rate/A	$/A	Stand (B/100')			Vigor Ratings (0-10)		
			May 22	July 15	Aug 6	May 27	June 30	Sept 5
2	7 fl oz	**$1,378**	192	**189**	**182**	**7.4**	**8.1**	**9.1**
3	9 fl oz	**$1,336**	185	**190**	**183**	**7.3**	**8.0**	8.9
4	11 fl oz	**$1,328**	200	**189**	**181**	**7.4**	**8.0**	**9.0**
1	5 fl oz	**$1,319**	191	**194**	**187**	**7.6**	**8.0**	**8.3**
6	15 fl oz	**$1,318**	178	**179**	171	7.1	**7.9**	**8.6**
5	13 fl oz	**$1,298**	190	**193**	**188**	**7.4**	**7.9**	**8.5**
7	Untreated	$1,034	**217**	172	149	**7.6**	7.4	7.3
Average		$1,287	193	187	177	7.4	7.9	8.5
LSD 5%		143.5	16.7	15.5	14.6	0.3	0.5	0.7
CV %		12.8	7.4	6.7	7.2	4.4	6.0	7.2

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Quadris In-Furrow Rates for Control of Rhizoctonia with a Tolerant and Susceptible Variety

Crumbaugh Farms, Breckenridge, MI - 2014

Average of Quadris Rates for each Variety

Variety	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets (Rhizoc) B/100'	
							July 16	Sept 8
C-RR074NT	**$1,354**	**7545**	232	**32.3**	15.7	95.3	5.9	10.2
C-RR059	$1,221	6809	**243**	28.0	**16.2**	**96.1**	**4.0**	**4.6**
Average	$1,287	7177	237	30.2	16.0	95.7	4.9	7.4
LSD 5%	76.7	422.4	5.6	1.5	0.3	0.4	1.0	1.5
CV %	12.8	12.7	4.1	11.1	3.2	0.6	42.9	41.7

Average of Quadris Rates for each Variety

Variety	$/A	Stand (B/100')			Vigor Ratings (0-10)		
		May 22	July 15	Aug 6	May 27	June 30	Sept 5
C-RR074NT	**$1,354**	**205**	**196**	**184**	7.3	**8.2**	**8.5**
C-RR059	$1,221	182	177	171	**7.5**	7.6	**8.5**
Average	$1,287	193	187	177	7.4	7.9	8.5
LSD 5%	76.7	8.9	8.3	7.8	0.2	0.3	ns(.35)
CV %	12.8	7.4	6.7	7.2	4.4	6.0	7.2

Vigor: a higher number is better.

Comments: The disease pressure was moderate to high. There was not much of a difference in the results due to different Quadris rates. Higher rates provided slightly better Rhizoctonia control but suppressed stand somewhat. Income, when considering the cost of Quadris was best at the 7 fl oz rate, but was only significantly different from the untreated check. Crystal RR059 had fewer dead beets but suffered from sugarbeet Cyst nematodes (wilted down in late summer). Crystal RR074NT (Nematode Variety) had a higher yield and higher grower income.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Control of Rhizoctonia Root Rot in Sugarbeets With Quadris In-Furrow (T-Band) at Different Rates and Band Widths

PIONEER · BIG CHIEF
MICHIGAN SUGAR

Crumbaugh, Breckenridge, MI - 2014 (Page 1 of 2)

Trial Quality: Fair
Variety: B-12RR2N
Planted: April 23
Harvested: September 11
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: In-furrow on planter, 2” to 5” T-Band, 9.9 gpa*

Soil Info: Sandy Loam
2.8% OM, 7.2 pH, CEC: 8.2
>Opt: P and K
High: MN, Low: B
Added N: 125 lbs
Prev Crop: Soybeans

Rhizoc Level: High
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 17.7 inches

Sugarbeet Yield, Quality and Stand

No	Treatment	Fl oz/A	T-Band*	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100’ May 20	Stand B/100’ July 15	Stand B/100’ Aug 6
15	Quadris	14.3	5”	**$1,160**	**6513**	**228**	**28.5**	**15.4**	**95.6**	**122**	**181**	**170**
8	Quadris	10.7	3.5”	**$1,157**	**6463**	**236**	**27.4**	**15.9**	**95.5**	**122**	**175**	**162**
2	Quadris	7.1	3.5”	**$1,146**	**6367**	**223**	**28.6**	**15.1**	**95.4**	120	**173**	**163**
9	Quadris	10.7	5”	**$1,116**	**6239**	**222**	**27.9**	**15.2**	**95.0**	**124**	**181**	**166**
6	Quadris	8.9	5”	**$1,104**	**6152**	**221**	**27.6**	**15.0**	**95.6**	114	**170**	**158**
12	Quadris	12.5	5”	**$1,103**	**6182**	**221**	**27.9**	**15.0**	**95.4**	114	**174**	**164**
7	Quadris	10.7	2”	**$1,096**	**6126**	**220**	**27.8**	**15.1**	**95.0**	100	**172**	**163**
5	Quadris	8.9	3.5”	**$1,063**	**5928**	**228**	**25.8**	**15.5**	**95.4**	115	**177**	**168**
3	Quadris	7.1	5”	**$1,040**	**5784**	**217**	**26.6**	**14.9**	**95.1**	113	**174**	**163**
1	Quadris	7.1	2”	**$1,028**	**5720**	211	**27.1**	14.5	**95.0**	**127**	**178**	**167**
13	Quadris	14.3	2”	**$1,005**	**5662**	**218**	**26.0**	**14.8**	**95.5**	114	**168**	**161**
11	Quadris	12.5	3.5”	**$987**	**5545**	**221**	**25.1**	**15.0**	**95.5**	113	**174**	**165**
4	Quadris	8.9	2”	**$979**	**5465**	215	**25.4**	**14.9**	**94.6**	114	**172**	**168**
14	Quadris	14.3	3.5”	**$976**	**5498**	**219**	**25.1**	**15.1**	**94.9**	100	150	153
10	Quadris	12.5	2”	$937	5274	214	24.6	14.7	**95.2**	115	**170**	**163**
16	Untreated Check			$587	3230	183	17.7	13.7	91.5	**138**	154	135

	$/A	RWSA	RWST	T/A	% Sugar	% CJP	May 20	July 15	Aug 6
Average	$1,030	5759	219	26.2	15.0	95.0	117	171	162
LSD 5%	192.3	1057.4	19.5	3.6	1.1	1.0	17.8	16.8	15.4
CV %	13.1	12.9	6.2	9.6	5.3	0.7	10.7	6.9	6.7

* Different band widths achieved by changing nozzle angle

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Control of Rhizoctonia Root Rot in Sugarbeets With Quadris In-Furrow (T-Band) at Different Rates and Band Widths

Crumbaugh, Breckenridge, MI - 2014

Dead Beet and Vigor Ratings

No	Treatment	Fl oz/A	T-Band*	$/A	Dead B/100'			Vigor Ratings 0-10		
					July 15	Aug 6	Sept 3	June 26	July 17	Aug 30
15	Quadris	14.3	5"	**$1,160**	**1**	**7**	**10**	**7.5**	**9.0**	**8.0**
8	Quadris	10.7	3.5"	**$1,157**	**5**	**10**	**15**	**7.6**	**8.9**	**7.8**
2	Quadris	7.1	3.5"	**$1,146**	**5**	**9**	**13**	**7.4**	**8.6**	**8.0**
9	Quadris	10.7	5"	**$1,116**	**5**	**11**	**19**	**7.6**	**8.8**	**8.0**
6	Quadris	8.9	5"	**$1,104**	**3**	**6**	**11**	7.3	**8.4**	**7.4**
12	Quadris	12.5	5"	**$1,103**	**3**	**6**	**12**	7.3	**8.3**	**7.5**
7	Quadris	10.7	2"	**$1,096**	**4**	**10**	**17**	7.2	**8.3**	**7.3**
5	Quadris	8.9	3.5"	**$1,063**	**2**	**7**	**12**	**7.4**	**8.9**	**7.3**
3	Quadris	7.1	5"	**$1,040**	**6**	**13**	**23**	6.9	8.1	**7.4**
1	Quadris	7.1	2"	**$1,028**	**2**	**8**	**14**	**8.1**	**9.3**	**7.6**
13	Quadris	14.3	2"	**$1,005**	7	**11**	**18**	6.4	**8.3**	**7.4**
11	Quadris	12.5	3.5"	**$987**	**5**	**11**	**20**	**7.4**	7.9	**7.3**
4	Quadris	8.9	2"	**$979**	7	18	27	7.2	8.1	**7.3**
14	Quadris	14.3	3.5"	**$976**	6	**10**	**21**	6.9	7.6	**7.1**
10	Quadris	12.5	2"	$937	7	**14**	**22**	7.3	**8.5**	7.0
16	Untreated Check			$587	26	57	78	**7.4**	**8.4**	5.5
Average				$1,030	5.9	12.9	20.7	7.3	8.5	7.4
LSD 5%				192.3	5.0	9.9	14.8	0.7	1.1	0.9
CV %				13.1	59.3	53.4	50.1	6.3	8.7	8.2

* Different band widths achieved by changing nozzle angle

Vigor: a higher number is better.

Comments: Quadris was applied in-furrow at planting at various rates and T-Band widths. The disease level was high and the disease was a natural population (not inoculated). The trial was harvested early which contributed to the low RWST levels. All of the Quadris treatments provided good control of Rhizoctonia root rot and had significantly higher yields and quality compared to the untreated. The Quadris treatments appeared to slow emergence (early stand counts), especially higher rates in narrow band widths, however, the treatments achieved a higher final stand than the untreated plots. There was a trend towards higher Quadris rates providing better Rhizoctonia control and higher yields, however, it was important to increase the band width when using the higher rates. It appeared that the 2 inch band width was less effective than the 3.5 and 5 inch band widths.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Quadris In-Furrow With Different Water Volumes for Rhizoctonia Control

Crumbaugh Farms, Breckenridge, MI - 2014 (Page 1 of 2)

Trial Quality:	Fair-Good	**Soil Info:**	Sandy Loam	**Rhizoc Level:**	High
Variety:	C-RR074NT		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Control:**	Good
Planted:	April 23		>Opt: P and K	**Problems:**	None
Harvested:	September 11		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	125 lbs	**Rainfall:**	17.7 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		

No	Quadris In-Fur Rate/A	GPA	Nozzle	PSI	MPH	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets/ 100' Sept 8	Stand Beets/ 100' July 18	Vigor 0-10 Sept 3
18	10 fl oz	8.1	65015E	25	4	**$1,320**	**7258**	**251**	**28.9**	**16.8**	**95.9**	**16**	**249**	**8.3**
2	10 fl oz	4.8	6501E	15	3.5	**$1,309**	**7199**	**248**	**29.0**	**16.7**	**95.6**	**14**	231	**8.3**
6	10 fl oz	4.8	6501E	20	4	**$1,303**	**7164**	**262**	**27.3**	**17.4**	**95.9**	**14**	239	7.8
17	10 fl oz	9.3	65015E	25	3.5	**$1,301**	**7157**	244	**29.4**	16.4	**95.6**	**11**	233	**8.8**
21	10 fl oz	8.2	6502E	15	4	**$1,294**	**7120**	**256**	**27.7**	**17.1**	**95.9**	24	237	7.4
3	10 fl oz	4.2	6501E	15	4	**$1,277**	**7026**	239	**29.4**	16.3	**95.1**	**15**	238	**8.3**
10	10 fl oz	8.3	65015E	15	3	**$1,274**	**7006**	**256**	**27.3**	**17.2**	**95.6**	35	222	7.2
26	10 fl oz	12.2	6502E	25	3.5	**$1,265**	**6959**	**248**	**28.1**	**16.6**	**95.8**	**13**	236	**8.5**
5	10 fl oz	5.5	6501E	20	3.5	**$1,258**	**6919**	241	**28.8**	16.3	**95.2**	**5**	236	**9.0**
16	10 fl oz	10.8	65015E	25	3	**$1,247**	**6859**	240	**28.6**	16.3	**95.2**	36	231	6.7
14	10 fl oz	8.5	65015E	20	3.5	**$1,244**	**6841**	**246**	**27.9**	**16.6**	**95.3**	**7**	233	**8.8**
24	10 fl oz	9.3	6502E	20	4	**$1,243**	**6834**	242	**28.1**	16.3	**95.5**	**12**	**252**	**8.6**
12	10 fl oz	6.2	65015E	15	4	**$1,234**	**6788**	**259**	**26.1**	**17.3**	**95.8**	20	**246**	**8.2**
11	10 fl oz	7.1	65015E	15	3.5	**$1,233**	**6784**	**246**	**27.5**	**16.6**	**95.2**	20	236	**8.3**
15	10 fl oz	7.4	65015E	20	4	**$1,215**	**6684**	243	**27.5**	16.3	**95.6**	**11**	**246**	**8.5**
23	10 fl oz	10.7	6502E	20	3.5	**$1,215**	**6683**	**248**	**26.9**	**16.7**	**95.4**	**17**	234	**8.4**
9	10 fl oz	5.4	6501E	25	4	**$1,214**	**6676**	**246**	**27.2**	**16.6**	**95.4**	37	236	7.3
27	10 fl oz	10.7	6502E	25	4	**$1,208**	**6646**	**255**	**26.0**	**17.1**	**95.7**	32	233	7.8
1	10 fl oz	5.6	6501E	15	3	**$1,203**	**6615**	237	**28.0**	16.2	**94.9**	33	220	7.3
13	10 fl oz	9.9	65015E	20	3	**$1,145**	**6299**	242	**25.9**	16.3	**95.4**	43	215	6.9
19	10 fl oz	11	6502E	15	3	**$1,140**	**6272**	243	**25.7**	**16.6**	**95.0**	37	234	6.7
22	10 fl oz	12.5	6502E	20	3	$1,123	6177	234	**26.4**	16.0	**94.9**	28	231	7.1
7	10 fl oz	7.2	6501E	25	3	$1,110	6108	233	**26.2**	16.1	94.6	43	219	6.5
25	10 fl oz	14.3	6502E	25	3	$1,103	6067	240	25.3	16.2	**95.5**	26	221	7.4
20	10 fl oz	9.4	6502E	15	3.5	$1,090	5994	235	**25.4**	16.1	**94.9**	24	**253**	7.5
8	10 fl oz	6.2	6501E	25	3.5	$1,069	5877	**247**	23.8	**16.7**	**95.3**	37	232	6.8
4	10 fl oz	6.5	6501E	20	3	$1,038	5709	241	23.6	16.4	**95.0**	38	216	6.7
Average						$1,210	6656	245	27.1	16.6	95.4	24	234	7.8
LSD 5%						187.2	1029.5	16.7	3.5	0.9	1.0	11.3	14.0	1.0
CV %						9.4	9.4	4.1	7.8	3.1	0.6	28.6	3.6	7.8

Vigor: a higher number is better.

Notes: all treatments sprayed with Quadris In-furrow at planting at 10 fl oz/A in a 3.5 inch T-Band.

Evaluate Quadris In-Furrow With Different Water Volumes for Rhizoctonia Control

Crumbaugh Farms, Breckenridge, MI - 2014

Comments: Quadris was applied in-furrow (3.5 inch T-Band) with a wide range of water volume rates (4.2 to 14.3 gallons per acre). The different GPA rates came from combinations of nozzle tips (6501E, 65015E and 6502E) with planting speeds (3, 3.5 and 4 mph) and spray pressures (15, 20 and 25 psi). The disease level was high and the sugarbeet populations were above normal. Even though there was a considerable spread in yields, quality and income, most of the differences were not statistically different and there was not a clear trend towards water volumes making a difference one way or the other. The same was true for dead beet counts and sugarbeet stand. It appears that the parameters we utilized for spray tips, planting speed and spray pressure were in acceptable ranges, however, 01 tips do have a higher chance of plugging over time. This trial will be redesigned and repeated in 2015.

Control of Rhizoctonia Root Rot in Sugarbeets With Quadris Applied In-Furrow (T-Band) and Foliar

Crumbaugh Farms, Breckenridge, MI - 2014 (Page 1 of 2)

Trial Quality: Fair-Good
Variety: C-RR074NT
Planted: April 23
Harvested: September 11
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: In-Furrow on planter, 3.5” T-Band; Foliar - 7” band, 15.3 gpa

Soil Info: Sandy Loam
2.8% OM, 7.2 pH, CEC: 8.2
>Opt: P and K
High: MN, Low: B
Added N: 125 lbs
Prev Crop: Soybeans

Rhizoc Level: High
Cerc Control: Good
Problems: Some low spots water ponding
Seeding Rate: 4.1 inches
Rainfall: 17.7 inches

No	Quadris Rate/A	Appl	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Live Beets/ 100’	Dead Beets/ 100’
3	11 fl oz	IF T-Band	**$1,230**	**6874**	**258**	**26.6**	**17.0**	**96.4**	**223**	**5**
12	9 fl oz 14.3 fl oz	IF T-Band 6-8 lf	**$1,177**	**6613**	**243**	**27.2**	**16.4**	**95.6**	**230**	**8**
2	9 fl oz	IF T-Band	**$1,168**	**6517**	**253**	**25.8**	**16.7**	**96.3**	**244**	**10**
6	14.3 fl oz	6-8 lf	**$1,168**	**6560**	**255**	**25.7**	**17.0**	**96.1**	**239**	25
1	7 fl oz	IF T-Band	**$1,153**	**6415**	**251**	**25.5**	**16.9**	**95.4**	**242**	**12**
11	12 fl oz	6-8 lf	**$1,111**	**6230**	**250**	**24.9**	**16.8**	**95.5**	**232**	**18**
8	16 fl oz	4-6 lf	**$1,098**	**6199**	**246**	**25.1**	**16.6**	**95.3**	**233**	21
10	10 fl oz	6-8 lf	**$1,084**	**6064**	**256**	23.7	**17.1**	**95.8**	**238**	21
5	14.3 fl oz	4-6 lf	**$1,050**	**5911**	**256**	23.1	**17.2**	**95.3**	**236**	**16**
9	16 fl oz	6-8 lf	$1,031	5832	**252**	23.2	**16.8**	**95.8**	**231**	27
13	14.3 fl oz 14.3 fl oz	2-4 lf 6-8 lf	$1,016	**5865**	**242**	**24.1**	**16.4**	**95.4**	**237**	**14**
4	14.3 fl oz	2-4 lf	$945	5333	**243**	22.0	**16.3**	**95.5**	**232**	30
7	16 fl oz	2-4 lf	$877	4980	236	21.0	16.0	**95.2**	**231**	34
14	Untreated Check		$633	3480	213	16.3	15.0	93.7	219	45
Average			$1,053	5920	247	23.9	16.6	95.5	233	20.5
LSD 5%			189.2	1040.5	21.3	3.2	1.1	1.2	24.0	14.8
CV %			12.6	12.3	6.0	9.3	4.8	0.9	7.2	50.4

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Control of Rhizoctonia Root Rot in Sugarbeets With Quadris Applied In-Furrow (T-Band) and Foliar

Crumbaugh Farms, Breckenridge, MI - 2014 (Page 2 of 2)

No	Quadris Rate/A	Appl	$/A	Stand - Live Beets/100’			Stand - Dead Beets/100’			Vigor 0-10 Sept 9
				May 23	June 25	July 23	July 8	July 23	Sept 12	
3	11 fl oz	IF T-Band	**$1,230**	230	**226**	**213**	**1**	**3**	**13**	**8.4**
12	9 fl oz 14.3 fl oz	IF T-Band 6-8 lf	**$1,177**	236	**231**	**223**	**2**	**6**	**17**	**7.9**
2	9 fl oz	IF T-Band	**$1,168**	**253**	**240**	**239**	**2**	**5**	**23**	**7.8**
6	14.3 fl oz	6-8 lf	**$1,168**	**264**	**237**	**216**	7	**18**	50	**7.9**
1	7 fl oz	IF T-Band	**$1,153**	**249**	**249**	**228**	**3**	**7**	**25**	**8.1**
11	12 fl oz	6-8 lf	**$1,111**	**267**	**226**	**205**	**5**	**15**	**33**	7.5
8	16 fl oz	4-6 lf	**$1,098**	**263**	222	**214**	**5**	**16**	42	**7.9**
10	10 fl oz	6-8 lf	**$1,084**	**264**	**232**	**217**	**5**	**17**	43	7.6
5	14.3 fl oz	4-6 lf	**$1,050**	**259**	**232**	**215**	6	**18**	**23**	7.1
9	16 fl oz	6-8 lf	$1,031	**263**	**227**	**204**	7	25	50	7.1
13	14.3 fl oz 14.3 fl oz	2-4 lf 6-8 lf	$1,016	**261**	**227**	**223**	**3**	**11**	**30**	7.4
4	14.3 fl oz	2-4 lf	$945	**258**	**237**	**201**	**8**	30	52	7.1
7	16 fl oz	2-4 lf	$877	**265**	**231**	**196**	10	41	52	7.1
14	Untreated Check		$633	**252**	218	189	14	50	72	5.6
Average			$1,053	256	231	213	5.5	18.8	37.3	7.5
LSD 5%			189.2	21.4	25.3	43.3	4.3	19.2	23.3	0.7
CV %			12.6	5.9	7.7	14.2	54.8	71.6	43.7	7.5

Vigor: a higher number is better.

Comments: Quadris was applied at different rates at planting (in a 3.5 inch T-Band) and as foliar sprays in a 7 inch band at the 2-4, 4-6 and 6-8 leaf stages. One treatment received an in-furrow and a foliar application and another treatment received two foliar sprays. The disease pressure was high and it was a natural population (not inoculated). Quadris at 11 fl oz applied in-furrow at planting provided the best overall control and had the highest yield and income. Quadris applied in-furrow at 9 fl oz followed by Quadris at 14.3 fl oz at the 6-8 leaf stage also gave good results. In general, in-furrow treatments were better than foliar treatments. The 6-8 leaf stage proved to be the best timing for the foliar treatments, the 2-4 leaf stage was definitely too early. The untreated check plots lost around 10 tons per acre and nearly 2 points of sugar compared to the better Quadris treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Serenade Soil, Proline and Propulse for Control of Rhizoctonia Root Rot in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality: Good/Poor*
Variety: C-RR074NT
Planted: April 23
Harvested: September 11
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: In-Furrow on planter, 3.5" T-Band, 9.9 gpa

Soil Info: Sandy Loam
2.8% OM, 7.2 pH, CEC: 8.2
> Opt: P and K
High: MN, Low: B
Added N: 125 lbs
Prev Crop: Soybeans

Rhizoc Level: Very High
Cerc Level: Low
Problems: Low areas caused ponding
Seeding Rate: 4.1 inches
Rainfall: 17.7 inches

No	Treatment	Rate/A	Appl Desc	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead/ 100'	Vigor 0-10
4	Proline Propulse	5.7 fl oz 0.57 fl oz/ 1000 ft	IF T-Band 4 lf	**$714**	**3925**	**224**	**17.0**	**15.5**	**94.6**	**74**	**6.8**
2	Serenade Soil Proline	2 qt 5.7 fl oz	IF T-Band 4 lf	**$568**	**3124**	**220**	**14.1**	**15.3**	**94.1**	**90**	**6.4**
3	Proline Quadris	5.7 fl oz 14.3 fl oz	IF T-Band 4 lf	**$515**	**2831**	**215**	**12.8**	**15.1**	**94.0**	**100**	**6.0**
1	Untreated			$316	1741	195	8.4	14.2	92.5	156	3.4

	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead/ 100'	Vigor 0-10
Average	$528	2905	214	13.1	15.0	93.8	105	5.7
LSD 5%	264.9	1457.2	19.8	5.7	0.9	1.7	38.3	1.0
CV %	40.8	40.8	7.6	35.3	4.7	1.5	29.7	14.5

* Good for ratings and counts, poor for yield

Vigor: a higher number is better.

Comments: Serenade Soil, Proline and Propulse (Bayer) were evaluated for Rhizoctonia root rot control in sugarbeets in this small plot replicated trial. The disease pressure was very high and the sugarbeet population was good (average of 200 beets per 100 ft of row). Proline (IF) followed by Propulse (4 lf) and Serenade Soil (IF) followed by Proline (4 lf) gave better Rhizoctonia control than Proline (IF) followed by Quadris (4 lf). Low areas in the field caused yield variation.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Control of Rhizoctonia Crown and Root Rot with Fungicides, 2014

Michigan State University AgBioResearch

W.W. Kirk and R.L. Schafter; Department of Plant, Soil and Microbial Sciences, Michigan State University, East Lansing, MI 48824

Sugar beet cv. ACH RR-824 was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 23 May. Seed was planted at 1” depth into four-row by 50-ft plots (ca. 4.375 in. between plants to give a target population of 275 plants/100ft. row) with 30” between rows replicated four times in a randomized complete block design. Fertilizer was drilled into plots immediately before planting, formulated according to results of soil tests (125 lb 46-0-0/A). No additional nitrogen was applied. All fungicides were applied with a hand held R&D spray boom delivering 10 gal/A (50 p.s.i.) and using one XR8003 nozzle per row in a 6” band at planting (A), GS 2-4 (B), GS 4-6 (C) and GS 6-8 (D). Applications were made at planting (A); and banded applications on 13 Jun at GS 2-4 (B), 25 Jun at GS 4-6 (B) and 30 Jun at GS 6-8 (D), respectively. Cercospora leaf spot was controlled with an application of Eminent 125SL (13 fl oz) + Koverall 75DF (1.5 lb) on 25 Jul and Inspire 2.08EC (7 fl oz) + Koverall 75DF (1.5 lb) on 15 Aug. Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt/A applied at GS2-4 and GS 6-8. Insects were controlled as necessary. Plant stand relative to the not-treated, not-inoculated check was rated up to 19 days after planting (DAP) and again 88 DAP on 19 Aug. The relative rate of emergence was not calculated in 2014 as stand was compromised by weather conditions at planting and emergence values for each plot were calculated relative to the not-treated, not-inoculated check in each replicate block to reduce variability across the trial. The change in plant stand was calculated. Plots were inoculated at planting by spreading *R. solani* Anastemoses Group 2.2 (IIIB) infested millet across all plants in each plot. Incidence of infected plants was evaluated on 146 DAP. Samples of 50 beets per plot were harvested 146 DAP (10 ft from start of each plot from two center rows) and assessed for crown and root rot (*R. solani*) incidence (%) and severity. Severity of crown and root rot was measured as an index calculated by counting the number of roots (n = 20) falling in class 0 = 0%; 1 = 1 - 5%; 2 = 6 -10%; 3 = 11 – 15%; 4 =15 - 25%; 5 = 25 – 50%; 6 = 50 – 100% surface area of root affected by lesions; and 7 = dead and/or extensively decayed root. The number in each class is multiplied by the class number and summed. The sum is multiplied by a constant to express as a percentage. Increasing index values indicated the degree of severity. The number of beets falling into classes 0 – 3 was summed and a percentage calculated as marketable beets. The trial was not harvested due to the high incidence and severity of crown and root rot. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 43.3995 and longitude -83.6980 deg. Average daily air temperature (^{o}F) was 57.8, 62.3, 66.2, 67.4, 60.0 and 51.5 (May, Jun, Jul, Aug, Sep, and to 10 Oct, respectively) and the number of days with maximum temperature >90^{o}F over the same period was 0 for each month. Average daily relative humidity (%) over the same period was 64.5, 63.9, 73.3, 63.1, 60.0 and 72.1. Average soil temperature at 2” depth over the same period was 57.0, 67.2, 69.8, 70.6, 63.3 and 55.5. Average soil moisture (% of field capacity) at 2” depth over the same period was 37.0, 37.2, 44.5, 51.9, 49.3 and 50.9. Precipitation over the same period was 3.06, 2.74, 4.17, 3.90, 3.03 and 0.64”.

Plant stand was compromised by weather conditions at planting and emergence values for each plot were calculated relative to the not-treated, not-inoculated check in each replicate block to reduce variability across the trial. Treatments with final plant stand less than 57.5% were significantly different from the not-inoculated not-treated check (100.0%) in terms of plant stand. Soil temperature and moisture conditions enhanced moderate development of crown and root rot throughout the season although severe symptoms did not appear until Aug. Treatments with final plant stand less than 52.1% were significantly different from the not-inoculated not-treated check (100.0%) in terms of plant stand 88 DAP. The change in plant stand between the evaluations between 88 and 19 DAP indicated the impact of crown and root rot during the growing season and values that were positive indicated a decrease in plant stand over that period. Treatments with a significant decrease in plant stand in comparison to the not-inoculated not-treated check (100.0%) were indicated by a decrease greater than 11.9%. The inoculated check had a decrease in plant stand of 19.4%. Treatments with a significant decrease in plant stand in comparison to the inoculated not-treated check were indicated by a decrease greater than 1.4%. The evaluation of crown and root incidence at harvest indicated that no treatments were significantly different from the inoculated not-treated check (100%) or the not-inoculated not-treated check (100%), data not shown. No treatments had a significantly lower severity index of crown and root rot on the beet roots and ranged from 14.1 (A13836 439SE 0.46 fl oz/1000 ft. row applied at GS 4-6) to 21.4 (Aproach 2.08SC 0.8 fl oz/1000 ft. row at planting) but were not significantly different to the inoculated not-treated check (14.1). There was background crown and root in the trial and the non-inoculated not-treated check treatments had a crown and root rot severity index of 14.1. There were no differences among treatments in terms of marketable beet roots and due to the onset of severe Rhizoctonia root rot during the latter part of the season the range was from 65 to 75% marketable and all treatments had significantly higher marketable yield values in comparison to the inoculated check. The non-inoculated not-treated check and the inoculated not-treated check had 75 and 49% marketable beets, respectively. No phytotoxicity was observed from any treatments.

Control of Rhizoctonia Crown and Root Rot with Fungicides, 2014

Michigan State University AgBioResearch

W.W. Kirk and R.L. Schafter; Department of Plant, Soil and Microbial Sciences, Michigan State University, East Lansing, MI 48824

Table 1. Efficacy of fungicides against Rhizoctonia crown and root rot.

Treatment and rate/1000 ft. row	Plant stand relative to not-inoculated check[a] 11 Jun 19 DAP[b] (%)		Plant stand relative to not-inoculated check[a] 19 Aug 88 DAP (%)		Percentage decrease in plant stand from 19 to 88 DAP 19 Aug (negative values indicate increase)		Crown and root rot Severity[c] 146 DAP		Crown and root rot Marketable beets (%)	
Inoculated Check…………………...	81.3	ab[d]	64.4	ab	19.4	a	30.9	a	49	b
Not-inoculated Check………………	100.0	a	100.0	a	-1.4	bc	14.1	b	75	a
Equation 2.08SC 0.4 fl oz (BD[e])…...	78.2	ab	75.6	ab	0.1	bc	19.7	b	65	a
Equation 2.08SC 0.8 fl oz (BD)……	70.9	ab	71.9	ab	-2.9	bc	14.6	b	73	a
Quadris 2.08SC 0.8 fl oz (BD)……..	78.2	ab	78.4	ab	-2.5	bc	14.4	b	74	a
A18126 45WG 0.574 oz (C)……….	74.6	ab	68.5	ab	7.0	abc	15.3	b	75	a
A18126 45WG 0.574 oz (A)……….	70.3	ab	68.1	ab	4.7	abc	15.0	b	72	a
Quadris 2.08SC 0.6 fl oz (C)……….	65.4	ab	68.7	ab	-7.3	c	16.9	b	72	a
Quadris 2.08SC 0.6 fl oz (A)……….	67.3	ab	68.2	ab	-2.9	bc	14.9	b	73	a
A13836 439SE 0.46 fl oz (C) …..….	85.7	ab	83.2	ab	1.4	bc	14.1	b	75	a
A13826 45SE 0.46 fl oz (A) ……….	57.5	ab	52.1	ab	8.9	abc	18.3	b	67	a
Aproach 2.08SC 0.6 fl oz (A)……..	79.3	ab	72.5	ab	7.7	abc	15.1	b	73	a
Aproach 2.08SC 0.8 fl oz (A)……...	61.9	ab	61.1	ab	1.8	abc	21.4	ab	65	a
Aproach 2.08SC 0.6 fl oz (C)………	70.3	ab	66.4	ab	5.2	abc	18.3	b	67	a
Proline 4SC 0.33 fl oz (A)…………	58.5	ab	56.8	ab	3.0	abc	17.3	b	67	a
Serenade Soil 1.34F 1.84 fl oz (A)…	57.5	ab	56.8	ab	0.0	bc	17.6	b	68	a
Serenade Soil 1.34F 3.67 fl oz (A)…	67.4	ab	58.7	ab	11.9	ab	16.7	b	69	a
Serenade Soil 1.34F 1.84 fl oz (A); Proline 4SC 0.33 fl oz (C)…………	72.8	ab	71.5	ab	0.2	bc	14.4	b	74	a
Proline 4SC 0.33 fl oz (C)…………	58.9	ab	55.6	ab	3.8	abc	18.4	b	68	a
Serenade Soil 1.34F 3.67 fl oz (A); Proline 4SC 0.33 fl oz (C)………..	81.7	ab	83.4	ab	-2.7	bc	17.4	b	69	a
Proline 4SC 0.33 fl oz (A); Quadris 2.08SC 0.6 fl oz (C)……….	60.4	ab	53.9	ab	9.5	abc	14.4	b	75	a
Quadris 2.08SC 0.6 fl oz (A)……….	61.4	ab	58.9	ab	3.5	abc	18.1	b	67	a
Quadris 2.08SC 0.6 fl oz (C)……….	69.0	ab	67.8	ab	1.6	abc	15.3	b	73	a
GWN-10338 1.5SC 2 fl oz (A)…….	45.0	b	44.6	b	0.2	bc	17.6	b	68	a
GWN-10338 1.5SC 2 fl oz (AC)…...	83.2	ab	80.9	ab	1.1	bc	19.9	b	66	a
GWN-10338 1.5SC 2 fl oz (C)……..	80.3	ab	78.1	ab	2.0	abc	16.4	b	72	a
Priaxor 4.17SC 0.344 fl oz (C)……..	81.4	ab	82.3	ab	-2.5	bc	18.0	b	71	a

[a] Plant stand expressed as a percentage of the target population of 275 plants/100ft. row from a sample of 2 x 50 ft rows per plot and expressed relative to the not-treated, not-inoculated check

[b] DAP = days after planting on 23 May.

[c] Severity of crown and root rot was measured as an index calculated as described in the text

[d] Means followed by same letter are not significantly different at $p = 0.05$ (Fishers LSD).

[e] Application dates; A= 23 May; B= 13 Jun at GS 2-4, C=25 Jun at GS 4-6; D= 30 Jun at GS 6-8.

Cercospora Leafspot Rating Scale
Michigan Sugar Company

0-9 Rating	Description	Spots/ leaf	% leaf damage	Estimated Losses		
				T/A	% Suc*	$/A
0	No Spots					
1	Takes 5 to 10 seconds to start finding spots	1				
2	Can see spots walking slow	5 to 10	0.25			
2.5	Most leaves have spots but not coalescing	up to 30	0.7			
2.75	A lot of spots and beginning to coalesce	up to 100	1.5	0.5	0.2	$50
3	Very heavy spotting and minor coalescence	up to 200	3	0.8	0.3	$85
4	Very heavy spotting and coalescing	Too many spots to count	10	1.5	0.5	$160
5	Very heavy spotting, coalescence and minor flagging		25	3	0.8	$280
6	Very heavy spotting, coalescence, flagging and minor regrowth		50	4	1	$375
7	Very heavy spotting, coalescence, flagging and regrowth		75	5	1.5	$480
8	Canopy almost entirely burned down, accelerated regrowth		90	6	2	$600
9	Entire canopy burned down, new canopy growing		100	7 +	2.5 +	$700 +

*** % Sucrose** = percentage points lost (ex. From 18 to 18.5 = 0.5 points lost)

Rating Scale: Variations of this Cercospora leafspot rating scale have been used for years by researchers. At low disease levels it is not possible to estimate the amount of leaf damage and at high disease levels it is not possible to count the number of spots per leaf. The scale uses an estimate of counts at the low end and an estimate of percent of damaged leaves on the high end. From much practice we know that when it is difficult to find spots, if you time yourself, for example, if you stand still and search for 5 to 10 seconds to find a spot, there is probably about 1 spot per leaf. When walking slow, if you can see just a few spots, when you stop and count there will probably be 10 to 30 spots per leaf. At a rating of 3 the leaves are covered with spots but not too many of the spots are running together (coalescing) to form large dead areas. There will be around 100 to 200 spots per leaf and about 3% leaf desiccation. From ratings of 4 on up there are to many spots to try to count, so we estimate the percent of the canopy that is damaged by Cercospora.

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Tolerant and Susceptible Varieties

Tom Ziel Farm, Elkton, MI - 2014

Trial Quality: Good
Variety: B-12RR2N and C-RR288
Planted: May 7
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
> Opt: P and < Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Moderate
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Applic DSV	Rate/A	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Manzate	35	1.6 qt	**0.8**	**$1,954**	**11105**	**265**	**41.8**	**17.6**	**96.1**
	Inspire + Manzate	50	7 fl oz + 1.6 qt							
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
11	Bravo	50	2 pt	**0.8**	**$1,956**	**10979**	**268**	**41.0**	**17.9**	95.7
	Manzate	70	1.6 qt							
	Bravo	90	2 pt							
	Manzate	110	1.6 qt							
	Bravo	130	2 pt							
3	Topguard + Manzate	50	14 fl oz + 1.6 qt	**0.9**	**$1,953**	**11071**	**271**	**40.9**	**17.9**	**96.1**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
10	Manzate	35	1.6 qt	**1.0**	**$1,938**	**10824**	260	**41.5**	17.3	**96.0**
	Manzate	50	1.6 qt							
	Manzate	70	1.6 qt							
	Manzate	90	1.6 qt							
	Manzate	110	1.6 qt							
	Manzate	130	1.6 qt							
6	Enable + Crop Oil + Dithane	50	8 fl oz + 1 % + 1.6 qt	**1.0**	**$1,951**	**11063**	**264**	**41.9**	**17.4**	**96.3**
	Super Tin + Dithane	95	8 fl oz + 1.6 qt							
	Dithane	135	1.6 qt							
2	Inspire + Manzate	50	7 fl oz + 1.6 qt	**1.1**	**$1,971**	**11169**	**263**	**42.4**	**17.5**	**96.1**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
7	Super Tin + Manzate	50	8 fl oz + 1.6 qt	**1.1**	$1,872	10585	**266**	39.7	**17.7**	**96.0**
	Inspire + Manzate	95	7 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Tolerant and Susceptible Variety

Tom Ziel Farm, Elkton, MI - 2014

No	Treatment	Applic DSV	Rate/A	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
9	Vertisan	50	30 fl oz	**1.1**	$1,860	10526	257	**40.9**	17.2	**95.9**
	Manzate	70	1.6 qt							
	Vertisan	90	30 fl oz							
	Manzate	110	1.6 qt							
	Vertisan	130	30 fl oz							
4	Eminent + Manzate	50	13 fl oz + 1.6 qt	1.2	$1,872	10627	**263**	40.4	**17.5**	**96.0**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
12	Ballard Plus	50	1 qt	1.3	**$1,902**	**10734**	**265**	40.6	**17.6**	**95.9**
	Manzate	70	1.6 qt							
	Ballard Plus	90	1 qt							
	Manzate	110	1.6 qt							
	Ballard Plus	130	1 qt							
5	Proline + Induce + Manzate	50	5.7 fl oz + .125% 1.6 qt	1.3	**$1,935**	**10973**	**264**	**41.6**	**17.4**	**96.3**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
8	Headline + Manzate	50	9 fl oz + 1.6 qt	1.6	**$1,917**	**10874**	**264**	**41.2**	**17.4**	**96.3**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 Qt							
13	Headline + Ballad Plus	50	9 fl oz + 1 qt	1.8	$1,826	10426	261	40.0	**17.4**	95.6
	Super Tin + Ballad Plus	95	8 fl oz + 1 qt							
	Ballard Plus	135	1 qt							
14	Untreated Check			3.8	$1,757	9662	253	38.2	16.9	**95.9**
	Average			1.3	$1,905	10758	263	40.4	17.5	96.0
	LSD 5%			0.3	93.9	516.6	8.5	1.7	0.5	0.4
	CV %			16.3	4.2	4.1	3.1	2.9	2.6	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

Comments: Cercospora leafspot pressure was moderate. The data is an average of a susceptible and a tolerant variety. The sugarbeet stand was good. The best treatment had Manzate applied at 35 DSV followed by a triazole + Manzate, Super Tin + Manzate (4 applic). Inspire, Topguard and Enable were the most effective triazole treatments (3 applics). Bravo/Manzate provided good leafspot control (5 applics). Leafspot control with Super Tin was fairly good (3 applics). Six sequential Manzate treatments gave good control and were more effective than alternating Manzate with Ballad Plus (5 applics). Headline treatments were near the bottom of the trial. None of the treatments caused crop injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Susceptible Variety

Tom Ziel Farm, Elkton, MI - 2014

Trial Quality: Good
Variety: B-12RR2N
Planted: May 7
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: JD 3250 Mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
> Opt: P and > Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Moderate
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Applic DSV	Rate/A	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
11	Bravo	50	2 pt	**0.9**	**$2,044**	**11460**	**271**	**42.2**	**18.0**	**96.0**
	Manzate	70	1.6 qt							
	Bravo	90	2 pt							
	Manzate	110	1.6 qt							
	Bravo	130	2 pt							
1	Manzate	35	1.6 qt	**1.1**	**$2,043**	**11596**	**268**	**43.3**	**17.7**	**96.4**
	Inspire XT + Manzate	50	7 fl oz + 1.6 qt							
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
3	Topguard + Manzate	50	14 fl oz + 1.6 qt	**1.1**	**$2,068**	**11705**	**272**	**43.0**	**17.9**	**96.3**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
7	Super Tin + Manzate	50	8 fl oz + 1.6 qt	**1.3**	**$1,956**	**11049**	**266**	**41.6**	**17.6**	**96.1**
	Inspire XT + Manzate	95	7 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
9	Vertisan	50	30 fl oz	**1.3**	**$1,956**	**11054**	**262**	**42.1**	**17.4**	**96.1**
	Manzate	70	1.6 qt							
	Vertisan	90	30 fl oz							
	Manzate	110	1.6 qt							
	Vertisan	130	30 fl oz							
10	Manzate	35	1.6 qt	**1.3**	**$2,016**	**11254**	**265**	**42.4**	**17.5**	**96.2**
	Manzate	50	1.6 qt							
	Manzate	70	1.6 qt							
	Manzate	90	1.6 qt							
	Manzate	110	1.6 qt							
	Manzate	130	1.6 qt							
6	Enable + Crop Oil + Dithane	50	8 fl oz + 1 % + 1.6 qt	1.4	**$1,999**	**11327**	**261**	**43.4**	**17.3**	**96.0**
	Super Tin + Dithane	95	8 fl oz + 1.6 qt							
	Dithane	135	1.6 qt							

PIONEER · BIG CHIEF
MICHIGAN SUGAR

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Susceptible Variety

Tom Ziel Farm, Elkton, MI - 2014

No	Treatment	Applic DSV	Rate/A	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
2	Inspire XT + Manzate	50	7 fl oz + 1.6 qt	1.4	**$2,044**	**11569**	**265**	**43.6**	**17.6**	**96.1**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
12	Ballad Plus	50	1 qt	1.5	**$1,982**	**11178**	**266**	**42.0**	**17.7**	**96.0**
	Manzate	70	1.6 qt							
	Ballad Plus	90	1 qt							
	Manzate	110	1.6 qt							
	Ballad Plus	130	1 qt							
5	Proline + Induce + Manzate	50	5.7 fl oz + .125 % 1.6 qt	1.7	**$2,006**	**11361**	**266**	**42.7**	**17.6**	**96.4**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
4	Eminent + Manzate	50	13 fl oz + 1.6 qt	1.7	**$1,959**	**11103**	**265**	**41.8**	**17.6**	**96.1**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
8	Headline + Manzate	50	9 fl oz + 1.6 qt	2.0	**$1,965**	**11139**	**261**	**42.6**	17.2	**96.4**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
13	Headline + Ballad Plus	50	9 fl oz + 1 qt	2.2	$1,884	10748	**263**	40.8	**17.6**	**95.8**
	Super Tin + Ballad Plus	95	8 fl oz + 1 qt							
	Ballad Plus	135	1 qt							
14	Untreated Check			4.8	$1,809	9951	256	38.9	17.1	**95.9**

Average	1.7	$1,981	11178	265	42.2	17.6	96.1
LSD 5%	0.4	153.0	841.7	13.0	2.5	0.7	ns(0.6)
CV %	16.2	5.4	5.3	3.4	4.1	3.0	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

Comments: Cercospora leafspot pressure was moderate. The sugarbeet stand was good and the variety was susceptible to leafspot. The top two treatments were Bravo alternating with Manzate (5 applics) and Manzate applied at 35 DSV followed by Inspire mixes (4 applics). Topguard (3 applics), Super Tin (3 applics), Vertisan/Manzate (5 applics) and Manzate (6 applics) also provided good leafspot control. Proline and Eminent treatments (3 applics) were less effective. Headline + Ballad Plus had the lowest leafspot ratings. None of the treatments caused crop injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Tolerant Variety

Tom Ziel Farm, Elkton, MI - 2014

Trial Quality: Good
Variety: C-RR288
Planted: May 7
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: JD 3250 Mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
> Opt: P and < Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Moderate
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Applic DSV	Rate/A	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Manzate	35	1.6 qt	**0.5**	**$1,825**	**10614**	**263**	**40.4**	**17.5**	95.9
	Inspire XT + Manzate	50	7 fl oz + 1.6 qt							
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
10	Manzate	35	1.6 qt	**0.6**	**$1,827**	**10395**	256	**40.7**	17.1	95.8
	Manzate	50	1.6 qt							
	Manzate	70	1.6 qt							
	Manzate	90	1.6 qt							
	Manzate	110	1.6 qt							
	Manzate	130	1.6 qt							
6	Enable + Crop Oil Dithane	50	8 fl oz + 1 % + 1.6 qt	**0.6**	**$1,867**	**10798**	**267**	**40.5**	**17.5**	**96.6**
	Super Tin + Dithane	95	8 fl oz + 1.6 qt							
	Dithane	135	1.6 qt							
3	Topguard + Manzate	50	14 fl oz + 1.6 qt	**0.7**	**$1,802**	**10437**	**269**	**38.8**	**17.9**	95.8
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
	Topguard + Manzate	155	14 fl oz + 1.6 qt							
11	Bravo	50	2 pt	**0.8**	**$1,834**	**10497**	**264**	**39.8**	**17.7**	95.3
	Manzate	70	1.6 qt							
	Bravo	90	2 pt							
	Manzate	110	1.6 qt							
	Bravo	130	2 pt							
4	Eminent + Manzate	50	13 fl oz + 1.6 qt	**0.8**	$1,750	10152	**261**	**38.9**	**17.4**	95.8
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
2	Inspire XT + Manzate	50	7 fl oz + 1.6 qt	**0.8**	**$1,862**	**10768**	**261**	**41.2**	**17.3**	**96.1**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							

Evaluate Fungicides for Control of Cercospora Leafspot in Sugarbeets with a Tolerant Variety

Tom Ziel Farm, Elkton, MI - 2014

No	Treatment	Applic DSV	Rate/A	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
7	Super Tin + Manzate	50	8 fl oz + 1.6 qt	0.9	**$1,770**	10121	**267**	37.9	**17.8**	95.9
	Inspire XT + Manzate	95	7 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
9	Vertisan	50	30 fl oz	1.0	$1,731	9998	253	**39.6**	16.9	95.6
	Manzate	70	1.6 qt							
	Vertisan	90	30 fl oz							
	Manzate	110	1.6 qt							
	Vertisan	130	30 fl oz							
5	Proline + Induce + Manzate	50	5.7 fl oz + .125 % 1.6 qt	1.0	**$1,829**	**10585**	**261**	**40.6**	**17.3**	**96.2**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
12	Ballad Plus	50	1 qt	1.1	**$1,791**	**10290**	**263**	**39.1**	**17.6**	95.7
	Manzate	70	1.6 qt							
	Ballad Plus	90	1 qt							
	Manzate	110	1.6 qt							
	Ballad Plus	130	1 qt							
8	Headline + Manzate	50	9 fl oz + 1.6 qt	1.1	**$1,833**	**10608**	**267**	**39.7**	**17.7**	**96.2**
	Super Tin + Manzate	95	8 fl oz + 1.6 qt							
	Manzate	135	1.6 qt							
13	Headline + Ballad Plus	50	9 fl oz + 1 qt	1.4	$1,741	10104	**258**	**39.2**	**17.3**	95.5
	Super Tin + Ballad Plus	95	8 fl oz + 1 qt							
	Ballad Plus	135	1 qt							
14	Untreated Check			2.8	$1,704	9374	249	37.6	16.7	95.9
Average				1.0	$1,797	10339	261	39.6	17.4	95.9
LSD 5%				0.3	110.9	610.1	11.0	2.4	0.6	0.5
CV %				23.4	4.3	4.1	3.0	4.2	2.5	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

Comments: Cercospora leafspot pressure was moderate. The sugarbeet stand was good and the variety was tolerant to leafspot. The best treatment had Manzate applied at 35 DSV followed by a triazole + Manzate, Super Tin + Manzate and Manzate (4 applics). Six Manzate applications starting at 35 DSV also gave very good leafspot control. Because the leaf-spot pressure was low most of the treatments provided good control of Cercospora. Headline and Ballad Plus treatments were near the bottom of the trial. A spotty nematode infestation probably increased the yield variability because C-RR288 is not a nematode tolerant variety. None of the treatments caused crop injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Control of Cercospora Leafspot in Sugarbeets with Fungicide Tank Mixes

Maust, Pigeon, MI - 2014

Trial Quality:	Good	**Soil Info:**	Loam	**Rhizoc Control:**	Good
Variety:	B-19RR1N		3.9% OM, 7.4 pH, CEC: 15.7	**Cerc Level:**	Medium
Planted:	May 19		> Opt: P and K	**Problems:**	None
Harvested:	October 8		High: Mn, Medium: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 35 ft, 4 reps	**Added N:**	150 lbs	**Rainfall:**	14.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Corn Silage		
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment	Rate/A	Applic DSV	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Inspire + Manzate	7 fl oz + 1.6 qt	50	**1.3**	**$1,893**	**10814**	**261**	**41.4**	**17.6**	**95.1**
	Super Tin + Manzate	8 fl oz + 1.6 qt	95							
	Inspire + Manzate	7 fl oz + 1.6 qt	135							
7	Super Tin + Manzate	8 fl oz + 1.6 qt	50	**1.5**	**$1,835**	**10519**	251	**41.9**	16.9	**95.4**
	Super Tin + Manzate	8 fl oz + 1.6 qt	80							
	Manzate	1.6 qt	100							
	Super Tin + Manzate	8 fl oz + 1.6 qt	130							
3	Eminent + Manzate	13 fl oz + 1.6 qt	50	**1.5**	**$1,846**	**10593**	**258**	**41.0**	**17.5**	**95.1**
	Super Tin + Manzate	8 fl oz + 1.6 qt	95							
	Eminent	13 fl oz	135							
2	Inspire XT	7 fl oz	50	**1.6**	**$1,861**	**10568**	**253**	**41.8**	**17.1**	**95.3**
	Super Tin	8 fl oz	95							
	Inspire	7 fl oz	135							
8	Super Tin	8 fl oz	50	1.8	**$1,860**	**10506**	248	**42.4**	16.7	**95.4**
	Manzate	1.6 qt	80							
	Super Tin	8 fl oz	100							
	Manzate	1.6 qt	130							
5	Headline + Manzate	9 fl oz + 1.6 qt	50	1.9	**$1,767**	**10160**	245	**41.4**	16.7	**95.0**
	Super Tin + Manzate	8 fl oz + 1.6 qt	95							
	Headline + Manzate	9 fl oz + 1.6 qt	135							

Control of Cercospora Leafspot in Sugarbeets with Fungicide Tank Mixes

Maust, Pigeon, MI - 2014

No	Treatment	Rate/A	Applic DSV	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Eminent	13 fl oz	50	2.1	**$1,876**	**10654**	248	**43.0**	16.7	**95.4**
	Super Tin	8 fl oz	95							
	Eminent	13 fl oz	135							
6	Headline	9 fl oz	50	2.3	**$1,846**	**10486**	**252**	**41.5**	17.0	**95.4**
	Super Tin	8 fl oz	95							
	Headline	9 fl oz	135							
9	Untreated Check			3.8	$1,687	9278	242	38.3	16.6	94.6
Average				2.0	$1,830	10398	250.9	41.4	17.0	95.2
LSD 5%				0.4	130.9	719.8	9.4	2.3	0.5	0.6
CV %				12.7	4.8	4.6	2.5	3.8	2.1	0.4

Even numbered treatments were applied alone
Odd numbered treatments were applied as a tank mix
CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

Comments: Inspire, Eminent, Super Tin and Headline were applied alone and tank mixed with Manzate. All of the fungicides performed better when tank mixed. Tank mixing is primarily recommended as a resistance management tool, however, this trial indicates that tank mixing also improves leafspot control. The disease level was low to moderate. None of the treatments caused sugarbeet leaf injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

PIONEER · BIG CHIEF
MICHIGAN SUGAR

Evaluate Copper Fungicides for Sugarbeet Leaf Injury when Tank Mixed with Roundup

Maust, Pigeon, MI - 2014

Trial Quality: Good
Variety: B-19RR1N
Planted: May 19
Harvested: October 8
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Loam
3.9% OM, 7.4 pH, CEC: 15.7
> Opt: P and K
High: Mn, Medium: B
Added N: 150 lbs
Prev Crop: Corn Silage

Rhizoc Control: Good
Cerc Level: Medium
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 14.1 inches

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment*	Rate/A	Applic Method	% SB Injury	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
9	Roundup	22 fl oz	50, 90, 130 DSV	**0.0**	3.8	$1,676	9216	244	37.7	16.6	**95.2**
1	Cuprofix	2 lb	5 applics 50 and every 20 DSV	**0.6**	**1.8**	**$1,720**	**9789**	**251**	**39.0**	**17.0**	**94.9**
5	Badge SC	2.5 pt	5 applics 50 and every 20 DSV	**1.3**	**1.8**	$1,708	9726	245	**39.8**	16.6	**95.1**
3	Kocide 3000	2 lb	5 applics 50 and every 20 DSV	**1.3**	**2.1**	**$1,790**	**10175**	**251**	**40.5**	**17.0**	**95.3**
7	ChampION	2 lb	5 applics 50 and every 20 DSV	**2.5**	**2.1**	**$1,803**	**10247**	**254**	**40.3**	**17.2**	**95.2**
2	Cuprofix + Roundup	2 lb + 22 fl oz	50, 90, 130 DSV	**2.5**	**2.2**	**$1,752**	**9966**	**253**	**39.4**	**17.1**	**95.1**
	Cuprofix	2 lb	70, 110								
6	Badge + Roundup	2.5 pt + 22 fl oz	50, 90, 130 DSV	4.4	**2.1**	**$1,889**	**10717**	**258**	**41.5**	**17.4**	**95.3**
	Badge	2.5 pt	70,110								
8	ChampION + Roundup	2 lb + 22 fl oz	50, 90, 130 DSV	13.1	**2.0**	**$1,724**	**9811**	**252**	**39.0**	**17.1**	**95.0**
	ChampION	2 lb	70,110								
4	Kocide + Roundup	2 lb + 22 fl oz	50,90,130 DSV	19.4	**2.1**	**$1,744**	**9922**	**252**	**39.4**	**17.2**	**94.9**
	Kocide	2 lb	70,110								
Average				5.0	2.2	$1,756	9952	251	39.6	17.0	95.1
LSD 5%				3.6	0.5	177.3	975.0	10.4	3.6	0.6	ns(0.8)
CV %				53.3	17.2	6.9	6.7	2.9	6.0	2.4	0.6

* Roundup Powermax sprayed on all treatment for weed control.
AMS added to each Roundup application at 17lb/100 gal
CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7
% SB Injury: Average of Mid and late season ratings.

Comments: Commonly used copper fungicides were applied alone and in combination with Roundup Power Max to evaluate reports of leaf injury caused by copper fungicides tank mixed with Roundup. Five copper applications were made, three of which were tank mixed with Roundup. When applied alone none of the fungicides caused noticeable leaf injury (spotting), however, when tank mixed, leaf injury was detected. Kocide 3000 and ChampION caused noticeable injury while injury caused by Cuprofix and Badge SC was minor. Cercospora leafspot control, yield and quality were not influenced by the leaf injury. All of the copper fungicides provided adequate Cercospora leafspot control. The sugarbeet stand was adequate (140 beets/100 ft) and fairly uniform. The untreated check (Roundup only) had the lowest yield and quality.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate EBDC and Copper Fungicides (Protectants) for Control of Cercospora Leafspot in Sugarbeets

Research Station, Blumfield, MI - 2014

Trial Quality: Good
Variety: B-19RR1N
Planted: May 6
Harvested: September 19
Plots: 6 rows X 35 ft, 4 reps
Row Spacing: 22 inch
Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
2.4% OM, 7.7 pH, CEC:10.2
> Opt: P and K
High: Mn, Low: B
Added N: 125 lbs
Prev Crop: Oil Seed Radish

Rhizoc Control: Good
Cerc Level: High
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 21.6 inches

No	Treatment	Rate/A	DSV	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	% Phyto
1	Dithane Inspire XT + Dithane Super Tin + Dithane Dithane Inspire + Dithane	1.6 qt 7 fl oz + 1.6 qt 8 fl oz + 1.6 qt 1.6 qt 7 fl oz + 1.6 qt	35 50 95 135 155	**1.1**	**$1,926**	**10259**	**256**	**40.1**	**16.8**	**96.7**	7.5
2	Inspire XT + Dithane Super Tin + Dithane Dithane Inspire + Dithane	7 fl oz + 1.6 qt 8 fl oz + 1.6 qt 1.6 qt 7 fl oz + 1.6 qt	50 95 135 155	**1.3**	**$1,866**	**9909**	**262**	**37.8**	**17.2**	**96.7**	7.5
19	Super Tin Manzate FL Super Tin Manzate FL Super Tin	8 fl oz 1.6 qt 8 fl oz 1.6 qt 8 fl oz	50 70 105 140 160	**1.4**	**$1,743**	9154	**257**	35.7	**16.9**	**96.5**	13.8
18	Manzate FL Super Tin Manzate FL Super Tin Manzate FL	1.6 qt 8 fl oz 1.6 qt 8 fl oz 1.6 qt	50 70 105 125 160	**1.5**	**$1,818**	**9502**	**259**	**36.7**	**17.0**	**96.7**	7.5
3	Super Tin + Dithane Inspire XT + Dithane Dithane Super Tin + 'Dithane	8 fl oz + 1.6 qt 7 fl oz + 1.6 qt 1.6 qt 8 fl oz + 1.6 qt	50 95 135 155	**1.7**	$1,689	8973	**257**	34.9	**17.0**	**96.4**	12.5
20	Agri Tin Manzate FL Agri Tin Manzate FL Agri Tin	8 fl oz 1.6 qt 8 fl oz 1.6 qt 8 fl oz	50 70 105 140 160	1.9	**$1,842**	**9652**	**261**	**37.0**	**17.1**	**96.7**	13.8
5	Dithane Bravo Weatherstick Dithane Bravo Weatherstick Dithane Bravo Weatherstick Dithane	1.6 qt 2.5 pt 1.6 qt 2.5 pt 1.6 qt 2.5 pt 1.6 qt	50 70 90 110 130 150 170	1.9	**$1,780**	**9431**	**261**	36.2	**17.2**	**96.5**	**3.8**

Evaluate EBDC and Copper Fungicides (Protectants) for Control of Cercospora Leafspot in Sugarbeets

Research Station, Blumfield, MI - 2014

No	Treatment	Rate/A	DSV	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	% Phyto
12	Dithane **See Trt 14, 6 applic every 20 DSV**	1.6 qt	50	2.3	**$1,823**	**9592**	**260**	**37.0**	**17.0**	**96.8**	5.3
14	Manzate FL	1.6 qt	35	2.4	**$1,901**	**9991**	252	**39.6**	**16.7**	96.2	**3.8**
	Manzate FL	1.6 qt	50								
	Manzate FL	1.6 qt	70								
	Manzate FL	1.6 qt	90								
	Manzate FL	1.6 qt	110								
	Manzate FL	1.6 qt	130								
	Manzate FL	1.6 qt	150								
	Manzate FL	1.6 qt	170								
13	Manzate FL **See Trt 14, 6 applic every 20 DSV**	1.6 qt	50	2.5	**$1,757**	9258	**256**	**36.3**	**16.8**	**96.6**	**2.5**
15	Koverall **See Trt 14, 6 applic every 20 DSV**	2 lb	50	2.6	$1,627	8602	**254**	33.8	**16.7**	**96.7**	**3.8**
11	ChampION **See Trt 14, 6 applic every 20 DSV**	2 lb	50	2.8	$1,719	9065	250	**36.4**	**16.7**	96.1	5.0
4	Dithane	1.6 qt	50	2.9	$1,697	9086	**260**	35.0	**17.1**	**96.6**	5.0
	Vertisan	30 fl oz	70								
	Dithane	1.6 qt	90								
	Vertisan	30 fl oz	110								
	Dithane	1.6 qt	130								
	Vertisan	30 fl oz	150								
	Dithane	1.6 qt	170								
9	Kocide 3000 **See Trt 14, 6 applic every 20 DSV**	2 lb	50	3.1	$1,687	8904	**253**	35.2	**16.6**	**96.6**	5.0
8	Cuprofix **See Trt 14, 6 applic every 20 DSV**	1.5 lb	50	3.2	$1,642	8677	250	34.8	**16.7**	95.9	**2.5**
16	Dithane	1.6 qt	50	3.4	$1,664	8817	**261**	33.7	**17.1**	**96.7**	6.3
	Ballad Plus	2 qt	70								
	Dithane	1.6 qt	90								
	Ballad Plus	2 qt	110								
	Dithane	1.6 qt	130								
	Ballad Plus	2 qt	150								
	Dithane	1.6 qt	170								
7	AgriLife **See Trt 14, 6 applic every 20 DSV**	48 fl oz	50	3.6	$1,693	8933	**254**	35.3	**16.9**	96.0	5.0

Evaluate EBDC and Copper Fungicides (Protectants) for Control of Cercospora Leafspot in Sugarbeets

Research Station, Blumfield, MI - 2014

No	Treatment	Rate/A	DSV	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	% Phyto
10	Badge SC **See Trt 14, 6 applic every 20 DSV**	2.1 pt	50	3.6	$1,599	8460	**254**	33.4	**16.7**	**96.8**	**2.5**
17	Dithane Ballad Plus Dithane Ballad Plus Dithane Ballad Plus Dithane	1.6 qt 4 qt 1.6 qt 4 qt 1.6 qt 4 qt 1.6 qt	50 70 90 110 130 150 170	3.6	**$1,757**	**9494**	250	**37.9**	**16.6**	96.2	5.0
6	AgriLife **See Trt 14, 6 applic every 20 DSV**	24 fl oz	50	3.7	$1,576	8339	248	33.6	16.4	**96.4**	**3.8**
21	Untreated Check			8.3	$1,330	6741	229	29.5	15.3	96.0	**0.0**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	% Phyto
Average	2.8	$1,721	9088	255	35.7	16.8	96.5	5.8
LSD 5%	0.7	182.6	925.3	9.7	3.9	0.6	0.5	4.7
CV %	17.2	7.5	7.2	2.7	7.8	2.4	0.4	57.8

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 16
% Phyto: a lower number is better.

Comments: Protectant fungicides (Copper's and EBDC's) were evaluated for Cercospora leafspot control. The purpose of the trial was to compare different EBDC's, coppers and Ballad Plus to a triazole/tin/EBDC rotation and determine if protectant fungicides can control leafspot in the event Cercospora develops resistance to the more effective fungicides. For most of the treatments the initial application was at 50 DSV and was followed by an application every 20 DSV, for a total of 7 applications. Several 4 spray treatments that included a triazole or tin provided better control than the 7 applications of protectants. Cercospora was late developing but by September the plots had a heavy infestation. The untreated control plots lost approximately 6 tons/A and 1.5 points of sugar. All of treatments provided effective control of Cercospora. Two new products which have significant mixing advantages (Ballad Plus - a biological and Agri-Life - a copper solution) appeared to be somewhat less effective, however, still provided effective Cercospora control. The tin products caused noticeable leaf spotting. The rate response with Agri-Life has not been completely established. We will be conducting trials in 2015 looking at rates of 24, 48, 72 and 96 fl oz/a to see if higher rates will improve performance.

$/A: Gross Payment unless noted as net. Calculated assuming a $50 payment and an RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

AGRI-LIFE Copper Fungicide
3 Year Summary

AGRI-LIFE fungicide, from Life Science Group, has been tested by Michigan Sugar Company for three years, and was recently approved by EPA for Cercospora leafspot control in sugarbeets. AGRI-LIFE is formulated as a copper solution which has mixing and spraying advantages over other copper and EBDC fungicides and is less likely to plug screens and nozzles or damage pumps compared to dry granular or flowable formulations. The most likely use for AGRI-Life will be as a tank mix partner for other types of fungicides. In 2012 two trials were conducted with AGRI-LIFE at 24 fl oz/A compared to tank mixes of AGRI-LIFE with Inspire, Eminent and Super Tin. AGRI-LIFE had a Cercospora rating of 2.4 compared to 0.5 for the tank mix treatments and 5.0 for the untreated check (lower is better). In 2013 two trials were conducted comparing AGRI-LIFE rates of 24, 48 and 72 fl oz/A. There was not a lot of difference in the rates but the low rate was somewhat less effective. In these trials AGRI-LIFE and Cuprofix provided equal levels of leafspot control. In 2014 AGRI-LIFE was included in a trial with EBDC, Copper, Ballad Plus and other fungicide treatments. Treatments tank mixed or rotated with triazoles provided very good Cercospora control (in the range of 1 to 1.5 ratings). Dithane, Manzate and Koverall (EBDC's) had ratings around 2.5 which is still good leafspot control. We can usually detect leafspot yield loss with ratings of 2.75 or higher. The copper fungicides had leafspot ratings of: ChampION = 2.75, Kocide 3000 = 2.9, Cuprofix = 3.1, Badge SC = 3.5, AGRI-LIFE 48 fl oz = 3.5 and AGRI-LIFE 24 fl oz = 3.7, compared to 8.3 for the untreated check. Ballad Plus was alternated with Dithane and had a rating of 3.5.

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast DSV's and Label Days

Tom Ziel Farm, Pigeon, MI - 2014

Overall BEETcast Summary

Cercospora spray application timings were evaluated in this trial. We looked at different starting dates, spray durations and compared BEETcast DSV's to the fungicides "label days" for re-application timings. Three varieties were included: B-19RR1N (susceptible), C-RR059 (moderately tolerant) and C-RR288 (tolerant). The trial was conducted in a Red Zone (high Cercospora risk), however, the leafspot infestation was below normal in 2014. Sugarbeets in the trial had good stands and vigorous growth. The only problems were a scattered sugarbeet cyst nematode infestation and "the lower than normal disease level". The best treatment (utilizing the susceptible and moderately tolerant varieties) was beginning at 35 DSV with Manzate followed by a sequence of triazole and tin fungicides (all tank mixed with Manzate), for a total of 4 applications. C-RR288 did not benefit from starting early (35 DSV's). There was not a significant difference between starting at 45, 50 or 55 DSV's, or between re-applying by DSV's or Label Days, however, more applications were made when using "Label Days" to determine spray dates. There were clear differences between the varieties with C-RR288 providing better leafspot control than C-RR059 which gave better control than B-19RR1N. With respect to grower income, C-RR059 gave the highest income followed by B-19RR1N and C-RR288. All of the treatments kept Cercospora under control. It appears that our recommendations for Cercospora application timings are satisfactory, however, these trials were conducted under moderate disease pressure.

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast and Label Days

Tom Ziel Farm, Pigeon, MI - 2014

Trial Quality: Good
Variety: 3 varieties by Tmt
Planted: May 6
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
>Opt: P, <Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Medium
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Applic Days or DSV's	# Apps	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Variety C-RR288 Inspire + Manzate Super Tin + Manzate Topguard + Manzate	 50 95 135	3	**0.8**	$1,819	10493	**263**	39.9	**17.4**	**96.3**
4	Variety C-RR288 Manzate Inspire + Manzate Super Tin + Manzate Topguard + Manzate	 35 55 105 145	4	**0.9**	$1,828	10588	**266**	39.8	**17.5**	**96.5**
6	Variety C-RR288 Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	 55 18 days 13 days 17 days	4	**1.0**	$1,792	10467	**260**	40.2	17.2	**96.2**
2	Variety C-RR288 Inspire + Manzate Super Tin + Manzate	 55 105	2	**1.0**	$1,848	10653	**270**	39.4	**17.8**	**96.4**
7	Variety C-RR288 Inspire + Manzate Super Tin + Manzate Topguard + Manzate	 60 21 days 14 days	3	**1.1**	$1,816	10549	**267**	39.6	**17.6**	**96.4**
5	Variety C-RR288 Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate	 50 17 days 12 days 16 days 12 days	5	**1.1**	$1,839	10727	**269**	39.8	**17.9**	96.0
3	Variety C-RR288 Inspire + Manzate Super Tin + Manzate	 55 110	2	**1.1**	$1,896	**10919**	**264**	**41.4**	**17.4**	**96.3**

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast and Label Days

Tom Ziel Farm, Pigeon, MI - 2014

No	Treatment	Applic Days or DSV's	# Apps	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
12	Variety C-RR059									
	Manzate	35	4	1.4	**$1,963**	**11288**	**266**	**42.4**	**17.6**	96.1
	Inspire + Manzate	50								
	Super Tin + Manzate	95								
	Topguard + Manzate	135								
13	Variety C-RR059									
	Inspire + Manzate	50	5	1.8	**$1,946**	**11313**	**270**	**41.8**	**18.0**	95.8
	Super Tin + Manzate	15 days								
	Topguard + Manzate	10 days								
	Super Tin + Manzate	14 days								
	Manzate	11 days								
20	Variety: B-19RR1N									
	Manzate	35	5	1.8	**$1,911**	**11121**	**269**	**41.4**	**17.7**	**96.3**
	Inspire + Manzate	50								
	Super Tin + Manzate	85								
	Topguard + Manzate	115								
	Super Tin + Manzate	145								
11	Variety C-RR059									
	Inspire + Manzate	55	2	1.8	**$2,067**	**11651**	**270**	**43.0**	**17.9**	**96.2**
	Super Tin + Manzate	105								
10	Variety C-RR059									
	Inspire + Manzate	50	3	1.8	**$2,048**	**11706**	**274**	**42.8**	**18.1**	96.1
	Super Tin + Manzate	95								
	Topguard + Manzate	135								
9	Variety C-RR059									
	Inspire + Manzate	50	3	1.8	**$1,986**	**11361**	**269**	**42.2**	**17.8**	96.1
	Super Tin + Manzate	90								
	Topguard + Manzate	125								
23	Variety: B-19RR1N									
	Inspire + Manzate	55	4	1.9	**$1,982**	**11513**	**268**	**43.0**	**17.7**	**96.3**
	Super Tin + Manzate	18 days								
	Topguard + Manzate	12 days								
	Super Tin + Manzate	17 days								
14	Variety C-RR059									
	Inspire + Manzate	50	5	1.9	**$1,999**	**11606**	**274**	**42.4**	**18.2**	95.9
	Super Tin + Manzate	18 days								
	Topguard + Manzate	12 days								
	Super Tin + Manzate	17 days								
	Manzate	12 days								

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast and Label Days

Tom Ziel Farm, Pigeon, MI - 2014

No	Treatment	Applic Days or DSV's	# Apps	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
15	Variety C-RR059									
	Inspire + Manzate	55	4	1.9	**$2,032**	**11784**	**270**	**43.6**	**17.9**	95.9
	Super Tin + Manzate	19 days								
	Topguard + Manzate	13 days								
	Super Tin + Manzate	18 days								
21	Variety: B-19RR1N									
	Inspire + Manzate	45	6	2.0	$1,778	10436	**259**	40.3	17.1	**96.5**
	Super Tin + Manzate	14 days								
	Topguard + Manzate	10 days								
	Super Tin + Manzate	13 days								
	Manzate	10 days								
	Manzate	7 days								
19	Variety: B-19RR1N									
	Inspire + Manzate	55	3	2.0	$1,884	10805	**271**	39.8	**17.7**	**96.8**
	Super Tin + Manzate	95								
	Topguard + Manzate	135								
22	Variety: B-19RR1N									
	Inspire + Manzate	50	5	2.1	$1,726	10106	250	40.3	16.6	**96.3**
	Super Tin + Manzate	16 days								
	Topguard + Manzate	11 days								
	Super Tin + Manzate	15 days								
	Manzate	11 days								
17	Variety: B-19RR1N									
	Inspire + Manzate	45	4	2.1	$1,892	**10966**	**261**	**41.9**	17.2	**96.4**
	Super Tin + Manzate	80								
	Topguard + Manzate	105								
	Super Tin + Manzate	135								
18	Variety: B-19RR1N									
	Inspire + Manzate	50	4	2.3	$1,834	10646	**261**	40.7	17.2	**96.4**
	Super Tin + Manzate	90								
	Topguard + Manzate	120								
	Super Tin + Manzate	145								
8	Untreated-C-RR288			2.4	$1,837	10103	**266**	38.0	**17.6**	**96.3**
16	Untreated-C-RR059			3.1	$1,746	9605	**269**	35.7	**17.8**	**96.2**
24	Untreated-B-19RR1N			4.8	$1,807	9940	**265**	37.6	**17.4**	**96.4**
Average				1.8	$1,887	10848	266	40.7	17.6	96.3
LSD 5%				0.5	165.9	912.6	15	2.3	0.8	0.6
CV %				19.2	6.2	6.0	3.9	4.0	3.3	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicide Application Timings For Cercospora Leafspot using BEETcast and Label Days - With a Susceptible Variety

Pioneer · Big Chief Michigan Sugar

Tom Ziel Farm, Pigeon, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-19RR1N		3.0% OM, 7.4 pH, CEC: 7.7	**Cerc Level:**	Medium
Planted:	May 6		>Opt: P, <Opt: K	**Problems:**	Low level Cyst nem
Harvested:	October 7		Medium: Mn, Medium: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	Manure + 40 lbs	**Rainfall:**	15.5 Inches
Row Spacing:	22 inch	**Prev Crop:**	Alfalfa		

No	Treatment	Appl Days or DSV's	# App	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Manzate Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	35 50 85 115 145	5	**1.8**	**$1,976**	**11121**	**269**	**41.4**	**17.7**	**96.3**
7	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	55 18 Days 12 Days 17 Days	4	**1.9**	**$2,050**	**11513**	**268**	**43.0**	**17.7**	**96.3**
5	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate Manzate	45 14 Days 10 Days 13 Days 10 Days 7 Days	6	**2.0**	$1,839	**10436**	**259**	**40.3**	**17.1**	**96.5**
3	Inspire + Manzate Super Tin + Manzate Topguard + Manzate	55 95 135	3	**2.0**	**$1,948**	**10805**	**271**	39.8	**17.7**	**96.8**
6	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate	50 16 Days 11 Days 15 Days 11 Days	5	**2.1**	$1,786	10106	250	**40.3**	16.6	**96.3**
1	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	45 80 105 135	4	**2.1**	**$1,956**	**10966**	**261**	**41.9**	**17.2**	**96.4**
2	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	50 90 120 145	4	**2.3**	**$1,896**	**10646**	**261**	**40.7**	**17.2**	**96.4**
8	Untreated Check		0	4.8	**$1,866**	9940	**265**	37.6	**17.4**	**96.4**

	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	2.4	$1,915	10692	263	40.6	17.3	96.4
LSD 5%	0.5	210.0	1118.7	17.9	2.9	1.0	ns(0.5)
CV %	13.1	7.5	7.1	4.6	4.8	4.0	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast and Label Days - With a Moderately Tolerant Variety

Tom Ziel Farm, Pigeon, MI - 2014

Trial Quality: Good
Variety: C-RR059
Planted: May 6
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
>Opt: P, <Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Medium
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Appl Days or DSV's	# App	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Manzate Inspire + Manzate Super Tin + Manzate Topguard + Manzate	35 50 95 135	4	**1.4**	**$2,030**	**11288**	**266**	**42.4**	**17.6**	**96.1**
5	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate	50 15 Days 10 Days 14 Days 11 Days	5	**1.8**	**$2,012**	**11313**	**270**	**41.8**	**18.0**	**95.8**
3	Inspire + Manzate Super Tin + Manzate	55 105	2	**1.8**	**$2,136**	**11651**	**270**	**43.0**	**17.9**	**96.2**
2	Inspire + Manzate Super Tin + Manzate Topguard + Manzate	50 95 135	3	**1.8**	**$2,117**	**11706**	**274**	**42.8**	**18.1**	**96.1**
1	Inspire + Manzate Super Tin + Manzate Topguard + Manzate	50 90 125	3	**1.8**	**$2,052**	**11361**	**269**	**42.2**	**17.8**	**96.1**
6	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate	50 18 Days 12 Days 17 Days 12 Days	5	**1.9**	**$2,067**	**11606**	**274**	**42.4**	**18.2**	**95.9**
7	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	55 19 Days 13 Days 18 Days	4	**1.9**	**$2,101**	**11784**	**270**	**43.6**	**17.9**	**95.9**
8	Untreated Check		0	3.1	$1,803	9605	**269**	35.7	**17.8**	**96.2**
Average				1.9	$2,040	11289	270	41.8	17.9	96.0
LSD 5%				0.7	209.8	1117.9	ns(16.2)	2.8	ns(0.9)	ns(0.7)
CV %				22.8	7.0	6.7	4.1	4.6	3.3	0.5

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicide Application Timings For Cercospora Leafspot Using BEETcast and Label Days - With a Tolerant Variety

Tom Ziel Farm, Pigeon, MI - 2014

Trial Quality: Good
Variety: C-RR288
Planted: May 6
Harvested: October 7
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
3.0% OM, 7.4 pH, CEC: 7.7
>Opt: P, <Opt: K
Medium: Mn, Medium: B
Added N: Manure + 40 lbs
Prev Crop: Alfalfa

Rhizoc Control: Good
Cerc Level: Medium
Problems: Low level Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Appl Days or DSV's	# App	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Inspire + Manzate Super Tin + Manzate Topguard + Manzate	50 95 135	3	**0.8**	**$1,880**	**10493**	**263**	39.9	**17.4**	**96.3**
4	Manzate Inspire + Manzate Super Tin + Manzate Topguard + Manzate	35 55 105 145	4	**0.9**	**$1,890**	**10588**	**266**	39.8	**17.5**	**96.5**
6	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate	55 18 Days 13 Days 17 Days	4	**1.0**	$1,854	**10467**	**260**	40.2	**17.2**	**96.2**
2	Inspire + Manzate Super Tin + Manzate	55 105	2	**1.0**	**$1,910**	**10653**	**270**	39.4	**17.8**	**96.4**
7	Inspire + Manzate Super Tin + Manzate Topguard + Manzate	60 21 Days 14 Days	3	**1.1**	**$1,878**	**10549**	**267**	39.6	**17.6**	**96.4**
5	Inspire + Manzate Super Tin + Manzate Topguard + Manzate Super Tin + Manzate Manzate	50 17 Days 12 Days 16 Days 12 Days	5	**1.1**	**$1,902**	**10727**	**269**	39.8	**17.9**	**96.0**
3	Inspire + Manzate Super Tin + Manzate	55 110	2	**1.1**	**$1,960**	**10919**	**264**	**41.4**	**17.4**	**96.3**
8	Untreated Check		0	2.4	**$1,896**	10103	**266**	38.0	**17.6**	**96.3**
Average				1.2	$1,896	10562	266	39.8	17.6	96.3
LSD 5%				0.3	100.1	533.1	ns(11.6)	1.1	ns(0.7)	ns(0.5)
CV %				15.4	3.6	3.4	3.0	1.9	2.7	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus Biological Fungicide for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Average of 5 Locations

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane	13 fl oz + 1.6 qt	55 dsv	**0.9**	**$1,288**	**7580**	**232**	**32.7**	**15.7**	**95.2**
	Super Tin + Dithane	8 fl oz + 1.6 qt	18 days							
	Eminent + Dithane	13 fl oz + 1.6 qt	36 days							
	Dithane F45	1.6 qt	54 days							
2	Eminent + Ballad Plus	13 fl oz + 1 qt	55 dsv	**1.2**	**$1,252**	**7402**	**230**	**32.1**	**15.7**	**94.9**
	Super Tin + Ballad Plus	8 fl oz + 1 qt	18 days							
	Eminent + Ballad Plus	13 fl oz + 1 qt	36 days							
	Ballad Plus	1 qt	54 days							
3	Dithane	1.6 qt	55 dsv +	**1.4**	**$1,251**	**7212**	**231**	31.3	**15.8**	**95.0**
	Dithane	1.6 qt	5 applic							
			at 10 Days							
4	Ballad Plus	1 qt	55 dsv +	2.4	**$1,223**	7055	**230**	30.7	**15.7**	**94.9**
	Ballad Plus	1 qt	5 applic							
			at 10 Days							
5	Untreated Check			3.7	$1,196	6580	**230**	28.6	**15.8**	**94.8**
Average				1.9	$1,242	7166	231	31.1	15.7	95.0
LSD 5%				0.8	71.8	395.1	ns(5.0)	1.2	ns(0.3)	ns(0.4)
CV %				32.9	4.3	4.1	1.6	2.9	1.3	0.3

CLS 0-9: Cercospora visual rating, a lower number is better
*Induce at 0.125% was included in each treatment

Comments: Ballad Plus (biological fungicide) was evaluated for Cercospora leafspot control, alone and in combination with other fungicides. There is interest in this fungicide because it does not have the mixing and spraying problems (plugging screens and tips) associated with EBDC's and Coppers. It appears that the main use of Ballad Plus would be in tank mixes with triazoles and Super Tin. In a series of five trials, Balled Plus was less effective than Dithane for Cercospora control. Ballad Plus did, however, provide control of leafspot in these trials.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Piling Ground, Albee, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		2.9% OM, 7.4 pH, CEC: 8.6	**Cerc Level:**	Low
Planted:	June 2		> Opt: P, Opt: K	**Problems:**	Uneven ground
Harvested:	September 18		High: Mn, V. Low: B		stand gaps
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	100 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Fallow	**Rainfall:**	18.3 inches
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane Super Tin + Dithane Eminent + Dithane Dithane	13 fl oz + 1.6 qt 8 fl oz + 1.6 qt 13 fl oz + 1.6 qt 1.6 qt	55 dsv 18 days 36 days 54 days	**1.0**	**$981**	**5889**	**179**	**33.0**	**13.0**	**92.9**
2	Eminent + Ballad Plus Super Tin + Ballad Plus Eminent + Ballad Plus Ballad Plus	13 fl oz + 1 qt 8 fl oz + 1 qt 13 fl oz + 1 qt 1 qt	55 dsv 18 days 36 days 54 days	**1.3**	$917	**5560**	**172**	**32.3**	**12.8**	92.1
3	Dithane Dithane	1.6 qt 1.6 qt	55 dsv + 5 applic at 10 days	1.4	**$991**	**5779**	**177**	**32.7**	**13.0**	**92.6**
4	Ballad Plus Ballad Plus	1 qt 1 qt	55 dsv + 5 applic at 10 days	2.0	$925	5418	**173**	**31.3**	**12.7**	**92.5**
5	Untreated			2.8	**$935**	5144	**175**	29.3	**13.0**	92.0
Average				1.7	$950	5558	175	31.7	12.9	92.4
LSD 5%				0.3	60.6	333.1	ns(8)	2.0	ns(.5)	0.6
CV %				16.2	4.8	4.5	3.5	4.7	2.7	0.5

CLS 0-9: Cercospora visual rating, a lower is better. Rated on: September 26
* Induce at 0.125% was included in each treatment

Comments: Ballad Plus (biological fungicide) was applied alone and in combination with Eminent and Super Tin for control of Cercospora leafspot in sugarbeets. Ballad Plus provided Cercospora control but was less effective than Dithane. Results were better when used in combination with other fungicides. The disease level was low.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Research Station, Blumfield, MI - 2014

Trial Quality: Fair
Variety: SX-1212RR
Planted: May 6
Harvested: September 19
Plots: 6 rows X 35 ft, 4 reps
Row Spacing: 22 inch
Soil Info: Sandy Loam
2.4% OM, 7.7 pH, CEC: 10.2
> Opt: P and K
High: Mn, Low: B
Added N: 125 lbs
Prev Crop: Oil Seed Radish
Rhizoc Control: Good
Cerc Level: Medium
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 21.6 inches
Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane Super Tin + Dithane Eminent + Dithane Dithane	13 fl oz + 1.6 qt 8 fl oz + 1.6 qt 13 fl oz + 1.6 qt 1.6 qt	55 dsv 18 days 36 days 54 days	**0.4**	**$1,452**	**8481**	**235**	**36.2**	**15.8**	**95.8**
2	Eminent + Ballad Plus Super Tin + Ballad Plus Eminent + Ballad Plus Ballad Plus	13 fl oz + 1 qt 8 fl oz + 1 qt 13 fl oz + 1 qt 1 qt	55 dsv 18 days 36 days 54 days	**0.6**	**$1,487**	**8694**	**238**	**36.5**	**16.1**	**95.5**
3	Dithane Dithane	1.6 qt 1.6 qt	55 dsv + 5 applic at 10 days	1.4	**$1,426**	**8174**	**240**	**34.0**	**16.3**	**95.3**
4	Ballad Plus Ballad Plus	1 qt 1 qt	55 dsv + 5 applic at 10 days	3.6	**$1,431**	**8201**	**240**	**34.2**	**16.1**	**95.6**
5	Untreated Check			5.5	**$1,415**	**7785**	**239**	**32.6**	**16.2**	**95.4**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	2.3	$1,442	8267	238	34.7	16.1	95.5
LSD 5%	0.7	ns(240.3)	ns(1322)	ns(9.6)	ns(5.5)	ns(0.6)	ns(0.7)
CV %	20.9	10.8	10.4	2.6	10.4	2.3	0.5

CLS 0-9: Cercospora visual rating, lower is better. Rated on: August 13
*Induce at 0.125% was included in each treatment

Comments: Ballad plus (biological fungicide) was evaluated for Cercospora leafspot control in this trial. All treatments were applied in 22.5 gpa at 100 psi. Ballad Plus gave marginal results and was less effective than other treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Crumbaugh, Breckenridge, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Level:**	Low
Planted:	April 23		> Opt: P and K	**Problems:**	Low level Cyst nem
Harvested:	September 11		High: Mn, Low: B		Low disease
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	125 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Perv Crop:**	Soybeans	**Rainfall:**	17.7 inches

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane Super Tin + Dithane Eminent + Dithane Dithane	13 fl oz + 1.6 qt 8 fl oz + 1.6 qt 13 fl oz + 1.6 qt 1.6 qt	55 dsv 18 days 36 days 54 days	**0.9**	**$918**	**5543**	**225**	**24.6**	**15.4**	**95.1**
2	Eminent + Ballad Plus Super Tin + Ballad Plus Eminent + Ballad Plus Ballad Plus	13 fl oz + 1 qt 8 fl oz + 1 qt 13 fl oz + 1 qt 1 qt	55 dsv 18 days 36 days 54 days	**1.2**	**$847**	**5175**	**223**	**23.2**	**15.3**	**94.9**
3	Dithane Dithane	1.6 qt 1.6 qt	55 dsv + 5 applic at 10 days	**1.3**	**$939**	**5495**	**227**	**24.2**	**15.5**	**94.9**
4	Ballad Plus Ballad Plus	1 qt 1 qt	55 dsv + 5 applic at 10 days	2.0	**$900**	**5282**	**222**	**23.8**	**15.3**	**94.5**
5	Untreated Check			3.1	**$865**	4759	**232**	20.4	**15.8**	**95.1**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	1.7	$894	5251	226	23.3	15.5	94.9
LSD 5%	0.5	ns(108)	594.4	ns(13)	2.2	ns(0.7)	ns(0.9)
CV %	18.2	7.9	7.4	3.8	6.2	2.8	0.6

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 3
* Induce at 0.125% was included in each treatment

Comments: Ballad Plus (biological fungicide) was less effective than Dithane and the triazole + tin treatment, however, it did provide control of Cercospora leafspot. The disease level was low.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Troy Schuette, Elkton, MI - 2014

Trial Quality: Fair
Variety: SX-1212RR
Planted: May 28
Harvested: October 10
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inch
Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

Soil Info: Sandy Loam
2.2% OM, 7.3 pH, CEC: 7.7
> Opt: P and K
High: Mn, Low: B
Added N: Manure + 40 lbs
Prev Crop: Sugarbeets

Rhizoc Control: Good
Cerc Level: Medium
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane Super Tin + Dithane Eminent + Dithane Dithane	13 fl oz + 1.6 qt 8 fl oz + 1.6 qt 13 fl oz + 1.6 qt 1.6 qt	55 dsv 18 days 36 days 54 days	**1.0**	**$1,567**	**9113**	**278**	**32.9**	**18.1**	**96.7**
2	Eminent + Ballad Plus Super Tin + Ballad Plus Eminent + Ballad Plus Ballad Plus	13 fl oz + 1 qt 8 fl oz + 1 qt 13 fl oz + 1 qt 1 qt	55 dsv 18 days 36 days 54 days	**1.4**	**$1,546**	**9019**	**282**	**32.0**	**18.3**	**96.9**
3	Dithane Dithane	1.6 qt 1.6 qt	55 dsv 5 applic at 10 days	**1.4**	**$1,397**	**8012**	**278**	**28.8**	**18.0**	**97.1**
4	Ballad Plus Ballad Plus	1 qt 1 qt	55 dsv 5 applic at 10 days	2.3	**$1,363**	**7827**	**275**	**28.5**	**18.0**	96.5
5	Untreated Check			4.0	$1,304	7170	**269**	26.6	**17.8**	96.2
Average				2.0	$1,435	8228	276	29.8	18.1	96.7
LSD 5%				0.6	239.7	1318.5	ns(15)	4.8	ns(1)	0.4
CV %				20.0	10.8	10.4	3.4	10.4	3.5	0.3

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 10
* Induce at 0.125% was included in each treatment

Comments: Ballad Plus (biological fungicide) was less effective than Dithane and the triazole + tin treatment, however, it did provide control of Cercospora leafspot. The disease level was moderate.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Evaluate Ballad Plus for Control of Cercospora Leafspot in Sugarbeets (MSC Protocol)

Kirkpatrick, Sandusky, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		3.0% OM, 7.6 pH, CEC: 9.8	**Cerc Level:**	Low
Planted:	May 23		> Opt: P and K	**Problems:**	Low Crec
Harvested:	September 24		Medium: Mn, Medium: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	100 lbs	**Rainfall:**	19.7 inches
Row Spacing:	22 inch	**Prev Crop:**	Wheat		

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment*	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Eminent + Dithane Super Tin + Dithane Eminent + Dithane Dithane	13 fl oz + 1.6 qt 8 fl oz + 1.6 qt 13 fl oz + 1.6 qt 1.6 qt	55 dsv 18 days 36 days 54 days	**1.3**	**$1,524**	**8876**	**242**	**36.8**	**16.4**	**95.2**
2	Eminent + Ballad Plus Super Tin + Ballad Plus Eminent + Ballad Plus Ballad Plus	13 fl oz + 1 qt 8 fl oz + 1 qt 13 fl oz + 1 qt 1 qt	55 dsv 18 days 36 days 54 days	**1.6**	**$1,463**	**8561**	**236**	**36.3**	**16.0**	**95.2**
3	Dithane Dithane	1.6 qt 1.6 qt	55 dsv + 5 applic at 10 days	1.8	**$1,504**	**8603**	**235**	**36.6**	**16.1**	**95.0**
4	Ballad Plus Ballad Plus	1 qt 1 qt	55 dsv + 5 applic at 10 days	2.2	**$1,494**	**8545**	**239**	**35.8**	**16.2**	**95.2**
5	Untreated Check			3.0	**$1,462**	8041	**237**	33.8	**16.1**	**95.4**
Average				2.0	$1,489	8525	238	35.8	16.2	95.2
LSD 5%				0.4	ns(145)	795.4	ns(10)	2.7	ns(0.6)	ns(0.5)
CV %				15.5	8.1	7.8	3.5	6.3	2.9	0.5

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 24

* Induce at 0.125% was included in each treatment

Comments: Ballad Plus (biological fungicide) was less effective than Dithane and the triazole + tin treatment, however, it did provide control of Cercospora leafspot. The disease level was low.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus - Biological Fungicide for Cercospora Leafspot Control in Sugarbeets (Bayer Protocol)

Average of 2 Locations

No	Treatment*	Rate/A	Appl Desc	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
5	Inspire XT + Dithane	7 fl oz + 1.6 qt	50 DSV	**0.5**	**$1,611**	**8863**	**250**	**35.5**	**16.7**	**95.8**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Inspire XT + Dithane	7 fl oz + 1.6 qt	42 Days							
4	Inspire XT + Ballad Plus	7 fl oz + 1 qt	50 DSV	**1.1**	$1,520	8359	**248**	33.7	**16.6**	**95.7**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Inspire XT + Dithane	7 fl oz + 1.6 qt	42 Days							
3	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	**1.1**	**$1,594**	**8766**	**248**	**35.6**	**16.6**	**95.8**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Proline SC + Dithane	5.7 fl oz + 1.6 qt	42 Days							
2	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	**1.2**	$1,527	8399	**250**	33.5	**16.8**	**95.5**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	42 Days							
1	Untreated Check			2.8	$1,297	7133	**239**	29.8	**16.2**	**95.4**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	1.3	$1,510	8304	247	33.6	16.6	95.6
LSD 5%	0.8	59.8	328.6	ns(13.4)	1.5	ns(0.6)	ns(1.1)
CV %	21.8	1.4	1.4	2.0	1.6	1.4	0.4

CLS Rate: Cercospora, visual rating a lower number is better
*Induce at 0.25% was included in each treatment

Comments: Ballad Plus (biological fungicide) was evaluated for Cercospora leafspot in this trial. The disease level was low and treatments did not separate well. It appeared that Dithane performed better than Ballad Plus in the tank mix treatments. All treatments gave better leafspot control than the untreated check.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Cercospora Leafspot Control in Sugarbeets (Bayer Protocol)

Crumbaugh Farms, Breckenridge, MI - 2014 (Page 2 of 3)

Trial Quality:	Fair-Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	C-RR074NT		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Level:**	Low
Planted:	April 23		> Opt: P and K	**Problems:**	Low level Cyst nem
Harvested:	September 11		High: Mn, Low: B		Low spots
Plots:	6 rows X 38 ft, 4 reps	**Added N:**	125 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Prev. Crop:**	Soybeans	**Rainfall:**	17.7 inches

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment*	Rate/A	Appl Desc	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
5	Inspire XT + Dithane	7 fl oz + 1.6 qt	50 DSV	**0.5**	**$1,343**	**7387**	**255**	**29.0**	**16.9**	**96.3**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Inspire XT + Dithane	7 fl oz + 1.6 qt	42 Days							
4	Inspire XT + Ballad Plus	7 fl oz + 1 qt	50 DSV	**0.6**	**$1,234**	**6789**	**251**	**27.1**	**16.8**	**95.5**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Inspire XT + Dithane	7 fl oz + 1.6 qt	42 Days							
2	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	**0.8**	**$1,229**	**6760**	**247**	**27.2**	**16.7**	**95.4**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	42 Days							
3	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	**0.8**	**$1,318**	**7248**	**254**	**28.5**	**16.9**	**96.1**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Proline SC + Dithane	5.7 fl oz + 1.6 qt	42 Days							
1	Untreated Check			2.3	$1,038	5710	**241**	23.7	**16.3**	**95.2**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	1.0	$1,233	6779	250	27.1	16.7	95.7
LSD 5%	0.3	186.6	1026.1	ns(16)	3.5	ns(0.8)	ns(1.2)
CV %	16.6	9.8	9.8	4.2	8.5	3.1	0.8

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 11
* Induce at 0.25% was included in each treatment

Comments: Ballad Plus (biological fungicide) was evaluated for Cercospora leafspot control in this trial. The disease level was low. All of the treatments had better Cercospora ratings than the untreated check. When considering the rating and yield it appears that Dithane gave better results than Ballad Plus.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Ballad Plus for Cercospora Leafspot Control in Sugarbeets (Bayer Protocol)

Maust, Pigeon, MI - 2014

Trial Quality:	Fair	**Soil Info:**	Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		3.9% OM, 7.4 pH, CEC: 15.7	**Cerc Level:**	Low
Planted:	May 19		> Opt: P and K	**Problems:**	Stand, Low Crec
Harvested:	October 8		High: Mn. Medium: B	**Seeding Rate:**	4.1 inches
Plots Size:	6 rows X 35 ft, 4 reps	**Added N:**	150 lbs	**Rainfall:**	14.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Corn Silage		
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment *	Rate/A	Appl Desc	Cerc 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
5	Inspire XT + Dithane	7 fl oz + 1.6 qt	50 DSV	**0.4**	**$1,880**	**10338**	**246**	**42.0**	**16.6**	**95.4**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Inspire XT + Dithane	7 fl oz + 1.6 qt	42 Days							
3	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	1.4	**$1,870**	**10283**	241	**42.7**	**16.3**	**95.5**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Proline SC + Dithane	5.7 fl oz + 1.6 qt	42 Days							
2	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	50 DSV	1.6	**$1,825**	**10039**	**252**	**39.7**	**16.9**	**95.6**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Dithane	8 fl oz + 1.6 qt	28 Days							
	Proline SC + Ballad Plus	5.7 fl oz + 1 qt	42 Days							
4	Inspire XT + Ballad Plus	7 fl oz + 1 qt	50 DSV	1.6	**$1,805**	**9929**	**246**	**40.4**	**16.4**	**95.9**
	Gem SC + Dithane	3.6 fl oz + 1.6 qt	14 Days							
	Super Tin + Ballad Plus	8 fl oz + 1 qt	28 Days							
	Inspire XT + Dithane	7 fl oz 1.6 qt	42 Days							
1	Untreated Check			3.2	$1,556	8556	238	36.0	16.1	**95.5**

	Cerc 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	1.7	$1,787	9829	244	40.2	16.5	95.6
LSD 5%	0.7	300.1	1650.4	9.3	6.0	0.6	ns(0.6)
CV %	26.5	10.9	10.9	2.5	9.6	2.4	0.4

CLS 0-9: Cercospora visual rating, lower is better. Rated on: October 7
*Induce at 0.25 % was included in each treatment

Comments: Ballad Plus (biological fungicide) was evaluated for Cercospora leafspot control in this trial. The disease level was low and the sugarbeet stand was marginal. Ballad Plus was less effective than Dithane in controlling leafspot. All treatments were better than the untreated check.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275
Bold: Results are not statistically different from top-ranking variety in each column

Evaluate Agri Tin and ChampION for Cercospora Leafspot Control in Sugarbeets

Average of 2 Locations

No	Treatment	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Agri Tin	6 fl oz	55 DSV	**2.5**	**$1,455**	**8219**	**258**	**31.9**	**17.1**	**96.0**
	Manzate	1.6 qt	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Inspire XT	7 fl oz	10-14 Days							
1	Agri Tin	6 fl oz	55 DSV	**3.1**	**$1,387**	**7852**	**256**	**30.6**	**17.0**	**96.0**
	Topsin	7.6 fl oz	55 DSV							
	AgriTin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
3	Agri Tin	6 fl oz	55 DSV	**3.1**	**$1,401**	**7943**	**252**	**31.5**	**16.8**	**95.8**
	Topsin	7.6 fl oz	55 DSV							
	Eminent	10 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Agri Tin	6 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
2	Agri Tin	6 fl oz	55 DSV	**3.9**	**$1,379**	**7774**	**260**	29.9	**17.3**	**96.0**
	Topsin	7.6 fl oz	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Headline	9 fl oz	10-14 Days							
5	Untreated Check			7.0	$1,104	6104	237	25.9	15.9	**95.6**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	3.9	$1,345	7578	253	30.0	16.9	95.9
LSD 5%	1.9	226.5	918.0	13.6	1.9	0.7	ns(0.5)
CV %	17.4	6.1	4.4	1.9	2.3	1.6	0.2

CLS 0-9: Cercospora visual rating, lower is better.

Comments: Agri Tin (Nufarm Americas) provided good control of Cercospora leafspot when tank mixed with Manzate and when triazole fungicides were utilized. However, when Manzate was replaced by Topsin and triazoles were replaced by Headline, Cercospora leafspot control was reduced.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Agri Tin and ChampION for Cercospora Leafspot Control in Sugarbeets

Research Station, Blumfield, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-19RR1N		2.4% OM, 7.7 pH, CEC: 10.2	**Cerc Level:**	High
Planted:	May 6		> Opt: P and K	**Problems:**	None
Harvested:	September 19		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 Rows X 38 ft, 4 reps	**Added N:**	125 lbs	**Rainfall:**	21.6 inches
Row Spacing:	22 inch	**Prev Crop:**	Oil Seed Radish		

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment	Rate/A	Applic DSV or Days	CLS 0-9 Sept 16	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Agri Tin	6 fl oz	55 DSV	**2.9**	**$1,706**	**9444**	**257**	**36.8**	**16.9**	**96.4**
	Manzate	1.6 qt	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Inspire XT	7 fl oz	10-14 Days							
3	Agri Tin	6 fl oz	55 DSV	3.6	**$1,682**	**9312**	**255**	**36.6**	**16.8**	**96.4**
	Topsin	7.6 fl oz	55 DSV							
	Eminent	10 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Agri Tin	6 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
1	Agri Tin	6 fl oz	55 DSV	3.4	**$1,658**	**9179**	**258**	**35.5**	**16.9**	**96.7**
	Topsin	7.6 fl oz	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
2	Agri Tin	6 fl oz	55 DSV	4.5	**$1,609**	**8912**	**256**	**34.8**	**16.9**	**96.5**
	Topsin	7.6 fl oz	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Headline	9 fl oz	10-14 Days							
5	Untreated Check			8.5	$1,241	6886	232	29.8	15.5	**96.1**
Average				4.6	$1,579	8747	252	34.7	16.6	96.4
LSD 5%				0.4	97.6	536.9	12.7	2.4	0.7	ns(0.6)
CV %				6.1	4.0	4.0	3.3	4.5	2.6	0.4

CLS 0-9: Cercospora visual rating, lower is better.

Comments: Agri Tin in combination with ChampION and other fungicides provided good control of Cercospora leafspot in this trial. The disease level was high. Treatments in sequence with Inspire gave the best leafspot control. Cercospora has resistance to Headline and Topsin in most of our growing region and those treatments were less effective. None of the treatments caused crop injury. Agri Tin and Champion are sold by Nufarm Americas.

$/A: Gross Payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Agri Tin and ChampION for Cercospora Leafspot Control in Sugarbeets

Troy Schuette, Elkton, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-19RR1N		2.2% OM, 7.3 pH, CEC: 7.7	**Cerc Level:**	Medium
Planted:	May 28		> Opt: P and K	**Problems:**	None
Harvested:	October 10		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plot size:	6 rows X 38 ft, 3 reps	**Added N:**	Manure + 40 lbs	**Rainfall:**	15.5 inches
Row Spacing:	22 inch	**Prev Crop:**	Sugarbeets		
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment	Rate/A	Applic DSV or Days	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Agri Tin	6 fl oz	55 DSV	**2.1**	**$1,205**	**6993**	**259**	**27.1**	**17.3**	**95.7**
	Manzate	1.6 qt	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Inspire XT	7 fl oz	10-14 Days							
3	Agri Tin	6 fl oz	55 DSV	**2.7**	**$1,120**	**6574**	**249**	**26.4**	**16.8**	**95.2**
	Topsin	7.6 fl oz	55 DSV							
	Eminent	10 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Agri Tin	6 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
1	Agri Tin	6 fl oz	55 DSV	2.8	**$1,117**	**6526**	**255**	**25.6**	**17.2**	**95.4**
	Topsin	7.6 fl oz	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	Eminent	10 fl oz	10-14 Days							
	Headline	9 fl oz	10-14 Days							
2	Agri Tin	6 fl oz	55 DSV	3.3	**$1,150**	**6636**	**264**	**25.1**	**17.7**	**95.6**
	Topsin	7.6 fl oz	55 DSV							
	Agri Tin	6 fl oz	10-14 Days							
	ChampION	1 lb	10-14 Days							
	Headline	9 fl oz	10-14 Days							
5	Untreated Check			5.5	$968	5322	**242**	22.0	**16.4**	**95.2**

	CLS 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	3.3	$1,112	6410	254	25.2	17.1	95.4
LSD 5%	0.6	176.9	973.1	ns(28)	3.0	ns(1.5)	ns(1.5)
CV %	10.1	8.5	8.1	5.8	6.3	4.6	0.8

CLS 0-9: Cercospora visual rating, lower number is better. Rated on: October 29

Comments: Agri Tin in combination with ChampION and other fungicides provided good control of Cercospora leafspot in this trial. The disease level was moderate. The treatment in sequence with Inspire provided the best leafspot control. Cercospora has resistance to Headline in most of our growing region. None of the treatments caused crop injury. Agri Tin is a tin fungicide and ChampION is a copper fungicide, both from Nufarm Americas.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Manzate and Cuprofix for Cercospora Leafspot Control in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality:	Fair/Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-12RR2N		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Level:**	Low
Planted:	April 23		>Opt: P and K	**Problems:**	Cyst nem
Harvested:	September 11		High: MN, Low: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	125 lbs	**Rainfall:**	17.7 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		

Application: JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa

No	Treatment	Rate/A	Appl Desc	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'
5	Manzate Max	1.6 qt	35	0.2	**$1,338**	**7358**	**246**	**29.9**	**16.4**	**96.1**	**217**
	Super Tin + Manzate	8 fl oz + 1.6 qt	50								
	Inspire + Manzate	7 fl oz + 1.6 qt	80								
	Super Tin + Manzate	8 fl oz + 1.6 qt	115								
3	Super Tin + Manzate	8 fl oz + 1.6 qt	50	0.3	**$1,359**	**7476**	**244**	**30.6**	**16.2**	**96.4**	**230**
	Inspire + Manzate	7 fl oz + 1.6 qt	80								
	Super Tin + Manzate	8 fl oz + 1.6 qt	115								
2	Inspire + Manzate	7 fl oz + 1.6 qt	50	0.3	$1,236	6798	226	**30.0**	15.4	95.5	**216**
	Super Tin + Manzate	8 fl oz + 1.6 qt	85								
	Inspire + Manzate	7 fl oz + 1.6 qt	115								
4	Manzate	1.6 qt	35	0.5	**$1,341**	**7375**	**242**	**30.4**	**16.0**	**96.6**	**230**
	Inspire + Manzate	7 fl oz + 1.6 qt	50								
	Super Tin + Manzate	8 fl oz + 1.6 qt	85								
	Inspire + Manzate	7 fl oz + 1.6 qt	115								
7	Cuprofix + Manzate	3 lb + 1.6 qt	35	**0.6**	**$1,284**	**7062**	**242**	**29.1**	**15.9**	**96.7**	**239**
	4 applications										
	Every 35 DSV										
6	Manzate	1.6 qt	35	**0.7**	**$1,350**	**7423**	**243**	**30.6**	**16.1**	**96.3**	**224**
	4 applications										
	Every 35 DSV										
1	Untreated Check			**3.1**	$1,170	6436	**243**	26.5	**16.2**	**96.2**	**210**

	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'
Average	0.8	$1,297	7133	241	29.6	16.0	96.2	224
LSD 5%	0.4	102.9	565.9	11.7	2.0	0.6	0.7	ns(36.2)
CV %	33.0	5.3	5.3	3.3	4.6	2.4	0.5	10.9

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 3

Comments: Manzate and Cuprofix provided good control of Cercospora leafspot. The disease pressure was too low to separate treatments well. None of the treatments caused sugarbeet injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Topguard and Koverall for Control of Cercospora Leafspot in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-18RR4N		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Level:**	Low
Planted:	April 23		>Opt: P and K	**Problems:**	Low level Cyst nem
Harvested:	September 11		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 6 reps	**Added:**	125 lbs	**Rainfall:**	17.7 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment	Rate/A	Appl DSV/ Days	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Inspire + Koverall	7 fl oz + 2 lb	50 dsv	**0.2**	**$1,010**	**5998**	**220**	**27.3**	**15.1**	**95.0**
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
	Inspire + Koverall	7 fl oz + 2 lb	14 days							
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
5	Topguard + Koverall	14 fl oz + 2 lb	50 dsv	**0.2**	**$1,098**	**6479**	**229**	**28.2**	**15.4**	**95.7**
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
	Topguard + Koverall	14 fl oz + 2 lb	14 days							
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
3	Topguard + Koverall	14 fl oz + 2 lb	50 dsv	**0.2**	**$1,066**	**6301**	**219**	**28.7**	**15.1**	**94.7**
	Topguard + Koverall	14 fl oz + 2 lb	14 days							
	Topguard + Koverall	14 fl oz + 2 lb	14 days							
	Topguard + Koverall	14 fl oz + 2 lb	14 days							
4	Topguard + Koverall	14 fl oz + 2 lb	50 dsv	**0.3**	**$1,047**	**6200**	**223**	**27.8**	**15.2**	**95.0**
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
	Topguard + Koverall	14 fl oz + 2 lb	14 days							
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
2	Topguard + Koverall	12 fl oz + 2 lb	50 dsv	**0.3**	**$1,028**	**6092**	**221**	**27.6**	**15.1**	**95.1**
	Topguard + Koverall	12 fl oz + 2 lb	14 days							
	Topguard + Koverall	12 fl oz + 2 lb	14 days							
	Topguard + Koverall	12 fl oz + 2 lb	14 days							

Evaluate Topguard and Koverall for Control of Cercospora Leafspot in Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

No	Treatment	Rate/A	Appl DSV/ Days	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Topguard + Koverall	10 fl oz + 2 lb	50 dsv	**0.3**	**$1,025**	**6078**	**223**	**27.2**	**15.2**	**95.5**
	Topguard + Koverall	10 fl oz + 2 lb	14 days							
	Topguard + Koverall	10 fl oz + 2 lb	14 days							
	Topguard + Koverall	10 fl oz + 2 lb	14 days							
7	Eminent + Koverall	13 fl oz + 2 lb	50 dsv	**0.4**	**$1,032**	**6115**	**221**	**27.7**	**15.1**	**95.2**
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
	Eminent + Koverall	13 fl oz + 2 lb	14 days							
	Super Tin + Koverall	8 fl oz + 2 lb	14 days							
8	Untreated Check			3.2	$975	5361	213	25.1	**14.8**	94.5
Average				0.63	$1,035	6078	221	27.5	15.1	95.1
LSD 5%				0.3	108.6	597.3	13.2	1.7	ns(0.7)	0.7
CV %				32.5	8.1	7.6	4.6	4.9	3.6	0.6

nis: (Induce) at 0.25% was included in Treatments 1, 2, 3 and 4

CLS 0-9: Cercospora visual rating, lower number is better. Rated on: September 8

Comments: Topguard (triazole) was evaluated for control of Cercospora leafspot in this trial. The disease level was low. Koverall (EBDC) was tanked mixed with all of the treatments. Topguard and Koverall are fungicides from Cheminova. All of the treatments provided good Cercospora control. The disease level was not high enough to separate out treatment differences. None of the treatments caused leaf injury.

$A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Badge SC and an Experimental Fungicide for Cercospora Leafspot Control

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality:	Fair	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	B-18RR4N		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Level:**	Low
Planted:	April 23		>Opt: P and K	**Problems:**	Cyst nem
Harvested:	September 11		High: Mn, Low: B		Low Cerc
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	125 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans	**Rainfall:**	17.7 inches
Application:	JD 3250 mounted plot sprayer, compressed air, 100 psi, 22.5 gpa				

No	Treatment	Rate/A	Appl Desc DSV	CLS 0-9	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100' Aug 21
3	Manzate Eminent + Manzate Super Tin	1.6 qt 13 fl oz + 1.6 qt 8 fl oz	55 75 115	0.8	**$1,204**	**6624**	**238**	**27.9**	**15.9**	**95.9**	**203**
1	Manzate Eminent Manzate Inspire + Manzate	1.6 qt 13 fl oz 1.6 qt 7 fl oz + 1.6 qt	55 75 115 135	0.8	**$1,266**	**6963**	**237**	**29.3**	**15.9**	**95.9**	**200**
4	Manzate GWN-10338 + Badge Manzate QWN-10338 + Manzate	1.6 qt 12 fl oz + 2 pt 1.6 qt 12 fl oz + 1.6 qt	55 75 115 135	0.8	**$1,203**	**6616**	**237**	**27.9**	**16.0**	**95.6**	**201**
2	Badge Eminent Badge Inspire + Manzate	2 pt 13 fl oz 2 pt 7 fl oz + 1.6 qt	55 75 115 135	0.9	**$1,244**	**6842**	**237**	**28.7**	**16.0**	**95.5**	**195**
5	Untreated Check			**3.3**	$941	5177	**234**	22.1	**15.9**	**95.2**	**202**
	Average			1.3	$1,172	6444	237	27.2	15.9	95.6	200
	LSD 5%			0.4	159.9	879.3	ns(8.2)	3.3	ns(0.4)	ns(0.7)	ns(23.9)
	CV %			24.2	11.3	11.3	2.9	10.0	2.0	0.6	9.9

CLS 0-9: Cercospora visual rating, lower is better. Rated on: September 3

Comments: The sugarbeet stand was good but the disease level was low. Badge SC is a copper fungicide from Gowan. All of the treatments provided good leafspot control and yielded higher than the untreated. None of the treatments caused leaf injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Cercospora - Ballad Fungicide
Spartan Acres (Knoerr), Freeland - 2014

Trial Quality: Excellent
Variety: C-RR202/B-19RR1N
Planted: April 19
Harv/Samp: Oct 25 / Oct 14
Plot Size: 4 reps
Row Spacing: 20 inch
Seeding Rate: 65,000

Soil Info: Loam
Fertilizer: 2x2: 36-32-0 + S & micros; Total N=160#
Prev Crop: Dry Beans
Weather: Good weather

Rhizoc Control: Excellent Control: Quadris I.F. & 6-8 leaf
Cerc Control: Excellent Control: See notes
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
EBDC	$1,869	**10291**	**297**	**34.6**	**19.2**	**97.1**
Ballad Plus	$1,852	**10207**	**295**	**34.5**	**19.1**	**97.0**
Average	$1,860	10249	296	34.6	19.2	97.1
LSD 5%	—	ns (152)	ns (4)	ns (0.5)	ns (0.2)	ns (0.4)
CV %	—	1	1	0.7	0.7	0.2

Comments: Trial was conducted to evaluate the efficacy of using Ballad fungicide as a substitute for an EBDC fungicide as a tank mix partner or used alone. Ballad is a biological fungicide that is marketed by BAYER. Many growers are interested in using this product because it mixes easily in the tank when compared to an EBDC. It is generally not recommended as a stand-alone product for Cercospora leaf spot control. Four sprays were applied with grower equipment as follows: 1st application was Inspire XT alone on the whole field, 2nd application was Headline plus EBDC or Ballad, 3rd application was Eminent plus EBDC or Ballad, 4th application was EBDC or Ballad alone. There were no differences in visual observation, yield or quality when comparing strips with EBDC or Ballad. Leaf spot levels were relatively low for the 2014 growing season. The amount of leafspot in this field was well below what would be considered economic levels for both treatments

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Cercospora - Ballad Fungicide
Mossner Farms LLC, Reese - 2014

Trial Quality: Excellent
Variety: C-RR059
Planted: May 24
Harv/Samp: Oct 26 / Oct 15
Plot Size: 4 reps
Row Spacing: 28 inch
Seeding Rate: 60,800

Soil Info: Loam
Fertilizer: Var. Rate P & K; 2x2: 15 gal. 19-9-1 4S + micros; S.D. 30 gal. 28%
Prev Crop: Dry Beans
Weather: Good weather

Rhizoc Control: Good Control: Quadris I.F. & 6-8 leaf
Cerc Control: Excellent Control: See notes
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
EBDC	$1,808	**9941**	**280**	**35.5**	**18.4**	**96.3**
Ballad Plus	$1,800	**9899**	**284**	**34.9**	**18.6**	**96.4**
Average	$1,804	9920	282	35.2	18.5	96.4
LSD 5%	—	ns (761)	ns (11)	ns (2.7)	ns (0.5)	ns (0.8)
CV %	—	3	2	3.4	1.1	0.4

Comments: Trial was conducted to evaluate the efficacy of using Ballad fungicide as a substitute for an EBDC fungicide as a tank mix partner. Ballad is a biological fungicide that is marketed by BAYER. Many growers are interested in using this product because it mixes easily in the tank when compared to an EBDC. It is generally not recommended as a stand-alone product for Cercospora leaf spot control. Three sprays were applied in strips with the grower's equipment as follows: 1st application was Proline with either EBDC or Ballad, 2nd application was with GEM with an EBDC sprayed on the entire field, and 3rd application was Inspire with either EBDC or Ballad. There were no differences in visual observation of leafspot, yield or quality when comparing strips with EBDC or Ballad. Leafspot levels were relatively low for the 2014 growing season. The amount of leafspot in both treatments was below what would be considered economic levels. However, a small check area left unsprayed did have significant leafspot development with the start of browning of leaves.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top ranking variety in each column.

Efficacy of Application of Foliar Fungicides for Control of Cercospora Leafspot in Sugarbeet, 2014

Michigan State University AgBioResearch

W. W. Kirk, R. L Schafer; Department of Plant, Soil and Microbial Science,
Michigan State University, East Lansing, MI 48824

Sugar beet cv. ACH RR-824 was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 25 May. Seed was planted at 1" depth into four-row by 50-ft plots (ca. 4.375 in. between plants to give a target population of 275 plants/100ft. row) with 30" between rows replicated four times in a randomized complete block design. Fertilizer was drilled into plots immediately before planting, formulated according to results of soil tests (125 lb 46-0-0). No additional nitrogen was applied to the growing crop. Plots were inoculated by spraying a conidial suspension of *C. beticola* collected from infected sugarbeet foliar residue from the previous season on 16 Jun across all plots. Fungicides were applied starting after the 35 or 45 Beetcast disease severity values were recorded in the area on 8 and 15 Jul, respectively (Ontario Weather Network, Ridgetown, ON, Canada), applications were initiated on 8 Jul and three to five applications were made as specified in the table below. Fungicides were applied with a hand-held R&D spray boom delivering 25 gal (80 p.s.i.) and using three XR11003VS nozzles per row. Induce 480XL 0.25 % v/v was applied where indicated as "Induce" on the results table unless a different rate was indicated. Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt applied at GS2-4 and GS 6-8. Insects were controlled as necessary. Foliar leaf spot severity (%) was measured on 24 Aug and 5 Sep using a 0 – 10 scale; 0= 0%; 1= 1 - 5, 0.1%; 2= 6 -12, 0.35%; 3= 13 - 25, 0.75%; 4= 26 - 50, 1.5%; 5= 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6= 3% (proven economic damage); 7= 6%; 8= 12%; 9= 25%; and 10> 50% severity. Beetroots were machine-harvested on 10 Oct and individual treatments were weighed. Sugar content was measured at the Michigan Sugar Company analytical service laboratory. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 43.3995 and longitude -83.6980 deg. Average daily air temperature (°F) was 57.8, 62.3, 66.2, 67.4, 60.0 and 51.5 (May, Jun, Jul, Aug, Sep, and to 10 Oct, respectively) and the number of days with maximum temperature >90°F over the same period was 0 for each month. Average daily relative humidity (%) over the same period was 64.5, 63.9, 73.3, 63.1, 60.0 and 72.1. Precipitation over the same period was 3.06, 2.74, 4.17, 3.90, 3.03 and 0.64". There were 182 Beetcast DSV values accumulated in the Saginaw area from 1 May to 10 Sep at Richville, MI.

Weather conditions during the growing season at Richville, MI were moderately conducive for the development of Cercospora leaf spot (CLS) for most of the season and of note was the lack of hot and humid conditions during Jul. CLS reached an index of about 5.3, 8.0 and 9.0 in the not-treated control by 14, 26 Aug and 10 Sep, respectively. CLS severity (%) reached 4.0, 21.3 and 42.5% in the not-treated control during the same period (not all data not shown in table). All treatments had significantly less CLS severity (%) than the not-treated control (42.5%) by 10 Sep. Treatments with CLS RAUDPC values less than 6.0 were significantly different to the not-treated control (12.0) by 10 Sep. Treatments with CLS indices less than 7.5 had significantly less Cercospora leaf spot than the not-treated control (9.0) by 10 Sep. No treatments had significantly greater yield per acre than the untreated control (28.5 t) and the range in yield was from 20.4 to 40.5 as a result of the inconsistent stand and may not have reflected intensity of CLS pressure. Treatments with sugar content (%) greater than 16.8% had significantly greater sugar content than the not-treated control (16.2%). No treatments had significantly greater recoverable white sucrose per acre (RWSA) than the untreated control (6806 lb) and the range in RWSA was from 4731 to 10408 lb.

Michigan State University
AgBioResearch

Efficacy of Application of Foliar Fungicides for Control of Cercospora Leafspot in Sugarbeet, 2014

W. W. Kirk, R. L Schafer; Department of Plant, Soil and Microbial Science, Michigan State University, East Lansing, MI 48824

Treatment and rate	Cercospora leafspot Severity (%) 10 Sep 13 DAFA[a]	RAUDPC[b] (0-100) 10 Sep	Bayer 0-10 scale[c] 10 Sep	Yield (t)	Sugar content (%)	RWSA[d] (lb)
Not-treated check…………………………..	42.5 a[e]	12.0 a	9.0 a	28.5	16.2 k	6806
Inspire XT 4.16SL 7 fl.oz (B-E[f])…………	13.8 efg	4.5 b-e	7.5 a-e	26.9	16.7 g-k	6489
Eminent VP 1ME 13 fl.oz (B-E)…………...	3.0 klm	0.7 g-l	4.5 i-l	35.9	17.5 a-e	9154
Manzate Max 4FL 51 fl.oz (B-E); Inspire XT 4.16SL 7 fl.oz (B); Priaxor 4.17SC 6 fl.oz (C); Proline 480 SC 480SC 5.7 fl.oz (D); Super Tin 4L 4FL 8 fl.oz (E)………………	2.0 lm	0.3 l	3.8 kl	28.8	17.5 a-d	7257
Manzate Max 4FL 51 fl.oz (B-E); Inspire XT 4.16SL 7 fl.oz (BD); Super Tin 4L 4FL 8 fl.oz (C); Cuprofix Ultra 40 Disperss 40DF 3 lb (E)…	7.0 h-l	2.1 e-h	6.3 d-h	40.5	17.4 a-g	10408
Manzate Max 4FL 51 fl.oz (B-E); Super Tin 4L 4FL 8 fl.oz (BD); Inspire XT 4.16SL 7 fl.oz (C); Cuprofix Ultra 40 Disperss 40DF 3 lb (E)…	2.8 klm	0.7 g-l	3.8 kl	26.9	17.3 a-h	6909
Manzate Max 4FL 51 fl.oz (A-E); Inspire XT 4.16SL 7 fl.oz (BD); Super Tin 4L 4FL 8 fl.oz (C); Cuprofix Ultra 40 Disperss 40DF 3 lb (E)…	5.3 i-m	1.0 f-l	5.5 g-j	35.4	17.8 a	9374
Manzate Max 4FL 51 fl.oz (A-E); Super Tin 4L 4FL 8 fl.oz (BD); Inspire XT 4.16SL 7 fl.oz (C); Cuprofix Ultra 40 Disperss 40DF 3 lb (E)…	5.0 i-m	1.6 f-k	6.0 e-i	27.3	17.0 c-j	6620
Topguard 1.04SC 14 fl.oz + Koverall 75DF 2 lb + NIS (B-E)…………...	2.0 lm	0.4 jkl	3.8 kl	34.4	17.4 a-e	8718
Topguard 1.04SC 14 fl.oz + Koverall 75DF 2 lb + Cercobin 4.11SC 15.3 fl.oz (BD); Headline 2.09EC 9.6 fl.oz + Super Tin 4L 6 fl.oz + Cercobin 4.11SC 15.3 fl.oz + NIS (CE)…...	1.0 m	0.4 kl	3.0 l	37.1	16.7 f-k	9270
Topguard 1.04SC 14 fl.oz + Cercobin 4.11SC 15.3 fl.oz (B-E)…………	8.8 g-j	2.2 d-g	6.8 c-h	28.1	17.4 a-f	7184
Topguard 1.04SC 14 fl.oz (B-E)…………	3.0 klm	0.6 h-l	4.5 i-l	27.2	17.6 abc	6950
Dithane F45 37F 3.2 pt (B-E); Proline 480 SC 480SC 5.7 fl.oz (B); Headline 2.09SC 9.6 fl.oz (C); Enable 2F 10 fl.oz + NIS[g] (D); Super Tin 4L 4FL 8 fl.oz (E)………………	16.3 de	5.4 bc	7.8 a-d	22.9	17.4 a-f	5594
Dithane F45 37F 3.2 pt (B-E); Enable 2F 10 fl.oz + NIS L 8 fl.oz (B); Headline 2.09SC 9.6 fl.oz + NIS (C); Proline 480 SC 480SC 5.7 fl.oz + NIS (D); Super Tin 4L 4FL 8 fl.oz (E)………………	7.5 h-l	2.5 c-f	6.5 c-h	29.8	17.2 a-h	7447
Enable 2F 2F 10 fl.oz + NIS (B-E)……….	10.3 f-i	1.3 f-l	6.5 c-h	35.1	17.3 a-h	8847
Manzate Max 4FL 51 fl.oz (B-E); Eminent VP 1ME 13 fl.oz + Badge 2.27EC 2 pt (C); Inspire XT 4.16SL 7 fl.oz (E); Super Tin 4L 4FL 8 fl.oz (F)………………	6.5 i-m	1.8 f-i	5.8 f-i	30.2	17.2 a-h	7634
Badge 2.27EC 2 pt (BD); Eminent VP 1ME 13 fl.oz + Manzate Max 4FL 51 fl.oz (C); Inspire XT 4.16SL 7 fl.oz + Manzate Max 4FL 51 fl.oz (E); Super Tin 4L 4FL 8 fl.oz (F)………………	7.8 h-k	2.3 def	6.0 e-i	26.1	16.9 d-j	6303
Manzate Max 4FL 51 fl.oz (BCEF); Eminent VP 1ME 13 fl.oz (C); Super Tin 4L 4FL 8 fl.oz (D); Proline 480 SC 480SC 5.7 fl.oz (E); Badge 2.27EC 2 pt (F)……………………..	7.5 h-l	1.9 fgh	6.5 c-h	32.6	17.3 a-h	8283

Efficacy of Application of Foliar Fungicides for Control of Cercospora Leafspot in Sugarbeet, 2014

W. W. Kirk, R. L Schafer; Department of Plant, Soil and Microbial Science,
Michigan State University, East Lansing, MI 48824

SA-0040306 100SL 40 fl.oz (B); Super Tin 4FL 8 fl.oz + Topsin 4.5FL 7.6 fl.oz (C); Headline 2.09SC 9 fl.oz + Koverall 75DF 1.5 lb (D)…………………..	5.3	i-m	1.4	f-l	5.5	g-j	29.2	17.6	a-d	7340
SA-0040303 100SL 32 fl.oz (B); Topsin 4.5FL 7.6 fl.oz (C); Echo 100F 16 fl.oz (CD); Headline 2.09SC 9 fl.oz (D)………………..	21.3	cd	5.4	bc	8.0	abc	20.4	16.4	jk	4731
SA-0040306 100SL 40 fl.oz (B); Super Tin 4L 4FL 8 fl.oz (C); Headline 2.09SC 9 fl.oz (D)………………..	6.5	i-m	1.2	f-l	5.8	f-i	25.9	17.0	c-j	6480
Echo 100F 16 fl.oz (BCD)…………………	31.3	b	7.2	ab	8.5	ab	29.7	17.3	a-h	7561
SA-0040303 100SL 32 fl.oz (B); Super Tin 4L 4FL 8 fl.oz (CD); Topsin 4.5FL 7.6 fl.oz (C)…………………	4.0	j-m	1.1	f-l	5.3	h-k	25.4	17.7	ab	6682
SA-0040303 100SL 24 fl.oz (B); Super Tin 4L 4FL 8 fl.oz (CD); Topsin 4.5FL 7.6 fl.oz (C)	17.5	de	4.9	bcd	7.8	a-d	30.7	16.4	jk	7205
SA-0040303 100SL 32 fl.oz (B); Super Tin 4L 4FL 8 fl.oz (C); Headline 2.09SC 9 fl.oz (D); Koverall 75DF 1.5 lb (CD)…………………	7.5	h-l	1.6	f-k	6.5	c-h	31.7	17.4	a-f	7965
SA-0040303 100SL 32 fl.oz (B); Super Tin 4L 8 fl.oz + Topsin 4.5FL 7.6 fl.oz (C); Headline 2.09SC 9 fl.oz + Koverall 75DF 1.5 lb (D)…………………..	10.0	f-i	1.5	f-k	7.0	b-g	26.5	16.9	d-j	6192
SA-0040307 100SL 32 fl.oz (B); Super Tin 4L 8 fl.oz + Topsin 4.5FL 7.6 fl.oz (C); Headline 2.09SC 9 fl.oz (D)………………..	6.3	i-m	1.7	f-i	6.3	d-h	31.7	16.8	e-k	7832
SA-0040307 100SL 32 fl.oz (B); Super Tin 4L 8 fl.oz + Topsin 4.5FL 7.6 fl.oz (C); Headline 2.09SC 9 fl.oz + Koverall 75DF 1.5 lb (D)…………………..	7.5	h-l	1.6	f-j	6.5	c-h	29.6	17.8	a	6998
SA-0040307 100SL 32 fl.oz (B); Headline 2.09SC 9 fl.oz + Koverall 75DF 1.5 lb (C); Super Tin 4L 4FL 8 fl.oz (D)………………	5.3	i-m	1.1	f-l	5.5	g-j	36.1	17.2	a-h	9213
Proline 480 SC 5.7 fl.oz (B); Super Tin 4L 4FL 8 fl.oz + Topsin 4.5FL 7.6 fl.oz (C); Headline 2.09SC 9 fl.oz (D)………………..	6.3	i-m	1.3	f-l	6.3	d-h	35.5	17.4	a-e	9081
SA-0040306 100SL 40 fl.oz + Perfectose 100SC 56 fl.oz (B); Super Tin 4L 8 fl.oz (C); Headline 2.09SC 9 fl.oz (D)……………….	4.0	j-m	1.0	f-l	4.0	jkl	28.3	17.1	b-i	6358
Minerva 1SC 13 fl.oz + SA-0012003 100SL 19 fl.oz (B); Super Tin 4L 8 fl.oz (CD); Topsin 4.5FL 7.6 fl.oz (C)…………………	8.8	g-j	1.5	f-k	6.8	c-h	34.8	17.5	a-e	8957
Diffusion 60L 2 gal (B); Diffusion 60L 3 gal (CDE); Proline 480 SC 5.7 fl.oz (B); Super Tin 4L 4FL 8 fl.oz (C); Headline 2.09SC 9 fl.oz (D); Inspire XT 4.16SL 7 fl.oz (E)……………...	15.0	ef	2.0	e-h	7.8	a-d	34.2	17.1	b-h	8562
Diffusion 60L 2 gal (B); Diffusion 60L 3 gal (CDE)…………………	26.3	bc	6.0	ab	8.5	ab	28.0	16.4	ijk	6803
p-value if NSD							0.3119			0.4565

[a] DAFA= Days after final fungicide application
[b] RAUDPC = The relative area under the percentage late blight disease progress curve calculated for each treatment from the date of the first evaluation to 10 Sep, a period of 27 days (Max = 100)
[c] Foliar leaf spot severity; 0 - 10 scale; 0= 0%; 1 = 1 - 5, 0.1%; 2 = 6 -12, 0.35%; 3 = 13 - 25, 0.75%; 4 = 26 - 50, 1.5%; 5 = 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6 = 3% (proven economic damage); 7 = 6%; 8 = 12%; 9 = 25%; and 10 ≥ 50% severity
[d] RWSA = Recoverable White Sucrose per Acre (Ton* Recoverable White Sucrose per Ton of sugarbeet)
[e] Means followed by same letter are not significantly different at $p = 0.10$ (Fishers LSD)
[f] Application dates: A= 8 Jul; B= 15 Jul; C= 29 Jul; D= 5 Aug; E= 19 Aug ; F= 28
[g] Induce applied at 0.25% v/v

Efficacy of Application of Foliar Fungicides and Oxidate for Control for Control of Cercospora Leafspot in Sugarbeet 2014

Michigan State University AgBioResearch

W. W. Kirk, R. L Schafer; Department of Plant, Soil and Microbial Science,
Michigan State University, East Lansing, MI 48824

Sugar beet cv. ACH RR-824 was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 25 May. Seed was planted at 1" depth into four-row by 50-ft plots (ca. 4.375 in. between plants to give a target population of 275 plants/100ft. row) with 30" between rows replicated four times in a randomized complete block design. Fertilizer was drilled into plots immediately before planting, formulated according to results of soil tests (125 lb 46-0-0). No additional nitrogen was applied to the growing crop. Plots were inoculated by spraying a conidial suspension of *C. beticola* collected from infected sugarbeet foliar residue from the previous season on 16 Jun across all plots. Fungicides were applied starting after the 45 Beetcast disease severity values that were recorded in the area on 15 Jul, (Ontario Weather Network, Ridgetown, ON, Canada), applications were initiated on 17 Jul and four to eight applications were made as specified in the table below. Fungicides were applied with a hand-held R&D spray boom delivering 25 gal (80 p.s.i.) and using three XR11003VS nozzles per row. Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt applied at GS2-4 and GS 6-8. Insects were controlled as necessary. Foliar leaf spot severity (%) was measured on 24 Aug and 5 Sep using a 0 – 10 scale; 0= 0%; 1= 1 - 5, 0.1%; 2= 6 -12, 0.35%; 3= 13 - 25, 0.75%; 4= 26 - 50, 1.5%; 5= 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6= 3% (proven economic damage); 7= 6%; 8= 12%; 9= 25%; and 10> 50% severity. Beetroots were machine-harvested on 14 Oct and individual treatments were weighed. Sugar content was measured at the Michigan Sugar Company analytical service laboratory. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 43.3995 and longitude -83.6980 deg. Average daily air temperature (°F) was 57.8, 62.3, 66.2, 67.4, 60.0 and 51.5 (May, Jun, Jul, Aug, Sep, and to 14 Oct, respectively) and the number of days with maximum temperature >90°F over the same period was 0 for each month. Average daily relative humidity (%) over the same period was 64.5, 63.9, 73.3, 63.1, 60.0 and 72.1. Precipitation over the same period was 3.06, 2.74, 4.17, 3.90, 3.03 and 0.64". There were 182 Beetcast DSV values accumulated in the Saginaw area from 1 May to 10 Sep at Richville, MI.

Weather conditions during the growing season at Richville, MI were moderately conducive for the development of Cercospora leaf spot (CLS) for most of the season and of note was the lack of hot and humid conditions during Jul. CLS reached an index of about 5.3, 7.5 and 9.0 in the not-treated control by 14, 26 Aug and 10 Sep, respectively. CLS severity (%) reached 4.0, 15.0 and 45.0% in the not-treated control during the same period (not all data not shown in table). All treatments had significantly less CLS severity (%) than the not-treated control (45.0%) by 10 Sep. Treatments with CLS AUDPC values less than 455 were significantly different to the not-treated control (564) by 10 Sep. Treatments with CLS indices less than 8.5 had significantly less Cercospora leaf spot than the not-treated control (9.0) by 10 Sep. No treatments had significantly greater yield per acre than the untreated control (26.8 t) and the range in yield was from 24.7 to 30.2 as a result of the inconsistent stand and may not have reflected intensity of CLS pressure. Treatments with sugar content (%) greater than 15.8% had significantly greater sugar content than the not-treated control (15.6%). No treatments had significantly greater recoverable white sucrose per acre (RWSA) than the untreated control (6101 lb) and the range in RWSA was from 5695 to 6963 lb. No phytotoxicity was observed after any treatment.

Efficacy of Application of Foliar Fungicides and Oxidate for Control for Control of Cercospora Leafspot in Sugarbeet 2014

W. W. Kirk, R. L Schafer; Department of Plant, Soil and Microbial Science,
Michigan State University, East Lansing, MI 48824

Treatment and rate	Cercospora leaf spot Severity (%) 10 Sep 13 DAFA[a]		AUDPC[b] 10 Sep		Bayer 0-10 scale[c] 10 Sep		Yield (t)	Sugar content (%)		RWSA[d] (lb)
OxiDate 2.0 27L 80 fl oz (A-H)………	25.0	b	275	c	8.5	a	24.7	15.8	b	5695
OxiDate 2.0 27L 32 fl oz (A-H)………	31.3	b	455	ab	8.8	a	30.2	15.6	b	6963
Proline 480 SC 480SC 5.7 fl oz (A); Manzate Max 4FL 51 fl oz (ACEG); Super Tin 4L 4FL 8 fl oz (C); Headline 2.09SC 9 fl oz (E); Inspire XT 4.16SL 7 fl oz (G)………..	7.8	c	80	d	6.0	b	25.4	16.9	a	6353
Proline 480 SC 480SC 5.7 fl oz (A); OxiDate 2.0 27L 32 fl oz (ACEG); Super Tin 4L 4FL 8 fl oz (C); Headline 2.09SC 9 fl oz (E); Inspire XT 4.16SL 7 fl oz (G)………..	27.5	b	340	bc	8.5	a	27.1	16.2	ab	6511
Untreated Check………………………	45.0	a	564	a	9.0	a	26.8	15.6	b	6101
p-value if NSD							0.1975			0.3365

[a] DAFA= Days after final fungicide application

[b] AUDPC = The area under the percentage late blight disease progress curve calculated for each treatment from the date of the first evaluation to 10 Sep, a period of 27 days

[c] Foliar leaf spot severity; 0 - 10 scale; 0= 0%; 1 = 1 - 5, 0.1%; 2 = 6 -12, 0.35%; 3 = 13 - 25, 0.75%; 4 = 26 - 50, 1.5%; 5 = 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6 = 3% (proven economic damage); 7 = 6%; 8 = 12%; 9 = 25%; and 10 $\geq$ 50% severity

[d] RWSA = Recoverable White Sucrose per Acre (Ton* Recoverable White Sucrose per Ton of sugarbeet)

[e] Means followed by same letter are not significantly different at p = 0.10 (Fishers LSD)

[f] Application dates: A= 17 Jul; B= 24 Jul; C= 31 Jul; D= 7 Aug; E= 15 Aug ; F= 22 Aug; G= 28 Aug; H= 5 Sep

Evaluation of Plant Protection Products for Management of Cercospora Leafspot in Sugarbeet

Ridgetown, Ontario, Canada - 2014

Rishi Burlakoti, Weather INnovations Consulting LP, Chatham, ON
Cheryl Trueman, University of Guelph, Ridgetown Campus, Ridgetown, ON

Trial Quality:	Very Good	**Variety:**	RR074NT
Planted:	May 12	**Location:**	Ridgetown, Ontario, Canada
Harvested:	October 6	**Application Method:**	hand-held boom, CO_2 pressure
Plot Size:	2 rows x 23 feet	**Application Water Volume:**	24.7 gal/A
Row Spacing:	2.5 feet	**Reps:**	4
Seeding Rate:	3.5 seeds/foot		

Treatment (program) [z, y]	AUDPC [x]	Yield (t acre^{-1})	Sugar (%)	RWSA (lbs acre^{-1})
Nontreated control	530 a [w]	35.7 a	15.07 c	7728 d
Inspire EC @ 0.70 qt (14-day)	**4 f**	43.8 a	**16.42 ab**	**10725 a**
Inspire EC @ 0.70 qt [1] (BEETcast™ 50/35)	**10 f**	40.7 a	**16.30 ab**	**9834 abc**
Headline EC @ 0.35 qt (14-day)	295 abcd	37.7 a	16.21 abc	8992 abcd
Senator 70WP @ 0.44 lb (14-day)	453 a	39.5 a	15.12 c	8662 bcd
Parasol WG @ 3.78 lb (14-day)	**101 cd**	41.0 a	16.11 abc	9711 abcd
Parasol WG @ 3.78 lb (BEETcast™ 50/35)	**141 bcde**	40.1 a	16.02 abc	9373 abcd
Manzate Pro-Stick DF @ 2.00 lb (14-day)	**67 e**	40.7 a	**16.55 a**	**10030 ab**
Manzate Pro-Stick DF @ 2.00 lb (BEETcast™ 50/35)	256 abcde	35.4 a	15.74 abc	8159 bcd
Bravo ZN @ 1.41 qt (14-day)	**107 cde**	38.6 a	**16.29 ab**	9379 abcd
Bravo ZN @ 1.41 qt (BEETcast™ 50/35)	**111 cde**	37.9 a	**16.45 ab**	9299 abcd
Luna Tranquility @ 0.35 qt (14-day)	218 abcd	38.7 a	15.89 abc	9007 abcd
Serenade Max @ 0.88 qt (14-day)	379 abcd	38.8 a	15.35 bc	8535 bcd
Taegro WP 0.33 lb + Agral 90 0.125% v/v (14-day)	564 ab	37.1 a	15.72 abc	8424 bcd
496/A 2.07 qt + 497/B 0.13 qt (14-day)	382 abc	35.5 a	15.40 abc	7888 cd

[z] BEETcast™ 50/35 program applications were made on 27 Jun (47 DSV), 17 Jul (33 DSV), 11 Aug (33 DSV), 27 Aug (34 DSV), and 12 Sep (38 DSV). Calendar applications (14-day) were made on 27 Jun, 11 Jul, 25 Jul, 8 Aug, 22 Aug, and 5 Sep. Product rates are per acre.
[y] Inspire EC (difenoconazole), Headline EC (pyraclostrobin), Senator WP (thiophanate-methyl), Parasol WG (copper hydroxide), Manzate Pro-Stick DF (mancozeb), Bravo ZN (chlorothalonil), Luna Tranquility (fluopyram + pyrimethanil), Serenade Max (*Bacillus subtilis* QST 713), Taegro (*Bacillus subtilis* var. *amyloliquefaciens* FZB24), 496/A + 497/B (unknown).
[x] AUDPC = area under the disease progress curve. A lower number is better. Symptoms were first observed on July 18 but disease progressed slowly during the growing season.
[w] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's HSD. Numbers in bold are different from the control in the same column.

Comments: Inspire, Parasol WG, and Bravo ZN using the 14-day and BEETcast™ interval, and the 14-day Manzate Pro-Stick program reduced CLS severity compared to the nontreated control. RWSA and sugar (%) was higher in the Inspire EC programs and the 14-day Manzate Pro-Stick DF program and the Inspire EC programs, the 14-day Manzate Pro-Stick DF program, and both Bravo ZN programs than the nontreated control.

Acknowledgements: This research was supported by the Ontario Sugarbeet Growers' Association, the Michigan Sugar Company, and the Ontario Ministry of Agriculture and Food.

This project is funded in part through the Ontario Farm Innovation Program (OFIP). OFIP is funded through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Evaluation of Products for Management of Cercospora Leafspot of Sugarbeet in Commercial Sugarbeet Field

Pain Court, Ontario, Canada - 2014

Sherri Tedford, University of Guelph, Ridgetown Campus; Rishi Burlakoti, Weather INnovations Inc; Cheryl Trueman, University of Guelph, Ridgetown Campus

Trial Quality:	Good	**Variety:**	RR059
Planted:	April 17 & 18	**Location:**	Pain Court, Ontario, Canada
Harvested:	October 14	**Application Method:**	hand-held boom, CO_2 pressure
Plot Size:	2 rows x 23 feet	**Application Water Volume:**	12.1 or 24.7 gal/A
Row Spacing:	2.5 feet	**Reps:**	4
Seeding Rate:	7.6 seeds/foot		

Treatment (# fungicide applications) [z, y]	Application water volume (gal/A)	AUDPC [x]	CJP	Sugar (%)	RWST	Beets (T/ac)	RWSA
Untreated control (0)	None	284 a[w]	95.9 a	19.1 a	289 a	56.7 a	16389 a
Calendar (7)	12.1	**4 b**	95.8 a	19.1 a	288 a	59.1 a	17007 a
Calendar (7)	24.7	**5 b**	95.9 a	19.5 a	295 a	55.7 a	16433 a
BEETcast™ 50/35 (4)	12.1	**59 b**	96.0 a	19.8 a	301 a	56.5 a	17011 a
BEETcast™ 50/35 (4)	24.7	**33 b**	96.1 a	19.6 a	299 a	57.4 a	17110 a
BEETcast™ 55/50 (3)	12.1	**14 b**	96.1 a	19.4 a	295 a	56.7 a	16644 a
BEETcast™ 55/50 (3)	24.7	**57 b**	95.6 a	19.5 a	294 a	55.2 a	16093 a

[z] Fungicide applications were made on 23 June, 15 Jul, 6 Aug, 26 Aug for program 50/35 and actual DSVs were 52/37/34/34; on 25 June, 29 July, and 27 Aug for program 55/50 and actual DSVs were 58/51/50; and 25 June, 8 Jul, 18 Jul, 1 Aug, 14 Aug, 21 Aug, and 1 Sept for the calendar program with the first application at 58 DSVs. [y] The fungicide program was Proline EC (prothioconazole) at 0.16 qt/A + Manzate Pro-Stick DF (mancozeb) at 2.00 lb/A, followed by Manzate Pro-Stick DF, followed by Proline EC + Manzate Pro-Stick, with all subsequent applications Manzate Pro-Stick. [x] Area under the disease progress curve (AUDPC) represents total disease accumulation over the season. A lower number is better. [w] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's adjustment. Numbers in bold are different from the control in the same column.

Comments: Disease incidence in the trial was very low and CLS symptoms were not detected until Sept 10. All the spray program schedules reduced disease levels. The number of fungicide applications was lower in treatments with the BEETcast™ 50/35 program (4 sprays) and BEETcast™ 55/50 program (3 sprays) compared to Calendar spray programs (7 sprays). There was no difference in disease severity among spray programs applied using different water volumes.

Acknowledgements: This research was supported by the Ontario Sugarbeet Growers' Association, the Michigan Sugar Company, and the Ontario Ministry of Agriculture and Food.

This project is funded in part through the Ontario Farm Innovation Program (OFIP). OFIP is funded through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Evaluation of Fungicide Programs and Application Water Volume for Management of Cercospora Leafspot of Sugarbeet

Ridgetown, Ontario, Canada - 2014

Sherri Tedford, University of Guelph, Ridgetown Campus; Rishi Burlakoti, Weather INnovations Inc; Cheryl Trueman, University of Guelph, Ridgetown Campus

Trial Quality: Good
Planted: May 12
Harvested: October 21
Plot Size: 2 rows x 23 feet
Row Spacing: 2.5 feet
Seeding Rate: 7.6 seeds/foot

Variety: RR074NT
Location: Ridgetown, Ontario, Canada
Application Method: hand-held boom, CO_2 pressure
Application Water Volume: 12.1 or 24.7 gal/A
Reps: 4

Treatment (# fungicide applications) [z, y]	Application water volume (gal/A)	DSV Start Date	AUDPC [x]	CJP	Sugar (%)	RWST	Beets (T/ac)	RWSA
Untreated control	Untreated	Untreated	154 a[w]	94.8 a	16.6 a	244 a	33.0 a	8200 a
Calendar (7)	12.1	May 1	**26 c**	95.7 a	17.5 a	262 a	36.2 a	9481 a
Calendar (7)	24.7	May 1	**22 c**	95.6 a	17.1 a	254 a	36.8 a	9369 a
Calendar (7)	12.1	May 22	**19 c**	94.7 a	17.0 a	249 a	39.9 a	9935 a
Calendar (7)	24.7	May 22	**25 c**	95.3 a	16.9 a	250 a	39.9 a	10026 a
BEETcast™ 50/35 (5)	12.1	May 1	36 abc	94.7 a	17.0 a	249 a	36.0 a	8931 a
BEETcast™ 50/35 (5)	24.7	May 1	**33 bc**	95.3 a	17.7 a	263 a	35.9 a	9458 a
BEETcast™ 50/35 (4)	12.1	May 22	**32 bc**	95.0 a	16.9 a	249 a	37.2 a	9246 a
BEETcast™ 50/35 (4)	24.7	May 22	41 abc	94.6 a	16.3 a	238 a	37.0 a	8835 a
BEETcast™ 55/50 (3)	12.1	May 1	81 abc	95.2 a	17.0 a	251 a	42.0 a	10534 a
BEETcast™ 55/50 (3)	24.7	May 1	54 abc	95.3 a	16.8 a	248 a	37.0 a	9201 a
BEETcast™ 55/50 (3)	12.1	May 22	133 ab	95.2 a	16.7 a	247 a	38.9 a	9640 a
BEETcast™ 55/50 (3)	24.7	May 22	81 abc	95.0 a	16.8 a	247 a	35.5 a	8859 a

[z] Fungicide applications were made on 27 June, 17 Jul, 11, 27 Aug, and 12 Sept for program 50/35 (May 1 DSV accumulation) and actual DSVs were 47/33/33/34/38; 4, 25 July, 21 Aug, and 4 Sept for program 50/35 (May 22 DSV accumulation) and actual DSVs were 50/33/38/36; on 2 Jul, 6 Aug, and 3 Sept for program 55/50 (May 1 DSV accumulation) and actual DSVs were 57/50/56;on 9 Jul, 8 Aug, and 4 Sept for program 55/50 (May 22 DSV accumulation) and actual DSVs were 56/47/57; on 2, 15, 25 July, 8, 18, 28 Aug, and 8 Sept for calendar program (first application 59 DSVs); and 9, 24 July, 1, 15, 25 Aug, 4, and 15 Sept (first application 58 DSVs). [y] The fungicide program was Proline EC (prothioconazole) at 0.16 qt/A + Manzate Pro-Stick DF (mancozeb) at 2.00 lb/A, followed by Manzate Pro-Stick DF, followed by Proline EC + Manzate Pro-Stick, with all subsequent applications Manzate Pro-Stick. [x] Area under the disease progress curve (AUDPC) represents total disease accumulation over the season. A lower number is better. [w] Numbers in a column followed by the same letter are not significantly different at $P \leq 0.05$, Tukey's adjustment. Numbers in bold are different from the control in the same column.

Comments: CLS was detected on July 16 and disease severity was moderate. Both the Calendar and BEETcast™ 50/35 programs reduced disease levels. The number of fungicide applications was lower in treatments with the BEETcast™ 50/35 program (4-5 sprays) compared to Calendar spray programs (7 sprays). There was no difference in the disease severity for the spray programs applied with different water volumes or different DSV accumulation start dates.

Acknowledgements: This research was supported by the Ontario Sugarbeet Growers' Association, the Michigan Sugar Company, and the Ontario Ministry of Agriculture and Food.

This project is funded in part through the Ontario Farm Innovation Program (OFIP). OFIP is funded through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Spore Activity of *Cercospora Beticola*, Causal Agent of Cercospora Leafspot of Sugarbeet, in a Commercial Sugarbeet Field

Pain Court, Ontario, Canada - 2014

Sherri Tedford, University of Guelph, Ridgetown Campus; Rishi Burlakoti, Weather INnovations Inc; Cheryl Trueman, University of Guelph, Ridgetown Campus

Trial Quality:	Good	**Variety:**	C-RR059
Planted:	April 17 & 18	**Location:**	Pain Court, Ontario, Canada

Method: A Burkard 7-day volumetric spore trap was set up on April 23. A weather station operated by Weather INnovations (WIN) at the site monitored relative humidity, air temperature, leaf wetness, and rainfall. The spore trap suctions pathogen spores from the air and deposits them on a piece of sticky tape where they can be counted. Due to spore trap malfunctionsspore counts are not available May 1-9. The commercial field and adjacent fungicide trial were scouted weekly for symptoms of Cercospora leafspot and symptoms were first confirmed on September 10.

Results Summary:

- In the early part of the season spore counts were very low.
- Disease symptoms were first observed on Sept 10 approximately 1 month after the first spore peak in early Aug. The spore pressure remained high at this site from Aug 16-Sept 11.
- Multi-year (2013-2015) comparisons among weather variables, disease progress, and spore count data will be performed at the end of 2015, which will help to further optimize BEETcast™ and CLS management.

Figure 1. Spore counts and Cercospora leaf spot disease severity, Pain Court, ON.

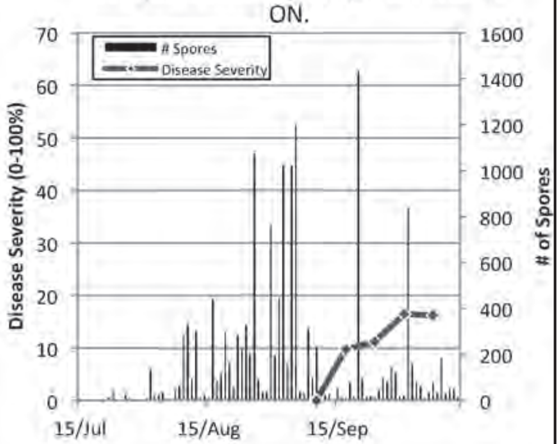
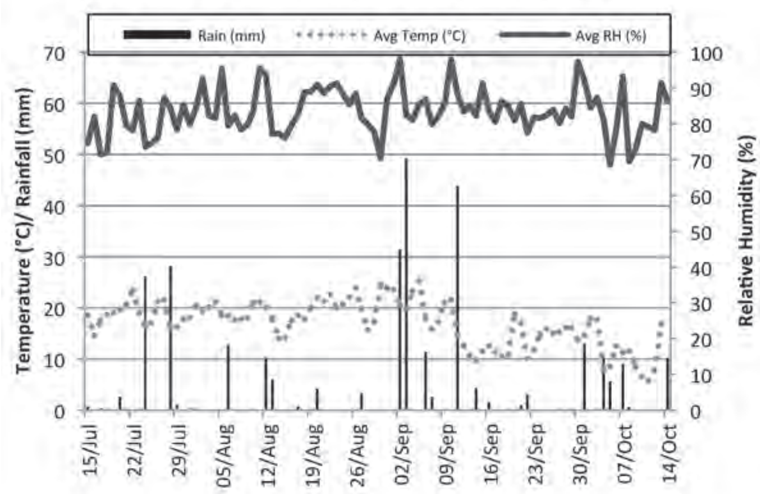


Figure 2. Weather conditions, Ridgetown, ON.



Acknowledgements: This research was supported by the Ontario Sugarbeet Growers' Association, the Michigan Sugar Company, and the Ontario Ministry of Agriculture and Food.

This project is funded in part through the Ontario Farm Innovation Program (OFIP). OFIP is funded through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Spore Activity of Cercospora Beticola, Causal Agent of Cercospora Leafspot of Sugarbeet

Ridgetown, Ontario, Canada - 2014

Sherri Tedford, University of Guelph, Ridgetown Campus; Rishi Burlakoti, Weather INnovations Inc; Cheryl Trueman, University of Guelph, Ridgetown Campus

Trial Quality: Good **Variety:** C-RR059
Planted: May 12 **Location:** Ridgetown, Ontario, Canada

Method: A Burkard 7-day volumetric spore trap was set up on April 23. A weather station operated by Weather INnovations (WIN) at the site monitored relative humidity, air temperature, and rainfall. The spore trap suctions pathogen spores from the air and deposits them on a piece of sticky tape where they can be counted. The field and adjacent fungicide trial were scouted weekly for symptoms of Cercospora leafspot and symptoms were first confirmed on July 16.

Results Summary:

- In the early part of the season spore counts were very low.
- Disease symptoms were first observed on July 16 approximately a week before the first spore peak on July 22-23. Daily spore counts remained lower than 20 spores until Aug 1, with the exception of July 22 and 23 when the spore count peaked at 51 and 78, respectively.
- Multi-year (2013-2015) comparisons among weather variables, disease progress, and spore count data will be performed at the end of 2015, which will help to further optimize BEETcast™ and CLS management.

Figure 1. Spore counts and Cercopora leafspot disease severity, Ridgetown, ON.

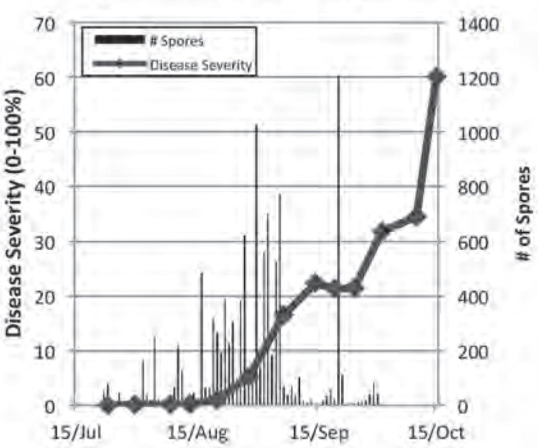
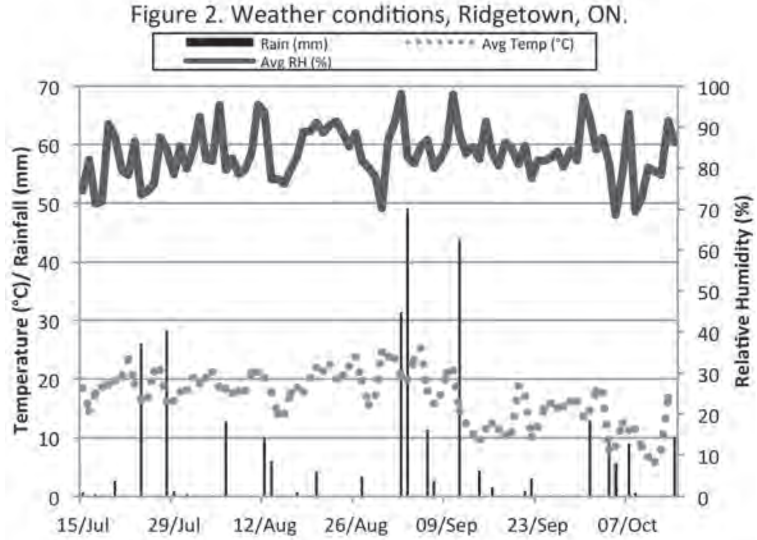


Figure 2. Weather conditions, Ridgetown, ON.



Acknowledgements: This research was supported by the Ontario Sugarbeet Growers' Association, the Michigan Sugar Company, and the Ontario Ministry of Agriculture and Food.

This project is funded in part through the Ontario Farm Innovation Program (OFIP). OFIP is funded through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Rapid Methods for Detecting *Cercospora beticola* Resistance to Fungicides Using Molecular Screening

Jiang, Q.W., L.E. Hanson, W.W. Kirk, N. Rosenzweig, and P. Somohano

Cercospora leafspot is becoming more of a challenge for Michigan sugarbeet growers because Cercospora has developed resistance to strobilurin (Headline and Gem) and benzimidazole (Topsin M) fungicides in much of our growing region. There are indications that other classes of fungicides utilized by Michigan sugarbeet growers are also at risk. Resistance management programs will be essential in managing Cercospora in the future. A key component of resistance management is monitoring fungicide resistance levels and types.

Two new "rapid" and accurate methods for determining if *Cercospora* is developing resistance to pesticides have been developed by USDA and field tested in collaboration with Michigan State University. The high tech methods can determine the exact molecular site in the mitochondria or chromosome where mutations have occurred. From prior knowledge scientists then know the type of resistance that has developed.

Sugarbeet leaf samples were collected by Michigan Sugar Company agriculturalists throughout the growing region. Individual spots were cut out with hole punches for DNA extraction and analysis using gel electrophoresis (see Figures 1 and 2). The samples were analyzed for strobilurin and benzimidazole resistance. In 2012, 99 composite samples (7 leaf discs combined per sample) were screened, making a total of 693 leaf spots tested. In 2013, pure cultures were obtained and sampled, with a total of 95 samples tested for strobilurins and 98 for benzimidazoles. In 2014, 212 composite leaf disk samples were tested for strobilurins and 91 for benzimidaozles.

Figure1. Example of Fnu4HI PCR-RFLP restriction pattern of the cytochrome *b* gene from symptomatic leaf disc samples containing strobilurin-resistant (R) or sensitive (S) *Cercospora beticola.*

Rapid Methods for Detecting *Cercospora beticola* Resistance to Fungicides Using Molecular Screening

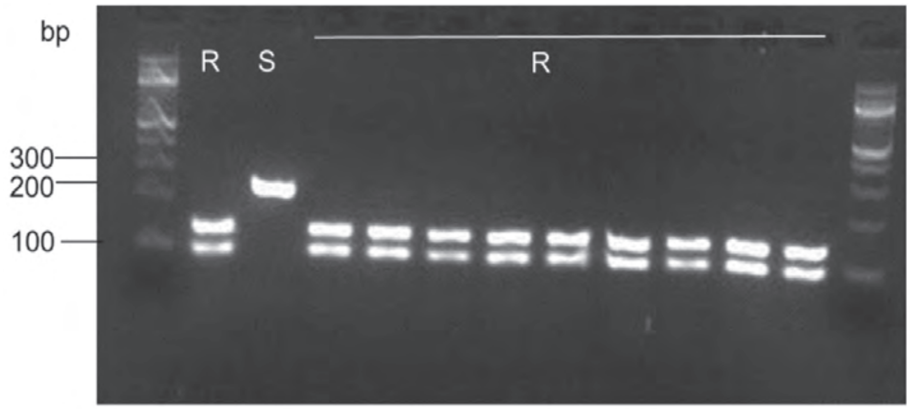


Figure 2. Example of BstuI PCR-RFLP restriction patterns of the β-tubulin gene from symptomatic leaf disc samples containing benzimidazole-resistant (R) or sensitive (S) *Cercospora beticola.*

Results showed that *Cercospora* with resistance to strobilurins and benzimidazole is widespread in the Michigan growing region. In 2012 and 2013 nearly 90 percent of the *Cercospora* samples tested contained the strobilurin resistance mutation (*Cercospora* resistant to fungicide). In 2014, almost 99 percent of the strobilurin samples contained the resistant mutation. The samples also had high levels benzimidazole resistance, with 95% of the samples resistant in 2013 and 71% of the samples in 2014. This is higher than had been found in the area between 2002 and 2011, during which time benzimidazole resistance was in the range of 40-50% of samples. Composite leaf disk samples can produce results in 48 hours after leaf samples are received in comparison to the 10-14 or more days required for methods using pure cultures. In addition, because of the simple method and screening composite samples, a larger number of fungi can be tested to provide a better picture of what is happening with fungicide resistance in the area.

For more detailed information about the testing, please see Rosenzweig, N., L.E. Hanson, G. Clark, G.D. Franc, W.L. Stump, Q.W. Jiang, J. Stewart, and W.W. Kirk. 2015. Use of PCR-RFLP analysis to monitor fungicide resistance in *Cercospora beticola* populations from sugarbeet (*Beta vulgaris*) in Michigan, United States. Plant Disease. [http://dx.doi.org/10.1094/PDIS-03-14-0241-RE.

Beta PIs from the USDA-ARS NPGS Evaluated for Resistance to *Cercospora beticola*, 2014

L.E. Hanson, T.R. Goodwill, and J.M. McGrath
USDA-ARS, Sugarbeet and Bean Research Unit, East Lansing, MI 48824-1325

Thirty Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) *Beta* Collection [includes garden beet, sugarbeet, leaf beet, fodder beet (*Beta vulgaris* L.), and wild beet (*Beta* spp.)] were evaluated for resistance to *Cercospora beticola* in an artificially produced epiphytotic environment (based on Ruppel, E.G. and J.O. Gaskill. 1971. J. Am. Soc. Sugar Beet Technol. 16:384). A randomized complete-block design, with three replications was used to evaluate germplasm at the Michigan State University Saginaw Valley Research and Extension Center (SVREC) near Frankenmuth, MI. The field had been planted in wheat with clover underseeded in 2013. Internal controls included a susceptible check, 12N0050 (kindly provided by L. Campbell), and a resistant check, EL50/2 (PI 664912). Single-row plots 4.5 m long, with 51 cm between rows were planted on 5 May 14. Moncut (N-[3-(1-methylethoxy)phenyl]-2-(trifluoromethyl) benzamide) was applied in a 14 cm band in-furrow at planting to control Rhizoctonia damping-off and crown and root rot. The nursery was inoculated on 10 Jul with a liquid spore suspension (approximately 1 x 10^3 spores/ml as determined with a hemacytometer) of *C. beticola*. Inoculum was produced from a mixture of leaves collected from the 2013 inoculated leaf spot nursery at SVREC and naturally infected beets grown on the Michigan State University campus farms in East Lansing, MI. Visual evaluations of the plot with a disease index (DI) on a scale from 0-10 where 0=no symptoms, 1=a few scattered spots, 2=spots coalescing or in large numbers on lower leaves only, 3= some dieback on lower leaves, but leaves not entirely dead, 4-8 are increasing amounts of dead and diseased tissue, 9= mostly dead with few remaining living leaves with large dead patches, and 10=all leaves dead. Evaluations were made on 14, 21, and 28 Aug, and 3 and 14 Sep, with the peak of the epidemic occurring around 3 Sep. An evaluation was attempted subsequently, but several PIs were losing leaves following production of seed stalks and others were showing new leaf growth following defoliation from Cercospora leaf spot, so these ratings were not used. The field was sprayed once with ethofumesate on May, three times with mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid (May, Jun and Jul 14), once with S-metolachlor (Jun 14) to control weed seedlings, and hand weeding was done as needed to control larger weeds. The beet crop was thinned by hand with the generous help of Michigan Sugar Cooperative. Bolting beets were removed throughout the season.

The moderate night temperatures in the summer of 2014, combined with high humidity and low rainfall, contributed to a moderate leaf spot epiphytotic. Supplemental moisture was applied using an overhead irrigation system 11, 14 and 16 Jul. The BeetCast leafspot advisory in the Frankenmuth area from 1 May to 20 Sep accumulated 208 daily severity values. Disease severity peaked by early Sep, after which regrowth started to outpace new disease development, so that disease ratings for several accessions remained constant or decreased after that rating, thus ratings are not given after this date. At the 3 Sep 14 rating, means of the resistant and susceptible internal controls for the entire nursery (including two additional experiments) were 2.4 and 5.8, respectively, across the nursery. At the peak of the epiphytotic in 2013 (12 Sep), these means were 3.1 and 5.2 for resistant and a moderately susceptible variety (CE, kindly provided by Syngenta seeds), respectively. Means of contributor lines in the entire nursery (including three additional tests) in 2014 ranged from 2.0 to 7.0. An analysis of variance (PROC GLM - SAS) on the disease indices (visual evaluation scores) determined that there were significant differences among entries ($p<0.05$) on all dates of evaluation.

Beta PIs from the USDA-ARS NPGS Evaluated for Resistance to Cercospora Beticola, 2014

L.E. Hanson, T.R. Goodwill, and J.M. McGrath
USDA-ARS, Sugarbeet and Bean Research Unit, East Lansing, MI 48824-1325

One accession, PI 604522, was not significantly different from the resistant control at any of the rating dates. Five additional accessions (PI504242, PI518298, PI540610, PI590767, and PI 599351) were not significantly different from the resistant control at three of the four rating dates but had higher ratings higher at the peak of the epidemic. Only five accessions (NSL141985, PI590616, PI590767, PI614828, and PI604521) did NOT require removal of seed stalks from at least one replicate during the season. These data, and more information on the accessions evaluated, are available through the USDA-ARS GRIN database at http://www.ars-grin.gov/npgs.

Identification				Average Disease Index[z]			
Entry	Donor's ID	subsp.	Origin	14 Aug	21 Aug	28 Aug	3 Sep
Ames 4265	IDBBNR 5652	*maritima*	Turkey	2.0	2.7	3.7	4.3
NSL 141985	JANASZ	*vulgaris*	United States	2.7	4.0	4.7	5.0
PI 504242	Wild beet	*maritima*	Italy	1.7	2.7	3.0	3.7
PI 504274	Wild beet	*maritima*	France	2.3	3.3	4.0	4.3
PI 518298	IDBBNR 5792	*maritima*	United Kingdom	2.0	3.0	3.0	4.0
PI 590614	DESPREZ Z	*vulgaris*	France, Nord	3.0	4.0	4.0	4.3
PI 590616	ELITE DESPREZ TYPE R	*vulgaris*	France, Nord	3.0	3.7	4.3	5.0
PI 540610	WB 864	*maritima*	France	1.7	2.7	3.0	3.7
PI 540684	WB 938	*maritima*	Denmark	2.3	3.3	3.7	4.3
PI 590767	FC606(4X)	*vulgaris*	United States	1.0	2.3	3.3	4.0
PI 546381	IDBBNR 5659	*maritima*	Spain	2.3	3.0	3.7	4.3
PI 614828	AT3994-4	*vulgaris*	United States	3.0[w]	4.5	5.0	6.0
PI 562590	IDBBNR 9741	*maritima*	Egypt, Matruh	2.7	4.0	nd	nd
PI 562603	IDBBNR 9752	*maritima*	Egypt, Matruh	3.0[w]	3.5	4.5	4.5
PI 599351	R423B	*maritima*	United States	1.3	2.3	3.0	3.7
PI 604510	IBBNR 2218	*maritima*	Italy, Sicily	2.7	3.7	4.0	4.0
PI 604511	IDBBNR 2649	*maritima*	France, Nord	2.0	3.0	3.7	4.0
PI 604512	IDBBNR 2670	*maritima*	Greece, Peloponnese	2.7	3.7	4.0	4.7
PI 604513	IDBBNR 3054	*maritima*	Greece	2.0	3.0	4.0	4.0
PI 604514	IDBBNR 3092	*maritima*	Greece, Peloponnese	2.3	3.3	4.3	4.3
PI 604515	IDBBNR 3294	*maritima*	Greece, Peloponnese	2.7	3.7	4.0	4.0
PI 604516	Seskla	*maritima*	Greece	1.0	2.5	3.5	4.0
PI 604517	IDBBNR 3350	*maritima*	Greece	2.7	4.0	5.0	5.0
PI 604518	IDBBNR 3356	*maritima*	Greece	2.0	3.0	3.7	4.3
PI 604519	IDBBNR 3390	*maritima*	Italy, Sicily	2.3	3.3	4.0	4.3
PI 604520	IDBBNR 3628	*maritima*	Spain, Alicante	2.7	3.5	4.5	5.0
PI 604521	IDBBNR 3705	*maritima*	Germany	2.3	3.7	4.3	5.0
PI 604522	IDBBNR 3739	*maritima*	Greece	1.3	2.3	3.0	3.3
PI 604523	IDBBNR 3742	*maritima*	Greece	2.0	3.7	4.3	4.7
PI 604524	IDBBNR 3851	*maritima*	Portugal, Lisboa	2.0	3.3	3.7	4.0
Leaf Spot Susceptible Check[y]	(12N0050)		USA	3.5	4.5	5.0	6.0
Leaf Spot Resistant Check[x]	(EL50/2)		USA	1.3	1.8	2.3	2.5
		$LSD_{0.05}$		1.24	1.06	1.01	0.98
Trial Mean				2.2	3.2	3.8	4.3

[z]Disease Index is based on a scale where 0=healthy to 10=all leaves dead. Each number is an average of three plots except as noted below.
[y]The Leafspot Susceptible Check, is kindly provided by Larry Campbell.
[z]The Leafspot Resistant Check is EL50/2 (PI 664912).
[w]Numbers based on average from two plots as insufficient leaf tissue remained of one of the replicates after seed stalks were removed to rate.
nd - ratings were not made because of insufficient leaf tissue

Seed Treatment Research - 2014
Michigan Sugar Company

Summary

Michigan Sugar Company Research evaluates seed treatments every year for seed companies, seed processors and chemical companies. Most of these trials are conducted with an agreement that the information will not be released unless or until the company agrees to. We are conflicted about doing research and not releasing information to our growers, but the results have been positive. Kabina, Metlock, Rizolex (all for Rhizoctonia) and Clariva for sugarbeet cyst nematode control are recent examples of products tested “confidentially” at Michigan Sugar which have become useful products for our Cooperative. We are currently testing seed treatments for seedling disease control (primarily Rhizoctonia Solani) and for improving emergence and early plant growth. These experimental seed treatments show promise for increasing sugarbeet yields and quality. In addition, we cooperate with Michigan State University researchers who do not have the staff and equipment (i.e. George Bird), helping them to conduct seed treatment research that they could not do without our help.

Clariva™ pn Nematode Seed Treatment

Meylan Farms Inc., Auburn - 2014

Trial Quality: Excellent
Variety: See Treatments
Planted: April 23
Harv/Samp: Oct 26 / Oct 7
Plot Size: 4 reps
Row Spacing: 22 inch
Seeding Rate: 62,000

Soil Info: Loam
Fertilizer: PPI: 40 gal of 28%; 2x2: 17 gal. 19-17-0 w/ 1 qt Mn & 1 qt B
Prev Crop: Pickles w/ Cover Crop
Weather: Good

Rhizoc Control: Exc. Control: Quadris I.F. & 6-8 Leaf
Cerc Control: Good Control: 1. Inspire XT, 2. Headline + Ballad, 3. Eminent
Other Pests: Sugarbeet Cyst nematode

Treatment	RWSA	RWST	T/A	% Sugar	% CJP	Stand 100 Ft. 36 Day	Nematodes - 100 cc of Soil		
							Cysts	Eggs	Eggs + Juv's
HM-173RR Clariva	**10437**	**305**	**34.2**	**19.9**	**96.5**	**196**	**11**	**730**	**871**
HM-173RR	**10202**	**302**	**33.8**	**19.6**	**96.6**	**203**	**17**	**1450**	**1660**
LSD 5%	ns (674)	ns (9)	ns (3.5)	ns (0.5)	ns (0.5)	ns (19)	ns (12)	ns (1040)	ns (1094)
CV %	3	1	3.9	1.0	0.2	4	38	42	38
HM-NT425RR Clariva	**10426**	**308**	**33.9**	**20.3**	**96.0**	**184**	**4**	**255**	**293**
HM-NT425RR	**10209**	**309**	**33.0**	**20.2**	**96.3**	**166**	**3**	**218**	**240**
LSD 5%	ns (736)	ns (7)	ns (2.6)	ns (0.4)	ns (0.6)	ns (47)	ns (2)	ns (114)	ns (144)
CV %	3	1	3.5	0.9	0.3	12	27	21	24

Comments: Trial was conducted to evaluate Clariva™ pn nematode seed treatment on the population of sugarbeet cyst nematodes (SBCN) and beet yield/quality. This biological product is marketed by Syngenta as a seed treatment that may reduce nematode populations and/or improve yield. It is not being recommended as a stand-alone product against SBCN. Two sugarbeet varieties were tested: a SBCN tolerant (HM-NT425RR) and a susceptible (HM-173RR). Seed was treated with or without Clariva from the same seed lot. SBCN samples were taken just before harvest in 100 foot of row in each of the 4 replications. No visual differences between treatments were noted in summer observations. SBCN tolerant variety had less nematode reproduction than susceptible type. The Clariva appeared to reduce the nematode population on the susceptible variety. A slight yield enhancement occurred on both varieties but not at a significant level. More testing is needed with this product to further evaluate effect.

Bold: Results are not statistically different from top ranking variety in each column.

Metlock & Kabina Seed Treatments

Spartan Acres (Knoerr), Auburn - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: May 10
Harv/Samp: Oct 24 / Oct 7
Plot Size: 4 reps
Row Spacing: 20 inch
Seeding Rate: 65,000

Soil Info: Loam
Fertilizer: 2x2: 36-32-0 + S & micros; Total N=160#
Prev Crop: Wheat / Radish
Weather: Excellent weather

Rhizoc Control: Exc. Control: See Treatments plus 6-8 on all
Cerc Control: Exc. Control: 1. Inspire, 2. Headline + EBDC, 3. Eminent + EBDC, 4. EBDC alone
Other Pests: None

Variety: SX-1212RR

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							9 Day	19 Day	
Kabina	$1,940	**10668**	**284**	**37.6**	**18.5**	**96.8**	**51**	**177**	**10**
Metlock + Kabina	$1,919	**10558**	**283**	**37.3**	**18.3**	**97.0**	**34**	**180**	**12**
Check & Quadris I.F.	$1,909	**10500**	**280**	**37.5**	**18.2**	**96.9**	**23**	**170**	**0**
Check	$1,870	**10289**	**277**	**37.1**	**18.1**	**96.8**	**47**	**186**	**13**
Kabina & Quadris I.F.	$1,859	**10225**	**276**	**37.0**	**18.0**	**96.8**	**36**	**176**	**1**
Metlock + Kabina & Quadris I.F.	$1,803	**9918**	**277**	**35.8**	**18.0**	**96.8**	**24**	**169**	**2**
Average	$1,883	10360	279	37.1	18.2	96.9	36	176	6
LSD 5%	—	ns (624)	ns (8)	ns (1.8)	ns (0.5)	ns (0.4)	ns (26)	ns (20)	ns (13)
CV %	—	4	2	3.3	1.8	0.3	49	8	131

Comments: Trial was conducted to look at the effects of new seed treatments Kabina ST™ and Metlock®/Rizolex alone and in combinations with Quadris applied T-band in furrow. Both of these seed treatments are used for control of seedling Rhizoctonia. The Kabina rate for the treatments with Kabina alone was 12 grams. The rate of Kabina when it was used with Metlock/Rizolex was 7 grams. All treatments were applied in conjunction with standard seed treatments (Metalaxyl-Thiram-TACH 20). No significant differences were seen between any treatments in seedling disease control or yield (very little disease present). Metlock treatments for a short period looked slightly delayed (held back at emergence) to other treatments. Though disease levels were very low, all Quadris in furrow treatments had less late season Rhizoctonia than seed treatment alone or check alone treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Kabina ST™ Seed Treatments
Spartan Acres (Knoerr), Auburn - 2014

Trial Quality: Good
Variety: C-RR059
Planted: May 10
Harv/Samp: Oct 24 / Oct 7
Plot Size: 4 reps
Row Spacing: 20 inch
Seeding Rate: 65,000

Soil Info: Loam
Fertilizer: 2x2: 36-32-0 + S & micros; Total N=160#
Prev Crop: Wheat / Radish
Weather: Excellent weather

Rhizoc Control: Exc. Control: See treatments plus 6-8 on all
Cerc Control: Exc. Control: 1. Inspire, 2. Headline + EBDC, 3. Eminent + EBDC, 4. EBDC alone
Other Pests: None

Variety: C-RR059

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							9 Day	19 Day	
Kabina	$1,938	**10657**	**286**	**37.2**	**18.7**	**96.6**	**57**	**191**	**1**
Check & Quadris I.F.	$1,914	**10528**	**288**	**36.6**	**18.8**	**96.7**	**48**	189	**0**
Kabina & Quadris I.F.	$1,907	**10481**	**285**	**36.8**	**18.6**	**96.7**	**34**	181	**0**
Check	$1,905	**10480**	**288**	**36.3**	**18.8**	**96.7**	**60**	**200**	**6**
Average	$1,916	10536	287	36.7	18.7	96.7	50	190	2
LSD 5%	—	ns (622)	ns (7)	ns (2.1)	ns (0.4)	ns (0.4)	ns (25)	10	ns (6)
CV %	—	4	2	3.5	1.5	0.2	31	3	216

Comments: Trial was conducted to look at the effects of the new seed treatment Kabina ST™ alone and in combinations with Quadris applied T-band in furrow. Kabina is used for control of seedling Rhizoctonia. All treatments were applied in conjunction with standard seed treatments including TACH 20. No significant differences were seen between treatments for yield or seedling disease control (very little disease present). Quadris in furrow application did slightly lower final stand counts. Even though disease levels were very low, Quadris in furrow treatments had slightly less late season Rhizoctonia than no in-furrow treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Kabina ST™ Seed Treatments
English Farms, Breckenridge - 2014

Trial Quality: Poor / Fair
Variety: C-RR059
Planted: May 26
Harv/Samp: Nov 5 / Oct 8
Plot Size: 4 reps
Row Spacing: 30 inch
Seeding Rate: 60,000

Soil Info: Loam
Fertilizer: Fall: 9000 gal. dairy manure; 2x2: 19 gal 28% w/ 1 pt B
Prev Crop: Corn / Rye
Weather: Heavy early season rain causing damage

Rhizoc Control: See treatments plus 6-8 leaf on all
Cerc Control: Good Control: 1. Eminent, 2. Tin + EBDC
Other Pests: None

Variety: C-RR059

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							8 Day	25 Day	
Check	$1,132	**6228**	**277**	**22.5**	**18.5**	**95.5**	60	**142**	**30**
Kabina & Quadris I.F.	$1,114	**6133**	**274**	**22.4**	**18.4**	**95.2**	**90**	**145**	**6**
Check & Quadris I.F.	$1,104	**6090**	**277**	**21.9**	**18.5**	**95.6**	**74**	**157**	**9**
Kabina	$1,106	**6083**	**275**	**22.1**	**18.4**	**95.4**	55	124	**43**
Average	$1,114	6134	276	22.2	18.4	95.4	70	142	22
LSD 5%	—	ns (866)	ns (13)	ns (2.8)	ns (0.7)	ns (0.6)	29	27	ns (38)
CV %	—	9	3	7.9	2.2	0.4	26	12	109

Comments: Trial was conducted to look at the efficacy of Kabina ST™ seed treatment on Rhizoctonia seedling disease. Kabina was applied in addition to standard seed treatment plus TACH 20. Also Quadris was applied in a T-band in furrow with and without Kabina seed treatment to compare season long control of Rhizoctonia. Heavy rainfall occurred after emergence that did stunt beet growth. All treatments received a Quadris foliar application at the 6-8 leaf stage. No significant difference was seen in seedling disease, yield and quality. The yield results seem out of order from what would be expected from the emergence and Rhizoctonia counts. This is likely due to trial variation from eratic emergence and water damage. No detrimental impact seen on emergence when Quadris is used in conjunction with Kabina. Quadris in-furrow did have a positive impact on both the 8 day and 25 day stand counts. Long term Rhizoctonia control was better when Quadris was used in furrow.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Kabina ST™ Seed Treatment
Stoneman Farms, Breckenridge - 2014

Trial Quality: Good
Variety: C-RR059
Planted: April 24
Harv/Samp: Sept 24 / Sept 22
Plot Size: 5 reps
Row Spacing: 30 inch
Seeding Rate: 53,000

Soil Info: Loam
Fertilizer: 2x2: 17 gal. of 18-13-0 w/ Mn & B; Fall: Manure; Total N=160#
Prev Crop: Pickles / Radish
Weather: Good weather

Rhizoc Control: Excellent Control: Quadris I.F.
Cerc Control: Fair Control: 1. Inspire, 2. Super Tin
Other Pests: None

Variety: C-RR059

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							10 Day	30 Day	
Kabina & Quadris I.F.	$1,718	**9443**	**279**	**33.9**	**18.5**	**95.9**	—	**250**	**0**
Check & Quadris I.F.	$1,704	**9372**	**278**	**33.8**	**18.4**	**96.1**	—	**252**	**2**
Average	$1,711	9408	278	33.8	18.4	96.0	—	251	1
LSD 5%	—	ns (754)	ns (6)	ns (2.3)	ns (0.4)	ns (0.1)	—	ns (12)	ns (4)
CV %	—	5	1	3.9	1.1	0.1	—	3	238

Comments: Trial was established to look at the effect of Kabina ST™ seed treatment compared to standard seed treatment (both treatments had TACH 20). Kabina is used for control of seedling Rhizoctonia. Quadris was applied to all treatments in a 3 ½ to 4 inch T-band at a rate of 7 oz/acre. Emergence, yield and quality were identical between seed treatments. Field trial had almost no seedling disease or late season Rhizoctonia present.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Quick Roots™ Inoculant
Stoneman Farms, Merrill - 2014

Trial Quality: Excellent
Variety: C-RR288
Planted: April 27
Harv/Samp: Oct 22 / Oct 8
Plot Size: 4 reps
Row Spacing: 30 inch
Seeding Rate: 53,000

Soil Info: Sandy Loam
Fertilizer: PPI: 160# K_2O, 200# 37-0-0-8, 2x2: 20 gal of 18-13-0-2 + micros
Prev Crop: Potatoes
Weather: Good

Rhizoc Control: Exc. Control: Quadris In Furrow
Cerc Control: Good Control: 1. Inspire, 2. Inspire, 3. Super Tin
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 30 Day
Quick Roots	$1,839	**10168**	**283**	**35.7**	**18.6**	**96.5**	**221**
Check	$1,759	9657	**279**	**34.6**	**18.3**	**96.6**	**222**
Average	$1,799	9913	281	35.2	18.4	96.5	222
LSD 5%	—	299	ns (5.7)	ns (1.2)	ns (0.3)	ns (0.3)	ns (23)
CV %	—	1	1	1.5	1.0	0.2	6

Comments: Trial was conducted to evaluate Quick Roots™, a product that is used as a microbial seed inoculant at planting time. Recommended application rate is 10 grams per 100,000 seed unit. Product claims to increase plant vigor and improve yields. No visual differences were seen between treatments. However, Quick Roots did show a significant advantage in RWSA and a significant difference in tonnage at the 90% confidence level. Further testing needs to be conducted to confirm results.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Quick Roots™ Inoculant

Schindler Farms LLC, Kawkawlin - 2014

Trial Quality: Fair
Variety: B-12RR2N
Planted: May 23
Harv/Samp: Oct 26 / Oct 14
Plot Size: 2 reps
Row Spacing: 22 inch
Seeding Rate: 63,700

Soil Info: Loam
Fertilizer: 2x2: 20 gal. 21-9-0-4S + micros; PPI: 138#; Fall: 200# K_2O
Prev Crop: Corn
Weather: Good weather, hit by summer hail

Rhizoc Control: Good Control: Quadris I.F. & 6-8 leaf
Cerc Control: Excellent Control: 1. Inspire + EBDC, 2. Headline + EBDC, 3. Eminent + EBDC
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 30 Day
Check	$1,698	**9339**	**291**	**32.1**	**19.1**	**96.2**	**189**
Quick Roots	$1,589	**8745**	**287**	**30.5**	**18.8**	**96.3**	**194**
Average	$1,643	9042	289	31.3	19.0	96.3	192
LSD 5%	—	ns	ns	ns	ns	ns	ns
CV %	—	5	2	2.7	0.9	0.8	3

Comments: Trial was conducted to evaluate Quick Roots™, a product that is used as a microbial seed inoculant at planting time. Recommended application rate is 10 grams per 100,000 seed unit. Product claims to increase plant vigor, root growth and improve yields. No visual differences were seen between treatments. Harvest (tonnage) data is based on only 2 replications and should be used with caution. Several quality samples were taken and showed no significant difference in sugar content.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Evaluate NIMITZ for control of Sugarbeet Cyst Nematode* (BCN) in Sugarbeets

Troy Schuette, Elkton, MI - 2014

Trial Quality: Fair to Good
Variety: SX-1212RR/B-18RR4N
Planted: June 4
Harvested: October 10
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
2.2% OM, 7.3 pH, CEC: 7.7
> Opt: P and K
High Mn, Low B
Added N: Manure + 40 lbs
Prev Crop: Sugarbeets

Rhizoc Control: Good
Cerc Control: Good
Problems: Soil crust affected emergence
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

Application: Plot Sprayer and incorp for PPI; spinner type and incorp for granular, plant 10 days later. Counter applied in-furrow with granular applic on planter.

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP
9	NIMITZ Tolerant Var	5.4 pt	PPI	**$1,415**	**7783**	275	**28.3**	18.4	**95.6**
3	NIMITZ Susc Var	5.4 pt	PPI	**$1,373**	**7554**	**284**	**26.6**	**18.9**	**95.7**
10	UTC Tolerant Var			**$1,358**	**7470**	271	**27.5**	18.1	**95.8**
4	NIMITZ Susc Var	7.2 pt	PPI	**$1,346**	**7405**	**288**	25.7	**19.0**	**96.0**
6	NIMITZ (G) Susc Var	18 lb	PPI	$1,312	7216	273	**26.4**	18.3	95.4
5	NIMITZ (G) Susc Var	12 lb	PPI	$1,311	7209	275	26.2	18.2	**95.9**
2	NIMITZ Susc Var	3.6 pt	PPI	$1,286	7073	**284**	24.9	**18.9**	**95.8**
7	NIMITZ (G) Susc Var	24 lb	PPI	$1,265	6958	268	26.1	17.9	**95.7**
1	UTC Susc Var			$1,250	6875	**280**	24.5	**18.7**	**95.7**
8	Counter Susc Var	8 oz	IF at Planting	$1,213	6670	270	24.7	18.0	**95.6**

	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$1,313	7221	277	26.1	18.4	95.7
LSD 5%	96.6	531.5	9.4	1.9	0.5	0.4
CV %	6.3	6.3	8.0	6.4	2.4	0.4

* Sugarbeet Cyst Nematode, *Heterodera schachtii*, (BCN)

Soil crusting caused an uneven stand, even though eventually ~ 160 beets/100 ft emerged

Note: NIMITZ was also applied in-furrow at planting in a 3.5 inch T-band at 1.5 and 3 pts/A, however, severe phytotoxicity occurred and there were not enough beets for evaluations or yield, those trts. were removed from data

Varieties: Nematode tolerant variety: B 4N, Nematode susceptible variety: SX 1212
B 4N is a slightly higher yielder than SX 1212

NIMITZ (fluensulfone) has a novel mode of action, is systemic, is relatively safe to users (signal word Caution), and is not a fumigant. Registered in vegetable crops in 2014, almost no work has been conducted on BCN. Needs to be applied PPI 7 to 10 days before planting.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate NIMITZ for control of Sugarbeet Cyst Nematode (BCN) in Sugarbeets

Troy Schuette, Elkton, MI - 2014

No	Treatment	Rate/A	Applic	BCN Pre - Count*	Cysts/ Root Aug 14	% Roots Forked Aug 14	Stand B/100' June 23	Vigor 0-10 July 23
9	NIMITZ Tolerant Var	5.4 pt	PPI	133	7.6	32	193	8.7
6	NIMITZ (G) Susc Var	18 lb	PPI	80	8.0	40	183	8.3
10	UTC Tolerant Var			80	9.4	30	169	8.2
2	NIMITZ Susc Var	3.6 pt	PPI	47	9.8	32	189	8.3
7	NIMITZ (G) Susc Var	24 lb	PPI	30	11.7	33	163	7.8
3	NIMITZ Susc Var	5.4 pt	PPI	20	11.7	33	190	8.5
5	NIMITZ (G) Susc Var	12 lb	PPI	113	12.2	31	187	8.4
8	Counter Susc Var	8 oz	IF at Planting	167	12.6	34	149	7.4
4	NIMITZ Susc Var	7.2 pt	PPI	33	12.7	34	185	8.4
1	UTC Susc Var			157	18.5	42	168	7.6
Average				86	11.4	33.8	177.7	8.1
LSD 5%				ns(225.9)	4.7	9.9	19.1	0.4
CV %				225.1	35.6	25.0	9.2	8.1

*** BCN precount**: number of eggs + juv's per 100 cc soil, taken before planting

Vigor: a higher number is better.

Comments: NIMITZ nematicide has performed well in vegetable trials and received registration on vegetable crops in 2014. Hardly any work has been conducted with sugarbeet cyst nematode. If NIMITZ controls BCN and is cost effective, it has major advantages over fumigants. NIMITZ is much safer (Caution on label), requires less time between application and planting (7 days) and does not require specialized equipment. **In this trial** soil test pre-counts showed a high level of BCN eggs + juv's and the field has a history of nematode problems, however, the distribution within the plot area was uneven. NIMITZ treatments were applied and incorporated 10 days before planting sugarbeets. Rains following planting caused a crust which resulted in gaps even though a good overall population was achieved. All of the NIMITZ treatments had higher yields, lower nematode counts, fewer sprangled roots, higher stands and better vigor than the untreated check plots and Counter (for susceptible variety). There was not a consistent rate response or difference between the liquid and granular formulation, however, NIMITZ G at the high rate appeared to reduce sugarbeet stand. The Counter treatment caused sugarbeet stand reduction. The tolerant variety provided good overall results, with or without NIMITZ treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Nematode Tolerant Varieties in a Field With a History of Sugarbeet Cyst Nematodes

Troy Schuette, Elkton, MI - 2014

Trial Quality: Good
Variety: See Trt. List
Planted: May 28
Harvested: October 10
Plots: 6 rows X 75 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
2.2% OM, 7.3 pH, CEC: 7.7
> Opt: P and K
High: Mn, Low B
Added N: Manure + 40 lbs
Prev Crop: Sugarbeets

Rhizoc Control: Good
Cerc Control: by Trt
Problems: None
Seedling Rate: 4.1 inches
Rainfall: 15.5 inches

No	Variety	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100' July 9	Vigor 0-10 Aug 18
4	C-RR074NT	**$1,372**	**7547**	**283**	**26.7**	**19.0**	95.3	**221**	**7.9**
2	B-18RR4N	**$1,283**	**7058**	**271**	**26.1**	18.0	**95.8**	187	**7.8**
3	B-12RR2N	$1,204	6624	261	**25.3**	17.6	95.0	185	**7.7**
1	B-19RR1N	$1,173	6451	244	**26.6**	16.6	95.2	**205**	7.3
5	C-RR202	$937	5153	**274**	18.8	18.0	**96.4**	180	6.7
	Average	$1,194	6566	267	24.7	17.9	95.5	196	7.5
	LSD 5%	106.1	583.6	15.6	2.3	0.8	0.7	17.2	0.5
	CV %	7.4	7.4	4.8	7.9	4.0	0.6	7.3	5.8

Vigor: a higher number is better

Comments: Four nematode tolerant varieties (Beta 1N, 2N, 4N and Crystal 074 NT) were evaluated for sugarbeet yield, quality, vigor and plant stand in a field with a known sugarbeet cyst nematode problem. C-RR202, a non tolerant variety, was included as a check. The nematode tolerant varieties out yielded the non tolerant variety by around 7 tons per acre. C-RR074NT had the highest yield, RWSA and income per acre.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluation of Oilseed Radish Cultivars and Other Cover/Rotational Crops as Host for the Beet Cyst Nematode

MICHIGAN STATE UNIVERSITY Extension

Fred Warner, fwnemalb@msu.edu and G.W. Bird, birdg@cns.msu.edu
Diagnostic Services and Dept. of Entomology, Michigan State University

INTRODUCTION

Four greenhouse/growth chamber trials were conducted from 2012-2014 to compare the development of beet cyst nematodes (BCN) on various species/cultivars of plants with potential use in sugarbeet cropping systems in Michigan. Since proper management of BCN is often critical to achieve high beet yields, this information should be useful for decision making in regards to BCN infested fields.

METHODOLOGY

Two experiments were conducted in a growth chamber (16 h light at 26°C; 8 h dark at 18°C) and two done in the greenhouse (variable light and temp.). Each trial consisted of a minimum of 4 replications per treatment. The methodology was similar for all experiments. BCN inocula were prepared by processing soil to recover cysts and then crushing the cysts to release the eggs and second-stage juveniles (J_{2s}). The soil used in this research (sand content of *ca.* 90%) was inoculated with equal numbers of eggs and J_{2s} (>2,000) and seeds planted either into containers with volumes of *ca.* 150 cm^3 soil or black pots that held 1 liter of soil. The duration of each experiment was at least 40 days, sufficient enough time for beet cyst nematode females to develop. Plants were then destructively sampled and BCN females scrubbed from the roots so they could be counted.

RESULTS and DISCUSSION

The results of these four studies were summarized to provide four groups of hosts (Tables 1-4). Thirty-four plant species/cultivars were evaluated and categorized as good hosts (>50 or more BCN females recovered per root system), moderate hosts (10-50 BCN females recovered), poor hosts (<10 beet BCN females recovered) and non-hosts (0 BCN females recovered). Growers obviously should avoid growing good hosts in fields with documented BCN infestations if nematode management is a primary concern.

These tables only include the plants evaluated in these experiments. There are many more plant species/cultivars which are good hosts for BCN as well as many that are non-hosts that were not tested. The primary objective of these trials was to compare the development of BCN on cultivars of oilseed radish available to growers.

BCN females can produce up to 500 eggs so reducing their numbers should be of primary importance to sugarbeet growers since this nematode can reduce yields up to 65%. Once cyst nematode females have filled their bodies with eggs, they die, drop from roots and become cysts. The cysts are the dead remains of the females and form protective environments for the developing eggs and juveniles. Cysts can remain viable in the soil 10 or more years in the absence of host crops because many of the eggs lay dormant for long periods. Effective trap crops, such as many radish varieties, stimulate BCN egg hatching, but since many of the nematodes do not develop to adults, their numbers decline. Because oilseed radish is more attractive to BCN than non-host crops, more eggs will hatch in its presence resulting in greater and more rapid decreases in BCN population densities. It is a death sentence for BCN eggs to hatch in the presence of plants on which it cannot feed and develop.

New six-row plot harvester for 2014 harvest

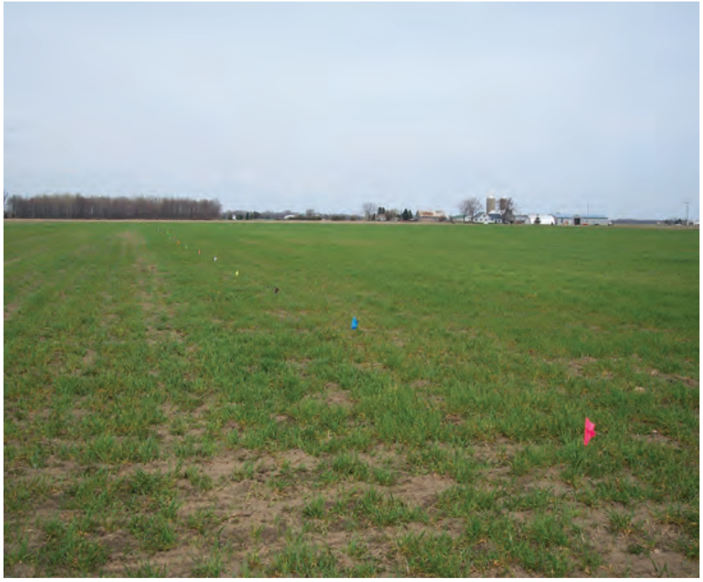
Bluetooth tablet for data recording and electronic controls

Grab rolls carry beets to weigh hopper

Hydraulic lift facilitates ergonomic sample handling

Beets placed in windrow after weight and sample

WIC harvester modified to pick up windrow



Sugarbeet Advancement variety trial
planted into sand field with wheat cover

Variety trial with killed wheat protecting from blow out

Emerging seedlings after wheat has been killed

Sand field variety trial in mid-June

Research variety planter, 12-row

Interns in research for three years from MSU and SVSU

Cercospora leafspot is a problem when not treated properly

Rhizoctonia, do not stop using a Quadris T-band
at planting even with the new seed treatments

Aphanomyces

Sugarbeet Cyst nematodes

Sugarbeet tour in Michigan, 2014. Attendees from sugar companies, universities, USDA and private industry from US and Canada.

Cyst nematode research

Field storage clamp being covered


Special tool tucking cover into clamp


Cover after being tucked


Field storage clamp partially covered


Finished field storage clamp with cover


Removing cover from field storage clamp

Evaluation of Oilseed Radish Cultivars and Other Cover/Rotational Crops as Host for the Beet Cyst Nematode

Fred Warner, fwnemalb@msu.edu and G.W. Bird, birdg@cns.msu.edu
Diagnostic Services and Dept. of Entomology, Michigan State University

Table 1. Good Hosts. Average numbers of beet cyst nematode (BCN) females recovered per root system. The number of trials of each plant species/cultivar is included in parentheses.

species	Cultivar	BCN females
brassica	Vivant (1)	137.75
brown mustard	Kodiak (3)	165.33
cabbage	Early Jersey Wakefield (1)	70.25
radish	Daikon (1)	197.25
radish	Driller (1)	211.25
radish	Graza (1)	135.25
radish	Groundhog (3)	174.00
radish	Pile Driver (2)	180.00
radish	Soilbuster (1)	220.25
radish (tillage) (1)		262.00
rapeseed	Dwarf Essex (3)	190.00
sugarbeet	HM-50RR (1)	56.00
sugarbeet	Prompt (1)	176.50
sugarbeet	SX-1211NRR (1)	65.75
turnip	Appin (3)	185.00
yellow mustard	Idagold (1)	267.75
yellow mustard	Pacific Gold (2)	121.00

Table 2. Moderate Hosts. Average numbers of beet cyst nematode (BCN) females recovered per root system. The number of trials of each plant species/cultivar is included in parentheses.

species	Cultivar	BCN females
dry bean	Zorro (1)	24.25
radish	Carwoodi (2)	11.25

Table 3. Poor Hosts. Average numbers of beet cyst nematode (BCN) females recovered per root system. The number of trials of each plant species/cultivar is included in parentheses.

species	Cultivar	BCN females
dry bean	Puebla 152 (1)	2.00
radish	Cannavaro (1)	0.25
radish	Cardinal (1)	3.50
radish	Defender (certified) (3)	0.13
radish	Defender (home grown) (2)	0.25
radish	FumaRad (2)	1.75
radish	Image (1)	0.50
radish	Intermezzo (2)	3.00
radish	Respect (1)	0.25
radish	Tajuna (2)	0.75
radish	Toro (1)	2.50
white mustard	Accent (3)	3.83

Fred Warner, fwnemalb@msu.edu and G.W. Bird, birdg@cns.msu.edu
Diagnostic Services and Dept. of Entomology, Michigan State University

Table 4. Non-Host Plants. Average numbers of beet cyst nematode (BCN) females recovered per root system. The number of trials of each plant species/cultivar is included in parentheses.

species	Cultivar	BCN females
alfalfa	Foregrazer (1)	0.00
crimson clover (1)		0.00
red clover	Dynamite (1)	0.00
white clover	Domino (1)	0.00

CONCLUSION

BCN developed on many of the plant species/cultivars evaluated in these four experiments. As a generalization, growers should be leery of any plants in the brassica family as it is likely these are hosts for BCN. However, a number of oilseed radish cultivars were identified as very poor hosts for BCN and can be used in sugarbeet cropping systems to reduce population densities of BCN. The result with the black bean variety Zorro was unexpected and will be further evaluated.

ACKNOWLEDGMENTS

Thanks to Dave Robison of Legacy Seeds, Jerry Hall of Grassland Oregon and Kirsten Wade of Columbia Seeds for supplying the seeds used in these studies. This research was not funded by any agencies/commodity groups.

2014 Beet Cyst Nematode Research Report

George W. Bird, Professor, Dept. of Entomology
Michigan State University, East Lansing, Michigan 48824

The 2014 Beet Cyst Nematode (BCN Annual Report is divided into four sections: 1) BCN Resistant Varieties, 2) Seed Treatment s, 3) Cover Crops and 4) Soil Health. I would like to start the report by thanking Jim Stewart, Lee Hubbell, Steve Poindexter and Fred Warner for their continued excellent efforts in providing new and important information about BCN management under Michigan Growing conditions.

BCN Resistant Varieties

- The Michigan Sugarbeet REACh 2014 Variety Trial Results lists 20 sugarbeet varieties approved for 2015 (page 4). Nine of these have BCN resistance or tolerance with an average projected gross dollars per acre, assuming a $50 payment, of $1,735; whereas, the eleven BCN susceptible varieties have an average projected gross of $1,674 per acre.
- Some of the BCN resistant/tolerant varieties are reported to have highly favorable properties in regards to low risk for *Cercospora, Rhizoctonia, Rhizomania* and root aphid problems, in addition to good RWSA (page 7), of the 2014 REACh Variety Trial Results.
- The Michigan Sugar Company 2013-2104 Cyst Nematode Nursery results lists ten varieties, all but one of which had significantly higher (P = 0.05) yields than the susceptible controls and two having significantly greater RWSA (page 37). All of the BCN resistant (N) and tolerant (NT) varieties, however, exhibited both symptoms of BCN damage and BCN reproduction. This is a strong indication that all ten of the varieties are BCN tolerant and none truly resistant. It appears that the seed companies are actively engaged in the development of new BCN tolerant and hopefully resistant varieties. This is essential for the Michigan sugarbeet industry.
- Among the 24 plots in my 2014 BCN research trials in Deckerville, the BCN resistant varieties yielded 27 T/A; whereas, the susceptible BCN susceptible variety was 25.3 T/A, a 9.9% yield difference.

Seed Treatment

There are three types of seed treatments for nematode control: 1) chemical nematicides (Avicta), biological nematicides (Clariva and VOTiVA) and 3) plant health regulators (N'Hibit). While Avicta, VOTiVA and N'Hibit have been available in Michigan for various crops for several years, 2014 was the first year Clariva was available. Currently, all chemical and biological nematicide seed treatments are being marketed only for use on BCN or SCN resistant varieties. This is not true for N'Hibit. The 2014 registration of Clariva was for SCN management. Clariva, however, is available in 2015 for the first time as a sugarbeet seed treatment for BCN management.

Clariva is a biological nematicide containing the bacterium *Pasteuria*. It is my understanding that the product marketed for both BCN and SCN control in 2015 is formulated from a soybean population of *Pasteuria nishizawae* . 2014 was the first year Clariva was available for testing on Michigan sugarbeets. The economics related to the 2015 price of the product indicates that a 0.5 ton per acre yield increase is needed for the treatment to be profitable.

Researcher	Location	Cultivar/Formulation	T/A (+Clariva)	T/A (-Clariva)
Poindexter	Auburn	HM-173RR	34.2	33.8
Poindexter	Auburn	HM-NT425RR	33.9	33
Bird	Deckerville	Formulation No. 1	30	28.4
Bird	Deckerville	Formulation No. 2	29.2	28.4

The Poindexter data from the Auburn location came from the 2014 Sugarbeet Advancement Report. In all four of the 2014 Michigan Clariva trials, sugarbeet yields from seed treated with Clariva were slightly greater than 0.5 tons per acre. In my laboratory/greenhouse BCN research with Syngenta, I have tested possible future formulations of Clariva, including strains from Michigan sugarbeet sites. Based on more than a decade of experience with *Pasteuria* spp. it is my opinion that future strains for Clariva for BCN management will be developed from *Pasteuria* populations obtained from BCN nematodes.

Cover Crops

During the last decade, the Michigan Sugarbeet Industry has successfully used BCN trap crops as part of the management program for this nematode. Recently, however, there has been a major increase in cover crop interest and use throughout Michigan agriculture. This has resulted in considerable confusion, especially in regards to radish and mustard. The objective of this cover crops section is to 1) describe the Three Laws for Successful Cover Crop Use, 2) present a new Cover Crop Status Index for use by Michigan growers and 3) use the Index to demonstrate the complexities of cover crops in regards to BCN and soybean cyst nematode (SCN) reproduction and management.

The Three Laws for Successful Cover Crop Use are:

- Identify the specific objective for using a cover crop. There are currently more than a dozen possibilities, including BCN management, soil nutrition enhancement, soil erosion prevention, soil health improvement etc.
- Select the proper cultivar for achieving the desired objective. Cover crops, like cash crops, come in varieties! Selection of the proper cultivar is essential for achieving a specific objective. In some cases, selection of the wrong cultivar can make a management problem worse.
- Manage the selected cover crop cultivar in a way that is specifically designed to achieve the objective. For example, it is well known that various mustards can be used in the process of bio-fumigation. Bio-fumigation will not be achieved unless the cover crop is managed specifically for this purpose.

2014 Beet Cyst Nematode Research Report

George W. Bird, Professor, Dept. of Entomology
Michigan State University, East Lansing, Michigan 48824

Because of the current confusion and misinformation about cover crops, the following Nematode-Cover Crop Index should be of assistance to Michigan growers in regards to making cover crop decisions. The index uses a scale of 1 – 5, with one being the best for nematode management and five increasing the risk for future nematode problems. It should be noted that this system differs from the one currently being used in Europe.

Cover Crop Index Value	Cover Crop Type	Nematode-Cover Crop Response
1.	Proven Nematode Trap Crop	The cover crop cultivar stimulates nematode egg hatch, juveniles enter cover crop roots, where the system is a hostile environment for the developing female, which dies before producing next generation eggs, resulting in a significant reduction in the soil nematode population density.
2.	Non-Host	The nematode will not reproduce on a non-host cover crop cultivar. Over an extended period of time, the soil population density of the nematode will decline. This decline, however, is almost always slower than that associated with a trap crop (Index Value 1).
3.	Poor Host	The nematodes will feed on the cover crop roots, resulting in a low level of reproduction that is usually enough to maintain the soil population density of the nematode.
4.	Moderate Host	The nematode will feed on the cover crop and reproduce at a rate greater than that of a cover crop with an Index Value of 3 and less than that of a cover crop with an index value of 5. The soil population density of the nematode is likely to increase with the use of a moderate host cover crop.
5.	Good Host	With rotational and cover crops having Index Values of 5, nematodes feed on the root tissue and reproduce in a normal manner, resulting in an increase in the soil population density of the nematode.

2014 Beet Cyst Nematode Research Report

George W. Bird, Professor, Dept. of Entomology
Michigan State University, East Lansing, Michigan 48824

The following is a list of BCN and SCN host status for twenty selected rotational and cover crop cultivars. It is given as an example of the complexities involved in selection of cover corps for use on land infested with BCN or SCN. Current plans for 2015 are to publish a comprehensive analysis of rotational and cover crop cultivars in regards to their impacts on nematodes. Plans are also underway to have a one-day Nematology Short Course on Cover Crops sponsored by the NE-1040 Regional Nematology Research project.

Cover Crop (Cultivar)	BCN (Index Value)	SCN (Index Value)
Sugar beets (susceptible cvs.)	5 (good host)	2 (non-host)
Soybeans (susceptible cvs.)	2 (non-host)	5 (good host)
Radish (Defender, Adagio, Colonel)	**1 (trap crop)**	?
Radish (Trio)	3 (poor host)	3 (poor host)
Radish (Groundhog)	5 (good host)	?
Cover Crop (Cultivar)	BCN (Index)	SCN (Index)
Radish (Pile Driver)	5 (good host)	3 (poor host)
Radish (Soil Buster)	5 (good host)	?
Radish (Cappuchino)	5 (good host)	3 (poor host)
White Mustard (Accent)	3 (poor host)	?
Brown Mustard (Kodiac)	5 (good host)	?
Yellow Mustard (Ida Gold)	5 (good host)	?
Dry Bean (Puebla 152)	3 (poor host)	5 (good host)
Alfalfa (Foregrazer)	2 (non-host)	?
Red Clover (Mammoth)	2 (non-host)	?
White Clover (Dynamite)	2 (non-host)	3 (poor host)
Crimson Clover (Domino)	2 (non-host)	3 (poor-host)
Annual Rye Grass (Lone-star)	2 (non-host)	1 (non-host)
Corn (all known cultivars)	2 (non-host)	2 (non-host)
Wheat (all known cultivars)	2 (non-host)	2 (non-host)
Rape (Dwarf Essex)	5 (good host)	3 (poor host)

The data for construction of this BCN/SCN Cover Crop Index came from numerous greenhouse and growth chamber experiments conducted by Fred Warner (Diagnostic Services, MSU) and George Bird (ENT, MSU).

Soil Health

Soil health has recently become a topic of major interest among mid-west growers . In 2012, the Michigan Potato Industry Commission started a comprehensive soil health initiative. The results of the initial studies indicate that root crops may benefit substantially from soil health enhancement practices. In a survey of 96 sites, the longer the crop rotation and the greater the diversity of crops in the rotation, the higher the soil health rating. The percentage of water stable aggregates in a soil is one of the parameters used to assess soil health. This parameter is designed to integrate physical, chemical and biological properties of a soil. Additional information about soil health can be obtained by visiting soilhealth.cals.cornell.edu/.

Effects of Rotation and Cover Crops on Harmful Nematodes and Soil Health in Loam and Silt Loam Sugarbeet Fields

Michigan State University
AgBioResearch

Zin Maung (Department of Horticulture, MSU), Steve Poindexter (MSU Extension),
Greg Clark, James Stewart, Lee Hubbell and Brian Groulx (Michigan Sugar Company), and
Haddish Melakeberhan (Department of Horticulture, MSU; Corresponding author: melakebe@msu.edu)

Introduction:

Improving soil health and reducing the impact of sugar beet cyst nematode (SBCN) through use of rotation (e.g. Corn and soybean) and cover crops (e.g. Mustard and oil seed radish) and soil amendments are priorities for the Michigan Sugar Beet Industry (MSBI). While the selection of the rotation and cover crops may be based on their status against SBCN, they are hosts to most other plant-parasitic nematodes (PPN). This could lead to increasing non-target nematodes like the root-lesion and affect the use of rotation and cover crops. For example, all of the soybean cyst nematode (SCN) resistant cultivars to-date are excellent hosts for the root-lesion nematode. Finding a balance between suppressing harmful nematodes (SBCN and other PPN) and improving soil health will require **a**) understanding of the soil food web and the biology and nutrient cycling that the rotation and cover crops are causing in the soil, **b**) diagnostic tools that identify the changes in time and space, and **c**) and packaging it in ways that growers can adopt into their soil management routine. Without such knowledge, it will be difficult to address the complex nematode and soil management challenges that the growers face.

The nematode community (NC) analysis based soil food web model is a tool that identifies the outcome of **a** management practice on soil health by nitrogen (N) availability (Ferris *et al*., 2001). It uses a graphic representation of the relationship between the nematode Enrichment Index (*a measure of turnover of opportunistic bacteriovore* and *fungivore nematodes)* and Structure Index (*indicator of food web state affected by stress or disturbance*) to describe the outcomes (Fig. 1). If the experimental outcome data points fall above the dashed horizontal line (*Quadrants A* and *B*), it will mean that N is available and the C:N ratio is low. If the data fall below (*Quadrants C* and *D*), it will mean that N is not available and will require biological activity to be released. Data points to the left of the vertical dashed line indicate that the NC is not structured; whereas, data points to the right indicate that it is structured. Combined, the four quadrants indicate: N is available in boom-and-bust mode (A), steady and suitable for agro-ecosystems (B, *best case and suitable for agroecosystem*), requires biological activity to be released (C and D), or the conditions are biologically depleted (D, *worst case*). The biological depletion will throw the C:N ratio out of balance. With such models, it is not only possible to separate the outcome of the rotation and cover crops precisely, but one can design targeted treatments that will lead to improving the soil conditions.

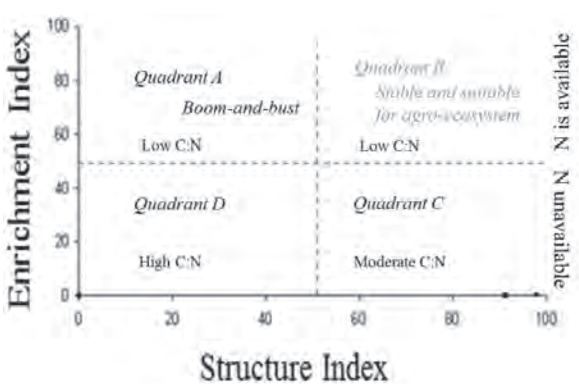


Figure 1. Graphic representation of the nematode community analysis based soil food web model that separates the outcome of a soil management practice in four quadrants (A, B, C and D). Modified from Ferris *et al*., 2001.

Objectives:

The primary research objectives of this two-year MSC-funded project were to determine the effects of the oil seed radish, mustard, sugar beet, soybean and corn on: (1) soil health and (2) SBCN and other harmful nematodes in loam and silt loam soils.

Effects of Rotation and Cover Crops on Harmful Nematodes and Soil Health in Loam and Silt Loam Sugarbeet Fields

Zin Maung (Department of Horticulture, MSU), Steve Poindexter (MSU Extension),
Greg Clark, James Stewart, Lee Hubbell and Brian Groulx (Michigan Sugar Company), and
Haddish Melakeberhan (Department of Horticulture, MSU; Corresponding author: melakebe@msu.edu)

Materials and Methods:

The study was conducted in 2013 and 2014 at the Albee MSC field (silt loam) in Saginaw County and a collaborating grower field (loam) in Huron County. SBCN resistant and susceptible oilseed radish (RR and SR), mustard (RM and SM), tolerant (RSB) and susceptible (SSB) sugar beet, SCN- resistant (RS) and susceptible (SS) soybean and corn (C) were planted (Table 1).

Table 1. Crops used in the study and codes in graphs.

Crop	Cultivar	Status	Code
Oilseed radish	Defender	Resistant	RR
	Tillage	Susceptible	SR
Mustard	Pacific Gold	Resistant	RM
	Ida Gold	Susceptible	SM
Sugar beet	BTS18RR4N	Tolerant	RSB
	BTS10RR34	Susceptible	SSB
Soybean	92Y80	SCN-resistant	RS
	92M91	SCN-susceptible	SS
Corn	P9910R		C

Oilseed radish and mustard represent cover crops and soybean and corn represent rotation crops. Each treatment was replicated six times at both locations for a total of 54 plots at each location. Planting, plot maintenance and harvesting was done by MSC to local standards. Over the growing season, many parameters were collected. These included soil physiochemical, at planting and at harvest, and yield (biomass and seed) and sugar contents. Soil samples were collected every 4-6 weeks during the growing seasons and nematodes extracted from 100 cc of soil (Avendano *et al.*, 2003). Nematodes were classified into trophic (bacteriovre, fungivore, herbivore [PPN], omnivore and predator) and colonizer-persister (cp) groups (cp-1, *resistant to disturbance*, to cp-5, *sensitive to disturbance*) (Bongers *et al.*, 1997; Sanchez *et al.*, 2009). PPN were further classified into algal/lichens/moss feeders, epidermal root hair feeders, ecto-prasites (e.g. Needle), semi-endo-parasites (e.g. Lance), migratory endo-parasites (e.g. Root-lesion), and sedentary parasites (e.g. SBCN). The colonizer-persister groups for PPN are (PP2, *resistant to disturbance*, to PP5, *sensitive to disturbance*). The most serious of them and to which SBCN and root-lesion belong are PP3. All nematode data were then processed to extract disturbances, soil food web and nutrient cycling potential indices (Ferris *et al.*, 2001), and proportions by trophic and cp groups.

Results:

Effect on soil health as described by the soil food web model: The effect of the crops on the soil food web are shown on Figure 2 for both years for the silt loam (left side) and loam soil (right side). The data clearly shows that the two soils have different impacts. In the loam soil, the majority of the data points fell in *Quadrant* A in almost all of the crops in both years. All crops had a few data points in *Quadrant* D in both years. In the silt loam soil, the majority of the data points fell in *Quadrants* A and D in both years. Resistant and susceptible hosts seem to have similar effects in both soils. In both soils and years, few data points fell in *Quadrants* B and C (Fig. 2).

Effects of Rotation and Cover Crops on Harmful Nematodes and Soil Health in Loam and Silt Loam Sugarbeet Fields

Michigan State University AgBioResearch

Zin Maung (Department of Horticulture, MSU), Steve Poindexter (MSU Extension),
Greg Clark, James Stewart, Lee Hubbell and Brian Groulx (Michigan Sugar Company), and
Haddish Melakeberhan (Department of Horticulture, MSU; Corresponding author: melakebe@msu.edu)

Figure 3 reflects seasonal variation in the proportion of beneficial (omnivore, predator, bactriovore and fungivore) and herbivore nematodes. Bacteriovore and herbivore nematodes were the abundant nematode trophic groups (Fig. 3, top). Within beneficial nematodes, cp 2 (fast-reproducing) were the most abundant in the soil (Fig. 3, bottom).

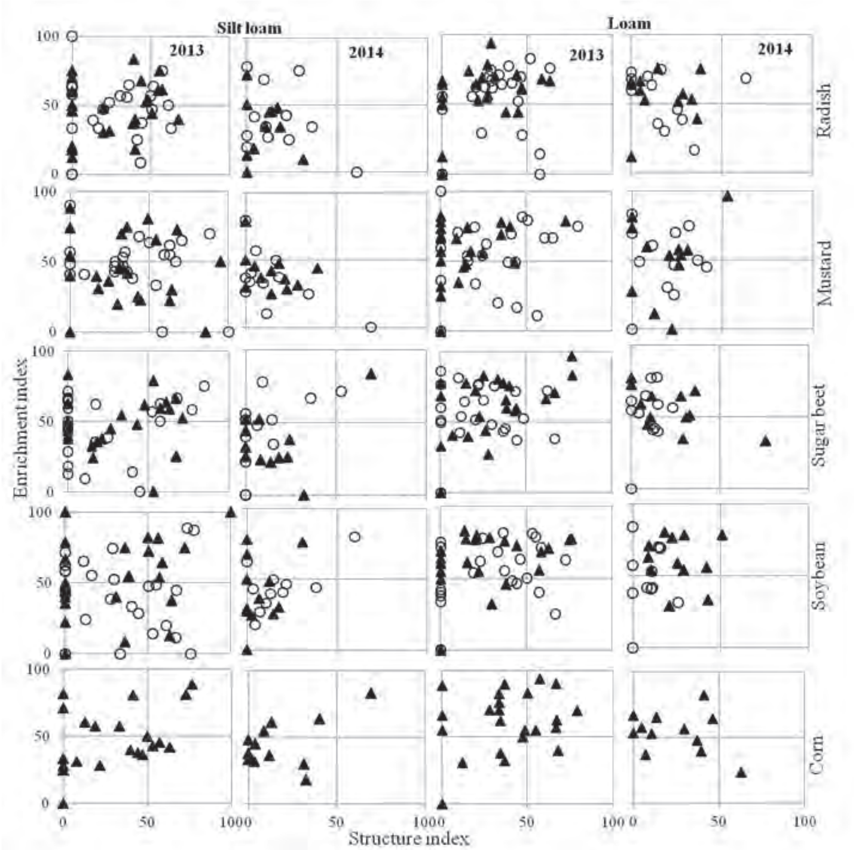


Figure 2. Effects of resistant, tolerant or non-host (**triangles**) and susceptible (**circles**) oil seed radish, mustard, sugar beet, soybean and corn on the soil food web conditions in silt loam and loam soils in 2013 and 2014. Crop codes are shown in Table 1. Enrichment Index describes the turn over and Structure Index describes impact of stress and disturbance of the nematode community. A combination of both indices describes the soil food web. *Note the scarcity of the data points in Quadrant B, ideal for agroecosystems*. Based on these results, *cover and rotation crops can be used more precisely.*

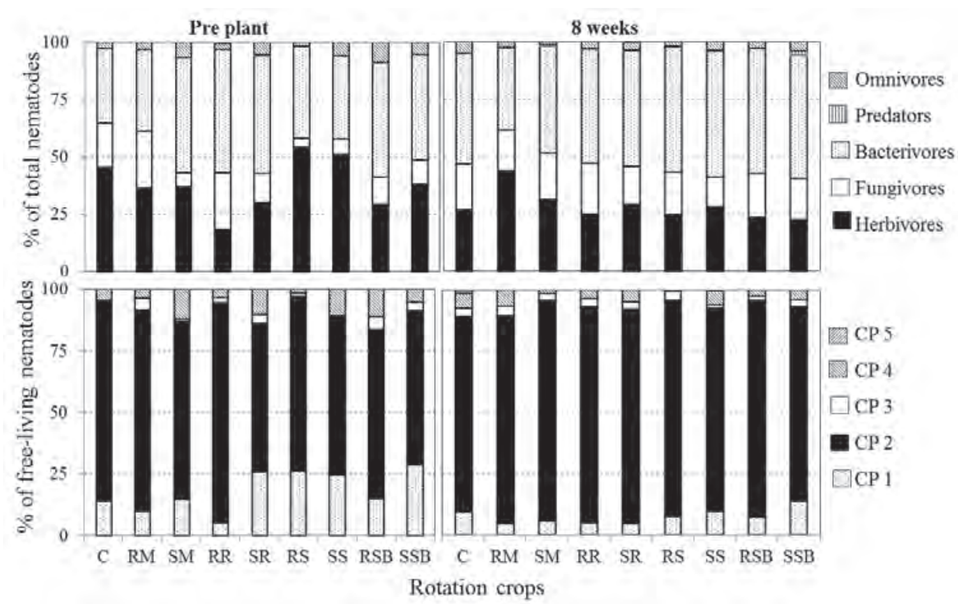


Figure 3. Percent composition of omnivore, predator, bacteriovore, fungivore and herbivore trophic groups (**top bars**) and colonizer-persister (cp) groups of non-herbivore nematodes (**bottom bars**) in the silt loam soil at pre-plant and 8 weeks after planting in 2014 season under different rotation crops. Crop codes are shown in Table 1.

Michigan State University AgBioResearch
Zin Maung (Department of Horticulture, MSU), Steve Poindexter (MSU Extension),
Greg Clark, James Stewart, Lee Hubbell and Brian Groulx (Michigan Sugar Company), and
Haddish Melakeberhan (Department of Horticulture, MSU; Corresponding author: melakebe@msu.edu)

Effect on harmful nematodes: Figure 4 shows the full picture of stylet-bearing nematodes, including algal, lichen and moss feeders. The soils were dominated by migratory-, ecto- and sedentary parasites (Fig. 4, top). Across colonizer-persister groups, PP3 were the most abundant (Fig. 4, bottom).

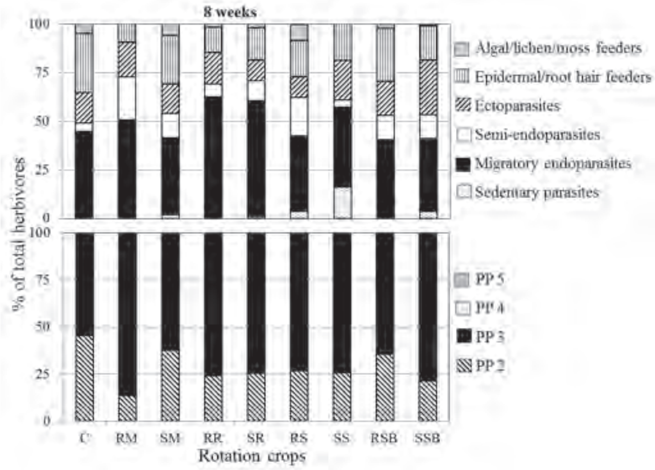


Figure 4. Percentage composition of stylet-bearing herbivore by root infection categories (**top bars**) and broken down by the length of the life cycle or colonizer persister (pp for PPN) groups (**bottom bars**) in the silt loam soil at 8 weeks under different rotation crops in 2014 season. Crop codes are shown in Table 1.

Effect on sugar content: Sugar content was less in the silt loam than in the loam soil and comparable between resistant and susceptible cultivars in both soils (Fig. 5). Data were not statistically different.

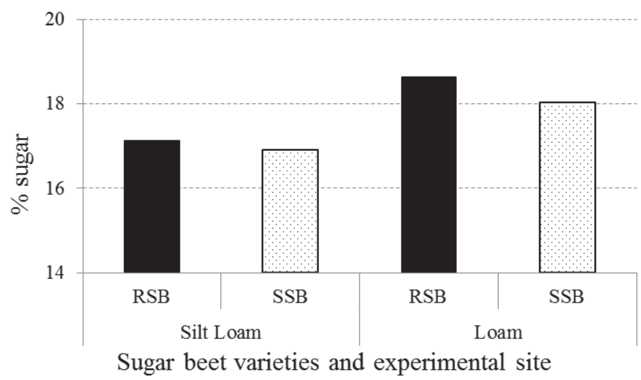


Figure 5. Percent sugar content of the SBCN-tolerant (RSB) and susceptible (SSB) sugarbeets in the silt loam and loam soils in the 2014 season.

Discussion:

The most significant outcome of this study is that we know what we have and what to do and how to get to the industry identified priorities in agrobiologically balanced ways. The soil food web and nematode composition data paint a picture of many colors. If an agronomic practice is yielding agrobiologically suitable and sustainable outcomes, there should be data points in *Quadrant* B of the soil food web model (Fig. 1). There were few data points in *Quadrant* B in this study in both soil types (Fig. 2), suggesting biologically unsuitable soil conditions. The majority of the data points in *Quadrant* A in both soil types in general suggests that we have a boom-and-bust system. This fact is supported by the domination of bacteriovores and herbivores (Fig. 3, top bars) and fast reproducing groups (Fig. 3, bottom bars). Data in *Quadrant* D suggest that the soil is depleted. More of this happening in the silt loam than in the loam soil shows that the former soil type is more depleted. As in *Quadrant* B, there were few data points in *Quadrant* C. This shows that systems are highly disturbed, favoring the fast reproducing groups (Fig. 3). Overall, the soil food web data show that there are significant biological challenges to be overcome on the road to getting suitable soil conditions. Simply put, how do we move the soil conditions from leading to outcomes in *Quadrants* A and D

Michigan State University AgBioResearch

Zin Maung (Department of Horticulture, MSU), Steve Poindexter (MSU Extension),
Greg Clark, James Stewart, Lee Hubbell and Brian Groulx (Michigan Sugar Company), and
Haddish Melakeberhan (Department of Horticulture, MSU; Corresponding author: melakebe@msu.edu)

to *Quadrants* B and C, where there is more biological structure (Ferris *et al*., 2001)? If we had data points in *Quadrant* C, it would have suggested treat to stimulate biological activity; whereas, *Quadrant* D requires first boosting biological activity.

Not only were herbivore nematodes among the most abundant nematodes in these fields (Fig. 3, top bars), their composition tells a story and makes a compelling case for special attention in managing them (Fig. 4). The presence of diversity herbivore nematodes in these fields shows that soil conditions favor them. Moreover, the dominance of pp-3 groups, which include SBCN and root-lesion nematode, suggests that considering multiple harmful nematodes together with the target nematode, SBCN in this case, could be beneficial. The advantage we have from this study is that we know what the soil food web and the PPN picture look like and we can develop multi-dimensional strategies to tackle them.

While the sugar yield data were not statistically different between the cultivars or the soil types, they were lower in the silt loam than in the loam soil (Fig. 5). As described by the soil food web data (above), it is worth noting that the silt loam field is more stressed and depleted than the loam soil (Fig. 2). We need to collect more data and do extensive analyses to establish significant correlations.

Summary conclusions and the next steps: Using a combination of the soil food web model and analyses of herbivore nematode composition in silt loam and loam soils, we have achieved the following milestones: **i)** both soil types do not have ideal agrobiologically suitable soil conditions, but boom-and-bust systems; **ii**) the silt loam soil is biologically more depleted than loam soils; **iii**) the soils are dominated by bacterial feeders and short life cycle nematodes; **iv)** these conditions were very favorable for SBCN and other harmful PPNs; and **v)** identified the need for integrating microbial community analysis to better understand the dynamics of the soil biology . These results provide a ***two-pronged road map*** for designing treatments that could suppress SBCN and other harmful PPN and improve soil health conditions to meet industry priorities. First, there is the need for harmful nematode-suppressing soil amendments. We have a proposal with MSC to test *Pastueria* seed treatment on nematodes and microbial communities. Second, data points in *Quadrants* D of the soil food web model (Fig. 2) suggest the need for amendments that boost biological activities. We have chosen manure soil amendment to test in a proposal to Project GREEEN. We will know whether or not boosting biological activities move the outcome to *Quadrant* A or B or both. This, in turn, will lead to designing treatments that will move the outcome to *Quadrant* B, most ideal for agroecology. *The use manure does not necessarily mean that sugarbeet growers are going to use it routinely, but it is the right amendment to test boosting biological activity that can be transitioned into something else afterwards*. The **goal** is to identify treatments that suppress SBCN and other PPN, increase beneficial nematode and microbial communities, and lead to steady and suitable N conditions (*Quadrant* B).

Literature Cited:

Avendaño F, FJ Pierce, O Schabenberger & H Melakeberhan 2003. Geostatistical analysis of field spatial distribution patterns of the soybean cyst nematode, *Heterodera glycines*. Agronomy Journal, 95:936-948.

Bongers, T, H Meulen, & G Korthals 1997. Inverse relationship between the nematode maturity index and plant parasite index under enriched nutrient conditions. Applied Soil Ecology 6:195–199.

Ferris H, T Bongers & RGM De Goede 2001. A framework for soil food web diagnostics: extension of the nematode faunal analysis concept. Applied Soil Ecology, 18:13-29.

Sanchez-Moreno S, NL Nicola, H Ferris & FG Zalom 2009. Effects of agricultural management on nematode-mite assemblages: Soil food web indices as predictors of mite community composition. Applied Soil Ecology, 41:107-117.

Effect of Nitrogen Applied 2X2 at Planting on Sugarbeet Yield, Quality and Emergence

Piling Ground, Deckerville, MI - 2014

Trial Quality: Fair
Variety: SX-1211 N RR
Planted: June 3
Harvested: September 27
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch
Soil Info: Loam
3.2% OM, 7.9 pH, CEC: 14
>Opt : P and K
High: Mn, Medium: B
Added N: 125 lbs
Prev Crop: Corn
Rhizoc Control: Good
Cerc Control: Good
Problems: Uneven ground
Seeding Rate: 4.1 inches
Rainfall: 17.2 inches
Application: Planter, 2x2 (2" below seed level and 2" to the side of row). Sidedress - fluted coulter incorporates between rows at 6 lf. stage.

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100' June 20
6	UAN	32.7 lb	2X2	**$1,444**	**7943**	**238**	**33.4**	**16.1**	**95.4**	**233**
	10-34-0	7.3 lb	2X2							
	UAN	90 lb	Sidedress							
7	UAN	42.6 lb	2X2	**$1,287**	**7077**	**233**	**30.4**	**15.9**	**95.0**	220
	10-34-0	7.3 lb	2X2							
	UAN	80 lb	Sidedress							
4	UAN	60 lb	2X2	**$1,263**	**6949**	**224**	**30.9**	**15.5**	94.4	**229**
	UAN	70 lb	Sidedress							
3	UAN	50 lb	2X2	**$1,250**	**6875**	**230**	**30.1**	**15.7**	**94.9**	**230**
	UAN	80 lb	Sidedress							
8	UAN	52.7 lb	2X2	$1,225	6736	**224**	**30.1**	**15.5**	**94.7**	221
	10-34-0	7.3 lb	2X2							
	UAN	70 lb	Sidedress							
9	10-34-0	7.3 lb	2X2	$1,206	6634	**228**	**29.0**	**15.6**	**94.9**	**240**
	UAN	122.7 lb	Sidedress							
5	UAN	22.7 lb	2X2	$1,205	6627	218	**30.4**	**15.1**	94.4	**246**
	10-34-0	7.3 lb	2X2							
	UAN	100 lb	Sidedress							
1	UAN	30 lb	2X2	$1,194	6568	**234**	28.1	**15.9**	**95.0**	**246**
	UAN	100 lb	Sidedress							
2	UAN	40 lb	2X2	$1,129	6211	**227**	27.3	**15.7**	94.4	**236**
	UAN	90 lb	Sidedress							
10	UAN	130 lb		$1,042	5729	**225**	25.5	**15.5**	**94.6**	**240**
Average				$1,225	6735	228	29.5	15.7	94.8	234
LSD 5%				202.8	1115.4	19.3	4.4	ns(1.0)	0.9	19.9
CV %				11.4	11.4	5.8	10.3	4.3	0.7	5.8

Comments: Previous trials have determined the advantages of applying nitrogen at planting 2 inches below the seed level and 2 inches to the side of the sugarbeet row (2X2). All of the treatments received 130 lbs of N, applied either 2X2 and sidedress or only sidedress. The top treatment had 40 lbs N 2X2, 7.3 lbs P 2X2 and 90 lbs sidedress. The lowest yielding treatment was the only one without nitrogen applied 2X2 at planting. Treatments with the best sugarbeet stand had lower rates of N applied 2X2 or no N applied 2X2. The only treatments that appeared to cause stand loss had 50 or 60 lbs of N applied 2X2 at planting.

$A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate KTS (Potassium Thiosulfate - 0-0-25, 17 S) Fertilizer in Sugarbeets

Piling Ground, Albee, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	SX-1228RR		2.9% OM, 7.4 pH, CEC: 8.6	**Cerc Control:**	Good
Planted:	June 2		> Opt: P, Opt: K	**Problems:**	Some low spots
Harvested:	September 18		High: Mn, V. Low: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 38 ft, 4 reps	**Added N:**	See tmts	**Rainfall:**	18.3 inches
Row Spacing:	22 inches	**Prev Crop:**	Fallow		
Applic:	2X2 planter; Sidedress, fluted coulter; Foliar, 15.3 gpa				

No	Treatment	Rate/A	Applic Method	Applic Timing	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100' June 19	Stand B/100' Aug 27
3	KTS UAN 28%	2 gal 30 gal	2X2 Sidedress	Planting 4 lf	**$1,169**	**6428**	**232**	**27.7**	**15.7**	**95.7**	**243**	**262**
7	KTS 10-34-0 UAN 28%	2 gal 3 gal 30 gal	2X2 2X2 Sidedress	Planting Planting 4 lf	**$1,168**	**6425**	**226**	**28.3**	**15.3**	**95.4**	**270**	**281**
2	KTS UAN 28%	1 gal 30 gal	2X2 Sidedress	Planting 4 lf	**$1,073**	**5901**	**220**	**26.9**	**15.0**	**95.2**	**253**	**258**
11	KTS UAN 28%	2 gal 30 gal	Sidedress Sidedress	4 lf 4 lf	**$1,055**	**5801**	210	**27.6**	14.7	94.3	**258**	**267**
14	10-34-0 UAN 28%	3 gal 30 gal	Sidedress Sidedress	Planting 4 lf	$1,042	5733	**228**	25.2	**15.3**	**95.9**	**255**	**266**
16	UAN 28% KTS N-Sure	30 gal 1 gal 1 qt	Sidedress Foliar Foliar	4 lf 6 lf 6 lf	$1,036	5696	**229**	24.8	**15.5**	**95.6**	218	**249**
4	KTS UAN 28%	4 gal 30 gal	2X2 Sidedress	Planting 4 lf	$1,019	5606	**224**	25.1	**15.3**	**95.2**	**239**	**249**
18	UAN 28% KTS N-Sure	30 gal 3 gal 1 qt	Sidedress Foliar Foliar	4 lf 6 lf 6 lf	$1,004	5521	**222**	24.9	**15.2**	95.0	**239**	**261**
15	UAN 28% N-Sure	30 gal 1 qt	Sidedress Foliar	4 lf 6 lf	$997	5484	**223**	24.6	**15.2**	**95.4**	**233**	**256**
1	Untreated				$984	5414	212	**25.6**	14.6	94.8	219	239
10	10-34-0 UAN 28%	3 gal 30 gal	2X2 Sidedress	Planting 4 lf	$972	5345	214	25.0	14.7	**95.2**	222	**255**
9	KTS 10-34-0 UAN 28%	8 gal 3 gal 30 gal	2X2 2X2 Sidedress	Planting Planting 4 lf	$967	5319	**215**	24.8	14.7	**95.4**	217	**243**
17	UAN 28% KTS N-Sure	30 gal 2 gal 1 qt	Sidedress Foliar Foliar	4 lf 6 lf 6 lf	$964	5303	**222**	23.9	**15.3**	94.9	**249**	**265**
13	KTS UAN 28%	8 gal 30 gal	Sidedress Sidedress	4 lf 4 lf	$962	5293	**215**	24.6	**14.8**	94.8	215	**244**

Evaluate KTS (Potassium Thiosulfate - 0-0-25, 17 S) Fertilizer in Sugarbeets

Piling Ground, Albee, MI - 2014

No	Treatment	Rate/A	Applic Method	Applic Timing	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100' June 19	Stand B/100' Aug 27
6	KTS	1 gal	2X2	Planting	$958	5270	**215**	24.6	**15.0**	94.0	**228**	**261**
	10-34-0	3 gal	2X2	Planting								
	UAN 28%	30 gal	Sidedress	4 lf								
8	KTS	3 gal	2X2	Planting	$935	5143	**224**	23.1	**15.2**	**95.6**	224	**256**
	10-34-0	3 gal	2X2	Planting								
	UAN 28%	30 gal	Sidedress	4 lf								
5	KTS	8 gal	2X2	Planting	$928	5102	**225**	22.7	**15.3**	**95.3**	**235**	**242**
	UAN 28%	30 gal	Sidedress	4 lf								
12	KTS	4 gal	Sidedress	4 lf	$869	4778	**215**	22.4	**14.8**	94.9	203	234
	UAN 28%	30 gal	Sidedress	4 lf								
Average					$1,006	5531	221	25.1	15.1	95.1	234	255
LSD 5%					124.4	684.1	17.1	3.0	0.9	0.8	45.5	39.0
CV %					8.7	8.7	5.4	8.4	4.2	0.6	13.6	10.7

KTS: Potassium thiosulfate (0-0-25, 17 S) from Tessenderto Kerley

Comments: KTS was applied at rates of 1, 2, 3, 4 and 8 gal/A by different methods (2x2, 4 leaf sidedress with fluted coulter and foliar at the 6 leaf stage). The 2x2 application method appears to provide the best results. It appears that the 8 gal rate applied 2x2 was too high. KTS combined with 10-34-0 applied 2X2 was safe to beets.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate NutriPak (8-10-12) Fertilizer in Sugarbeets

MSC Piling Ground, Deckerville, MI - 2014

Trial Quality:	Fair	**Soil Info:**	Loam	**Rhizoc Control:**	Good
Variety:	SX-1211N RR		3.2% OM, 7.9 pH, CEC: 14	**Cerc Control:**	Good
Planted:	June 3		> Opt: P, Opt: K	**Problems:**	Uneven ground
Harvested:	September 27		High: Mn, Medium: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 38 ft, 4 reps	**Added N:**	See tmts	**Rainfall:**	17.2 inches
Row Spacing:	22 inch	**Prev Crop:**	Corn		

Application: 2X2 on planter; IF, 3.5” T-band 9.9 gpa; Foliar 15.3 gpa; Sidedress, fluted coulter at 6 lf

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Vigor 1-10	Stand B/100 ft June 16	Stand B/100 ft June 27
1	UAN 28%	11 gal	2X2	**$1,298**	**7138**	**222**	**32.2**	**15.4**	**94.4**	**8.9**	**222**	**251**
	10-34-0	6 gal	2X2									
	Quadris	10 fl oz	T-band									
	NutriPak (8-10-2)	16 fl oz	Sidedress									
	UAN 28%	11 gal	Sidedress									
2	UAN 28%	11 gal	2X2	**$1,296**	**7126**	**217**	**32.9**	**15.2**	**94.0**	**8.9**	**206**	**250**
	10-34-0	6 gal	2X2									
	Quadris	10 fl oz	T-band									
	NutriPak (8-10-2)	16 fl oz	Sidedress									
	UAN 28%	11 gal	Sidedress									
	NutraK (0-0-27)	32 fl oz	10-12 lf									
5	Quadris	10 fl oz	T-band	**$1,239**	**6815**	**218**	**31.2**	**15.3**	**93.9**	7.3	199	233
4	UAN 28%	11 gal	2X2	**$1,225**	**6738**	**215**	**31.3**	**15.0**	**94.3**	**8.9**	**216**	**250**
	10-34-0	6 gal	2X2									
	Quadris	10 fl oz	T-band									
	UAN 28%	11 gal	Sidedress									
3	UAN 28%	11 gal	2X2	**$1,206**	**6633**	**212**	**31.2**	**14.9**	**94.0**	**9.0**	**227**	**253**
	10-34-0	6 gal	2X2									
	Quadris	10 fl oz	T-band									
	NutriPak (8-10-2)	16 fl oz	Sidedress									
	UAN 28%	11 gal	Sidedress									
	NutraK (0-0-27)	32 fl oz	10-12 lf									
	NutriPak (8-10-2)	16 fl oz	16 lf									
Average				$1,253	6890	217	31.7	15.1	94.1	8.6	214	247
LSD 5%				ns(282)	ns(1550)	ns(19)	ns(5)	ns(1)	ns(1)	0.6	26.4	14.3
CV %				14.1	14.1	5.5	9.7	4.1	0.7	4.4	8.0	3.8

Vigor: a higher number is better.

Comments: NutriPak was applied to sugarbeet with a fluted coulter applicator midway between the rows and incorporated at the 6 lf stage and at the 16 lf stage as a foliar spray. 11 gallons of 28% N was applied at the 6 lf stage with the fluted coulter applicator. Nutra K (0-0-27) was applied in a 7 inch band at the 10-12 lf stage. Due to field variation there were no significant differences in yield or quality. The treatments did not cause sugarbeet injury.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Gantec Pro in Sugarbeets

Piling Ground, Albee, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	SX-1228RR		2.9% OM, 7.4 pH, CEC: 8.6	**Cerc Control:**	Good
Planted:	June 6		> Opt: P and K	**Problems:**	Some low spots
Harvested:	September 18		High: Mn, V. Low: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 38 ft, 4 reps	**Added N:**	125 lbs	**Rainfall:**	18.3 inches
Row Spacing:	22 inch	**Prev Crop:**	Fallow		

Application: IF 3.5” T-Band, 9.9 gpa; Sidedress, fluted coulter; Foliar, 15.3 gpa

No	Treatment	Rate/A	Appl Method	Appl Timing	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100’ Jun 19	Stand B/100’ Aug 27
3	Gantec Pro	4 fl oz	IF T-Band	Plant	**$1,162**	**6392**	**224**	**28.6**	**15.3**	**95.2**	**227**	**233**
	28% N	30 gal	Sidedress	4 lf								
	Round up	32 fl oz	Foliar	6 lf								
	Round up	32 fl oz	Foliar	14 lf								
1	Gantec Pro	4 fl oz	IF T-Band	Plant	**$1,101**	**6056**	204	**29.7**	14.3	94.0	**228**	**241**
	Round up	32 fl oz	Foliar	6 lf								
	Round up	32 fl oz	Foliar	14 lf								
5	28% N	30 gal	Sidedress	4 lf	**$1,056**	**5807**	**211**	**27.5**	**14.7**	**94.5**	**237**	**235**
	Round up	32 fl oz	Foliar	6 lf								
	Round up	32 fl oz	Foliar	14 lf								
6	Untreated Check				$1,035	5690	204	**27.9**	14.3	94.1	**214**	**226**
4	Gantec Pro	4 fl oz	IF T-Band	Plant	$1,022	5623	208	**27.1**	14.5	**94.3**	**233**	**238**
	28% N	30 gal	Sidedress	4 lf								
	Gantec Pro + Round up	4 fl oz 32 fl oz	Foliar	6 lf								
	Gantec Pro + Round up	4 fl oz 32 fl oz	Foliar	14 lf								
2	Gantec Pro	4 fl oz	IF T-Band	Plant	$998	5491	209	26.3	14.5	**94.4**	**221**	**236**
	Gantec Pro + Round up	4 fl oz 32 fl oz	Foliar	6 lf								
	Gantec Pro + Round up	4 fl oz 32 fl oz	Foliar	14 lf								
Average					$1,062	5843	209.9	27.9	14.6	94.4	227	235
LSD 5%					125.2	688.6	14.5	2.9	0.7	0.9	ns(39)	ns(40)
CV %					7.4	7.4	4.3	6.5	3.1	0.6	11.2	10.8

Comments: Gantec contains adjuvants, natural fertilizer soil conditioners and bio-active ingredients that improve plant growth. Gantec applied at 4 fl oz/a in-furrow at planting appeared to increase sugarbeet yield and quality. The treatment did not cause any stand loss. Gantec foliar applications, tank mixed with Roundup, did not appear to be of any benefit. Nitrogen did not improve yields and lowered quality.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Generate in Sugarbeets

Maurer, Forestville, MI - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: May 30
Harvested: October 6
Plot Size: 6 Rows X 38 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
3.5% OM, 7.5 pH, CEC: 11.3
> Opt: P and K
High: Mn, Medium: B
Added N: 125 lbs
Prev Crop: Wheat

Rhizoc Control: Good
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 18.1 inches

Application: IF on planter, 3.5" T-Band, 9.9 gpa; 2x2 on planter; Sidedress, fluted coulter; Foliar 15.3 gpa

No	Treatment	Rate/A	Applic Method	Applic Timing	$/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Quadris	10 fl oz	IF T-Band	Planting	**$1,754**	**9646**	**246**	**39.2**	**16.4**	**96.2**
	Generate	1 qt	2x2	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
3	Quadris	10 fl oz	IF T-Band	Planting	**$1,749**	**9618**	**238**	**40.5**	**15.9**	**95.9**
	Generate	1 qt	Foliar	6 lf						
	UAN 28%	33 gal	Sidedress	6 lf						
9	Untreated				**$1,747**	**9606**	**252**	**38.2**	**16.7**	**96.4**
2	Quadris	10 fl oz	IF T-Band	Planting	**$1,693**	**9313**	235	**39.7**	15.8	**95.8**
	Generate	1 qt	2x2	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
8	Quadris	10 fl oz	IF T-Band	Planting	**$1,661**	**9134**	**238**	**38.4**	**15.9**	**96.0**
	Generate	1 qt	Sidedress	6 lf						
	UAN 28%	33 gal	Sidedress	6 lf						
4	Quadris	10 fl oz	IF T-Band	Planting	**$1,652**	**9086**	236	**38.5**	**15.9**	**95.8**
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
7	Quadris	10 fl oz	IF T-Band	Planting	**$1,630**	**8965**	**239**	37.5	**16.1**	**95.7**
	Generate	1 qt	Foliar	6 lf						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
5	Quadris	10 fl oz	IF T-Band	Planting	**$1,611**	**8860**	233	38.0	15.7	**95.8**
	Generate	1 qt	IF T-Band	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
1	Quadris	10 fl oz	IF T-Band	Planting	$1,600	8803	**241**	36.5	**16.1**	**95.9**
	Generate	1 qt	IF T-Band	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						

	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$1,677	9226	240	38.5	16.0	96.0
LSD 5%	148.7	818.1	15.7	2.3	0.8	ns(1)
CV %	6.0	6.0	4.5	4.1	3.2	0.7

Evaluate Generate in Sugarbeets

Maurer, Forestville, MI - 2014

No	Treatment	Rate/A	Applic Method	Applic Timing	$/A	Stand				Vigor
						B/100ft June 13	B/100ft July 10	B/100ft Aug 1	B/100ft Aug 20	0-10 July 18
6	Quadris	10 fl oz	IF T-Band	Planting	**$1,754**	**152**	**184**	181	**186**	**8.1**
	Generate	1 qt	2x2	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
3	Quadris	10 fl oz	IF T-Band	Planting	**$1,749**	**181**	**210**	**207**	**211**	**8.8**
	Generate	1 qt	Foliar	6 lf						
	UAN 28%	33 gal	6 lf	6 lf						
9	Untreated				**$1,747**	**171**	**203**	**216**	**210**	7.9
2	Quadris	10 fl oz	IF T-Band	Planting	**$1,693**	**176**	**203**	**196**	**201**	**8.9**
	Generate	1 qt	2x2	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
8	Quadris	10 fl oz	IF T-Band	Planting	**$1,661**	**155**	**186**	177	**184**	**8.1**
	Generate	1 qt	Sidedress	6 lf						
	UAN 28%	33 gal	Sidedress	6 lf						
4	Quadris	10 fl oz	IF T-Band	Planting	**$1,652**	**165**	**204**	**195**	**190**	**8.6**
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
7	Quadris	10 fl oz	IF T-Band	Planting	**$1,630**	**157**	**193**	186	**186**	**8.5**
	Generate	1 qt	Foliar	6 lf						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
5	Quadris	10 fl oz	IF T-Band	Planting	**$1,611**	**175**	**204**	**199**	**202**	**8.9**
	Generate	1 qt	IF T-Band	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						
	Generate	1 qt	Foliar	Row Close						
1	Quadris	10 fl oz	IF T-Band	Planting	$1,600	**161**	**204**	**196**	**199**	**8.4**
	Generate	1 qt	IF T-Band	Planting						
	UAN 28%	33 gal	Sidedress	6 lf						

Average	$1,677	166	199	195	196	8.5
LSD 5%	148.7	ns(32)	ns(30)	28.5	ns(28)	0.9
CV %	6.0	13.3	10.3	10.0	9.7	7.0

Vigor: a higher number is better

Comments: Generate is a product from AGNITION that claims to make nutrients more available for plant growth. Generate was soil applied at 10 fl oz/A in-furrow (3.5 inch T-Band at planting), 2x2 (2 inches below seed level and 2 inches from row at planting), sidedressed to soil (fluted coulter) at the 6 lf stage and as a foliar spray at the 6 leaf stage and at row closure. Quadris and nitrogen fertilizer was applied to each treatment. Generate appeared to be less effective when applied in-furrow.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Redline Starter Fertilizer at Planting in Sugarbeets

Maust, Forestville, MI - 2014

Study Director: Steve Roehl, West Central

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		3.5% OM, 7.5 pH, CEC: 11.3	**Cerc Control:**	Good
Planted:	May 30		>Opt: P and K	**Problems:**	None
Harvested:	October 6		High: Mn, Medium: B	**Seeding Rate:**	4.1 spacing
Plot Size:	6 rows X 38 ft, 6 reps	**Added N:**	See tmts.	**Rainfall:**	18.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Wheat		

No	Treatment	Rate/A	Applic Method*	Applic Timing	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1	UAN 28% 10-34-0 UAN 28% Quadris	11 gal 7 gal 30 gal 14.3 fl oz	Soil 2x2 Soil 2x2 Sidedress Foliar	Planting Planting 4-6 lf 6-8 lf	**$1,474**	**8107**	**222**	**36.5**	**15.1**	**95.5**
3	Quadris UAN 28% 10-34-0 UAN 28% Quadris	10 fl oz 11 gal 7 gal 30 gal 14.3 fl oz	Planting Soil 2x2 Soil 2x2 Sidedress Foliar	T-Band Planting Planting 4-6 lf 6-8 lf	**$1,438**	**7907**	**215**	**36.7**	**14.6**	**95.8**
5	Quadris Redline SourceMan 5 UAN 28% 10-34-0 UAN 28% Quadris	10 fl oz 3 gal 1 qt 11 gal 7 gal 30 gal 14.3 fl oz	Planting Planting Planting Soil 2x2 Soil 2x2 Sidedress Foliar	T-Band T-Band T-Band Planting Planting 4-6 lf 6-8 lf	**$1,422**	**7822**	**217**	**36.1**	**14.7**	**95.5**
2	Redline SourceMan 5 UAN 28% 10-34-0 UAN 28% Quadris	3 gal 1 qt 11 gal 7 gal 30 gal 14.3 fl oz	Dribble IF Dribble IF Soil 2x2 Soil 2x2 Sidedress Foliar	Planting Planting Planting Planting 4-6 lf 6-8 lf	**$1,394**	**7665**	**209**	**36.6**	**14.4**	**95.1**
4	Quadris Redline SourceMan 5 UAN 28% 10-34-0 UAN 28% Quadris	10 fl oz 3 gal 1 qt 11 gal 7 gal 30 gal 14.3 fl oz	Planting Dribble IF Dribble IF Soil 2x2 Soil 2x2 Sidedress Foliar	T-Band Planting Planting Planting Planting 4-6 lf 6-8 lf	**$1,389**	**7640**	**213**	**35.9**	**14.6**	**95.3**

	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$1,423	7828	215	36.4	14.7	95.4
LSD 5%	ns(151)	ns(829)	ns(19)	ns(2.3)	ns(1.1)	ns(0.9)
CV%	8.8	8.8	7.4	5.2	6.0	0.8

Evaluate Redline Starter Fertilizer at Planting in Sugarbeets

Maust, Forestville, MI - 2014

Study Director: Steve Roehl, West Central

No	Treatment	Rate/A	Applic Method*	Applic Timing	$/A	Beets/100'			Vigor 0-10	Dead B/100'
						June 9	July 10	Aug 1		
1	UAN 28%	11 gal	Soil 2x2	Planting	**$1,474**	**175**	**202**	**194**	**8.7**	**0.8**
	10-34-0	7 gal	Soil 2x2	Planting						
	UAN 28%	30 gal	Sidedress	4-6 lf						
	Quadris	14.3 fl oz	Foliar	6-8 lf						
3	Quadris	10 fl oz	Planting	T-Band	**$1,438**	151	**180**	**180**	**8.3**	0.3
	UAN 28%	11 gal	Soil 2x2	Planting						
	10-34-0	7 gal	Soil 2x2	Planting						
	UAN 28%	30 gal	Sidedress	4-6 lf						
	Quadris	14.3 fl oz	Foliar	6-8 lf						
5	Quadris	10 fl oz	Planting	T-Band	**$1,422**	148	176	**171**	**8.2**	0.0
	Redline	3 gal	Planting	T-Band						
	SourceMan 5	1 qt	Planting	T-Band						
	UAN 28%	11 gal	Soil 2x2	Planting						
	10-34-0	7 gal	Soil 2x2	Planting						
	UAN 28%	30 gal	Sidedress	4-6 lf						
	Quadris	14.3 fl oz	Foliar	6-8 lf						
2	Redline	3 gal	Dribble IF	Planting	**$1,394**	150	**190**	**187**	**8.3**	**1.0**
	SourceMan 5	1 qt	Dribble IF	Planting						
	UAN 28%	11 gal	Soil 2x2	Planting						
	10-34-0	7 gal	Soil 2x2	Planting						
	UAN 28%	30 gal	Sidedress	4-6 lf						
	Quadris	14.3 fl oz	Foliar	6-8 lf						
4	Quadris	10 fl oz	Planting	T-Band	**$1,389**	125	154	153	7.2	0.2
	Redline	3 gal	Dribble IF	Planting						
	SourceMan 5	1 qt	Dribble IF	Planting						
	UAN 28%	11 gal	Soil 2x2	Planting						
	10-34-0	7 gal	Soil 2x2	Planting						
	UAN 28%	30 gal	Sidedress	4-6 lf						
	Quadris	14.3 fl oz	Foliar	6-8 lf						
Average					$1,423	149.9	180.5	177.1	8.1	0.5
LSD 5%					ns(151)	18.5	23.8	25.0	0.8	0.6
CV%					8.8	10.2	10.9	11.7	8.3	107

Vigor: a higher number is better

*** Applic Method:** Spray In-furrow - 3.5 inch T-Band sprayed over open furrow
Dribble In-furrow - Treatment not sprayed with a nozzle but dribbled in
Soil 2x2: Treatment applied 2 inches from row and 2 inches below seed level
Side dress: Treatment applied with fluted coulter midway between rows

Comments: Yield and quality differences were not significantly different (statistically). It appeared that when Quadris and Redline were both applied in-furrow, and Redline was dribbled in, stand loss occurred. When Quadris and Redline were both sprayed in a T-Band in-furrow there was no stand loss. The treatment with the highest sugarbeet population did not have either Quadris or Redline applied at planting.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate SumaGrow (Microbial Soil Enhancer) in Sugarbeets

Maurer, Forestville, MI - 2014

Trial Quality: Good
Variety: SX1212RR
Planted: May 30
Harvested: October 6
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inches
Application: Foliar; 7” band, 6502e, 30 psi, 15.3 gpa

Soil Info: Sandy Loam
3.5%OM, 7.5pH, CEC:11
>Opt: P and K
High: MN, Medium: B
Added N: 124 lbs
Prev Crop: Wheat

Rhizoc Control: Good
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 18.1 inches

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Vigor 1-10	Stand B/100’	
											June 13	Aug 20
1	Suma Grow	1 gal	2 lf	**$1,306**	**7180**	**220**	**32.7**	**15.1**	**94.9**	**8.5**	**170**	**212**
	Roundup PowerMax	32 fl oz	2 lf									
	AMS*	17 lb	2 lf									
	Roundup PowerMax	32 fl oz	6 lf									
	AMS*	17 lb	6 lf									
	Roundup PowerMax	22 fl oz	16 lf									
	AMS*	17 lb	16 lf									
2	Suma Grow	1/2 gal	2 lf	**$1,297**	**7132**	**217**	**32.9**	**14.9**	**94.8**	**8.4**	**157**	**205**
	Roundup PowerMax	32 fl oz	2 lf									
	AMS*	17 lb	2 lf									
	Suma Grow	1/2 gal	6 lf									
	Roundup PowerMax	32 fl oz	6 lf									
	AMS*	17 lb	6 lf									
	Roundup PowerMax	22 fl oz	16 lf									
	AMS*	17 lb	16 lf									
3	Roundup PowerMax	32 fl oz	2 lf	**$1,255**	**6905**	**218**	31.7	**15.1**	**94.5**	**8.7**	**159**	**203**
	AMS*	17 lb	2 lf									
	Roundup PowerMax	32 fl oz	6 lf									
	AMS*	17 lb	6 lf									
	Roundup PowerMax	22 fl oz	16 lf									
	AMS*	17 lb	16 lf									
Average				$1,286	7072	218	32.4	15.0	94.7	8.5	162	207
LSD 5%				ns(63)	ns(348)	ns(8)	0.7	ns(0.4)	ns(0.7)	ns(1.9)	ns(77)	ns(42)
CV %				3.2	3.2	2.4	1.5	1.9	0.5	15.4	31.8	13.4

Vigor 0-10: a higher number is better

***AMS:** applied at 17 lb/100 gal

Comments: SumaGrow (Agri Biotic Products) is composed of beneficial microbes formulated in a liquid humic acid base. SumaGrow is supposed to improve soil quality and increase nutrient availability to plants. In this trial, the SumaGrow treatments had slightly higher yields than the untreated (Roundup only).

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate SumaGrow (Microbial Soil Enhancer) in Sugarbeets

Schuette, Elkton, MI - 2014

Trial Quality: Poor-Fair
Variety: SX-1212RR
Planted: May 28
Harvested: October 10
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inch
Application: PPI - Plot sprayer and incorp foliar 7” band, 15.3 gpa

Soil Info: Sandy Loam
2.2% OM, 7.3pH, CEC:7.7
>Opt: P and K
High: Mn, Low: B
Added N: Manure + 40 lbs
Prev Crop: Sugarbeets

Rhizoc Control: Good
Cerc Control: Good
Problems: Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 15.5 inches

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Vigor 1-10
3	Check			**$1,322**	**7269**	**279**	**25.9**	**18.4**	**96.1**	**8.6**
2	Suma Grow	2 qt	2 lf	**$1,223**	**6726**	**266**	**25.3**	17.6	**96.1**	**7.7**
	Roundup PowerMax	32 fl oz	2 lf							
	AMS	17lb/100gal	2 lf							
	Suma Grow	2 qt	6 lf							
	Roundup PowerMax	32 fl oz	6 lf							
	AMS	17lb/100gal	6 lf							
1	Suma Grow	1 gal	PPI	**$1,191**	**6552**	**269**	**24.2**	**17.7**	**96.3**	**8.2**
	Suma Grow	2 qt	2 lf							
	Roundup PowerMax	32 fl oz	2 lf							
	AMS	17lb/100gal	2 lf							
Average				$1,245	6849	271	25.1	17.9	96.1	8.2
LSD 5%				ns(382)	ns(2100)	ns(14)	ns(7.4)	0.7	ns(0.7)	ns(1.5)
CV %				16.9	16.9	2.9	16.3	2.3	0.4	10.2

Vigor 0-10: a higher number is better

Comments: SumaGrow (Agri Biotic Products) is composed of beneficial microbes formulated in a liquid humic acid base. SumaGrow is supposed to improve soil quality and increase nutrient availability to plants. In this trial, the SumaGrow treatments had no effect on sugarbeet production. Sugarbeet cyst nematodes may have influenced the results.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different for top-ranking variety in each column.

Evaluate ProAct (Harpin Protein) in Sugarbeets

Kirkpatrick, Deckerville, MI - 2014

Trial Quality: Fair
Variety: SX-1212RR
Planted: May 23
Harvested: September 24
Plot Size: 6 Rows X 38 ft, 4 reps
Row Spacing: 22 inch
Application: Foliar - 7” band, 30 psi, 15.3 gpa

Soil Info: Sandy Loam
3.0% OM, 7.6 pH, CEC: 9.8
>Opt: P and K
Medium: Mn, Medium: B
Added N: 100 lbs
Prev Crop: Wheat

Rhizoc Control: Good
Cerc Control: Good
Problems: Cyst nem
Seeding Rate: 4.1 inches
Rainfall: 19.7 inches

No	Treatment	Rate/A	Applic	$/A	RWSA	RWST	T/A	% Sugar	% CJP
2	ProAct	2 oz	4 lf	**$1,848**	**10162**	**278**	**36.6**	**16.3**	**95.9**
3	Untreated			**$1,752**	**9637**	**269**	**36.0**	**15.8**	**95.9**
1	ProAct	1 oz	4 lf	**$1,661**	**9138**	**274**	**33.4**	**16.2**	**95.9**
Average				$1,754	9645	274	35.3	16.1	95.9
LSD 5%				ns(231)	ns(1269)	ns(17)	ns(5.0)	ns(0.9)	ns(0.0)
CV %				10.2	10.2	4.7	10.9	4.3	0.0

Comments: The active ingredient in ProAct is a Harpin Protein. When applied to a plant the Harpin Protein triggers a message throughout the plant that it is under stress. Plants react by increasing photosynthesis and energy production to fight the “perceived” threat. In this trial it is not clear if ProAct performed as described above. The 2 oz rate out yielded the untreated check but the difference is not statistically significant. BCN (Sugarbeet Cyst Nematodes) were present which probably caused more variability in yields.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Factory Lime Rates in Sugarbeets

Average of 9 Locations, 3 Years

Treatment	Net $A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 1-10
8 Tons/Acre	**$1,518**	**7590**	**261**	**28.9**	**17.3**	**96.0**	**203**	**3.2**	**8.4**
12 Tons/Acre	**$1,517**	**7625**	**260**	**29.1**	**17.3**	**95.9**	**204**	**2.3**	**8.6**
6 Tons/Acre	**$1,499**	**7493**	**263**	**28.3**	**17.5**	**96.0**	**201**	**3.5**	**8.5**
4 Tons/Acre	**$1,487**	**7408**	**260**	**28.3**	**17.3**	**95.8**	**198**	**2.6**	**8.5**
2 Tons/Acre	**$1,470**	7308	**266**	28.0	**17.3**	**95.9**	196	**2.9**	**8.4**
0 Tons/Acre	$1,418	7005	**258**	26.9	17.2	**95.8**	193	**3.6**	8.2
Average	$1,485	7405	261	28.3	17.3	95.9	199	3.0	8.4
LSD 5%	48.3	232.2	ns(8.8)	0.8	0.2	ns(.2)	7.8	ns(1.6)	0.2
CV %	3.4	3.3	3.6	2.9	1.1	0.2	4.1	54.2	2.6

Lime Trial - pH & Nutrients

Treatment	Net $A	pH			Tissue Test					
					Percent				ppm	
		Year 1	Year 2	Change	P	K	Mg	Ca	Mn	B
8 Tons/Acre	**$1,518**	**7.5**	**7.8**	**0.3**	**0.21**	**5.6**	**0.28**	**0.91**	13.4	**30.4**
12 Tons/Acre	**$1,517**	**7.5**	**7.8**	**0.4**	**0.21**	**5.7**	**0.29**	**1.43**	13.3	**30.1**
6 Tons/Acre	**$1,499**	**7.5**	**7.8**	**0.3**	**0.21**	**5.7**	**0.28**	**0.91**	14.3	**31.0**
4 Tons/Acre	**$1,487**	**7.4**	**7.6**	**0.2**	**0.21**	**5.6**	**0.28**	**0.92**	15.5	**30.6**
2 Tons/Acre	**$1,470**	**7.5**	7.5	0.0	**0.35**	**5.6**	**0.29**	**0.89**	16.5	**30.7**
0 Tons/Acre	$1,418	**7.4**	7.1	-0.3	**0.21**	5.3	**0.28**	**0.84**	**22.5**	**31.1**
Average	$1,485	7.5	7.6	0.2	0.23	5.6	0.28	0.99	15.9	30.7
LSD 5%	48.3	ns(0.1)	0.2	0.2	ns(0.16)	0.3	ns(0.02)	ns(0.70)	4.9	ns(1.4)
CV %	3.4	1.0	2.9	134.0	71.7	4.8	9.00	74.16	32.4	4.8

Vigor: a higher number is better.

Comments: The results of nine locations over three years shows a significant increase from all rates of lime compared to the untreated in $/acre, sugar/acre and tons/acre. The three higher rates of lime had a significant increase in stand. Lime increased the stand most at locations where there was noticeable seedling disease. Lime applications increased soil pH, CEC, calcium, and manganese was higher at six of nine locations. All rates of lime caused lower manganese levels in sugarbeet petioles. Zinc levels were lower at the higher lime rates and potassium was higher with all rates of lime. With lime applications manganese levels were higher in the corn plant and in soybeans there was no significant difference with any nutrient.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from-ranking variety in each treatment.

PIONEER · BIG CHIEF
MICHIGAN SUGAR

Evaluate Factory Lime Rates in Sugarbeets

Average of 3 Locations - 2014

Treatment	Net $A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 1-10
6 Tons/Acre	**$1,464**	**8149**	**250**	**32.5**	**16.5**	**96.4**	**209**	**4.7**	**9.1**
8 Tons/Acre	**$1,428**	**7977**	**246**	**32.2**	**16.3**	**96.3**	**205**	**5.4**	**9.0**
4 Tons/Acre	**$1,423**	**7900**	242	**32.2**	**16.1**	**96.1**	200	**3.0**	**9.1**
12 Tons/Acre	**$1,407**	**7909**	**243**	**32.4**	**16.1**	**96.1**	**204**	**3.7**	**9.0**
2 Tons/Acre	**$1,402**	**7764**	**245**	**31.5**	**16.3**	**96.3**	201	**3.9**	**9.0**
0 Tons/Acre	**$1,357**	7466	**243**	30.4	**16.2**	**96.0**	198	6.6	8.6
Average	$1,413	7861	245	31.9	16.2	96.2	203	4.6	9.0
LSD 5%	ns(109)	599.3	7.4	2.0	ns(0.4)	ns(0.6)	6.5	3.5	0.4
CV %	4.2	4.2	1.7	3.4	1.4	0.3	1.8	42.2	2.3

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test					
					Percent				ppm	
		2013	2014	Change	P	K	Mg	Ca	Mn	B
6 Tons/Acre	**$1,464**	**7.1**	**7.5**	**0.4**	**0.20**	**7.9**	**0.39**	**1.02**	19.40	**31.57**
8 Tons/Acre	**$1,428**	**7.1**	**7.6**	**0.5**	**0.19**	**7.4**	**0.38**	**1.07**	16.40	29.30
4 Tons/Acre	**$1,423**	**7.0**	**7.3**	**0.3**	**0.20**	**7.6**	**0.37**	**1.06**	22.20	**31.43**
12 Tons/Acre	**$1,407**	**7.1**	**7.6**	**0.5**	**0.20**	**7.8**	**0.39**	0.95	16.27	**29.57**
2 Tons/Acre	**$1,402**	**7.1**	7.0	-0.4	**0.61**	**7.6**	**0.39**	**1.04**	24.13	**31.87**
0 Tons/Acre	**$1,357**	**7.0**	6.5	-0.5	**0.19**	7.2	**0.38**	0.95	**39.73**	**32.53**
Average	$1,413	7.0	7.3	0.2	0.3	7.6	0.4	1.0	23.0	31.0
LSD 5%	ns(109)	ns(0.2)	0.4	0.3	ns(0.5)	0.6	ns(0.08)	0.1	11.6	3.1
CV %	4.2	1.6	2.9	72.2	108.5	4.7	10.8	4.6	27.6	5.5

Vigor: a higher number is better.

Comments: Factory lime was applied at rates of 0, 2, 4, 6, 8 and 12 T/A in the fall of 2013 and sugarbeets were planted in the spring of 2014. Lime treatments had significantly higher yields and sugarbeet populations compared to the no lime check. pH increased with lime applications. The petiole test level of manganese was lower with lime application.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from the top-ranking variety in each column.

Evaluate Factory Lime Rates for Sugarbeets

Crumbaugh Farms, Breckenridge, MI - 2014

Trial Quality:	Fair	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	SX-1212RR		2.8% OM, 7.2 pH, CEC: 8.2	**Cerc Control:**	Good
Planted:	April 23		> Opt: P and K	**Problems:**	None
Harvested:	September 11		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 50 ft, 6 reps	**Added N:**	125 lbs	**Rainfall:**	17.7 Inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		
Application:	Hand spread before field was worked				

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 1-10
12 Tons/Acre	**$1,217**	**6865**	**249**	**27.5**	**16.4**	**96.6**	**213**	**2.4**	**9.4**
6 Tons/Acre	**$1,189**	**6641**	**250**	**26.5**	**16.4**	**96.5**	**217**	**4.7**	**9.2**
8 Tons/Acre	**$1,173**	**6574**	**245**	**26.8**	**16.1**	**96.5**	**212**	**4.6**	**9.2**
0 Tons/Acre	**$1,099**	**6047**	**243**	**24.9**	**16.1**	**96.4**	**212**	**4.1**	**9.0**
4 Tons/Acre	**$1,073**	**5978**	**242**	**24.5**	**16.0**	**96.2**	**207**	**4.5**	**9.1**
2 Tons/Acre	$1,046	5802	**243**	24.0	**16.0**	**96.7**	**215**	**5.1**	**9.0**
Average	$1,133	6318	245	25.7	16.2	96.5	213	4.2	9.1
LSD 5%	168.0	924.1	ns(12.4)	3.3	ns(0.6)	ns(0.9)	ns(29.8)	ns(4.2)	ns(0.5)
CV %	12.4	12.2	4.2	10.6	3.3	0.8	11.8	83.1	4.4

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test - July 15					
		Oct 31 2013	June 25 2014	Change	Percent				ppm	
					P	K	Mg	Ca	Mn	B
12 Tons/Acre	**$1,217**	**7.4**	**7.8**	**0.4**	**0.15**	**8.0**	**0.39**	**1.00**	28.3	32.2
6 Tons/Acre	**$1,189**	**7.4**	**7.7**	**0.3**	**0.15**	**8.6**	**0.44**	**1.00**	**32.7**	**34.7**
8 Tons/Acre	**$1,173**	**7.4**	**7.8**	**0.4**	**0.14**	**7.6**	**0.40**	**1.05**	26.7	30.7
0 Tons/Acre	**$1,099**	**7.4**	7.1	-0.3	**0.14**	**7.7**	0.35	**1.02**	**42.0**	31.0
4 Tons/Acre	**$1,073**	**7.4**	**7.6**	**0.2**	**0.15**	**8.5**	**0.39**	**1.10**	30.0	**32.8**
2 Tons/Acre	$1,046	**7.4**	**7.4**	**0.0**	**0.14**	**8.5**	0.33	**1.11**	**31.4**	**34.0**
Average	$1,133	7.4	7.6	0.2	0.15	8.2	0.38	1.04	31.9	32.6
LSD 5%	168.0	ns(0.3)	0.4	0.4	ns(0.02)	ns(1.1)	0.05	ns(0.14)	11.5	2.2
CV %	12.4	3.0	4.3	236.9	12.08	11.3	10.73	10.82	30.1	5.6

Vigor: a higher number is better

Comments: Factory lime was applied at rates of 0, 2, 4, 6, 8 and 12 T/A in the fall of 2013 and sugarbeets were planted in the spring of 2014. The higher lime rates had higher yields and quality. Sugarbeet stand, vigor and dead beets were similar for all treatments. All of the lime treatments caused the soil pH to rise. The higher lime rates also had lower levels of manganese in sugarbeet petioles.

$A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Factory Lime Rates for Sugarbeets

Helmreich, Bay City, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Fair to Good
Variety:	SX-1212RR		3.2% OM, 7.1 pH, CEC 12.4	**Cerc Control:**	Good
Planted:	May 9		>Opt: P and K	**Problems:**	None
Harvested:	October 21		High: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plot Size:	6 rows X 50 ft, 6 reps	**Added N:**	125 lbs	**Rainfall:**	20.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Corn		
Application:	Hand spread before field was worked				

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 1-10
4 Tons/Acre	**$1,911**	**10585**	**267**	**39.6**	**17.4**	**96.9**	**238**	**4.5**	**8.6**
6 Tons/Acre	**$1,867**	**10369**	**275**	**37.7**	**18.0**	**96.7**	**243**	**9.5**	**8.5**
2 Tons/Acre	**$1,842**	**10183**	**270**	**37.7**	**17.8**	**96.4**	**235**	**6.6**	**8.3**
8 Tons/Acre	**$1,800**	**10022**	**267**	**37.6**	**17.4**	**96.8**	**236**	**11.4**	**8.3**
0 Tons/Acre	$1,772	9747	**271**	36.0	**17.8**	**96.7**	229	**13.7**	7.6
12 Tons/Acre	$1,762	**9862**	260	**37.9**	17.1	**96.6**	**236**	**8.8**	**8.1**
Average	$1,826	10128	268	37.8	17.6	96.7	236	9.1	8.2
LSD 5%	138.7	762.7	14.6	2.3	0.8	ns(0.5)	10.6	ns(10)	0.9
CV %	6.3	6.3	4.5	5.0	4.0	0.5	3.8	92.1	8.8

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test - July 15					
		Oct 31 2013	June 25 2014	Change	Percent				ppm	
					P	K	Mg	Ca	Mn	B
4 Tons/Acre	**$1,911**	**7.1**	**7.1**	**0.0**	**0.19**	**6.3**	**0.40**	**1.49**	14.5	**32.8**
6 Tons/Acre	**$1,867**	**7.2**	**7.3**	**0.1**	**0.18**	**6.5**	**0.39**	**1.47**	13.8	**31.7**
2 Tons/Acre	**$1,842**	**7.1**	**6.8**	-0.4	**0.19**	**6.0**	**0.42**	**1.42**	18.3	**31.8**
8 Tons/Acre	**$1,800**	**7.2**	**7.4**	**0.2**	**0.18**	**6.5**	**0.37**	**1.49**	13.7	30.2
0 Tons/Acre	$1,772	**7.3**	6.5	-0.8	**0.18**	5.8	**0.43**	1.30	**27.1**	**32.8**
12 Tons/Acre	$1,762	**7.3**	**7.4**	**0.1**	**0.18**	**6.3**	**0.37**	1.30	12.8	30.2
Average	$1,826	7.2	7.1	-0.1	0.18	6.3	0.40	1.41	16.7	31.6
LSD 5%	138.7	ns(0.3)	0.6	0.5	ns(0.02)	0.6	ns(0.07)	0.14	5.2	2.0
CV %	6.3	3.8	7.1	0.0	8.34	7.8	15.77	8.04	26.2	5.2

Vigor: a higher number is better.

Comments: Factory lime was applied at rates of 0, 2, 4, 6, 8 and 12 T/A in the fall of 2013 and sugarbeets were planted in the spring of 2014. All of the lime treatments out yielded the untreated but when considering the cost of the lime application the 12 ton rate had lower income than the untreated. The pH changes were minor. Manganese levels were lower in the sugugarbeet petioles with all of the lime treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Factory Lime Rates in Sugarbeets

Spero, South Saginaw, MI - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: May 23
Harvested: September 18
Plot Size: 6 rows X 50 ft, 6 reps
Row Spacing: 22 inch
Application: Hand spread before field was worked

Soil Info: Loamy Sand
4% OM, 7.2 pH, CEC 10.7
> Opt: P and K
Medium: Mn, Low: B
Added N: 125 lbs
Prev Crop: Soybeans

Rhizoc Control: Good
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches
Rainfall: 18.3 inches

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100	Vigor 1-10
6 Tons/Acre	**$1,334**	**7437**	**224**	**33.3**	**15.1**	**95.9**	**166**	**0.0**	**9.5**
2 Tons/Acre	**$1,319**	**7307**	**223**	**32.8**	**15.0**	**95.9**	**154**	**0.0**	**9.8**
8 Tons/Acre	**$1,311**	**7335**	**227**	**32.1**	**15.2**	**95.6**	**166**	**0.0**	**9.7**
4 Tons/Acre	**$1,284**	**7136**	**218**	**32.6**	**14.8**	**95.0**	**155**	**0.0**	**9.5**
12 Tons/Acre	**$1,241**	**7000**	**219**	**31.9**	**14.8**	**95.1**	**163**	**0.0**	**9.6**
0 Tons/Acre	$1,201	6603	216	30.4	**14.7**	**94.9**	152	2.1	**9.3**
Average	$1,282	7136	221	32.2	14.9	95.4	159	0.4	9.6
LSD 5%	115.2	633.9	10.8	2.4	ns(0.6)	ns(1.1)	12.2	1.6	ns(0.6)
CV %	7.4	7.3	4.0	6.1	3.2	1.0	6.4	379.5	5.1

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test - July 15					
					Percent				ppm	
		Oct 31 2013	June 25 2014	Change	P	K	Mg	Ca	Mn	Bn
6 Tons/Acre	**$1,334**	**6.6**	**7.6**	**0.9**	**0.27**	**8.5**	0.34	0.59	11.7	28.3
2 Tons/Acre	**$1,319**	**6.7**	6.9	0.3	**0.27**	8.2	**0.43**	0.60	22.0	29.8
8 Tons/Acre	**$1,311**	**6.6**	**7.6**	**1.0**	**0.25**	7.9	**0.37**	**0.68**	8.8	27.0
4 Tons/Acre	**$1,284**	**6.4**	7.1	**0.8**	**0.28**	8.1	0.32	0.60	21.3	28.7
12 Tons/Acre	**$1,241**	**6.6**	**7.7**	**1.1**	**0.26**	**9.1**	**0.41**	0.56	7.7	26.3
0 Tons/Acre	$1,201	6.2	6.0	-0.3	**0.25**	8.1	0.36	0.54	**46.4**	**33.8**
Average	$1,282	6.5	7.1	0.6	0.26	8.3	0.37	0.59	19.6	29.0
LSD 5%	115.2	0.3	0.4	0.5	ns(0.03)	0.8	0.06	0.07	6.3	1.8
CV %	7.4	3.8	4.9	62.9	8.90	8.2	13.29	9.21	26.6	5.2

Vigor: a higher number is better.

Comments: Factory lime was applied at rates of 0, 2, 4, 6, 8 and 12 T/A in the fall of 2013 and sugarbeets were planted in the spring of 2014. All of the lime rates had higher yields and quality compared to the untreated check, however, there was not a linear rate response (6T > 2T > 8T > 4T > 12T > untreated). Sugarbeet stand was also improved by the addition of lime and the untreated plots had lower vigor ratings. The lime treatments had higher soil pH values in 2014 compared to the untreated. The 12 Tons rate increased pH by 1.1 points and the 2 Ton rate increased pH by .25 points. Manganese and boron had lower ppm levels in sugarbeet petioles. Manganese was affected more than Boron.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Black Label® Zn
Reif Farms Inc., Reese - 2014

Trial Quality: Excellent
Variety: B-19RR1N
Planted: May 10
Harv/Samp: Sept 26 / Sept 22
Plot Size: 7 reps
Row Spacing: 22 inch
Seeding Rate: 63,000

Soil Info: Clay Loam
Fertilizer: 2x2: 10 gal. of 28% plus micros; PPI: 50 gal. of 28%
Prev Crop: Corn
Weather: Good weather

Rhizoc Control: Excellent Control: Quadris I.F.
Cerc Control: Fair Control: 1. Inspire, 2. Priaxor + EBDC, 3. Tin
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 45 Day
Check	$1,970	**10835**	**276**	**39.2**	**18.0**	**96.9**	**173**
Black Label Zn	$1,939	**10665**	**274**	**38.9**	**17.8**	**96.9**	**178**
Average	$1,954	10750	275	39.1	17.9	96.9	176
LSD 5%	—	ns (255)	ns (7)	ns (0.7)	ns (0.3)	ns (0.3)	ns (16)
CV %	—	2	2	1.4	1.5	0.3	7

Comments: Black Label® Zn is marketed by Loveland Products. Complexed with organic acid, Black Label Zn (6-20-0, 0.77% zinc) is a patented nitrogen and phosphate formulation with zinc designed to protect phosphate tie-up in the soil and help reduce nitrogen loss. Black Label was applied at a rate of 3 gallons per acre with 1 pint of Accomplish which is supposed to enhance nutrient uptake. Both products were applied in a T-band in-furrow with Quadris at planting time. No yield, quality or visual growth differences were seen between treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

Black Label® Zn

Schindler Farms LLC, Kawkawlin - 2014

Trial Quality: Excellent
Variety: B-12RR2N
Planted: May 23
Harv/Samp: Oct 26 / Oct 14
Plot Size: 4 reps
Row Spacing: 22 inch
Seeding Rate: 63,700

Soil Info: Loam
Fertilizer: 2x2: 20 gal. 21-9-0-4S + micros; PPI: 138#; Fall: 200# K_2O
Prev Crop: Corn
Weather: Good weather, hit by summer hail

Rhizoc Control: Good Control: Quadris I.F. & 6-8 leaf
Cerc Control: Excellent Control: 1. Inspire + EBDC, 2. Headline + EBDC, 3. Eminent + EBDC
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 30 Day
Black Label Zn	$1,637	**9007**	**289**	**31.1**	**18.9**	**96.6**	**196**
Check	$1,616	**8887**	**294**	**30.2**	**19.2**	**96.6**	**194**
Average	$1,627	8947	292	30.7	19.0	96.6	195
LSD 5%	—	ns (564)	ns (10)	ns (1.9)	ns (0.5)	ns (0.4)	ns (12)
CV %	—	3	2	2.8	1.7	0.3	7

Comments: Black Label® Zn is marketed by Loveland Products. Complexed with organic acid, Black Label Zn (6-20-0, 0.77% zinc) is a patented nitrogen and phosphate formulation with zinc designed to protect phosphate tie-up in the soil and help reduce nitrogen loss. Black label was applied at a rate of 3 gallons per acre with 1 pint of Accomplish which is supposed to enhance nutrient uptake. Both products were applied in a T-band in-furrow with Quadris at planting time. No yield, quality or visual growth differences were seen between treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top ranking variety in each column.

AgZyme
Stoneman Farms, Merrill - 2014

Trial Quality: Excellent
Variety: C-RR202
Planted: April 23
Harv/Samp: Oct 23 / Oct 9
Plot Size: 6 reps
Row Spacing: 30 inch
Seeding Rate: 53,000

Soil Info: Sandy Loam
Fertilizer: PPI: 160# K_2O, 200# 37-0-0-8, 2x2: 16 gal of 18-13-0-2 + micros
Prev Crop: Potatoes
Weather: Good

Rhizoc Control: Exc. Control: Quadris In Furrow
Cerc Control: Good Control: 1. Inspire, 2. Headline + Super Tin
Other Pests:

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 30 Day
Check	$1,880	**10350**	**276**	**37.5**	**18.1**	**96.4**	**250**
AgZyme (12.8 oz/acre)	$1,798	**9892**	**276**	**35.9**	**18.1**	**96.4**	**250**
Average	$1,839	10121	276	36.7	18.1	96.4	250
LSD 5%	—	ns (582)	ns (8)	ns (1.8)	ns (0.4)	ns (0.4)	ns (8)
CV %	—	4	2	3.4	1.6	0.3	2

Comments: Trial was conducted to evaluate the impact of yield and quality of sugarbeets when AgZyme is used. This product was used at the 12.8 ounce per acre rate and applied in a T-band in furrow with Quadris at planting. AgZyme label indicates product will stimulate soil microbes and increase nutrient uptake. Six replications were harvested for yield and quality showing no significant differences between treatments. No difference in visual observations were seen between treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top ranking variety in each column.

Gantec Pro
Bartle Farms, Brown City - 2014

Trial Quality:	Excellent	**Soil Info:**	Capac Loam	**Rhizoc Control:**	Exc Control: Quadris I.F. with/out Gantec Pro
Variety:	C-RR059	**Fertilizer:**	2x2: 42-40-0 w/ Mn; PPI: 91# N		
Planted:	April 24			**Cerc Control:**	Exc. Control: 1. Inspire & EBDC, 2. Priaxor & EBDC
Harv/Samp:	Oct 2 / Sept 30				
Plot Size:	6 reps	**Prev Crop:**	Corn		
Row Spacing:	22 inch	**Weather:**	Good weather	**Other Pests:**	None
Seeding Rate:	65,000				

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. 30 Day	Dead Beets / 1200 Ft
Gantec Pro	$1,924	**10581**	**285**	**37.2**	**18.6**	**96.6**	**241**	**0**
Check	$1,890	**10401**	**282**	**36.9**	**18.5**	**96.6**	**234**	**0**
Average	$1,907	10491	283	37.0	18.5	96.6	237	0
LSD 5%	—	ns (405)	ns (8)	ns (1.2)	ns (0.4)	ns (0.3)	ns (12)	—
CV %	—	3	2	2.3	1.6	0.2	3	—

Comments: Trial was established to evaluate growth, yield or quality enhancements from the addition of 4 oz/acre of Gantec Pro. The product was added to Quadris applied in a T-band in-furrow at planting time. Gantec Pro is labeled as a Natural Soil Conditioner that may enhance root development and possible biochemical/hormonal effect. No significant effect was seen in stand establishment or early season growth. Rhizoctonia diseased beets were non-existent in either treatment. Yield, sugar content and clear juice purity were not significantly different between treatments.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top ranking variety in each column.

Sugarbeet Nitrogen Response Following Corn

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center	**Tillage**: Conventional, 30-in. row
Planting Date: May 6, 2014 (Harvest 10/16/14)	**N Rates**: See below
Soil Type: Clay Loam; 2.7 OM; 8.0 pH; 41 ppm P; 162 ppm K	**Population**: 4 ¼ in. spacing
Variety: Crystal RR059	**Replicated**: 4 replications

N Trt. (Total lb. N/A)	RWSA	RWST	Tons/A	% Sugar	% CJP	NH2	Amino-N
0 – Check	7668	287	26.4	18.8	96.8	55	3.4
40	9377	291	32.8	18.8	96.4	73	4.4
80	9336	279	33.0	18.4	96.5	64	3.8
120	9653	276	34.6	18.2	96.6	72	4.5
160	11448	280	40.7	18.5	96.2	71	4.4
200	12131	284	43.0	18.5	96.3	82	4.9
240	11281	260	42.8	17.6	95.7	138	8.7
$LSD_{(0.10)}$[a]	**1291**	**NS**	**3.3**	**0.6**	**0.4**	**13**	**0.8**

[a] LSD, least significant difference between means within a column at (α = 0.10).

N Trt. (Total lb. N/A)	Gross Grower Payment ($/A)	Net Economic Return Minus N Costs ($/A)[b]	Net Economic Return Minus N Costs and Trucking ($/A)[c]
0 – Check	1375	1375	1276
40	1700	1680	1557
80	1674	1634	1510
120	1731	1671	1541
160	2052	1972	1820
200	2175	2075	1914
240	2022	1902	1742
$LSD_{(0.10)}$[a]	**208**	**208**	**196**

[a] LSD, least significant difference between means within a column at (α = 0.10).

[b, c] Gross grower payment and net economic returns based upon a $50/ton base payment with volume and quality incentives, an N price of $0.50/lb., and trucking costs of $3.75/T.

Sugarbeet Nitrogen Response Following Corn

Kurt Steinke and Andrew Chomas, Michigan State University

Summary: Trial was conducted to more accurately determine sugarbeet nitrogen fertilizer needs and nitrogen response following corn. All treatments received 40 lbs. N/A as 28%, 20 lbs. P2O5/A, 50 lbs. K2O/A. and 2 lbs. Mn/A as starter placed 2x2 on May 6 (check plots did not receive any N). The 40 lb. N/A treatment received no supplemental N beyond the starter application. Sidedress N (urea) applications were completed on May 29 and were lightly cultivated to avoid N volatilization.

Cool spring conditions as a carry-over effect from the winter of 2013-2014 delayed soil warming as 2-inch soil temperatures did not permanently exceed 50 degrees F until after May 22. Despite the cool spring conditions, consistent soil moisture throughout the growing season resulted in high tonnage and good quality. Nitrogen treatments receiving 160 lb. total N (40 N as 2x2 and 120 N sidedress) resulted in the best combination of tonnage and sugar quality. Nitrogen rates greater than 160 lbs N did not significantly increase yield or RWSA. For those growers wanting to fertilize at lower N rates, 40 lbs. N as a 2x2 at planting resulted in similar tonnage, RWST, RWSA, and sugar quality as both the 80 and 120 N rates.

When factoring in the economics of N fertilizer application and increased trucking for additional tonnage, 160 lbs total N still resulted in the most profitable N application rate with greater N rates not improving the overall economics of beet production. At sub-optimal N application rates, 40 lbs total N as a 2x2 resulted in similar economic returns as both the 80 and 120 N rates. This is an important result to keep in mind for those growers wishing to pursue early-harvest premiums as beets receiving near optimal N rate applications (160 N) will require a longer growing season (Sept. and into Oct.) in order to capitalize on the benefits of the greater N application rate. No significant differences in residual soil N after harvest were present among the 7 N rates in the study.

Polymer-Coated Urea Blending Ratios for Sugarbeet Production

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center	**Tillage**: Conventional, 30-in. row
Planting Date: May 6, 2014 (Harvest 10/16/14)	**N Trts**: See below
Soil Type: Clay Loam; 2.7 OM; 8.0 pH; 41 ppm P; 162 ppm K	**Population**: 4 ¼ in. spacing
Variety: Crystal RR059	**Replicated**: 4 replications

160 lb N/A Total (%PCU:%Urea)	RWSA	RWST	Tons/A	% Sugar	% CJP	NH2	Amino-N	Gross Grower Payment ($/A)[b]
100:0	11095	281	39.5	18.5	96.3	79	4.9	1989
75:25	10806	283	38.4	18.4	96.5	81	5.0	1958
50:50	10835	288	38.3	18.5	96.6	69	4.3	1943
25:75	10650	277	38.2	18.4	96.1	99	6.1	1909
0:100	11448	280	40.7	18.5	96.3	99	4.4	2052
$LSD_{(0.10)}$[a]	**NS**	**NS**	**NS**	**NS**	**0.3**	**13**	**0.6**	**NS**

[a] LSD, least significant difference between means within a column at ($\alpha = 0.10$).

[b] Gross grower payment based upon a $50/ton base payment with volume and quality incentives.

Summary: Trial was conducted to determine how to best utilize polymer-coated urea (PCU) in sugarbeet production. All treatments received 40 lbs. N/A as 28%, 20 lbs. P2O5/A, 50 lbs. K2O/A. and 2 lbs. Mn/A as starter placed 2x2 on May 6. PCU and urea were applied in 5 blending ratios consisting of 100:0, 75:25, 50:50, 25:75, and 0:100 (% PCU : % urea) for a total of 160 lbs N/A (minus the 40 lbs N/A as 2x2 starter). All treatments containing PCU (and the associated percentage of urea) were applied pre-plant incorporated the day of planting. The source of PCU was ESN, Environmentally Smart Nitrogen.

Despite moist growing conditions throughout the season, few significant differences were noticed between treatments regardless of the blending ratio. Tonnage, % sugar, and gross grower payment data indicated no significant advantage to including PCU in sugarbeet N applications. One explanation for the poor sugarbeet response to PCU application could be the lack of individual large rainfall events as only 3 rainfall events greater than 1-inch occurred throughout the growing season. Typically significant N loss conditions must occur in order to see the benefit to slow-release sources of N.

Organic Sources of Nitrogen in Sugarbeet Production

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center	**Tillage**: Conventional, 30-in. row
Planting Date: May 6, 2014 (Harvest 10/16/14)	**N Trts**: See below
Soil Type: Clay Loam; 2.7 OM; 8.0 pH; 41 ppm P; 162 ppm K	**Population**: 4 ¼ in. spacing
Variety: Crystal RR059	**Replicated**: 4 replications

N Trt. **160 lb N/A Total**	**RWSA**	**RWST**	**Tons/A**	**% Sugar**	**% CJP**	**NH2**	**Amino-N**	**Gross Grower Payment ($/A)[b]**
40 UAN 2x2 120 Urea Sd	11448	280	40.7	18.5	96.3	71	4.4	2052
1 T/A Biotic 40 UAN 2x2 13 Urea Sd	11743	293	40.3	18.9	96.7	71	4.4	2105
1 T/A Herbrucks 40 UAN 2x2 66 Urea Sd	10676	282	37.4	18.6	96.5	72	4.3	1914
2 T/A Herbrucks 40 UAN 2x2 13 Urea Sd	11445	287	39.6	18.9	96.4	76	4.5	2052
$LSD_{(0.10)}$[a]	**NS**	**NS**	**NS**	**NS**	**0.3**	**NS**	**NS**	**NS**

[a] LSD, least significant difference between means within a column at (α = 0.10).

[b] Gross grower payment based upon a $50/ton base payment with volume and quality incentives.

Summary: Trial was conducted to determine the effects of organic spring-applied sources of N on sugarbeet production and quality. All treatments received 40 lbs. N/A as 28%, 20 lbs. P2O5/A, 50 lbs. K2O/A. and 2 lbs. Mn/A as starter placed 2x2 on May 6. A biotic (8-5-5, mycorrhizae-inoculated) fertilizer and Herbrucks pelleted chicken manure (4-3-2) were applied pre-plant incorporated the day of planting at 1 or 2 T/A. The 100% soluble N treatment was applied as 120 N urea sidedress on May 29, other than 40 lbs N in 2x2 starter which all treatments received. Nitrogen applications in all treatments were equalized at 160 lbs of first-year mineralizable N/A.

Few significant differences were realized amongst any of the treatments. The organic-based N products produced similar and in some cases improved sugar quality parameters as compared to the soluble N standard treatment. The economics of organic N applications including price per pound of N and delivery of product need to be considered in addition to any perceived or realized benefits to soil health. The concern of spring-applied organic N products reducing beet quality was not substantiated during the 2014 growing season.

PIONEER · BIG CHIEF
MICHIGAN SUGAR

Evaluate Roundup and Alternate Herbicides For Weed Control in Sugarbeets

Piling Ground, Deckerville, MI - 2014

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Good
Variety:	C-RR288		3.0% OM, 7.4 pH, CEC: 7.7	**Cerc Control:**	See Trts
Planted:	May 7		>Opt: P, Opt: K	**Problems:**	Low level
Harvested:	October 7		High: Mn, Medium: B		Cyst nem
Plots:	6 rows X 38 ft, 6 reps	**Added N:**	100 lbs	**Seeding Rate:**	4.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Corn	**Rainfall:**	17.2 inches
Application:	JD 3250 mounted plot sprayer, compressed air, 30 psi, 15.3 gpa				

No	Treatment	Rate/A	Applied	$/A	RWSA	RWST	T/A	% Sugar	% CJP	% Weed Control	% SB Injury*	Stand B/100’
5	Nortron Roundup Nortron Nortron Roundup	3 pt 32 fl oz 8 fl oz 16 fl oz 22 fl oz	Pre 2, 6 lf 2 lf 6 lf 16 lf	**$1,772**	**7839**	**228**	**34.4**	**15.4**	**95.7**	**97**	**18**	**241**
10	Roundup Stinger Stinger Roundup	32 fl oz 1 fl oz 4 fl oz 22 fl oz	2, 6 lf 2 lf 6 lf 16 lf	**$1,696**	**7503**	**232**	**32.4**	**15.8**	**95.3**	**97**	10	**244**
4	Nortron Roundup Nortron Nortron Roundup	3 pt 32 fl oz 4 fl oz 8 fl oz 22 fl oz	Pre 2, 6 lf 2 lf 6 lf 16 lf	**$1,679**	**7426**	214	**34.7**	14.9	94.2	**100**	10	**246**
9	Warrant Roundup Warrant Warrant Roundup	8 fl oz 32 fl oz 12 fl oz 3 pt 22 fl oz	Pre 2, 6 lf 2 lf 6 lf 16 lf	**$1,672**	**7399**	**226**	**32.9**	**15.4**	**95.0**	**97**	**21**	**242**
16	Roundup UpBeet Roundup	32 fl oz 1 oz 22 fl oz	2, 6 lf 2, 6 lf 16 lf	**$1,662**	**7354**	**230**	**32.0**	**15.6**	**95.4**	96	15	**247**
21 Bmix Splits	Betamix UpBeet Betamix Stinger Assure II Betamix	1.5 pt 1 oz 3 pt 2 fl oz 10 fl oz 5 pt	2 lf 2, 4, 12 lf 4 lf 4 lf 4 lf 12 lf	**$1,635**	**7231**	214	**33.8**	14.8	**94.8**	95	14	229
12	Roundup Stinger Roundup	32 fl oz 4 fl oz 22 fl oz	2, 6 lf 2, 6 lf 16 lf	**$1,633**	**7225**	**225**	**32.0**	**15.5**	**94.9**	**98**	16	**244**
20 Bmix Splits	Betamix UpBeet Betamix Stinger Assure II Betamix	1.5 pt 0.75 oz 3 pt 2 fl oz 10 fl oz 5 pt	2 lf 2, 4, 12 lf 4 lf 4 lf 4 lf 12 lf	**$1,625**	**7188**	**225**	**32.0**	**15.3**	**95.2**	95	13	**240**

Evaluate Roundup and Alternate Herbicides For Weed Control in Sugarbeets

Piling Ground, Deckerville, MI - 2014

No	Treatment	Rate/A	Applied	$/A	RWSA	RWST	T/A	% Sugar	% CJP	% Weed Control	% SB Injury*	Stand B/100'
2	Nortron	3 pt	Pre	$1,585	7013	**227**	31.0	**15.6**	**94.9**	**98**	11	**241**
	Roundup	32 fl oz	2, 6 lf									
	Roundup	22 fl oz	16 lf									
11	Roundup	32 fl oz	2, 6 lf	$1,584	7009	**233**	30.1	**15.9**	**95.0**	**97**	14	**242**
	Stinger	2 fl oz	2 lf									
	Stinger	4 fl oz	6 lf									
	Roundup	22 fl oz	16 lf									
1	Roundup	32 fl oz	2, 6 lf	$1,578	6981	212	**32.9**	14.7	94.5	**98**	3	**246**
	Roundup	22 fl oz	16 lf									
7	Dual Magnum	8 fl oz	Pre	$1,575	6969	**227**	30.7	**15.5**	**95.0**	**98**	**23**	**242**
	Roundup	32 fl oz	2, 6 lf									
	Dual Magnum	1.3 pt	6 lf									
	Dual Magnum	10 fl oz	2 lf									
	Roundup	22 fl oz	16 lf									
3	Nortron	3 pt	Pre	$1,568	6935	216	**32.2**	14.9	**94.8**	**99**	11	**251**
	Dual Magnum	8 fl oz	Pre									
	Roundup	32 fl oz	2, 6 lf									
	Roundup	22 fl oz	16 lf									
8	Outlook	6 fl oz	Pre	$1,543	6825	213	**32.0**	14.8	94.5	**100**	14	**240**
	Roundup	32 fl oz	2, 6 lf									
	Outlook	8 fl oz	2 lf									
	Outlook	1 pt	6 lf									
	Roundup	22 fl oz	16 lf									
6	Nortron	3 pt	Pre	$1,527	6754	**223**	30.3	**15.2**	**95.2**	**98**	**20**	**239**
	Roundup	32 fl oz	2, 6 lf									
	Nortron	16 fl oz	2 lf									
	Nortron	24 fl oz	6 lf									
	Roundup	22 fl oz	16 lf									
19	Betamix	1.5 pt	2 lf	$1,521	6728	216	**31.4**	14.9	94.6	94	15	235
Bmix Splits	UpBeet	0.5 oz	2, 4, 12 lf									
	Betamix	3 pt	4 lf									
	Stinger	2 fl oz	4 lf									
	Assure II	10 fl oz	4 lf									
	Betamix	5 pt	12 lf									
18	Betamix	8 fl oz	Cot, 2 lf	$1,514	6697	**226**	29.6	**15.4**	**95.4**	95	**19**	235
Bmix Micro-Rates	Betamix	10 fl oz	4 lf									
	Betamix	12 fl oz	6 lf									
	Betamix	16 fl oz	12 lf									
	UpBeet +	0.125 oz	Cot, 2									
	Stinger +	1 fl oz	4, 6									
	Assure II +	4 fl oz	and									
	Destiny HC	1.5%	12 lf									
	Dual Magnum	1.3 pt	6 lf									

Evaluate Roundup and Alternate Herbicides For Weed Control in Sugarbeets

Piling Ground, Deckerville, MI - 2014

No	Treatment	Rate/A	Applied	$/A	RWSA	RWST	T/A	% Sugar	% CJP	% Weed Control	% SB Injury*	Stand B/100'
15	Roundup	32 fl oz	2, 6 lf	$1,457	6448	214	30.2	14.7	**94.8**	**97**	13	231
	UpBeet	0.75 oz	2, 6 lf									
	Roundup	22 fl oz	16 lf									
17	Nortron	3 pt	Pre	$1,451	6420	**220**	29.2	15.1	**94.9**	95	10	**248**
Bmix Splits	Betamix	1.5 pt	2 lf									
	Betamix	3 pt	4 lf									
	Dual Magnum	1.33 pt	4 lf									
	Stinger	4 fl oz	4 lf									
	Betamix	5 pt	12 lf									
14	Roundup	32 fl oz	2, 6 lf	$1,428	6318	**222**	28.5	**15.2**	**94.9**	96	11	**247**
	UpBeet	0.5 oz	2, 6 lf									
	Roundup	22 fl oz	16 lf									
13	Roundup	32 fl oz	2, 6 lf	$1,419	6279	212	29.8	14.7	94.6	**97**	11	**238**
	Betamix	1.5 pt	2 lf									
	Betamix	3 pt	6 lf									
	Roundup	22 fl oz	16 lf									
22	Untreated Check			$277	1226	215	5.6	14.7	**95.0**	0	0	214

	$/A	RWSA	RWST	T/A	% Sugar	% CJP	% Weed Control	% SB Injury*	Stand B/100'
Average	$1,518	6717	221	30.4	15.2	94.9	92.5	13.2	240.1
LSD 5%	169.5	750.0	14.4	3.5	0.7	0.9	3.4	6.6	15.2
CV %	7.9	7.9	4.6	8.3	3.5	0.7	2.6	35.3	4.5

***% Beet injury:** Ratings taken mid-season, by harvest injury was not noticable.

***AMS** at 17 lb/100 gal included in all Round up PowerMax applications.
Trts 2-6 have Nortron pre followed by post trts
Trts 7, 8 and 9 look at Dual, Outlook and Warrant low rates pre and early post
Trts 10-12 look at Stinger rates
Trts 14-16 and 19-21 look at UpBeet rates
Trt 18 is a Betamix Micro-Rate treatment
Trts 17, 19, 20 and 21 are Betamix Standard Splits

Comments: This trial was conducted to evaluate weed control methods in sugarbeets that include herbicides other than Roundup. Several weeds in our growing region have resistance to Roundup and other regions have more severe weed resistance problems. All of the Roundup PowerMax based treatments provided 95-100% weed control. Applying Nortron pre, followed by tank mixtures of Roundup and Nortron caused some sugarbeet injury but had the highest yield and grower income in the trial. Injury ratings were taken mid season and by harvest symptoms were not noticeable (all treatments). Combinations of Roundup and Warrant, Dual, Outlook and Betamix also caused some injury but provided good results. Low rates of Dual, Outlook and Warrent applied pre followed by a little higher rate at the 2 lf stage and the full rate at the 6 lf stage gave good results. Betamix standard splits and Micro-Rates were effective treatments, but provided slightly lower levels of weed control and more injury than most treatments. The weed pressure was very high (pigweed, lambsquarter, wild mustard). None of the treatments caused stand loss. The average yield was over 30 ton/A and the untreated check plots yielded 5.6 tons/A.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from top-ranking variety in each column.

Management of Glyphosate (Group 9) - Resistant Horseweed in Sugarbeet

Christy Sprague, Amanda Goffnett & Gary Powell
Michigan State University

Locations: Gratiot Co.; SVREC (Richville)	Application timings: 2- & 6-leaf beets
Planting Dates: May 23 (GR); May 6 (SVREC)	**Herbicides:** see treatments
Soil Type: Loamy Sand (GR); Clay Loam (SVREC)	**O.M.:** 2.9% (GR); 2.9 (SVREC)
Replicated: 4 times	**Variety:** HM-173 RR (SVREC)

Table 1. Sugarbeet injury and glyphosate-resistant horseweed control (Gratiot Co.) and sugarbeet injury, yield and recoverable white sugar per acre (RWSA) (SVREC) for various herbicide programs for potential horseweed control.

		Gratiot Co.		SVREC (Richville)		
Herbicide treatments[a]	Timing	Sugarbeet injury[b]	Horseweed control[b]	Sugarbeet injury[b]	Yield	RWSA
		— % —	— % —	— % —	- ton/A -	– lb/A –
Roundup - applied 2X		0	30	0	31.8	7780
Stinger (2 oz)	2-lf	0	64	0	35.9	8885
Stinger (3 oz)	2-lf	2	81	0	30.5	7692
Stinger (4 oz)	2-lf	5	71	0	31.7	8024
Stinger (6 oz)	2-lf	6	74	0	32.6	7933
Stinger (2 oz) fb. (2 oz)	2-lf fb. 6-lf	11	80	0	32.9	8259
Stinger (3 oz) fb. (3 oz)	2-lf fb. 6-lf	13	93	0	31.9	8095
Stinger (2 oz) fb. (4 oz)	2-lf fb. 6-lf	13	92	0	32.4	7852
Stinger (4 oz)	6-lf	3	91	0	31.7	7837
Stinger (6 oz)	6-lf	11	88	1	33.8	8514
Stinger (8 oz)	6-lf	14	82	0	33.5	8350
Stinger (2 oz) fb. (4 oz) fb. (4 oz)	2-lf fb. 6-lf fb. canopy	11	99	0	33.6	7982
Stinger (2 oz) + UpBeet[c] (0.5 oz) fb. Stinger (4 oz) + UpBeet (0.5 oz)	2-lf fb. 6-lf	16	90	4	32.4	8086
UpBeet (1 oz) fb. UpBeet (1 oz)	2-lf fb. 6-lf	0	38	5	33.8	8666
Untreated		0	0	0	23.5	5843
$LSD_{0.05}$[d]		5	15	2	4.4	1242

[a] Roundup PowerMax at 22 fl oz/A was applied with all POST herbicide treatments when sugarbeet were at the 2- and 6-leaf stages. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.

[b] Sugarbeet injury was evaluated ~10 d after the 6-leaf application timing; horseweed control was at harvest (Oct. 2).

[c] All treatments with UpBeet included 1 pt/A of Destiny HC.

[d] Means within a column greater than least significant difference (LSD) value are different from each other.

Comments: Two field trials were conducted to evaluate possible herbicide treatments to control glyphosate-resistant horseweed (marestail) in sugarbeet. The first trial was conducted on a grower's field in Gratiot Co. where glyphosate-resistant horseweed was present. The second study was conducted at the Saginaw Valley Research and Extension Center to evaluate the impacts of these treatments on sugarbeet injury and yield. All treatments contained Roundup PowerMax at 22 fl oz/A at each application timing. Overall, sugarbeet injury was less than 15% with all treatments, 10 d after the 6-leaf sugarbeet application. At least two-applications of Stinger at a minimum rate of 3 oz/A were needed for season-long control of glyphosate-resistant horseweed. The treatment that provided the best control of glyphosate resistant horseweed was three applications of Stinger at 2 oz, fb. 4 oz fb. 4 oz/A at the 2-, 6-leaf sugarbeet stages and at canopy closure. None of the treatments reduced yield compared with the Roundup only treatments. This is one year's results and these treatments need to be evaluated further.

Management of Glyphosate (Group 9) - Resistant Palmer Amaranth in Sugarbeet

Christy Sprague and Gary Powell, Michigan State University

Locations: Gratiot Co.; SVREC (Richville)	**Application timings**: 2-, 6-leaf beets & @ canopy
Planting Dates: May 29 (GR); May 6 (SVREC)	**Herbicides:** see treatments
Soil Type: Sandy Loam (GR); Clay Loam (SVREC)	**O.M.:** 3.1% (GR); 2.9 (SVREC)
Replicated: 4 times	**Variety:** HM-173 RR (SVREC)

Table 1. Palmer amaranth control (Gratiot Co.) and sugarbeet injury, yield and recoverable white sugar per acre (RWSA) (SVREC) of selected herbicide programs examined for glyphosate-resistant Palmer amaranth control.

		Gratiot Co.	SVREC (Richville)		
Herbicide treatments[a]	Timing	Palmer amaranth[b]	Sugarbeet injury[b]	Yield	RWSA
		— % —	— % —	- ton/A -	— lb/A —
Roundup - applied 3X	2-lf fb. 6-lf fb. canopy	8	0	31.8	7879
Betamix (2 pt) + Warrant (3 pt)	2-lf fb. 6-lf	86	13	33.1	8392
Betamix (2 pt) fb. Betamix (3 pt) + Warrant (3 pt)	2-lf fb. 6-lf	85	16	31.4	8507
Warrant (3 pt) fb. Warrant (3 pt)	2-lf fb. 6-lf	75	5	32.6	7837
Betamix (2 pt) + Warrant (3 pt) fb. Warrant (3 pt)	2-lf fb. 6-lf	89	9	30.6	7886
Betamix (2 pt) fb. Betamix (3 pt)	2-lf fb. 6-lf	51	0	33.0	8355
Betamix (2 pt) + Stinger (2 oz) fb. Betamix (3 pt) + Stinger (4 oz)	2-lf fb. 6-lf	49	3	31.8	8470
Betamix (2 pt) + Stinger (2 oz) fb. Betamix (3 pt) + Stinger (4 oz) + Warrant (3 pt)	2-lf fb. 6-lf	96	6	33.3	8456
Betamix (2 pt) fb. Betamix (3 pt) fb. Betamix (3 pt)	2-lf fb. 6-lf fb. canopy	86	3	31.1	8111
Betamix (2 pt) + Stinger (2 oz) fb. Betamix (3 pt) + Stinger (4 oz) fb. Betamix (3 pt) + Stinger (4 oz)	2-lf fb. 6-lf fb. canopy	59	4	30.6	7827
Betamix (2 pt) fb. Betamix (4 pt) fb. Betamix (6 pt)	2-lf fb. 6-lf fb. canopy	92	2	35.6	9386
Betamix (2 pt) fb. Betamix (4 pt) + Warrant (3 pt) fb. Betamix (6 pt)	2-lf fb. 6-lf fb. canopy	99	15	29.8	7673
$LSD_{0.05}$[c]		15	12	3.5	878

[a] Roundup PowerMax at 32 fl oz/A fb. 22 fl oz/A and 22 fl oz/A was applied in each of the treatments. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.

[b] Palmer amaranth control was evaluated in mid-August and sugarbeet injury was evaluated ~10 d after the 6-leaf application.

[c] Means within a column greater than least significant difference (LSD) value are different from each other.

Comments: Two field trials were conducted to evaluate possible herbicide treatments to control glyphosate-resistant Palmer amaranth in sugarbeet. The first trial was conducted to evaluate Palmer amaranth control and the second trial was conducted to examine the effects of these treatments on sugarbeet injury and yield. Not all treatments are presented. Results indicate that there are some treatments that show some promise for glyphosate-resistant Palmer amaranth control (Table 1), without reducing yield compared with three applications of glyphosate alone. This is only one year's results and these treatments need to be evaluated further.

Evaluate Planting Dates and Plant Populations in Sugarbeets

Average of 3 Trials (2012, 2013 and 2014)

Planting Date (Average of all Populations)

Planting Date*	$/A	RWSA	RWST	T/A	% Sugar	% CJP
1st Planting Date	**$1,640**	**9021**	**268**	**33.7**	**17.9**	**95.5**
17 Days After 1st Planting Date	$1,453	7989	261	30.5	17.6	95.3
24 Days After 2nd Planting Date	$1,232	6778	255	26.5	17.3	95.2
Average	$1,442	7929	261	30.3	17.6	95.3
LSD 5%	35.7	196.4	2.7	0.7	0.2	0.1
CV %	9.5	9.5	3.8	8.8	3.4	0.6

Population (Average of all Planting Dates)

Beets/ 100' *	$/A	RWSA	RWST	T/A	% Sugar	% CJP
250	**$1,575**	**8664**	**269**	**32.1**	**17.9**	**95.8**
200	**$1,564**	**8603**	**268**	**32.0**	**17.9**	95.6
150	$1,526	8393	**267**	**31.4**	**17.9**	95.5
100	$1,462	8039	262	30.7	**17.7**	95.3
75	$1,354	7449	256	29.2	17.3	95.1
50	$1,169	6427	246	26.1	16.9	94.7
Average	$1,442	7929	261	30.3	17.6	95.3
LSD 5%	50.5	277.6	3.8	1.0	0.2	0.2
CV %	9.5	9.5	3.8	8.8	3.4	0.6

*** Planting Dates:** (2012 - 3/22, 4/2, 4/21) (2013 - 5/2, 5/15, 6/4) (2014 - 5/6, 5/19, 6/4)

*** Beets/100':** Planted at a 2 inch spacing and thinned to desired populations at the 4 leaf stage

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Planting Dates and Plant Populations in Sugarbeets

Pioneer · Big Chief
Michigan Sugar

Average of 3 Trials (2012, 2013 and 2014)

Planted	Beets/ 100'	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Early (Apr 3)	250	**$1,835**	**10093**	**277**	**36.3**	**18.3**	**96.0**
Early (Apr 3)	200	**$1,810**	**9954**	**278**	**35.8**	**18.5**	**95.9**
Early (Apr 3)	150	$1,703	9367	**272**	**34.8**	**18.1**	**95.6**
Early (Apr 3)	100	$1,622	8924	265	33.9	17.7	95.5
Mid (Apr 20)	250	$1,596	8780	270	32.5	18.0	**95.7**
Mid (Apr 20)	150	$1,557	8566	271	31.5	**18.1**	**95.7**
Early (Apr 3)	75	$1,517	8341	261	32.0	17.6	95.1
Mid (Apr 20)	200	$1,551	8531	266	32.2	17.8	95.4
Mid (Apr 20)	100	$1,467	8071	264	30.6	17.7	95.3
Mid (Apr 20)	75	$1,382	7600	256	29.8	17.4	95.1
Early (Apr 3)	50	$1,354	7446	254	29.3	17.3	94.9
Late (May 14)	150	$1,317	7244	259	28.0	17.5	95.3
Late (May 14)	100	$1,295	7122	259	27.6	17.5	95.2
Late (May 14)	200	$1,332	7324	261	28.1	17.5	95.6
Late (May 14)	250	$1,294	7119	260	27.2	17.4	**95.7**
Mid (Apr 20)	50	$1,161	6385	241	26.5	16.6	94.4
Late (May 14)	75	$1,165	6407	250	25.7	17.0	95.0
Late (May 14)	50	$991	5450	243	22.5	16.7	94.6
Average		$1,442	7929	261	30.3	17.6	95.3
LSD 5%		87.5	481.1	6.7	1.7	0.4	0.4
CV %		9.5	9.5	3.8	8.8	3.4	0.6

Planting Date Summary: Averaged over 3 years sugarbeets lost approximately 1.25 tons per week (each week) when planted after the optimum planting date. Sugarbeets lost less than 1.25 tons closer to the prime planting date and more than 1.25 tons for later plantings. Sugarbeets also lost 0.12 points of sugar per week, 2.1 lbs of RWST per week, 388 lbs of RWSA per week and $71 per week when planted late.

Sugarbeet Population Summary: The highest yield was obtained with 250 beets per 100 ft of row followed closely by 200 beets per 100 ft of row. From past trials we have determined that as the beet population climbs above 250 beets the yield begins to decline due to an increasing proportion of small beets that are not harvestable. In these trials, for every 10 beets below 200, the yield declined by 0.4 tons, sugar declined by nearly 0.1 pt, RWST declined by 1.5 lbs, RWSA declined by 146 lbs and grower income declined by $27 (all per acre).

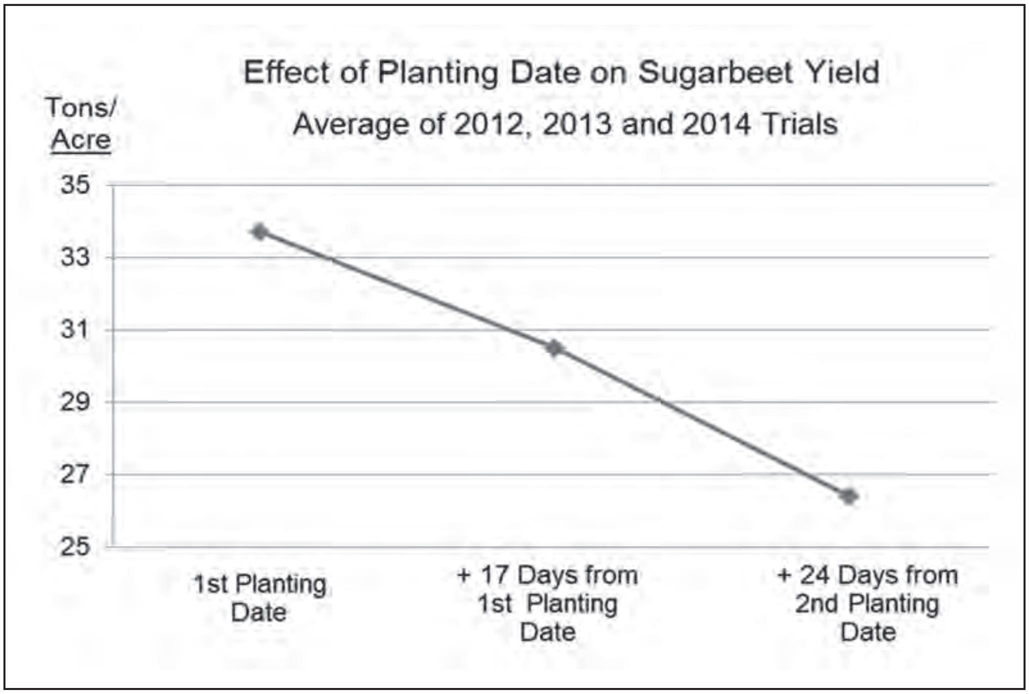
Replanting Considerations: Based on these trials it would be advisable to keep fields with 100 beets per 100 ft and replant fields with around 50 beets per 100 ft. Fields with around 75 beets per 100 ft would be marginal to keep. More information about replanting can be found in the replanting guide included in this report.

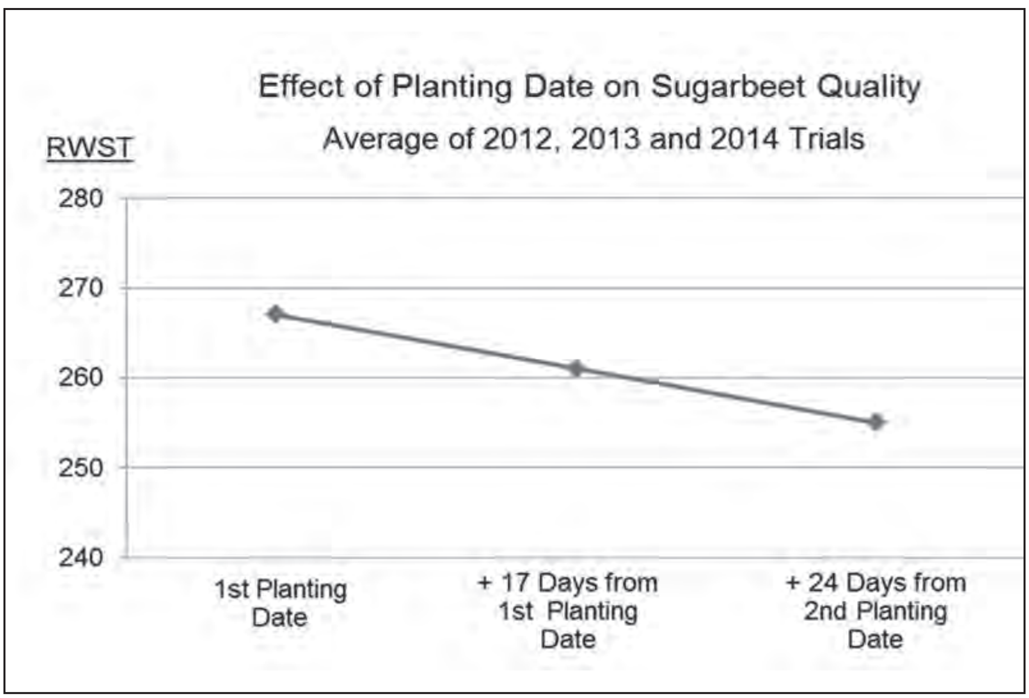
$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Planting Dates in Sugarbeets

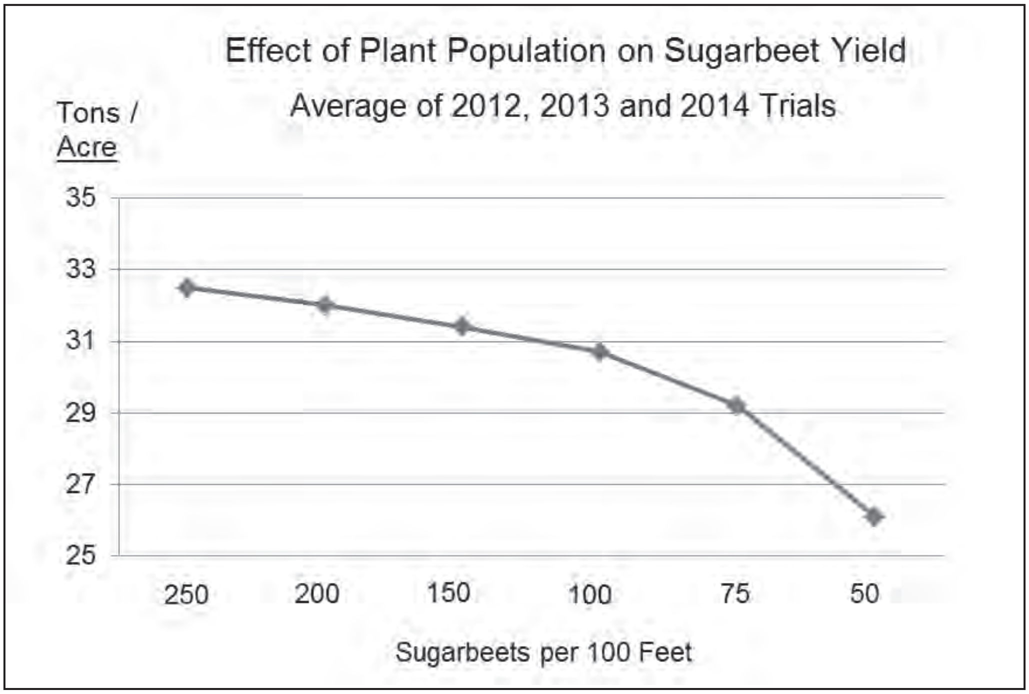
Average of 3 Trials (2012, 2013 and 2014)

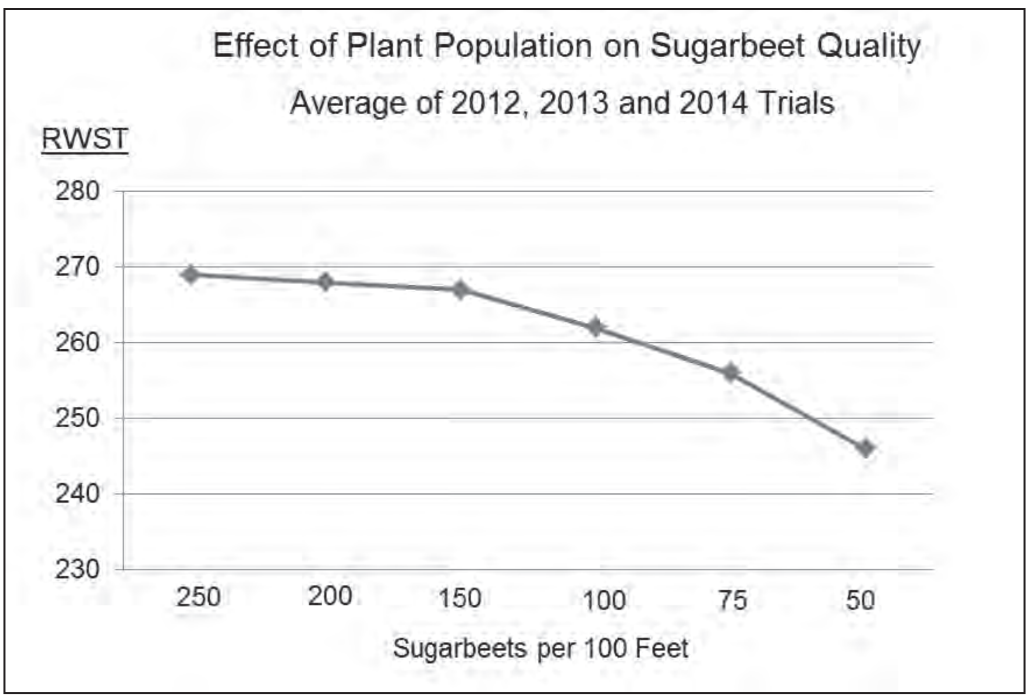




Evaluate Plant Populations in Sugarbeets

Average of 3 Trials (2012, 2013 and 2014)





Evaluate Planting Date and Population on Sugarbeet Yield and Quality

Shaffner, Freeland, MI - 2014

Trial Quality:	Good	**Soil Info:**	Clay Loam	**Rhizoc Control:**	Good
Variety:	C-RR059		3.1% OM, 7.4 pH, CEC: 11.4	**Cerc Control:**	Good
Planted:	See tmts		Opt: P, < Opt: K	**Problems:**	None
Harvested:	October 24		Medium: Mn, Low: B	**Seeding Rate:**	4.1 inches
Plots:	6 rows X 38 ft, 8 reps	**Added N:**	130 lbs	**Rainfall:**	19 inches
Row Spacing:	22 inch	**Prev Crop:**	Wheat/Clover		

Plant Date	Beets/ 100’	$/A	RWSA	RWST	T/A	% Sugar	% CJP
May 6	200	**$2,242**	**12331**	**276**	**44.6**	**18.5**	**95.3**
May 6	250	**$2,229**	**12258**	**279**	**43.9**	**18.6**	**95.7**
May 19	150	$1,994	10967	**276**	39.7	**18.5**	**95.4**
May 6	100	$1,935	10645	252	42.2	17.2	94.8
May 6	150	$1,905	10478	254	41.3	17.3	94.9
May 6	75	$1,889	10390	258	40.3	17.6	94.7
May 19	250	$1,872	10297	**271**	37.9	**18.2**	**95.3**
May 19	200	$1,820	10008	260	38.6	17.6	94.9
May 19	100	$1,722	9473	260	36.4	17.7	94.9
May 19	75	$1,681	9247	245	37.6	16.9	94.4
May 6	50	$1,626	8945	249	35.8	17.1	94.4
June 4	200	$1,560	8579	261	32.9	17.7	95.0
June 4	250	$1,477	8123	265	30.7	17.8	**95.3**
June 4	100	$1,467	8070	250	32.3	17.2	94.5
June 4	150	$1,463	8044	250	32.3	17.1	94.6
May 19	50	$1,420	7810	240	32.5	16.8	93.7
June 4	75	$1,396	7680	241	31.9	16.6	94.3
June 4	50	$1,203	6616	237	28.0	16.5	93.8

	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$1,717	9442.2	257.0	36.6	17.5	94.8
LSD 5%	126.6	696.5	11.1	2.1	0.6	0.5
CV %	7.5	7.5	4.4	5.9	3.6	0.5

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Planting Date and Population on Sugarbeet Yield and Quality

Shaffner, Freeland, MI - 2014

Planting Date Effect

Planting Date	$/A	RWSA	RWST	T/A	% Sugar	% CJP
May 6	**$1,971**	**10841**	**261**	**41.4**	**17.7**	**95.0**
May 19	$1,752	9634	**259**	37.1	**17.6**	94.8
June 4	$1,428	7852	251	31.3	17.2	94.6
Average	$1,717	9442	257	36.6	17.5	94.8
LSD 5%	70.7	388.8	4.6	1.3	0.3	0.2

Sugarbeet Population Effect

Beets/ 100'	$/A	RWSA	RWST	T/A	% Sugar	% CJP
200	**$1,874**	**10306**	**266**	**38.7**	**17.9**	**95.1**
250	**$1,859**	**10226**	**272**	**37.5**	**18.2**	**95.4**
150	**$1,787**	**9830**	260	**37.8**	17.6	95.0
100	$1,708	9396	254	**37.0**	17.3	94.7
75	$1,656	9106	248	36.6	17.0	94.5
50	$1,416	7790	242	32.1	16.8	94.0
Average	$1,717	9442	257	36.6	17.5	94.8
LSD 5%	100.0	549.8	6.5	1.8	0.4	0.3
CV %	7.5	7.5	4.4	5.9	3.6	0.5

Comments: Sugarbeets planted on May 6 produced 4.3 more tons per acre than sugarbeets planted 2 weeks later and 10.1 more tons per acre than sugarbeets planted a little more than 4 weeks later. Sugarbeet quality and grower income were also reduced significantly by delayed planting dates. With respect to sugarbeet populations, 200 beets per 100 ft of row provided the highest yield and grower income. A population of 250 beets gave slightly less yield and income. Sugarbeet yields and income declined with lower beet populations.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Replanting Guide - Base on Sugarbeet Stand and Planting Date

Michigan Sugar Company - 2014

To use this replanting guide compare the stand and planting date of the field in question to the values in the table below. The % values represent the income that can be expected from a field based on planting dates and sugarbeet populations. For our area, 225 beets per 100 ft of row is considered optimum. The best planting date will be as soon as the field can be worked lightly and frost is not a major concern, normally late March to early April.

	Sugarbeet Population (Beets/100 ft of Row)							
Planting Date	**50 B/100’**	**75 B/100’**	**100 B/100’**	**125 B/100’**	**150 B/100’**	**175 B/100’**	**200 B/100’**	**225 B/100’**
Optimum	72%	79%	85%	90%	94%	97%	99%	100%
+ 1 week	71%	78%	84%	89%	93%	96%	98%	99%
+ 2 weeks	69%	76%	82%	86%	90%	93%	95%	96%
+ 3 weeks	64%	73%	78%	83%	86%	89%	91%	92%
+ 4 weeks	63%	69%	74%	78%	82%	84%	86%	87%
+ 5 weeks	58%	64%	69%	73%	76%	79%	80%	81%
+ 6 weeks	53%	58%	63%	67%	70%	72%	73%	74%
+ 7 weeks	48%	52%	56%	59%	62%	64%	65%	66%
+ 8 weeks	40%	44%	48%	50%	53%	54%	55%	56%

Example: Planted at optimum time but beet population is only 75 beets/100 ft. Expect 79% of income in this situation. If the replant date would be + 3 weeks, the new stand would need to be 125 beets to break even (without considering replant costs).

This Replanting Guide is based primarily on Michigan Sugar Company research, however, information from the Red River Valley and Idaho was also utilized.

Effect of Harvest Date on Sugarbeet Yield, Quality and Grower Income

Average of 5 Years, 11 Locations

Harvest: 6 Dates, Aug. 15 to Nov. 1

Plot Size: 6 rows X 38 ft, 6 reps

Seeding Rate: 4.1 inches

Beet Population: About 190 B/100'

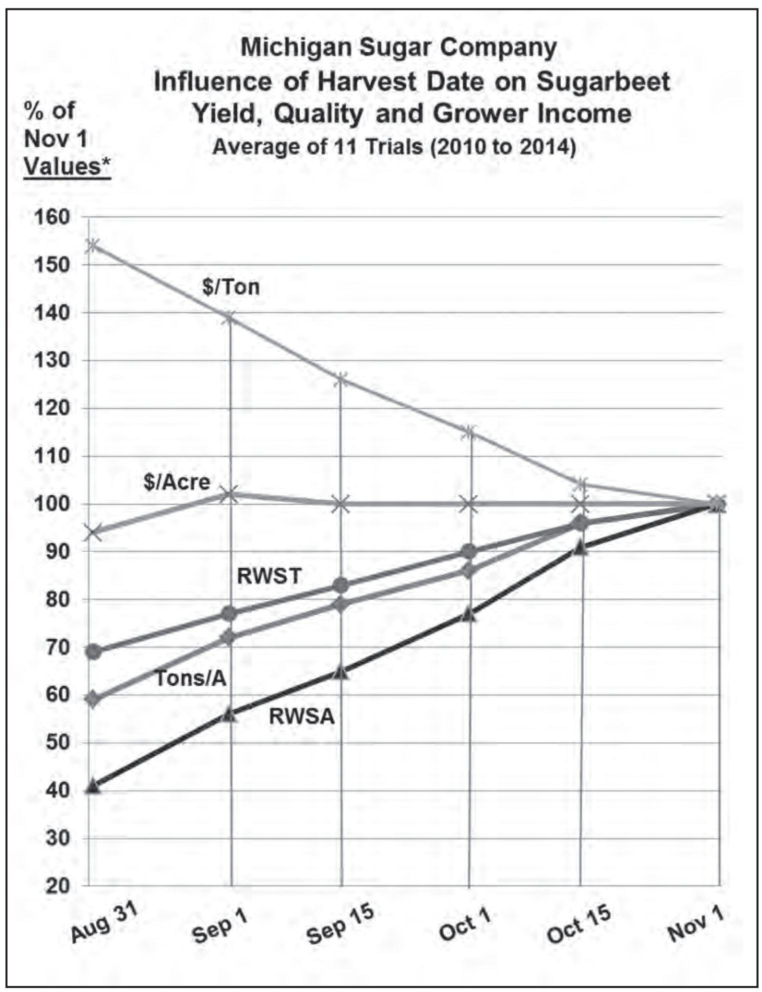
Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Beets 100'
Sept 1	**$1,954**	$75	6045	228	26.3	15.8	94.3	**190**
Nov 1	**$1,929**	$54	**10927**	**298**	**36.8**	**19.6**	**95.9**	**187**
Oct 15	**$1,918**	$56	9968	**285**	**35.3**	**19.0**	**95.5**	**195**
Sept 15	**$1,911**	$68	7095	248	28.8	16.7	95.3	185
Oct 1	**$1,911**	$62	8378	268	31.4	18.1	95.0	186
August 15	$1,793	**$83**	4432	206	21.6	14.6	93.7	**189**
Average	$1,903	$66	7808	256	30.0	17.3	95.0	189
LSD 5%	140.5	4.5	452.9	13.7	2.0	0.8	0.4	8.6
CV %	8.6	7.9	6.7	6.2	7.6	5.6	0.5	5.1

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

5 Year Summary: Sugarbeet harvest date trials with consistent protocols have been conducted for the past 5 years. The trials have been of good quality. Prior to 2010 harvest date trials were conducted sporadically without following the same protocol. Fairly accurate yield and quality trends are being developed which will become more accurate with additional research. There will always be year to year variation due to weather differences. Beginning harvest on August 15, on average, we gain about 1.4 tons per week, each week until November 1, for a total gain of 15.2 tons/A. We also gain about 8.4 lbs RWST per week during the same harvest period. However, the early payment incentive formula pretty much evens things out. The highest payment is on September 1, but it is not significantly different from any of the other dates except for August 15.

Graph: By converting $/Ton, $/Acre, RWST, Tons/A and RWSA all to a common value (% of the Nov 1st amount for each) all of the parameters can be graphed on the same scale. It is interesting to note that yield and quality all increase at a rapid rate, $/T decreases inversely and $/A holds steady (all as the harvest dates become later).



Effect of Harvest Date on Sugarbeet Yield, Quality and Grower Income

Average of 3 Locations - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: Blum - May 6, Shaffner - May 6
Vader - May 8
Harvested: See trts
Plot Size: 6 rows X 38 ft, 6 reps

Rhizoc Control: Good
Cerc Control: Good
Seeding Rate: 4.1 inches
Row Spacing: 22 inch

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Beets /100'
Sept 1	**$2,409**	$78	7641	237	32.2	16.0	95.6	**211**
Oct 1	**$2,293**	$59	**10469**	253	**41.1**	16.8	**96.3**	197
August 15	$2,130	**$92**	5368	229	23.6	15.8	94.6	**219**
Sept 15	$2,106	$66	8101	242	33.6	16.0	**96.4**	198
Nov 1	$2,036	$54	**12378**	**299**	**41.5**	**19.4**	**96.7**	**212**
Oct 15	$2,010	$51	**11067**	260	**42.6**	17.3	95.9	**216**
Average	$2,164	$67	9171	253	35.8	16.9	95.9	209
LSD 5%	192.1	5.8	786.6	17.0	3.3	1.0	0.6	20.8
CV %	4.9	4.8	4.7	3.7	5.1	3.3	0.4	5.5

Comments: The sugarbeet yield increased quickly until early October then began leveling off. The sugarbeet quality increased steadily throughout the harvest period. The early harvest incentive formula moved the Sept 1 harvest to the top income spot followed by Oct 1. Later harvest dates had lower incomes.

MSC Research Station, Blumfield, MI - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: May 6
Harvested: 6 dates
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
2.4% OM, 7.7 pH, CEC: 10.2
>Opt: P and K
High: Mn, Low: B
Added N: 125 lbs
Prev Crop: Oil Seed Radish

Rhizoc Control: Good
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	GDD*	Rain Inch*
Sept 1	**$2,703**	$78	8585	238	36.1	16.0	95.7	**202**	34.4	2.11
Oct 1	$2,372	$61	10758	264	**40.8**	17.3	**96.6**	**191**	23.8	1.56
Sept 15	$2,238	$66	8619	241	35.9	15.9	**96.6**	182	26.0	2.03
August 15	$2,230	**$95**	5674	237	24.0	16.3	94.5	**198**	29.1	2.06
Nov 1	$2,083	$53	**12390**	**292**	**42.5**	**19.0**	**96.5**	**216**	11.9	0.99
Oct 15	$2,026	$52	11078	263	**42.2**	17.4	**96.0**	**195**	16.5	1.53
Average	$2,275	$67	9517	256	36.9	17	96	197	23.6	1.71
LSD 5%	179.1	2.7	673.5	8.6	3.0	0.5	0.7	33.0		
CV %	5.9	3.0	5.3	2.5	6.0	2.1	0.5	12.5		

***GDD** (Growing Degree Days): an average daily amount for the 2 weeks prior to that harvest date.
***Rain Inch**: actual rainfall amount 2 weeks prior to that harvest date.

Comments: At this location the yields were 36 T/A on Sept. 1 which also had the highest payment. The yield increased to 42.5 T/A on Nov. 1. Sugarbeet quality increased throughout the trial period. The early harvest dates received higher payments at this location.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.
Bold: Results are not statistically different from the top-ranking variety in each column.

PIONEER • BIG CHIEF
MICHIGAN SUGAR

Effect of Harvest Date on Sugarbeet Yield, Quality and Grower Income

Shaffner, Freeland, MI - 2014

Trial Quality: Fair
Variety: SX-1212RR
Planted: May 6
Harvested: 6 Dates
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Clay Loam
3.1% OM, 7.4 pH, CEC: 11.4
Opt: P, < Opt: K
Medium: Mn, Low: B
Added N: 130 lbs
Prev Crop: Wheat/Clover

Rhizoc Control: Good
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	GDD*	Rain Inch*
Sept 1	**$2,252**	$74	7154	225	31.6	15.3	95.2	**228**	34.1	1.1
Oct 1	**$2,160**	$57	9925	244	**40.7**	16.4	95.7	200	23.3	1.6
Sept 15	**$2,131**	$64	8216	234	35.1	15.6	96.1	**219**	25.4	2.6
August 15	**$2,102**	**$83**	5232	206	25.4	14.3	94.6	**243**	29.9	4.0
Oct 15	**$2,052**	$50	11337	253	**44.8**	17.1	95.3	**248**	16.3	2.3
Nov 1	**$2,011**	$56	**12784**	**306**	**41.8**	**19.7**	**97.2**	**214**	11.9	0.6
Average	$2,118	$64	9108	245	36.6	16.4	95.7	225	23.5	2.0
LSD 5%	ns(347)	3.2	1258.0	10.4	4.9	0.5	0.7	40.3		
CV %	13.6	4.2	11.5	3.5	11.2	2.7	0.6	15.0		

Comments: Sugarbeet yields increased substantially until mid October. Sugarbeet quality increased throughout the entire harvest. The early harvest payment premium kept the payment relatively level for all harvest dates.

Vader, Wisner, MI - 2014

Trial Quality: Good
Variety: SX-1212RR
Planted: May 8
Harvested: 6 Dates
Plots: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
3.0% OM, 7.7 pH, CEC: 14.2
>Opt: P and K
High: Mn, High: B
Added N: 124 lbs
Prev Crop: Wheat/Clover

Rhizoc Control: Good
Cerc Control: Good
Problems: Cyst nem
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	GDD*	Rain Inch*
Oct 1	**$2,347**	$59	10724	252	**41.8**	16.6	**96.6**	**200**	24.1	1.4
Sept 1	**$2,273**	$81	7183	248	28.9	16.6	95.8	**204**	33.8	1.3
August 15	$2,058	**$97**	5200	243	21.4	16.7	94.7	**216**	29.7	2.7
Nov 1	$2,014	$54	**11960**	**299**	**40.0**	**19.5**	**96.6**	**206**	12.4	1.2
Oct 15	$1,950	$52	10784	265	**40.7**	17.5	**96.3**	**204**	26.4	1.3
Sept 15	$1,948	$68	7467	250	29.8	16.5	**96.5**	**193**	17.3	1.6
Average	$2,098	$69	8887	260	33.8	17.2	96.1	204	24.0	1.6
LSD 5%	174.1	2.8	643.8	10.7	1.9	0.6	0.5	ns(29.9)		
CV %	6.9	3.4	6.0	3.4	4.7	3.0	0.4	12.3		

***GDD** (Growing Degree Days): an average daily amount for the 2 weeks prior to that harvest date.
Rain Inch: actual rainfall amount 2 weeks prior to that harvest date.

Comments: The sugarbeet yield increased substantially until Oct. 1 then it leveled off. Sugarbeet quality improved throughout the entire harvest. The highest payment was on Oct. 1 due primarily to the high yield an that date.

$/A: Gross payment unless noted as net. Calculated assuming a $50 payment and an average RWST of 275.

Bold: Results are not statistically different from top-ranking variety in each column.

Modeling Temperature and Heat Flux in Field Piles of Sugarbeets in Michigan

Randolph Beaudry and Mona Shaaban, beaudry@msu.edu
Bradley Marks, Greg Clark, and Khaled Yousef, Department of Horticulture

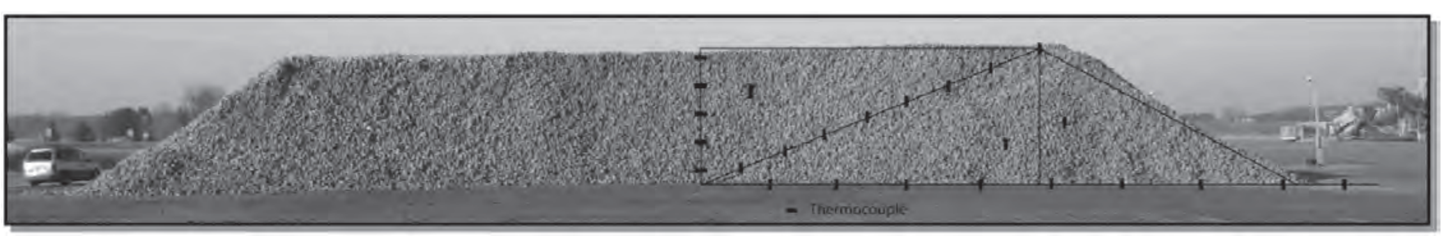
INTRODUCTION

Harvested sugar beet (*Beta vulgaris* L.) roots are stored in Michigan in large piles and exposed to ambient weather conditions during winter storage period, which generally lasts three to four months. During this time, the air temperature may range from as low as -23°C to as high as 16°C. Winter air temperatures are rising in association with long-term trends of increasing global temperatures. Higher air temperatures contribute to increasing respiration and storage decay due to increasing metabolic activities, and give decay organisms optimal conditions to increase their growth and aggressiveness.

Several studies have been conducted for various plant materials to enable the design a model of heat and/or mass transfer that simulates storage conditions. Some of these models were for packed beds that well represented porous non-living materials with uniform spherical fragments (Eisfeld, 2001). Models for agricultural produces were proposed as well. Hogan (2003) designed a 3D transit heat and mass transfer model for bulk storage of chicory roots. However, temperature gradients in the product, and the variation of respiration rate throughout the product. Markarian and Vigneault (2006) developed a mathematical model and software for controlled airflow and temperature in a storage room. Chourasia and Goswami (2007) proposed a model for controlled natural convection cold storage room. Our study is focusing on developing a model of heat transfer that occurs inside the sugar beet pile through the storage period with uncontrolled ambient conditions where cooling is by natural convection. Such simulation is intended to help storage managers estimate pile temperature and take the correct decision regarding the structure and management of beet piles and the design and installation of appropriate ventilation systems.

MATERIALS AND METHODS

To monitor the pile temperature, we installed a wiring harnesses of T type thermocouples encased in polypropylene tubing for protection in beet piles at the Gera road piling ground, Reese, Michigan. Harnesses were positioned in the pile (Fig. 1) at the time of pile construction at the beginning of November. Data were collected until the end of the storage period, optimally at the end of March. Each harness had from 1 to 10 thermocouples, depending upon their position in the pile. One harness ran vertically down the face of the pile at the midpoint, another harness ran diagonally across the face of the pile from its outer shoulder to the base at its midpoint, a third harness ran along the base of the pile to its midpoint, a fourth harness (thermocouples only, no protective tubing used) was buried two inches in the soil surface along the base of the pile to its midpoint. In addition, one additional thermocouple was embedded in the pile between the vertical harness and the diagonal harness and another two thermocouples were embedded in the pile between the diagonal harness and the horizontal harness. A total of 36 locations in each pile were monitored. Data was collected by data loggers every minute and average each hour recorded. The experiment was conducted on Michigan Sugar Company piling area at Reese, MI, USA during the 2011-2012 and the 2012-2013 storage seasons. Only data from the 2012-2013 storage season were modeled.
Figure 1: Image illustrates the positions of the thermocouples in the pile.



Input data (air temperature and velocity, and ground temperature) was used in a finite element analysis to calculate the rate of heat gain (from the ground and respiratory activity) and heat loss (to the environment). Initial analysis will mathematically relate heat content of the pile and air temperature.

The Model's accuracy was assessed by comparing the output results to experimental data obtained from installed dataloggers. The model was developed and integrated in finite element simulation software (COMSOL Muliyphysics 4.4). Important parameters include: air temperature (collected from MSU extension station), sugar beet thermal conductivity, heat capacity of sugar beets, and the heat generation of respiration (measured in previous studies in our lab).

Modeling Temperature and Heat Flux in Field Piles of Sugarbeets in Michigan

Michigan State University
AgBioResearch

Randolph Beaudry and Mona Shaaban, beaudry@msu.edu

Bradley Marks, Greg Clark, and Khaled Yousef, Department of Horticulture

Heat transfer assumptions

- Heat energy moves through the shortest two dimensions of the pile (width and height), however, the energy transfer through the length can be negligible due to its relatively long dimension.
- Root density, and specific heat, and other physical and thermal properties don't vary significantly within the temperature range through the storage period.
- Ground density, specific heat, and thermal conductivity don't vary significantly within the temperature range through the storage period.
- The pile will be considered as a porous material.
- The heat energy removed by evapotranspiration is negligible.
- The inlet air properties change each day depending on the average of temperature and the average wind velocity. However, the air direction will be assumed constant from south to north.

Model Parameters

For the numerical solution of the proposed problem, COMSOL Muliyphysics 4.4 was used. Values for model variables are given in Table 1.

Ground Parameters. Reese, MI is characterized by its clay-loam soil type and its thermal properties were assumed to be similar to those described by Ochsner (2001). We also assumed that at a depth of 2 feet, the soil temperature was a constant 55°F.

Root parameters. Tabil (2003) measured the thermal properties of sugarbeet roots; we are using the mean of the bulk density and the specific heat as a reference in our model. While calculating the thermal conductivity (W/m. K) as a function of temperature (°K = 273.15 + °C) to obtain the following equation:

$$K_R = 0.0011(T)^2 - 0.6291(T) + 90.014 \qquad (1)$$

Where: K_R is Sugarbeet root's thermal conductivity (W/m·°K).

Table 1. Model fixed parameters used in heat transfer simulation of stored sugar beet.

Parameter	Value	Unit
Soil Density	1700	kg/m3
Soil Thermal Conductivity	0.525	W/m·K
Soil Specific Heat	1615	J/kg·K
Root Specific Heat	3.5464	KJ/kgK
Root Density	1169.9	kg/m^3

Heat of Respiration. We calculated the respiration rate of the sugar beet roots from previous experiments. The relationship reflects the average respiration rate of 38 varieties of sugar beet at 3, 10, and 20°C**.** Burke (1979) stated that plant cells efficiently utilize 44% of the respiration energy for metabolic processes, therefore 56% of the energy associated with respiration will be assumed to be released producing the exponential relationship between respiration rate and the ambient temperature (°K) as follows:

Modeling Temperature and Heat Flux in Field Piles of Sugarbeets in Michigan

Randolph Beaudry and Mona Shaaban, beaudry@msu.edu
Bradley Marks, Greg Clark, and Khaled Yousef, Department of Horticulture

$$Q_g = \exp(25.292 - 6291(1/T)) \quad (2)$$

Where: Q_g is Heat of respiration (w/m^3) and T is temperature in °K.

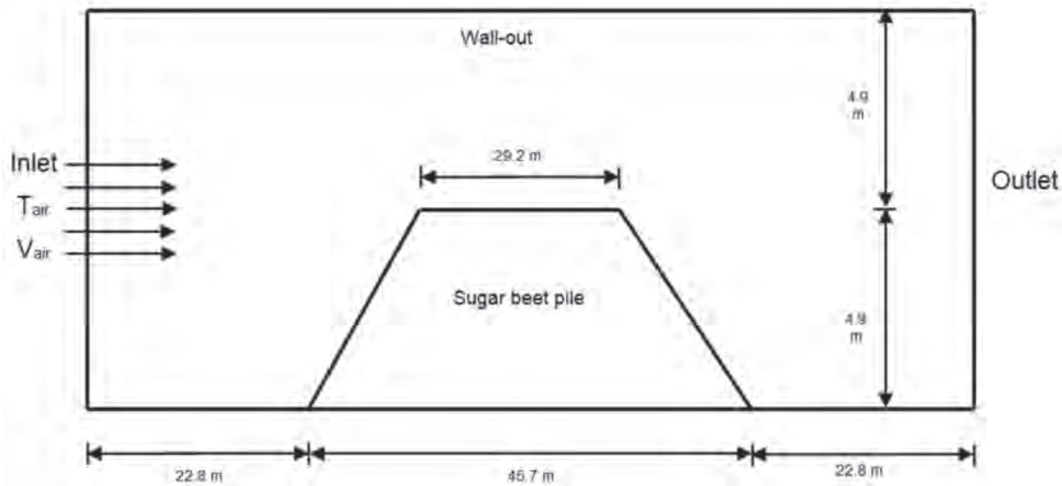


Figure 3. Schematic representation of the Boundaries included in the model as input air temperature, wind speed, and ground temperature, the program calculated the air parameters and heat transfer coefficient depending on the inserted data.

Geometry and Boundary Conditions

Figure 3 shows a schematic representation of the COMSOL model geometry that contains the pile base, height, and top, the dimensions of which are 45.7 m, 4.9 m, and 22.8 m respectively. We assumed that there is a limited boundary for the active air that interacts with the pile, and beyond this limits there is no effect from the air to the pile. These limits are assumed as a trail, 91.44 m in width and 9.75 m in height.

FINDINGS

Gas exchange measurements indicated that there was no significant build-up of either CO_2 in the beet pile, even during the warmest days (data not shown). The temperature of the pile typically declined from the outside to the inside of the pile (Figs. 4 and 5). The warmest portion of the pile was at its center and typically ranged from 5 to 20 °F warmer than the surface of the pile. The portion of the pile near the ground surface was also quite warm relative to the upper portions of the pile. We found that the pile temperature was quite responsive to the air temperature and changed rapidly on a daily basis. During warm periods when the air temperature was in the mid-30s, large portions of the pile (>70%) had root temperatures above 45 ºF. During cooler periods when the air temperature was in the low 20s, about 30% of the pile still had temperatures in 40 ºF range. At these times, almost half of the pile had temperatures below freezing.

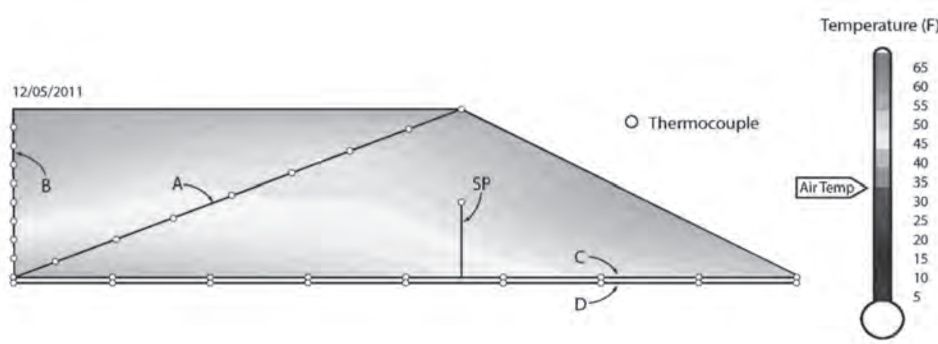


Figure 4. Temperature profile of Gera Road beet pile on December 5, 2011. Air temperature averaged 35 ºF on this date. A, B, C, D and SP indicate five thermocouple harnesses; harness D was embedded approximately 2 inches into the soil. White circles indicate locations of individual thermocouples.

Modeling Temperature and Heat Flux in Field Piles of Sugarbeets in Michigan

Randolph Beaudry and Mona Shaaban, beaudry@msu.edu
Bradley Marks, Greg Clark, and Khaled Yousef, Department of Horticulture

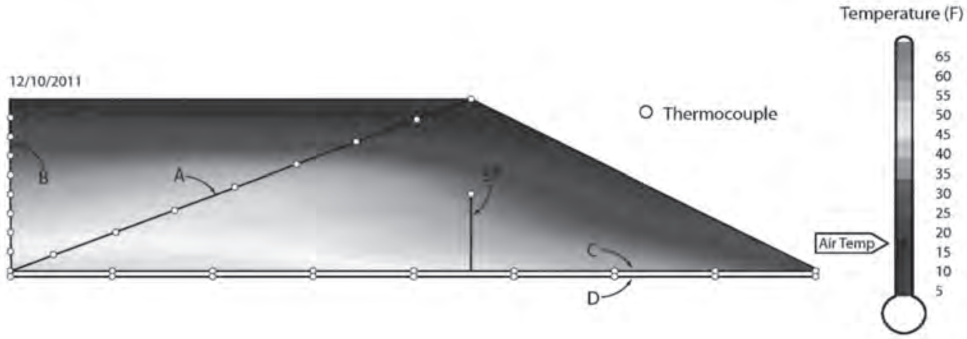


Figure 5. Temperature profile of Gera Road beet pile on December 10, 2011. Air temperature averaged 17°F on this date. A, B, C, D and SP indicate five thermocouple harnesses; harness D was embedded approximately 2 inches into the soil. White circles indicate locations of individual thermocouples.

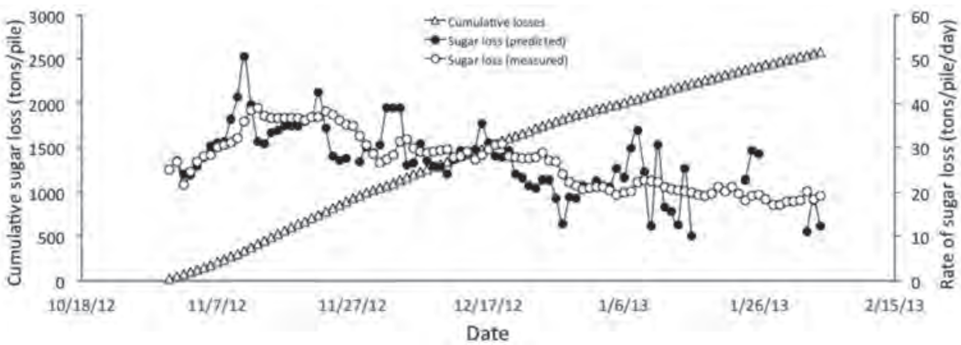


Figure 6. The rate of sugar loss based on respiratory measurements for sugar beets at the piling grounds. Open circles represent data calculated from pile temperature measurements, solid circles represent data calculated using the finite element model (which is much more sensitive to temperature changes). Triangles represent cumulative sugar losses for a typical sugar beet pile over a 3-month campaign.

The finite element model built using COMSOL software was able to predict pile temperatures using only air temperature and air velocity, and ground temperature (Fig. 6). These data are easily obtainable from weather stations. Knowing the pile temperature permits us to estimate the collective rate of respiration of the pile and, from that, predict the rate of sugar loss.

CONCLUSIONS

The heat build-up in sugar beet piles can be estimated with some degree of accuracy using a relatively simple model. Properly implemented, this model will help us assess the effect of pile architecture, air temperature and even storage duration on the rate of sugar loss in the pile. The model can also be adapted to predict the effectiveness of active and passive pile ventilation strategies. The model is currently configured as a steady-state model and needs to be translated into a dynamic model, which will more accurately depict day-by-day changes in respiratory activity and sugar loss.

LITERATURE CITED

Chourasia, M.K. and T.K. Goswami. 2007. CFD simulation of effects of operating parameters and product on heat transfer and moisture loss in the stack of bagged potatoes. Journal of Food Engineering. 80:947-960.

Eisfeld, B., and K. Schnitzlein. 2001. The influence of confining walls on the pressure drop in packed beds. Chemical Eng. Science 56:4321 – 4329.

Hogan, M.L., P. Verboven, M. Baelmans, and B. M. Nicolai. 2003. A Continuum Model for Airflow, Heat and Mass Transefer in Bulk of Chicory Roots. ASAE. 46:1603 – 1611.

Burke, J.I. and B. Rice, and VA. Dodd. 1979. Measurement of Respiration Rate of Stored Sugar Beet. Irish Journal of Agricultural Research. 18:305-313.

Tabil, L.G., M.V. Eliason, and H. Qi. 2003. Thermal Properties of Sugarbeet Roots. Journal of Sugar Beet Research. 40:209 - 228.

Markarian, N.R. and J.-A.L. C. Vigneault. 2006. Development of a model for simulating ambient conditions in fresh fruit and vegetable storage facility. Journal of Food, Agriculture & Environment. 4:34-40.

Ochsner, T.E., R. Horton, and T. Ren. 2001. A New Perspective on Soil Thermal Properties. Soil Sci. Soc. Am. J. 65:1641–1647.

Impact of Field Piling and Maus Transfer on Sugarbeet Storability

Michigan State University AgBioResearch

Principal Investigator: Randolph Beaudry, Department of Horticulture, beaudry@msu.edu
Greg Clark, Dan Zemitis, Matt Alt, John Zandstra, Mahmud Tengku Mohamed

INTRODUCTION

In 2004-2005, the sugarbeet industry lost approximately $25 million due to losses incurred in field storage piles. Uncharacteristically warm late winter temperatures and larger pile dimensions lead to excessive sprouting and decay with the result that thousands of tons of harvested beet roots were unusable. The unusual 2004 storage season and trends of increasing winter temperatures in Michigan highlight the need to understand factors that lead to sugar losses in the storage campaign.

Earlier research supported by GREEEN and Michigan Sugar has quantitatively described the impact of traditional harvest and handling techniques on the severity on sugar losses. From this work, we reported to the sugarbeet industry that a reasonable return of $1.5 million could be obtained by ameliorating postharvest stresses. This could be done by reducing damage by half or reducing the average pile storage temperature by 5 to 8°F (Beaudry and Loescher, 2008). Our central hypothesis is that handling abuses at harvest and environmental stresses late in the storage season comprise a stress complex that results in untenable storage losses by the sugarbeet industry.

The ROPA euro-Maus beet loader is an innovative means of handling sugarbeet (*Beta vulgaris*) roots that gives the grower more control and convenience in harvest and transport. In this system, beets are harvested then unloaded at the perimeter of the field and the Maus is used to transfer the beet roots from the perimeter field piles to hauling trucks, which then carry the beets to the piling grounds. The Maus system enables the grower to get roots out of the ground during optimal harvest conditions, avoids delays and potential difficulties brought on by inclement weather, and aids in soil removal from the root. It also makes for more convenient shipment of the harvested beets to processing facilities or piling grounds; the hauling truck no longer needs to be in the field at the time of harvest. However, the Maus system also increases the number of handling steps and has the potential to increase root damage and sugar loss. The current policy of Michigan Sugar is to process Maus-handled beets first and, if possible, avoid long-term storage of these roots at the piling grounds. Just as significant savings could be obtained by ameliorating postharvest handling stresses, harsher handling systems have the potential to exacerbate losses.

The *long-term goal* of our research program is to develop and implement effective techniques to improve the storability of field-stored sugarbeets. We were interested in determining if the current system of handling compromises root storability. Our objective is to provide a handling analysis of the Maus and conventional systems using instrumented sphere technology and make quantitative measures of root quality loss including respiratory activity, decay incidence, and loss in recoverable white sugar as a function of initial content.

Impact of Field Piling and Maus Transfer on Sugarbeet Storability

Principal Investigator: Randolph Beaudry, Department of Horticulture, beaudry@msu.edu
Greg Clark, Dan Zemitis, Matt Alt, John Zandstra, Mahmud Tengku Mohamed

MATERIALS AND METHODS

For this study, the severity of impacts during handling by several pieces of harvest equipment was determined using a 4.75-inch diameter Impact Recording Device (instrumented sphere, IS) manufactured by Techmark, Inc. The sphere was run three times through a Ropa beet harvester, a Kringstadt Ironworks beet cart and a MAUS loader. The Ropa harvester was evaluated dropping on to a field pile and dropping into a beet cart. The beet cart was evaluated dropping into a semi trailer. The Maus was evaluated dropping into a semi trailer. The semi trailer was evaluated (once) as it deposited its load.

A drop-testing platform was calibrated and used to impart impact energies to sugarbeet roots in the range of those encountered in the harvest and handling processes based on data from the instrumented sphere. Roots will be subjected to a range of impact energies using the drop-testing platform and the effects determined as a function of impact severity. Measurements will include descriptions of root injury (e.g., splitting, spalling, and bruising), respiratory activity, decay susceptibility, and recoverable white sugar.

The storability of beets harvested conventionally and via the euro-Maus system was evaluated. Roots were sourced from two grower field locations after 0, 3, 11, 17, and 32 days in the field pile. Beets were stored at MSU at a sub-optimal storage temperature (7.5 to 12.5°C) to reflect the more severe conditions that might be found at piling grounds and respiration measurements were made after holding the beets at this temperature for 2 months.

FINDINGS

Effect of Harvester Impacts on Respiration. The IS recorded hundreds of impacts in the 40 to 100 gravity range, numerous impacts in the 100 to 200 gravity range and several impacts in the 200 to 500 gravity range. Of the three pieces of equipment evaluated, the Ropa harvester imparted far more and more severe impacts then either the beet cart or the MAUS. On average, the Ropa harvester delivered 292 impacts between 40 and 100 gravities, 67 between 100 and 200, and 6 between 200 and 400 gravities (Fig. 1). The Kringstadt Ironworks beet cart yielded 60, 15, and 4 impacts between 40-100, 100-200, and 200-400 gravities, respectively. The MAUS was the least damaging, yielding 40, 12, and <1 impacts between 40-100, 100-200, and 200-400 gravities, respectively.

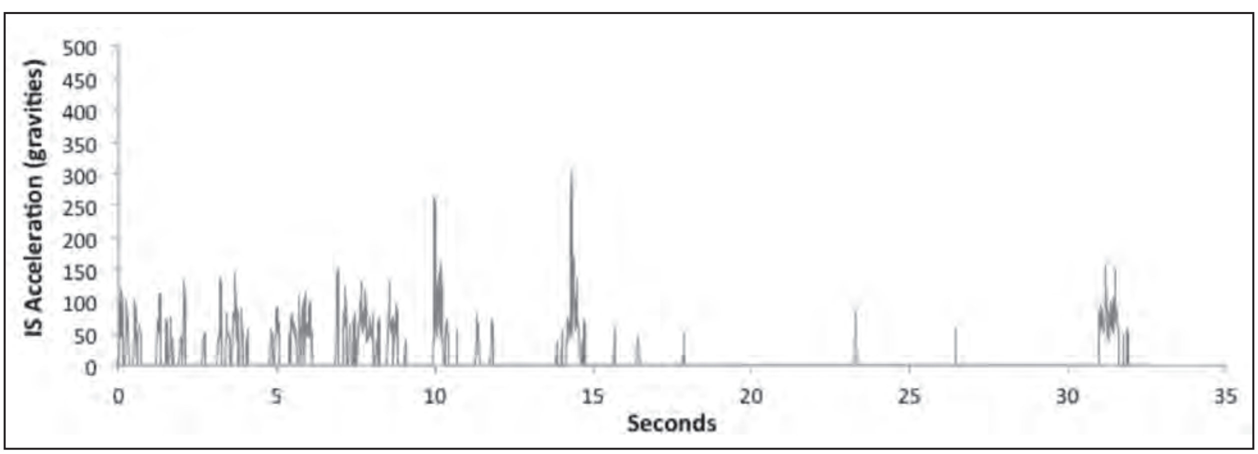


Figure 1. Characteristic pattern of impacts and for the instrumented sphere traversing a Ropa beet harvester from the ground through its eventual transfer to a field pile.

Impact of Field Piling and Maus Transfer on Sugarbeet Storability

Principal Investigator: Randolph Beaudry, Department of Horticulture, beaudry@msu.edu
Greg Clark, Dan Zemitis, Matt Alt, John Zandstra, Mahmud Tengku Mohamed

One must keep in mind that there is no real control over the surface on which the IS is impacting, so some of these impacts, perhaps most, are sphere-on-beet and some, perhaps only the very highest impact energies, are sphere-on-steel as the sphere wends its way through the harvester.

In our drop tests, we found that the acceleration experienced by the root increased as drop height increased until the height of the drop reached approximately 32 inches (Fig. 2). Above this point, the acceleration experienced by the root did not increase, even when the height of the drop was 100 inches (a little over 8 feet - about the distance the beets fall into an empty beet cart). We interpreted this to mean that the beet absorbed the energy of the impact through elastic (reversible) deformation, much like a rubber ball might, up to a drop height of 32 inches. At higher drop heights, the fact that the beet acceleration did not continue to increase was taken to mean that the beet underwent irreversible deformation, that is, the beets was bruised and tissues inside the beet collapsed, resulting in damage.

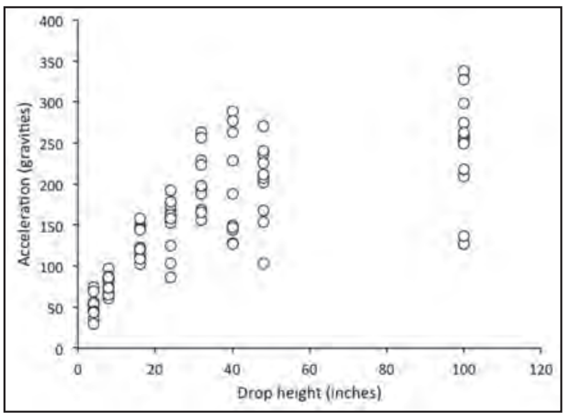


Figure 2. Relationship between drop height and impact energy measured in gravities acceleration/deceleration for beet-on-beet impacts.

When we measured the respiratory response to impacts (in this case caused by dropping) in the first 10 days, we found drop height and the number of drops affected root respiration (Fig. 3). For roots dropped 16 inches, only when the number of impacts reached 40 did we see an increase in respiration relative to undropped roots (controls). For beets impacted by a drop height of 32 inches, an increase was evident with as few as 20 drops. For beets dropped 72 inches (6 feet), an increase in respiration was measured following as few as 5 drops. A beet experiencing 20 impacts equivalent to a 6-foot drop has twice the respiratory rate of a gently harvested beet. Importantly, previous work suggests that the response to root damage at harvest only increases in its impact on respiration, largely as a result of decay of the damaged tissue.

The fact that the Ropa harvester imparted so many impacts to the beet root, suggests that the harvester, rather than the beet cart or the MAUS loader, should be further evaluated for its impact on respiratory activity. Further, the Ropa and other harvesters should be assessed for ways to ‘soften the blow’ of the handling operations as the beets are lifted, cleaned and transported, perhaps by reducing operation speed and by padding steel surfaces.

Michigan State University
AgBioResearch

Impact of Field Piling and Maus Transfer on Sugarbeet Storability

Principal Investigator: Randolph Beaudry, Department of Horticulture, beaudry@msu.edu
Greg Clark, Dan Zemitis, Matt Alt, John Zandstra, Mahmud Tengku Mohamed

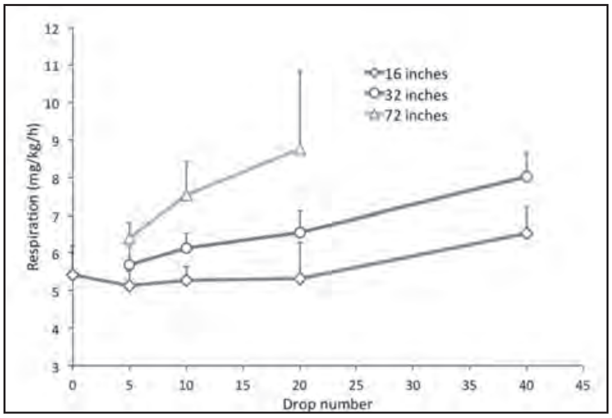
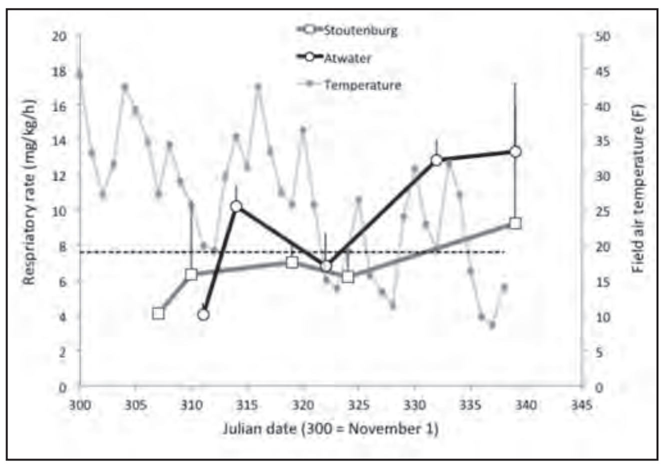


Figure 3. Respiratory increases in response to increasing drop height and drop number for sugar beets.

Field Storage in MAUS Piles. The respiration rate of beets removed from field piles awaiting MAUS transfer to a semi truck, then held two months (as if they had been held in piling grounds after removing them from the field pile) tended to increase with increasing time in the field. However, the relationship was not particularly clean. Nevertheless, the beets held longest in the field had higher respiratory rates than those transferred from the field immediately after harvest. The elevated respiration may have been due to freezing damage given that the air temperature was well below the freezing point of beets on several occasions prior to removal from the field.

Figure 4. Respiratory rate of sugar beets at two locations held for 60 days at 50 °F as a function of the date they were removed from a field pile. Harvests were on day 307 (Nov. 8) for Stoutenberg (squares), and day 311 (Nov. 12) for Atwater (circles). Beets were harvested and deposited in field piles for later transfer to semi trailers with a MAUS. Data points are, from left to right, 0, 3, 11, 17 and 32 days in the field pile. The gray line indicates the minimum air temperature for that date. The horizontal dotted line reflects the freezing temperature of beet roots.



CONCLUSIONS

The impact data from the harvester and other beet handling implements suggests that there are numerous high-energy impacts imparted to the beet during the lifting, cleaning and transport. When the impacts are then translated to beets, respiratory activity increases significantly, suggesting sugar loss is measurably enhanced by current rough handling procedures. Field storage of beets to be moved to piling grounds compromises beet storability as measured by respiration rate after some months in storage. Collectively, the data suggest there is much room for improvement in our current practices.

Response of Sugar Beet Recombinant Inbred Lines to Post-Harvest Rot Fungi

L.E. Hanson, R.M. Beaudry[1], T.R. Goodwill, and J.M. McGrath
[1]Dept. of Horticulture, Michigan State University

Sugar beet (*Beta vulgaris*) is commonly stored in outdoor piles prior to processing for food and animal feed. During this storage period the crop is subject to multiple post-harvest rots (Figure 1). Resistance to three post harvest rots was identified in two sugar beet germplasm in the 1970s, but there has been little work done on host resistance to post-harvest storage pathogens in recent years. In recent survey work in Michigan, several fungi known to cause post harvest rot were found. The results varied from previous surveys in the area as little *Phoma* was isolated from beets out of storage piles. The most commonly isolated pathogens were *Botrytis cinerea* and *Penicillium* species, followed by *Fusarium* species. To look for variable responses to storage rots, recombinant inbred lines (RILs) and other USDA germplasm of sugar beet that have been developed in Michigan were screened for susceptibility to biotic post-harvest deterioration.

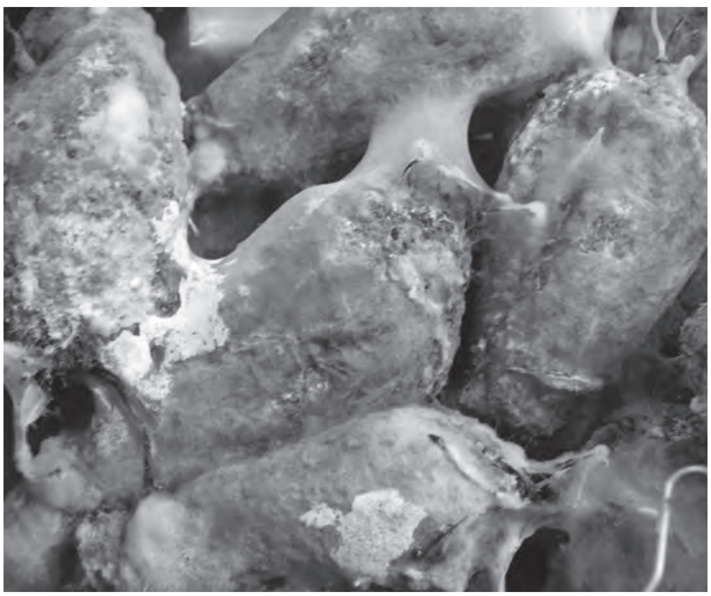


Figure 1. Example of sugarbeet with several different fungi and storage rots. Beets had been stored at 4-7°C under high humidity for five months.

Methods

Screening used a method adapted from Gaskill (1952). Beets were sliced into at least 2 cm thick slices with 4 cm or larger diameter. Slices were placed on moist paper towels in covered metal pans. Based on results from 2013, in 2014 *Botrytis cinerea* and *Fusarium graminearum* were used. *Phoma betae* was added because, while it was not found commonly in storage samples in Michigan, it has been reported in storage rot from other regions. Hyphal plugs (6 mm diameter) from cultures grown on potato dextrose agar (PDA) for seven days were cut and placed, hyphal side down, near the center of each slice. Controls had a plug of sterile PDA placed on the beet slice. Three replicate beets from each RIL or germplasm were inoculated with slices from each beet inoculated with at least three different pathogens and a media control. Boxes were incubated at 22°C. After 24 hours, plugs were removed. The diameter of rotted tissue was measured with a ruler and the beet sections were sliced through the inoculation site and the depth of rotted tissue measured with the same ruler. Re-isolation was done from a subset of samples to confirm presence of the pathogen by cutting tissue from the edge of the lesion, surface disinfesting for 60 sec. in 10% bleach, and plating on PDA. Because of the low disease severity observed on table beet germplasm W357b in prior years, additional table beet were tested to determine whether this was a standard factor for table beet.

L.E. Hanson, R.M. Beaudry[1], T.R. Goodwill, and J.M. McGrath
[1]Dept. of Horticulture, Michigan State University

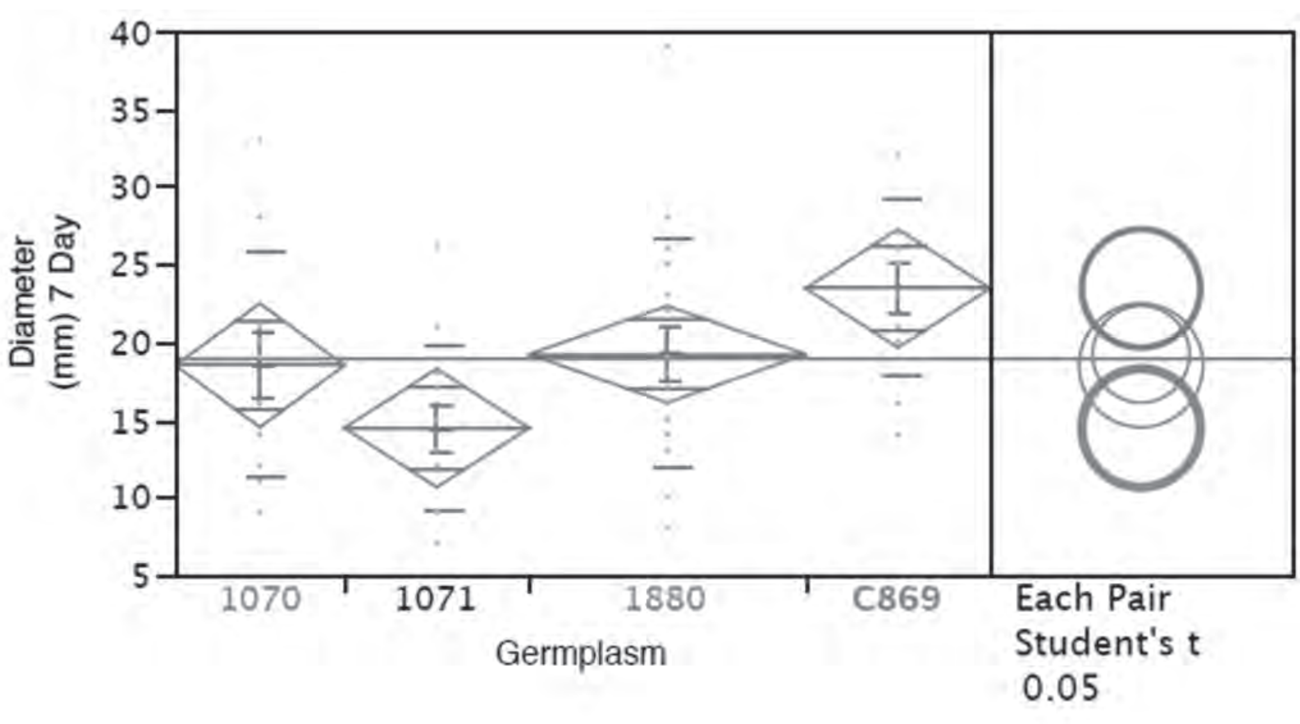
Results and Discussion

None of the table beet germplasm showed significant differences from the control germplasm, C869, for rot severity with any of the pathogens.

Significant differences ($P<0.05$) were found in the response to two of the three pathogens tested in the USDA germplasm. One of these germplasms showed reduced rot with *Fusarium graminearum* compared to the control (Figure 2). This same germplasm had less rot with *F. graminearum* in testing in 2013. In addition, it showed reduced rot following exposure to *Phoma betae* (Figure 3).

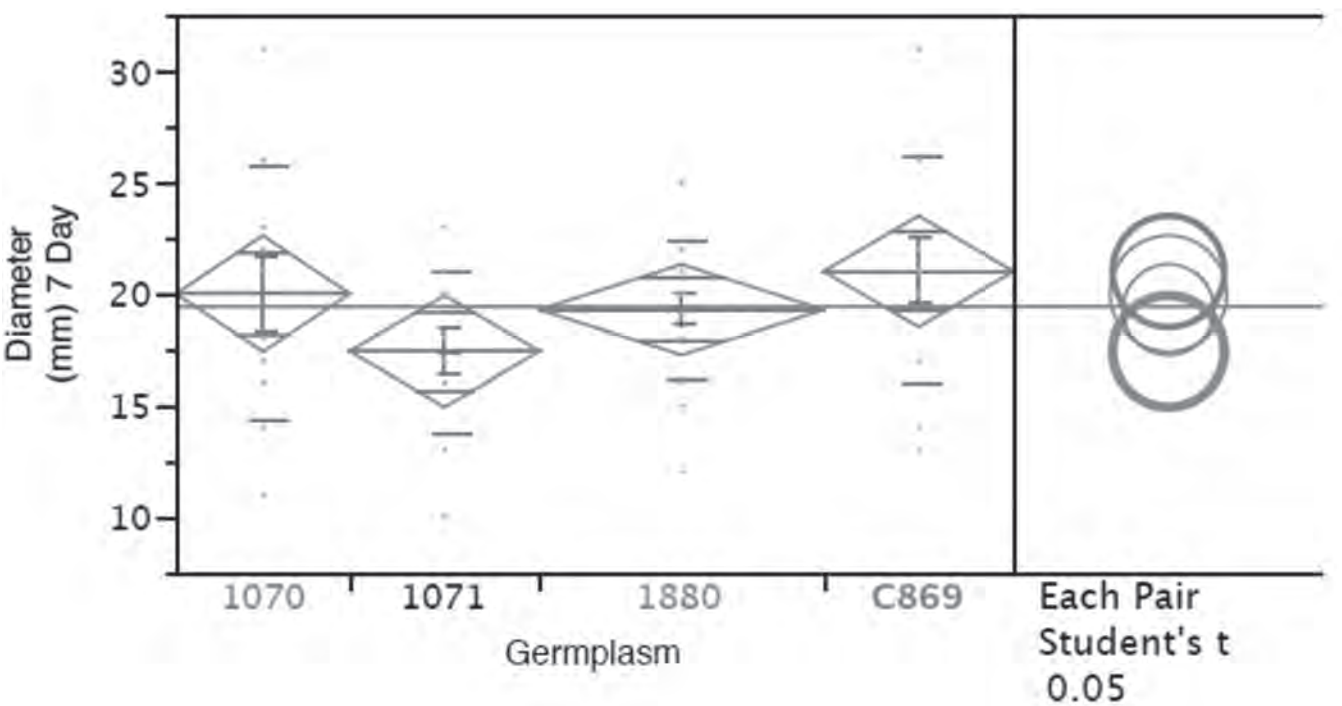
There is the potential to develop materials that may be less damaged by post harvest rot pathogens, as well as gaining a better understanding of the interaction between fungal storage rot pathogens and host genotype.

Figure 2. Comparison of area of rot in beet tissue exposed to *Fusarium graminearum* and incubated for 7 days at room temperature and high humidity. C869 was the susceptible control. Germplasm in red are not significantly different from the susceptible control by Student's T test (0.05). One germplasm (e.g., 1071) was significantly different from the susceptible control.



L.E. Hanson, R.M. Beaudry[1], T.R. Goodwill, and J.M. McGrath
[1]Dept. of Horticulture, Michigan State University

Figure 3. Comparison of area of rot in beet tissue exposed to *Phoma betae* and incubated for 7 days at room temperature and high humidity. C869 was the susceptible control. Germplasm in red are not significantly different from the susceptible control by Student's T test (0.05). One germplasm (e.g., 1071) was significantly different from the susceptible control.



Seedling Diseases of Sugar Beet — Diversity and Host Interactions

Linda Hanson, Mitch McGrath, and Tom Goodwill

Seedling diseases cause losses for sugar beet in most growing regions. As well as causing seedling damping-off, pathogens such as *Rhizoctonia solani* and *Fusarium* spp. that infect seedlings without killing them can serve as inoculum for disease later in the season. Rhizoctonia damping-off tolerance in USDA germplasm, and variability in seedling response to *F. oxysporum* raises the possibility of breeding for seedling resistance and adding to the options for disease management. The resistance is expressed differently in seedlings than in adult plants, and several germplasms that express adult plant resistance do not show resistance at the seedling stage, so screening at both growth stages is needed for identifying germplasm of use for disease management. The aim of this work is to identify material that will be useful for breeding and to examine the effect of different pathogen types on seedling response to pathogens.

In five years of testing, *Rhizoctonia solani* and *Fusarium* spp. were commonly isolated from infected field-isolated diseased sugar beet seedlings. Which fungus is more commonly isolated from seedlings has varied over the seasons. For example, *R. solani* was the most frequently isolated pathogen in 2010, and *Fusarium* spp. was isolated from the most fields in 2011 and again in 2013 (100% of fields sampled). The two pathogens were often isolated from the same field, and even from the same beet. In 2013, there was a wet spring and *Aphanomyces* and *Pythium* were isolated from approximately 60% of samples collected. *Fusarium* spp., *R. solani*, and *Aphanomyces* all were isolated as the sole organism cultured from at least one plated beet plant while *Pythium* was isolated only from beets with one or more other potential pathogens. *Phoma* was isolated from single seedlings from two different fields. Both isolates were *Phoma betae*.

Sugar beet germplasm varied in the amount of seedling damage caused by *R. solani* when plants were inoculated at the 2-leaf growth stage, both in the greenhouse and in the field. Germplasm were examined which were known to have resistance to Rhizoctonia crown and root rot. The response can show some differences depending on the AG and the isolate used in the screening (Figure 1, Figure 2)

Figure 1. Seedling damage response of USDA germplasm to inoculation with different isolates of *Rhizoctonia solani* at the two-leaf growth stage. Data shown is the average disease severity index for 3 replicates of 15 plants inoculated with 10 different *Rhizoctonia solani* isolates. Plants were removed from the soil after 3 weeks and assessed for diseases severity using a 0-5 scale where 0=no symptoms and 5=plant dead and a disease index (DI) calculated based on a weighted average (Ruppel et al. 1979). Isolates are AG 2-2 except for isolate 27 (in pink), which is an AG 4.

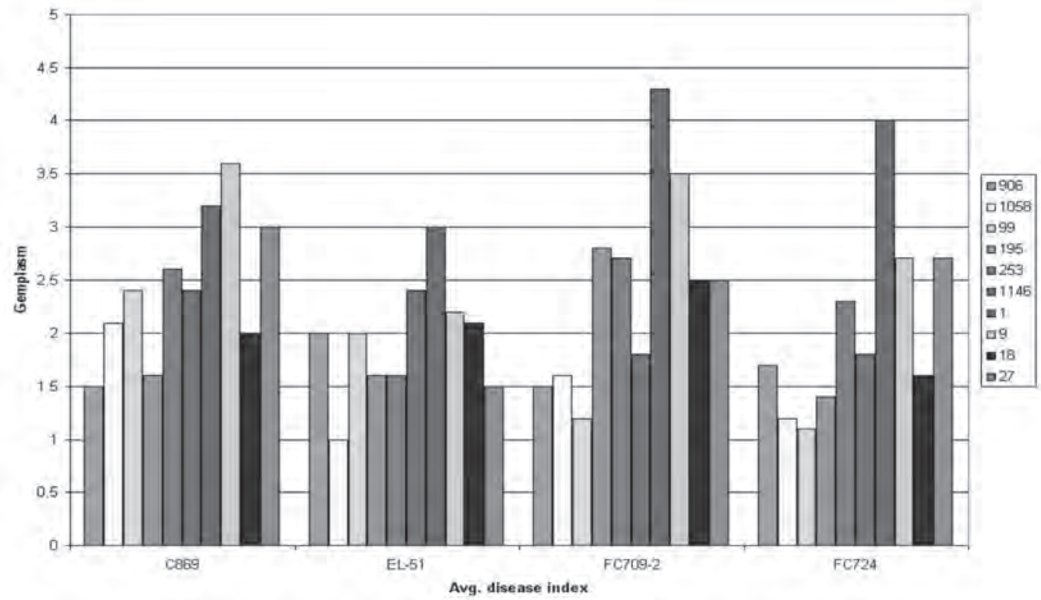
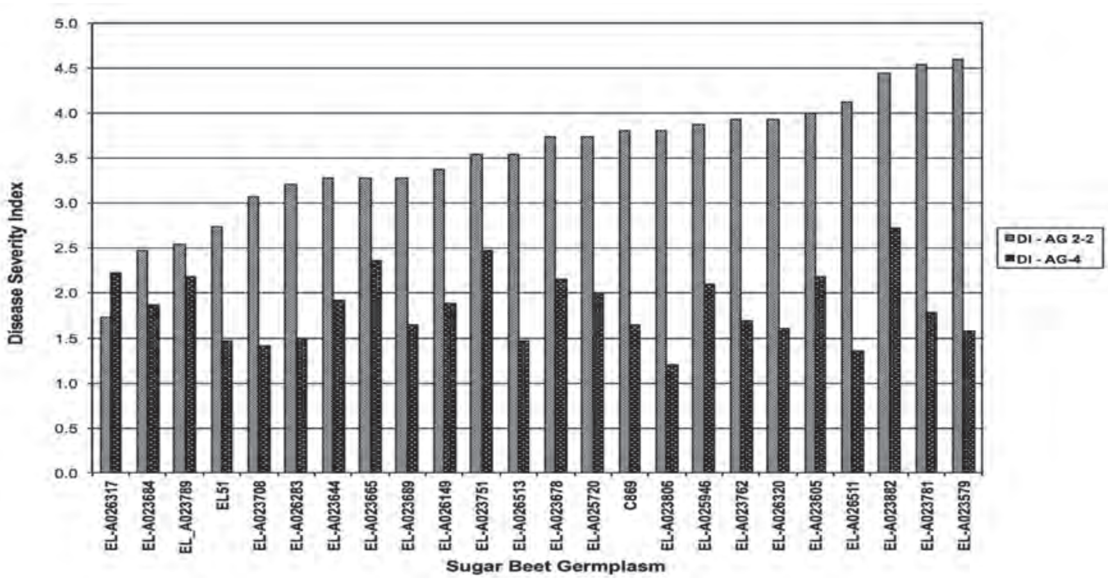


Figure 2. Response of 22 sugar beet recombinant inbred lines (population RTA) and the parental lines, EL51 and C869, to inoculation by either *Rhizoctonia solani* AG-2-2 or AG-4. Plants were inoculated at the 2-leaf growth stage and harvested after 3 weeks. Plants were rated for damping-off on a 0-5 scale where 0=no symptoms and 5=plant dead. A disease severity index was calculated for each germplasm.



PRESENTED IN PARTNERSHIP

Pioneer • Big Chief
Michigan Sugar

Michigan Sugar Company
2600 South Euclid Avenue
Bay City, MI 48706

RETURN SERVICE REQUESTED

BROUGHT TO YOU BY THESE PARTNERS:

Pioneer • Big Chief
Michigan Sugar

MICHIGAN STATE UNIVERSITY | Extension