2013 Research Results

growing the best sugarbeets

MICHIGAN SUGARBEET REACh

Research & Education Advisory Council

REACh/SUGARBEET ADVANCEMENT COMMITTEE LIST
2013 Voting Membership

24 Voting Members

Company & Name	Terms	Expire
Michigan Sugar Company		
Paul Pfenninger (5th Member)	2	2015
Greg Clark	4	2017
Jim Stewart	3	2016
Paul Wheeler	1	2014
Dave Bailey	2	2015
Glen Martis	4	2017
Lee Hubbell	3	2016
Rudy Schlatter	1	2014
Michigan Sugar Company District Growers		
Chris Guza (Chairman)	1	2014
Mark Sylvester	1	2014
Rick Leach (Treasurer)	1	2014
Michigan Sugar Company At Large Growers		
Jeff Gulick	3	2016
Kurt Hrabel	2	2015
Scott Roggenbuck (Vice Chair)	1	2014
Andy Schaffner (Secretary)	3	2016
Rob McKerrall	1	2014
Michigan State University and University of Guelph		
Linda Hanson	1	2014
Laura Van Eerd	2	2015
Christy Sprague	3	2016
Sugar Beet Seed Company		
Dave Wishowski	2	2015
Agri-Business		
Steve Wendzel	2	2015
Brian Devine	1	2014
Michigan Sugar Company Board of Directors		
Mark Richards	1	2014
Kent Houghtaling	1	2014

Ex-Officio Members

Company	Name
Farm Bureau	Bob Boehm
USDA	Mitch McGrath
SBA Director	Steve Poindexter
Chairman of Board of Directors Michigan Sugar Company	Rick Gerstenberger
CEO of Michigan Sugar Company	Mark Flegenheimer

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.

2013 Research Results

Table of Contents

Rhizoctonia Control Trials

Cercospora

Aphanomyces

Seed Treatment

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

2013 Research Results

Table of Contents

Evaluate Quadris Rates and Application Timings in Sugarbeets With Tolerant and Susceptible Varieties

Crumbaugh, Breckenridge, MI - 2013 (Page 1 of 2)

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	by trt
Variety:	C-RR059 & C-RR074NT		3.1% OM, 7.0 pH	**Cerc. Control:**	Good
Planted:	May 8		Above Opt. Levels: P, K	**Seed Spacing:**	4.1 inches
Harvested:	Sept 18		High: Mn, Low: B	**Problems:**	Uneven field
Plot Size:	6 rows X 50 ft,	**Added N:**	100 lbs		some ponding
	4 reps	**Prev. Crop:**	Soybeans	**Rainfall:**	12.3 inches
Row Spacing:	22 inch				

No	Treatment	Rate fl oz/A	Appl	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
2	Quadris	9.5	IF	**$1,073**	**5958**	**243**	**24.5**	**16.7**	**94.6**
6	Quadris	19	IF	**$1,057**	**5924**	**249**	**23.8**	**16.9**	**95.0**
1	Quadris	7.125	IF	**$1,026**	**5683**	**238**	**23.7**	**16.3**	**95.0**
18	Quadris	7.125	IF	**$1,021**	**5755**	**242**	**23.8**	**16.6**	**94.6**
	Quadris	16.6	8 lf						
9	Quadris	19	IF	**$1,016**	**5807**	**238**	**24.4**	**16.4**	**94.5**
	Quadris	19	6 lf						
4	Quadris	14.3	IF	**$1,007**	**5619**	**237**	**23.7**	**16.2**	**94.7**
19	Quadris	9.5	IF	**$1,006**	**5683**	**243**	**23.3**	**16.6**	**94.9**
	Quadris	16.6	8 lf						
15	Quadris	7.125	IF	**$972**	**5468**	**240**	**22.9**	**16.4**	**94.7**
	Quadris	14.3	8 lf						
8	Quadris	16.6	IF	**$968**	**5517**	**235**	**23.4**	**16.3**	94.2
	Quadris	16.6	8 lf						
7	Quadris	14.3	IF	**$964**	**5469**	232	**23.5**	16.0	**94.5**
	Quadris	14.3	8 lf						
11	Quadris	14.3	8 lf	**$958**	**5350**	**245**	21.8	**16.8**	**94.7**
3	Quadris	11.9	IF	**$954**	**5315**	**246**	21.6	**16.8**	**94.7**
10	Quadris	14.3	6 lf	**$948**	**5299**	**240**	**22.0**	**16.5**	**94.4**
17	Quadris	14.3	IF	**$937**	**5321**	**239**	**22.2**	**16.5**	94.3
	Quadris	14.3	8 lf						
5	Quadris	16.6	IF	$917	**5141**	**235**	21.8	**16.2**	**94.5**
16	Quadris	11.9	IF	$916	**5188**	234	**22.1**	**16.2**	94.3
	Quadris	14.3	8 lf						
12	Quadris	16.6	8 lf	$898	5034	**240**	21.0	**16.5**	**94.4**
13	Quadris	19	8 lf	$841	4734	232	20.3	16.1	94.3
14	Quadris	14.3	6 lf	$774	4423	232	19.1	16.0	**94.5**
	Quadris	14.3	8 lf						
20	Untreated Check			$726	3995	213	18.7	15.1	93.3

	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$949	5334	238	22.4	16.3	94.5
LSD 5%	152.4	838.0	14.0	2.6	0.7	0.7
CV %	8.8	8.6	3.8	7.7	3.1	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 Quadris Rates and Application Timings in Sugarbeets With Tolerant and Susceptible Varieties

Crumbaugh, Breckenridge, MI - 2013

No	Treatment	Rate fl oz/A	Appl	Net $/A	Late Dead Beets 100 ft	Late Vigor Rating 0-10	Early Live Beets 100 ft	Late Live Beets 100 ft	Early - Late Beets 100 ft
2	Quadris	9.5	IF	**$1,073**	**9.9**	**8.4**	**178**	**169**	**8.5**
6	Quadris	19	IF	**$1,057**	**6.9**	**8.3**	**155**	**144**	**10.6**
1	Quadris	7.125	IF	**$1,026**	**9.3**	8.1	**170**	**161**	**8.8**
18	Quadris Quadris	7.125 16.6	IF 8 lf	**$1,021**	**9.9**	**8.7**	**171**	**163**	**8.1**
9	Quadris Quadris	19 19	IF 6 lf	**$1,016**	**10.2**	8.0	**154**	**148**	**6.0**
4	Quadris	14.3	IF	**$1,007**	**10.0**	**8.5**	**165**	**157**	**8.3**
19	Quadris Quadris	9.5 16.6	IF 8 lf	**$1,006**	**9.6**	**8.7**	**181**	**169**	**11.9**
15	Quadris Quadris	7.125 14.3	IF 8 lf	**$972**	**9.3**	**8.4**	**174**	**161**	**12.5**
8	Quadris Quadris	16.6 16.6	IF 8 lf	**$968**	**7.2**	**7.9**	**153**	**142**	**11.2**
7	Quadris Quadris	14.3 14.3	IF 8 lf	**$964**	**12.2**	**8.3**	**161**	**153**	**8.0**
11	Quadris	14.3	8 lf	**$958**	26.0	8.1	**169**	**145**	24.1
3	Quadris	11.9	IF	**$954**	**11.2**	8.2	**162**	**150**	**11.7**
10	Quadris	14.3	6 lf	**$948**	35.0	**8.0**	**161**	**137**	24.1
17	Quadris Quadris	14.3 14.3	IF 8 lf	**$937**	**13.8**	8.1	**173**	**162**	**10.9**
5	Quadris	16.6	IF	$917	**11.1**	**8.2**	**153**	**146**	**7.3**
16	Quadris Quadris	11.9 14.3	IF 8 lf	$916	**10.4**	**8.3**	**163**	**155**	**7.4**
12	Quadris	16.6	8 lf	$898	30.3	8.0	152	133	19.4
13	Quadris	19	8 lf	$841	33.7	**7.5**	149	126	23.1
14	Quadris Quadris	14.3 14.3	6 lf 8 lf	$774	23.1	**7.9**	**159**	139	19.4
20	Untreated Check			$726	47.4	7.1	**153**	125	28.1
Average				$949	16.8	8.1	163	149	13.5
LSD 5%				152.4	13.9	0.6	28.1	28.8	7.9
CV %				8.8	58.4	4.8	8.3	8.7	58.5

Comments: All In-furrow treatments were applied in a 3.5 inch T-Band (9 gpa) at planting. Foliar applications were applied in a 7 inch band (15 gpa). All Quadris treatments applied in-furrow provided adequate Rhizoctonia control. Foliar treatments were less effective. It appeared that the highest Quadris rate (19 fl oz/A) applied in-furrow provided better disease control but this rate also appeared to reduce sugarbeet stand. Lower Quadris rates did not lower stand. The tolerant variety (C-RR059) had fewer dead beets compared to the susceptible variety (C-RR074NT). The disease level was high.

Vigor: a higher number is better

$/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 Rates and Application Timings for Control of Rhizoctonia Root Rot With a Tolerant Variety (C-RR059)

Crumbaugh, Breckenridge, MI - 2013

Trial Quality: Good
Variety: C-RR059
Planted: May 8
Harvested: Sept 18
Plot Size: 6 rows X 50 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam, 3.1% OM, 7.0 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: by trt
Cerc. Control: Good
Seed Spacing: 4.1 inches
Problems: Uneven field, some ponding
Rainfall: 12.3 inches

No	Treatment	Rate fl oz/A	Appl	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Quadris	7.125	IF	**$1,120**	**6199**	**248**	**24.9**	**16.7**	**95.5**
2	Quadris	9.5	IF	**$1,107**	**6145**	**244**	**25.2**	**16.7**	**94.8**
19	Quadris	9.5	IF	**$1,089**	**6142**	**254**	**24.2**	**17.2**	**95.0**
	Quadris	16.6	8 lf						
6	Quadris	19	IF	**$1,061**	**5945**	**253**	**23.5**	**17.1**	**95.3**
7	Quadris	14.3	IF	**$1,038**	**5872**	**243**	**24.2**	**16.6**	**94.9**
	Quadris	14.3	8 lf						
9	Quadris	19	IF	**$1,032**	**5898**	**239**	**24.8**	**16.4**	94.6
	Quadris	19	4 lf						
4	Quadris	14.3	IF	**$1,029**	**5743**	**241**	**23.8**	**16.3**	**95.4**
8	Quadris	16.6	IF	**$1,027**	**5840**	**237**	**24.6**	**16.4**	94.4
	Quadris	16.6	8 lf						
3	Quadris	11.9	IF	**$1,022**	**5690**	**249**	**22.8**	**17.0**	**94.7**
18	Quadris	7.125	IF	**$1,012**	**5701**	**247**	**23.1**	**16.8**	**94.8**
	Quadris	16.6	8 lf						
17	Quadris	14.3	IF	**$1,005**	**5694**	**242**	**23.5**	**16.7**	94.4
	Quadris	14.3	8 lf						
10	Quadris	14.3	4 lf	**$971**	**5423**	**238**	**22.7**	**16.4**	94.3
11	Quadris	14.3	8 lf	**$963**	**5379**	**246**	21.8	**16.9**	94.6
16	Quadris	11.9	IF	**$958**	**5421**	**240**	**22.4**	**16.4**	**94.7**
	Quadris	14.3	8 lf						
5	Quadris	16.6	IF	**$950**	**5321**	**237**	**22.5**	**16.3**	94.4
15	Quadris	7.125	IF	$930	5239	**243**	21.6	**16.5**	**95.0**
	Quadris	14.3	8 lf						
13	Quadris	19	8 lf	$921	5175	**239**	21.6	**16.5**	94.4
12	Quadris	16.6	8 lf	$920	5157	**247**	20.9	**17.1**	94.2
14	Quadris	14.3	4 lf	$797	4547	**237**	19.1	16.3	**94.7**
	Quadris	14.3	8 lf						
20	Untreated Check			$747	4108	225	18.1	15.7	94.1
Average				$985	5532	242	22.8	16.6	94.7
LSD 5%				171.3	942.1	17.2	2.9	0.9	0.8
CV %				12.3	12.0	5.0	9.1	3.9	0.6

$/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 Rates and Application Timings for Control of Rhizoctonia Root Rot With a Tolerant Variety (C-RR059)

Crumbaugh, Breckenridge, MI - 2013

No	Treatment	Rate fl oz/A	Appl	Net $/A	Dead Late B/100'	Rhizoc Late 0-10	Stand Early B/100'	Stand Late B/100'	Stand Early-Late 100 ft
1	Quadris	7.125	IF	**$1,120**	**3.3**	**7.5**	**161**	**156**	**5.0**
2	Quadris	9.5	IF	**$1,107**	**4.5**	**8.0**	**169**	**161**	**7.2**
19	Quadris	9.5	IF	**$1,089**	**5.0**	**7.9**	**179**	**170**	**9.4**
	Quadris	16.6	8 lf						
6	Quadris	19	IF	**$1,061**	**3.5**	**7.4**	142	136	**6.4**
7	Quadris	14.3	IF	**$1,038**	**8.1**	**7.4**	**159**	**156**	**3.1**
	Quadris	14.3	8 lf						
9	Quadris	19	IF	**$1,032**	**4.8**	**7.5**	**147**	**144**	**2.9**
	Quadris	19	4 lf						
4	Quadris	14.3	IF	**$1,029**	**5.9**	**7.5**	**154**	**149**	**4.9**
8	Quadris	16.6	IF	**$1,027**	**2.5**	**7.5**	145	137	**7.7**
	Quadris	16.6	8 lf						
3	Quadris	11.9	IF	**$1,022**	**2.9**	**7.4**	**160**	**152**	**7.6**
18	Quadris	7.125	IF	**$1,012**	**7.6**	**7.4**	**157**	**151**	**5.4**
	Quadris	16.6	8 lf						
17	Quadris	14.3	IF	**$1,005**	**9.2**	**7.3**	**165**	**156**	**9.1**
	Quadris	14.3	8 lf						
10	Quadris	14.3	4 lf	**$971**	14.0	7.1	**151**	135	15.5
11	Quadris	14.3	8 lf	**$963**	18.5	7.0	**153**	135	17.6
16	Quadris	11.9	IF	**$958**	**8.9**	7.0	**153**	**145**	**8.1**
	Quadris	14.3	8 lf						
5	Quadris	16.6	IF	**$950**	**9.0**	**7.3**	**158**	**150**	**7.8**
15	Quadris	7.125	IF	$930	**7.7**	**7.3**	**162**	**154**	**8.2**
	Quadris	14.3	8 lf						
13	Quadris	19	8 lf	$921	15.5	6.9	**149**	131	18.1
12	Quadris	16.6	8 lf	$920	17.7	**7.3**	147	135	11.8
14	Quadris	14.3	4 lf	$797	15.0	**7.3**	146	130	15.9
	Quadris	14.3	8 lf						
20	Untreated Check			$747	24.5	6.8	137	118	19.0
Average				$985	9.4	7.3	154	143	9.5
LSD 5%				171.3	8.4	0.8	32.4	31.8	8.8
CV %				12.3	63.5	7.7	14.8	15.8	65.4

Rhizoc: a higher number is better

$/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 Rates and Application Timings for Control of Rhizoctonia Root Rot With a Susceptible Variety (C-RR074NT)

Crumbaugh, Breckenridge, MI - 2013 (Page 1 of 2)

Trial Quality: Fair-Good
Variety: C-RR074NT
Planted: May 8
Harvested: Sept 18
Plot Size: 6 rows X 50 ft
4 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
3.1% OM, 7.0 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: by trt
Cerc. Control: Good
Seed Spacing: 4.1 inches
Problems: Uneven field
some ponding
Rainfall: 12.3 inches

No	Treatment	Rate fl oz/A	Appl	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Quadris	19	IF	**$1,053**	**5904**	**245**	**24.1**	**16.7**	**94.8**
2	Quadris	9.5	IF	**$1,039**	**5771**	**243**	**23.8**	**16.7**	**94.4**
18	Quadris	7.125	IF	**$1,031**	**5809**	**237**	**24.5**	**16.4**	**94.5**
	Quadris	16.6	8 lf						
15	Quadris	7.125	IF	**$1,013**	**5697**	**237**	**24.1**	**16.4**	**94.3**
	Quadris	14.3	8 lf						
9	Quadris	19	IF	**$999**	**5717**	**237**	**24.1**	**16.4**	**94.3**
	Quadris	19	4 lf						
4	Quadris	14.3	IF	**$984**	**5494**	**232**	**23.5**	**16.1**	**94.1**
11	Quadris	14.3	8 lf	**$952**	**5321**	**244**	**21.8**	**16.6**	**94.8**
1	Quadris	7.125	IF	**$932**	**5166**	228	**22.5**	15.8	**94.4**
10	Quadris	14.3	4 lf	**$926**	**5175**	**241**	**21.4**	**16.6**	**94.5**
19	Quadris	9.5	IF	**$922**	**5225**	**232**	**22.4**	**15.9**	**94.8**
	Quadris	16.6	8 lf						
8	Quadris	16.6	IF	**$909**	**5195**	**232**	**22.3**	**16.2**	**94.0**
	Quadris	16.6	8 lf						
7	Quadris	14.3	IF	**$891**	**5065**	221	**22.9**	15.4	**94.0**
	Quadris	14.3	8 lf						
3	Quadris	11.9	IF	**$886**	4940	**242**	20.4	**16.6**	**94.7**
5	Quadris	16.6	IF	**$884**	4961	**234**	21.2	**16.1**	**94.5**
12	Quadris	16.6	8 lf	$875	4911	**232**	21.2	**16.0**	**94.6**
16	Quadris	11.9	IF	$873	4954	227	**21.7**	**15.9**	93.8
	Quadris	14.3	8 lf						
17	Quadris	14.3	IF	$869	4947	**236**	20.9	**16.3**	**94.2**
	Quadris	14.3	8 lf						
13	Quadris	19	8 lf	$760	4292	226	19.0	15.7	**94.2**
14	Quadris	14.3	4 lf	$752	4298	227	19.0	15.7	**94.4**
	Quadris	14.3	8 lf						
20	Untreated Check			$706	3881	200	19.3	14.5	92.6

	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$913	5136	233	22.0	16.1	94.3
LSD 5%	170.7	938.9	16.1	3.2	0.9	0.9
CV %	13.2	12.9	4.9	10.4	3.8	0.7

$/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 Quadris Rates and Application Timings for Control of Rhizoctonia Root Rot With a Susceptible Variety (C-RR074NT)

Crumbaugh, Breckenridge, MI - 2013 (Page 2 of 2)

No	Treatment	Rate fl oz /A	Appl	Net $/A	Late Dead Beets 100 ft	Late Rhizoc Rating 0-10	Early Stand Beets 100 ft	Late Stand Beets 100 ft	Early - Late Stand 100 ft
6	Quadris	19	IF	**$1,053**	**10.3**	**8.3**	**167**	**152**	**14.8**
2	Quadris	9.5	IF	**$1,039**	**15.3**	**8.3**	**187**	**177**	**9.7**
18	Quadris	7.125	IF	**$1,031**	**12.3**	**8.6**	**186**	**175**	**10.7**
	Quadris	16.6	8 lf						
15	Quadris	7.125	IF	**$1,013**	**10.9**	**8.4**	**186**	**169**	**16.9**
	Quadris	14.3	8 lf						
9	Quadris	19	IF	**$999**	**15.6**	7.9	**162**	**153**	**9.0**
	Quadris	19	4 lf						
4	Quadris	14.3	IF	**$984**	**14.1**	**8.5**	**177**	**165**	**11.6**
11	Quadris	14.3	8 lf	**$952**	33.6	7.9	**185**	**155**	30.8
1	Quadris	7.125	IF	**$932**	**15.2**	7.9	**179**	**166**	**12.7**
10	Quadris	14.3	4 lf	**$926**	56.0	7.6	**162**	139	22.6
19	Quadris	9.5	IF	**$922**	**14.2**	8.5	**183**	**169**	**14.4**
	Quadris	16.6	8 lf						
8	Quadris	16.6	IF	**$909**	**12.0**	7.8	**162**	**147**	**14.6**
	Quadris	16.6	8 lf						
7	Quadris	14.3	IF	**$891**	**16.4**	**8.2**	**163**	**150**	**12.8**
	Quadris	14.3	8 lf						
3	Quadris	11.9	IF	**$886**	**19.5**	7.8	**163**	**147**	**15.9**
5	Quadris	16.6	IF	**$884**	**13.2**	**8.1**	149	142	**6.8**
12	Quadris	16.6	8 lf	$875	43.0	7.9	**158**	131	27.0
16	Quadris	11.9	IF	$873	**12.0**	**8.3**	**172**	**166**	**6.8**
	Quadris	14.3	8 lf						
17	Quadris	14.3	IF	$869	**18.4**	7.9	**181**	**169**	**12.6**
	Quadris	14.3	8 lf						
13	Quadris	19	8 lf	$760	51.8	7.3	150	122	28.0
14	Quadris	14.3	4 lf	$752	31.3	7.8	**172**	**149**	23.0
	Quadris	14.3	8 lf						
20	Untreated Check			$706	70.2	6.6	**169**	132	37.3
Average				$913	24.3	8.0	171	154	17.4
LSD 5%				170.7	20.2	0.7	31.4	32.4	13.1
CV %				13.2	58.9	6.2	13.0	15.0	53.4

Rhizoc: a higher number is better

$/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 Rhizoctonia Root Rot With a Susceptible Variety

Crumbaugh, Breckenridge, MI - 2013

Trial Quality: Good for Counts
Variety: C-RR074NT
Planted: May 9
Harvested: Not Harvested
Plot Size: 6 rows X 50 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam, 3.1% OM, 7.0 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: by trt
Cerc Control: Good
Seed Spacing: 4.1 inches
Problems: Uneven field, some ponding
Rainfall: 12.5 inches

No	Treatment	Rate/A	Appl	Late Dead Beets 100 ft	Late Rhizoc Rating 0-10	Early Stand Beets 100 ft	Late Stand Beets 100 ft	Early - Late Beets 100 ft
3	Quadris	9.5 fl oz	IF	**10.7**	**7.8**	**179**	**169**	**10**
	Quadris	16.6 fl oz	8 lf					
1	Quadris	9.5 fl oz	IF	**13.2**	**7.4**	**171**	**162**	**9**
4	Vertisan	30 fl oz	IF	**15.3**	**7.3**	**169**	**157**	**12**
6	Moncut	18 oz	IF	**17.8**	**7.3**	**173**	**161**	**12**
2	Quadris	14.25 fl oz	8 lf	**18.3**	**7.3**	**172**	**156**	**16**
9	Priaxor	8 fl oz	IF	**23.1**	**7.5**	166	**173**	**12**
8	Headline	9.2 fl oz	IF	**28.5**	**7.6**	**188**	**157**	32
11	Priaxor	8 fl oz	IF	30.2	**7.3**	**169**	**156**	**14**
	Priaxor	8 fl oz	8 lf					
7	Moncut	18 oz	8 lf	30.2	**7.4**	166	147	**19**
5	Vertisan	30 fl oz	8 lf	33.2	7.1	168	139	29
10	Priaxor	8 fl oz	8 lf	33.6	7.0	163	141	**22**
12	Untreated Check			50.1	6.8	162	124	38
	Average			25.4	7.3	172	153	18.8
	LSD 5%			18.6	0.5	20.2	20.8	15.0
	CV %			50.9	4.9	8.2	9.5	55.5

Comments: Quadris in-furrow and foliar applications were compared to other fungicides for control of Rhizoctonia Root Rot. Quadris was marginally better than Moncut and Vertisan in this trial. Headline and Priaxor were less effective. The disease level was high. Sugarbeet yields were too variable to be meaningful.

Rhizoc: a higher number is better

$/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 T-Band Width (In-Furrow) For Control of Rhizoctonia Root Rot

Crumbaugh, Breckenridge, MI - 2013

Trial Quality: Fair
Variety: C-RR074NT
Planted: May 9
Harvested: Sept 17
Plot Size: 6 rows X 150 ft, 3 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam, 3.1% OM, 7.0 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: Good
Cerc Control: Good
Seed Spacing: 4.1 inches
Problems: Uneven field some ponding
Rainfall: 12.3 inches

No	Treatment	T-Band Width	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Early Stand 100 ft	Late Rhizoc Rate 0-10	Late Dead Beets 100 ft
2	Quadris 7.13 fl oz	3.5	**$924**	**5082**	**221**	**23.0**	**15.5**	**93.6**	**177**	**8.0**	**55.4**
3	Quadris 7.13 fl oz	7	**$874**	**4806**	**213**	**22.5**	**14.9**	**93.9**	**176**	**8.1**	**67.5**
1	Quadris 7.13 fl oz	2	**$867**	**4768**	**220**	**21.6**	**15.3**	**94.3**	**175**	**8.1**	**51.9**
Average			$888	4885	218	22.4	15.3	93.9	176.0	8.1	58.3
LSD 5%			ns(259)	ns(1423)	ns(25.4)	ns(4.1)	ns(1.2)	ns(1.5)	ns(11.5)	ns(.3)	ns(44.2)
CV %			12.9	12.9	5.2	8.1	3.5	0.7	2.9	1.7	33.5

Comments: Quadris at 7.125 fl oz/A was applied in-furrow in a 2, 3.5, and 7 inch T-bands. There did not appear to be differences in emergence, Rhizoctonia control or yield based on band width.

Rhizoc: a higher number is better

$/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 Topsin M for Control of Rhizoctonia Root Rot

Crumbaugh, Breckenridge, MI - 2013

Trial Quality: Fair - Good
Variety: B-18RR4N
Planted: May 9
Harvested: Sept 13
Plot Size: 6 rows X 50 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam, 3.0% OM, 7.0 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 100 lbs
Prev Crop: Soybeans

Rhizoc Control: By Trt
Cerc Control: Good
Other Problems: Low spots some flooding
Seeding Rate: 4.1 inches
Rainfall: 12.3 inches

No	Treatment	Rate/A	Appl	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
13	Quadris	10.5 fl oz	IF	**$877**	**4965**	**225**	**22.1**	**15.5**	**94.7**
	Quadris	14.25 fl oz	6-8 lf						
5	Topsin	20 fl oz	IF	**$854**	**5017**	**226**	**22.1**	**15.5**	**94.9**
	Quadris	10.5 fl oz	IF						
	Topsin	20 fl oz	6-8 lf						
	Quadris	14.25 fl oz	6-8 lf						
15	Quadris	19 fl oz	IF	**$809**	**4561**	**221**	**20.7**	**15.4**	**94.2**
10	Quadris	10.5 fl oz	IF	**$801**	**4553**	**213**	**21.4**	**14.9**	**94.3**
	Topsin	20 fl oz	6-8 lf						
9	Topsin	20 fl oz	IF	**$789**	**4512**	**217**	**20.7**	**15.1**	**94.4**
	Quadris	14.25 fl oz	6-8 lf						
3	Topsin	20 fl oz	IF	**$782**	**4475**	**217**	**20.5**	**14.9**	**94.8**
	Topsin	20 fl oz	6-8 lf						
11	Quadris	10.5 fl oz	IF	**$760**	4240	**225**	18.9	**15.4**	**95.1**
1	Topsin	20 fl oz	IF	$731	4109	**217**	18.9	**15.2**	93.9
14	Quadris	16.5 fl oz	IF	$723	4074	**222**	18.3	**15.3**	**94.8**
12	Quadris	14.25 fl oz	6-8 lf	$716	4023	**214**	18.8	**14.8**	**94.7**
4	Topsin	20 fl oz	IF	$700	3968	**217**	18.2	**15.1**	**94.2**
	Quadris	10.5 fl oz	IF						
8	Topsin	20 fl oz	6-8 lf	$677	3840	**215**	17.8	**15.0**	94.1
	Cuprofix	2 lb	6-8 lf						
16	Untreated			$647	3556	**213**	16.7	**14.9**	94.0
2	Topsin	20 fl oz	6-8 lf	$627	3535	204	17.4	14.4	93.8
7	Topsin	20 fl oz	6-8 lf	$621	3533	209	16.9	14.7	94.1
	Manzate	2 lb	6-8 lf						
6	Topsin	20 fl oz	6-8 lf	$561	3221	200	16.2	14.2	93.6
	Super Tin	8 fl oz	6-8 lf						
Average				$730	4136	216	19.1	15.0	94.4
LSD 5%				135.8	746.7	13.4	2.9	0.7	0.9
CV %				12.6	12.6	4.3	10.5	3.2	0.7

$/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 Topsin M for Control of Rhizoctonia Root Rot

Crumbaugh, Breckenridge, MI - 2013

No	Treatment	Rate/A	Appl	Avg of Missing/Dead B/100'	Late Dead B/100'	Early Stand B/100'	Late Stand B/100'	Early-Late Stand B/100'	Vigor Rating 0-10
10	Quadris Topsin	10.5 fl oz 20 fl oz	IF 6-8 lf	**19.9**	**18.2**	**160**	**138**	**21.6**	**7.8**
13	Quadris Quadris	10.5 fl oz 14.25 fl oz	IF 6-8 lf	**28.6**	**24.9**	**167**	**135**	**32.4**	**8.0**
5	Topsin Quadris Topsin Quadris	20 fl oz 10.5 fl oz 20 fl oz 14.25 fl oz	IF IF 6-8 lf 6-8 lf	**29.9**	**25.5**	**160**	**126**	**34.3**	**7.8**
9	Topsin Quadris	20 fl oz 14.25 fl oz	IF 6-8 lf	**34.7**	**25.9**	**162**	**118**	**43.6**	**7.3**
3	Topsin Topsin	20 fl oz 20 fl oz	IF 6-8 lf	**35.3**	**23.7**	**165**	**118**	46.8	**7.2**
15	Quadris	19 fl oz	IF	36.9	33.6	**173**	**133**	**40.1**	**7.5**
11	Quadris	10.5 fl oz	IF	39.5	34.8	**165**	**120**	**44.2**	**7.1**
14	Quadris	16.5 fl oz	IF	40.1	33.6	**158**	**112**	46.7	**7.2**
4	Topsin Quadris	20 fl oz 10.5 fl oz	IF IF	40.6	40.8	**162**	**122**	**40.3**	**7.3**
12	Quadris	14.25 fl oz	6-8 lf	41.2	34.8	143	96	47.6	6.9
8	Topsin Cuprofix	20 fl oz 2 lb	6-8 lf 6-8 lf	41.4	**29.1**	**152**	98	53.8	6.8
1	Topsin	20 fl oz	IF	42.2	40.6	**152**	**109**	**43.7**	**7.3**
7	Topsin Manzate	20 fl oz 2 lb	6-8 lf 6-8 lf	43.7	34.8	**160**	107	52.6	6.9
6	Topsin Super Tin	20 fl oz 8 fl oz	6-8 lf 6-8 lf	47.2	42.7	**154**	102	51.6	6.6
2	Topsin	20 fl oz	6-8 lf	48.8	40.6	131	73	57.1	6.4
16	Untreated Check			53.0	54.9	**150**	99	51.1	6.7
Average				38.9	33.7	157	113	44.2	7.2
LSD 5%				16.0	15.4	24.4	29.8	23.0	1.0
CV %				28.8	31.9	10.8	18.5	36.4	9.9

Comments: The sugarbeet yield and quality was low due to a late planting and an early harvest. The disease pressure (Rhizoctonia) was high. Topsin provided Rhizoctonia control but not at the same level as Quadris. In-furrow T-Band treatments were superior to foliar applications. It appears that Topsin could be a possible replacement for Quadris if resistance to Quadris occurs.

Vigor- a higher number is better

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

Evaluate Vertisan in Sugarbeets for Rhizoctonia Control

Crumbaugh, Breckenridge, MI - 2013

Study Director: Marsha Martin, Bond McInnes, DuPont (Page 1 of 2)

Trial Quality: Fair
Variety: C-RR074NT
Planted: May 9
Harvested: Sept 18
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
3.1% OM, 7.0 pH
Nutrient levels adequate
Added N: 100 lbs
Prev Crop: Soybeans

Cerc Control: Good
Rhizoc Control: by Tmts
Problems: Low spots some flooding
Seeding Rate: 4.1 inches
Rainfall: 12.3 inches

No	Treatment	Rate fl oz/A	Applied	$/A	RWSA	RWST	T/A	% Sugar	% CJP
7	Quadris	14.25	IF	**$847**	**4660**	**234**	**19.9**	**16.0**	**94.8**
	Quadris	14.25	6 lf						
3	Vertisan	30	IF	**$844**	**4644**	**235**	**19.8**	**16.2**	**94.5**
	Vertisan	30	6 lf						
6	Quadris	14.25	6 lf	**$821**	**4516**	**235**	**19.3**	**16.3**	**94.3**
2	Vertisan	30	6 lf	**$816**	**4486**	**243**	**18.4**	**16.7**	**94.5**
4	Quadris	14.25	IF	**$752**	**4134**	**232**	**17.7**	**16.1**	**94.2**
	Vertisan	30	6 lf						
1	Vertisan	30	IF	**$735**	**4044**	**223**	**18.0**	15.6	93.8
5	Quadris	14.25	IF	$715	3935	**224**	**17.6**	15.7	93.6
8	Untreated			$689	3789	221	**17.2**	15.5	93.7
Average				$777	4276	231	18.5	16.0	94.2
LSD 5%				127.0	698.5	13.7	ns(2.7)	0.7	0.8
CV %				11.1	11.1	4.0	10.0	3.2	0.6

Comments: Vertisan was evaluated for Rhizoctonia control in this small plot replicated trial. Vertisan treatments provided good Rhizoctonia control compared to Quadris. Vertisan did not perform well in 2012 but we tested a lower rate in 2012.

$/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 Vertisan in Sugarbeets for Rhizoctonia Control

Crumbaugh, Breckenridge, MI - 2013

Study Director: Marsha Martin, Bond McInnes, DuPont

No	Treatment	Rate fl oz/A	Applied	$/A	Stand B/100 ft Jun 7	Stand B/100 ft Aug 6	Dead B/100 ft Jul 16	Dead B/100 ft Sep 6	Vigor 1-10 Sep 12
7	Quadris	14.25	IF	**$847**	**155**	**158**	**3.1**	**5.8**	**7.9**
	Quadris	14.25	6 lf						
3	Vertisan	30	IF	**$844**	**175**	**177**	**3.0**	**8.0**	**8.4**
	Vertisan	30	6 lf						
6	Quadris	14.25	6 lf	**$821**	**164**	**159**	**5.3**	**8.8**	**8.4**
2	Vertisan	30	6 lf	**$816**	**167**	**160**	**1.4**	**4.8**	**8.2**
4	Quadris	14.25	IF	**$752**	**178**	**162**	**3.0**	**7.8**	**8.4**
	Vertisan	30	6 lf						
1	Vertisan	30	IF	**$735**	**173**	**168**	**4.5**	**6.3**	**8.3**
5	Quadris	14.25	IF	$715	**174**	**168**	**4.7**	**8.0**	**8.1**
8	Untreated			$689	152	122	8.8	22.0	**7.5**
Average				$777	167.3	159.2	4.2	8.9	8.2
LSD 5%				127.0	25.1	26.6	4.7	14.6	ns(1.0)
CV %				11.1	10.2	11.3	75.3	111.4	8.5

Vigor: a higher number is better

$/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.

Rhizoctonia - Multiple Fungicides

Gene Meylan, Linwood - 2013

Trial Quality: Fair / Good
Variety: B-19RR1N
Planted: May 6
Harv/Samp: Oct 28 / Oct 8
Plot Size: 4 reps
Row Spacing: 30 inch
Seeding Rate: 52,000

Soil Info: Loam
Fertilizer: Fall: 2 ton lime & 200# K20; 2x2: 36-33-0 w/ 0.3Mn-0.3B-5.5S; S.D.: 30 Gal 28%
Prev Crop: Soybeans
Weather: Dry summer

Rhizoc Control: No In-furrow. See Treatments
Cerc Control: Good Control: 1. Eminent, 2. Topsin, 3. Kocide
Other Pests: Sugarbeet Cyst Nematode

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets / 1200 Ft
Quadris - Normal Rate	$848	**4677**	**249**	**18.8**	**16.7**	**95.4**	**365**
Vertisan	$822	**4541**	**241**	**18.8**	**16.4**	**95.0**	**440**
Priaxor	$788	**4337**	**238**	**18.2**	**16.3**	**94.6**	546
Check	$770	**4263**	**245**	**17.3**	**16.6**	**95.2**	555
Topsin	$738	**4112**	**241**	**16.9**	**16.4**	**94.9**	517
Average	$793	4386	243	18.0	16.5	95.0	485
LSD 5%	—	ns (603)	ns (16)	ns (2.1)	ns (0.8)	ns (0.9)	143
CV %	—	9	4	7.6	3.0	0.6	19

Comments: Trial was conducted to evaluate the effectiveness of different foliar fungicides on Rhizoctonia control. A single application of each fungicide was applied at the 6-8 leaf stage in a 7 inch band with 10 gallons of water per acre. Rates were as follows: Quadris 10.5 oz./acre, Vertisan 30 oz./acre, Priaxor 8 oz./acre and Topsin 20 oz./acre. No in-furrow applications were used, only foliar. Rhizoctonia dead/dying beet counts where taken in September in 1200 foot of row. Highest RWSA and the lowest amount of dead beets in two trials (Schindler and Meylan) occurred with Quadris, but not significantly different than Vertisan. This trial had very heavy natural Rhizoctonia pressure. Previous research would suggest in heavy pressure situation that in-furrow followed by foliar would be the best approach for long term control of Rhizoctonia.

$/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.

Rhizoctonia - Multiple Fungicides

Schindler Farms LLC, Kawkawlin - 2013

Trial Quality: Fair
Variety: B-19RR1N
Planted: May 4
Harv/Samp: Oct 23 / Oct 8
Plot Size: 4 reps
Row Spacing: 22 inch
Seeding Rate: 58,500

Soil Info: Loam
Fertilizer: Fall: 200# K_2O; Spring Broad: 140#; 2x2: 35-20-0+Mn
Prev Crop: Wheat
Weather: Dry summer

Rhizoc Control: No in-furrow. See treatments.
Cerc Control: 1. Inspire XT, 2. Headline, 3. Enable, 4. EBDC
Other Pests: Sugarbeet Cyst Nematode

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets / 1200 Ft
Quadris - Normal Rate	$1,421	**7817**	**284**	**27.6**	**18.8**	**95.9**	**151**
Vertisan	$1,415	**7784**	**287**	**27.1**	**18.9**	**96.0**	**198**
Topsin	$1,313	**7224**	**278**	**26.0**	**18.5**	**95.7**	**261**
Check	$1,204	6645	265	**25.0**	17.8	**95.4**	**304**
Priaxor	$1,161	6423	**268**	23.8	**17.9**	**95.6**	**307**
Average	$1,303	7179	276	25.9	18.4	95.8	244
LSD 5%	—	1152	20	3.5	1.1	ns (0.7)	ns (175)
CV %	—	10	5	8.7	3.8	0.5	47

Comments: Trial was conducted to evaluate the effectiveness of different foliar fungicides on Rhizoctonia control. A single application of each fungicide was applied at the 6-8 leaf stage in a 7 inch band and 12 gallons of water per acre. Rates were as follows: Quadris 14.25 oz./acre, Vertisan 30 oz./acre, Priaxor 8 oz./acre and Topsin 20 oz./acre. No in-furrow applications were used, only foliar. Rhizoctonia dead/dying beet counts where taken in September in 1200 foot of row. Highest RWSA and lowest amount of dead beets in two trials (Schindler and Gene Meylan) occurred with Quadris but not significantly different than Vertisan.

$/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.

Rhizoctonia - Quadris Rates

Meylan Farms Inc., Auburn - 2013

Trial Quality: Fair/Good
Variety: C-RR074NT
Planted: May 3
Harv/Samp: Oct 28 / Oct 9
Plot Size: 3 reps
Row Spacing: 22 inch
Seeding Rate: 67,000

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
Weather: Dry summer

Rhizoc Control: See treatments
Cerc Control: Good Control: 1. Inspire XT, 2. Headline + Ballad, 3. Eminent
Other Pests: Mustang Maxx In Furrow

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							12 Day	34 Day	
High Rate I.F. & High Rate 6-8 Leaf	$1,534	**8448**	**284**	**29.7**	**19.1**	**95.0**	—	—	**24**
Normal Rate I.F.	$1,534	**8440**	**287**	**29.4**	**19.3**	**95.1**	58	**165**	69
High Rate 6-8 Leaf	$1,514	**8336**	**284**	**29.3**	**19.1**	**95.2**	—	—	**52**
Normal Rate I.F. & Normal Rate 6-8 Lf	$1,506	**8279**	**289**	**28.7**	**19.3**	**95.2**	—	—	**41**
Normal Rate 6-8 Lf	$1,486	**8186**	**287**	**28.5**	**19.2**	**95.3**	—	—	**44**
High Rate I.F	$1,447	**7993**	**278**	**28.6**	**18.7**	**95.0**	43	**143**	**53**
Check	$1,424	**7856**	**278**	**28.1**	**18.8**	**95.0**	**102**	**174**	121
Average	$1,492	8220	284	28.9	19.1	95.1	68	161	58
LSD 5%	—	ns (1179)	ns (21)	ns (2.9)	ns (1.1)	ns (0.7)	49	ns (47)	42
CV %	—	8	4	5.5	3.3	0.4	32	13	40

Comments: Trial was conducted to evaluate the efficacy of high label rates of Quadris applied in-furrow and foliar (6-8 leaf). In-furrow T-band width was 3 ½ to 4 inches with the Normal Rate of 7 oz/acre and the High Rate of 14.25 oz/acre. Foliar applications were applied in a 7 inch T-band at the 6-8 leaf stage in 12 gallons of water. The Normal Foliar Rate was 14.25 oz/ac and the High Rate was 19 oz/acre. Dead beet counts were taken in September in 1200 foot of row. Rhizoctonia levels were considered relatively low for all treatments. Any treatment utilizing Quadris had lower Rhizoctonia levels and higher yields than the check. High rates of Quadris in-furrow did reduce stand counts. Large amount of stand reduction occurred in sandy areas of the field. To apply the high rate Quadris in-furrow treatments, the flow rate of water was increased to apply the required amount of Quadris. This also doubled the amount of Mustang Maxx from the normal rate of 4 ounces per acre to eight. It is unknown what effect this had on the reduced emergence. It is not recommended that full rates of Quadris be applied in a narrow T-band, especially on lighter soils. With the low level of Rhizoctonia pressure, no significant improvement of Rhizoctonia control was seen with high rates compared to normal rates.

$/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.

Rhizoctonia - Serenade Fungicide
Sherwood Farms, Breckenridge - 2013

Trial Quality: Good
Variety: C-RR059
Planted: May 7
Harv/Samp: Oct 21 / Oct 14
Plot Size: 3 reps
Row Spacing: 30 inch
Seeding Rate: 53,000

Soil Info: Loam
Fertilizer: 2x2: 20 gal. of 19-17-0 + micros; Broadcast: 37 gal. of 28%
Prev Crop: Corn
Weather: Excessively wet early, dry summer

Rhizoc Control: Exc. Control: Quadris I.F (7oz) & Foliar
Cerc Control: Good Control: 1. Inspire + EBDC, 2. Agritin + Topsin, 3. Eminent
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Dead Beets / 1200 Ft
Check: Quadris I.F	$1,252	**6889**	**259**	**26.6**	**17.3**	**95.7**	**3**
Serenade & Quadris I.F.	$1,233	**6761**	**261**	**26.0**	**17.4**	**95.7**	**2**
Average	$1,243	6825	260	26.3	17.4	95.7	3
LSD 5%	—	ns (898)	ns (32)	ns (6.4)	ns (1.6)	ns (1.2)	ns (10)
CV %	—	4	4	7.0	2.7	0.3	114

Comments: Trial was conducted to evaluate a Biological Rhizoctonia control product (Serenade Soil) applied in a T-band at planting time. Serenade was used as a tank mix partner with Quadris. Standard Quadris in-furrow treatments (7 oz./acre) were compared to Quadris in furrow plus Serenade at the two quart per acre rate. All treatments had Quadris foliar applied at the 6-8 leaf stage. A moderately tolerant Rhizoctonia variety was planted. Rhizoctonia was almost non-existent in both treatments when counts were done in September. Product could not be evaluated properly because of low levels of Rhizoctonia.

$/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.

MICHIGAN STATE UNIVERSITY
AgBioResearch

Control of Rhizoctonia crown and root rot with fungicides, 2013.

W. W. Kirk and R. L. Schafer; 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 4 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) or at GS 4-6 (B) or at GS 6-8 (C). Applications were made at planting (A); and banded applications on 30 May at GS 4-6 (B) and 4 Jun at GS 6-8 (C), respectively. Cercospora leaf spot was controlled with an application of Eminent 125SL (13 fl oz) + Koverall 75DF (1.5 lb) on 17 Jul and Inspire 2.08EC (7 fl oz) + Kocide 3000 46.1WG (2 lb) on 7 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 was rated 13, 21 and 30 days after planting (DAP) and relative rate of emergence was calculated as the Relative Area Under the Emergence Progress Curve [RAUEPC from 0 – 30 DAP, maximum value = 100]. Plots were inoculated on 3 Jun [30 days after planting (DAP)] by spreading R. solani Anastemoses Group 2.2 (IIIB) infested millet across all plants in each plot. Incidence of infected plants was evaluated on 60 and 123 DAP. Samples of 50 beets per plot were harvested 123 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 (oF) was 60.7, 65.3, 70.4, 67.1, 58.8 and 51.1 (May, Jun, Jul, Aug, Sep, and Oct, respectively) and the number of days with maximum temperature >90oF over the same period was 0, 0, 5, 0, 1 and 0 (in 2012 there were 12 days for Aug). Average daily relative humidity (%) over the same period was 59.1, 66.1, 68.3, 63.1, 69.0, 68.1 and 70.1. Average soil temperature at 2” depth over the same period was 60.4, 69.2, 74.8, 71.7, 64.6 and 52.9. Average soil moisture (% of field capacity) at 2” depth over the same period was 33.5, 24.3, 28.3, 30.6, 23.4 and 30.4. Precipitation over the same period was 3.43, 1.73, 2.03, 1.85, 0.58 and 3.26”.

Treatments with final plant stand greater than 90.0% were significantly different from the non-inoculated not-treated check (80.0%) in terms of plant stand. No treatments were significantly different from either check in terms of RAUEPC. Soil temperature and moisture conditions enhanced moderate development of crown and root rot throughout the season although severe symptoms did not appear until Aug. The initial evaluation of crown and root at harvest indicated that treatments with less 4.9% incidence of dead or dying plants were significantly different from the inoculated not-treated check (8.6%). 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 (99%). No treatments had a significantly lower severity index of crown and root rot on the beetroots and ranged from 38.3 (Priaxor 4.17SC 0.55 fl oz/1000 ft. row applied at GS 4-6) to 61.4 (Proline 480SC 0.24 fl oz/1000 ft. row at GS 4-6) but were not significantly different to the inoculated not-treated check (47.9). 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 40.1. There were no differences among treatments in terms of marketable beetroots and due to the onset of severe Rhizoctonia root rot during the latter part of the season the range was from 35 to 59% marketable and the non-inoculated not-treated check inoculated not-treated check had 55 and 48% marketable beets, respectively. No phytotoxicity was observed from any treatments.

MICHIGAN STATE UNIVERSITY

AgBioResearch

Control of Rhizoctonia crown and root rot with fungicides, 2013.

W. W. Kirk and R. L. Schafer; 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[a] 26 DAP[b] (%)	RAUEPC[c] 0 – 26 DAP	Crown and root rot			Marketable beets (%)
			Incidence 60 DAP (%)	Incidence 123 DAP (%)	Severity[d] 123 DAP (%)	
Topguard 1.04SC 0.96 fl oz (A[e])…...	84.6 a-ef	34.7 a	4.0 efg	89.0 a	41.4 a	57.0 a
Topguard 1.04SC 0.69 fl oz (A); Topguard 1.04SC 0.69 fl oz + Koverall 75DF 1.65 oz wt + NIS 100SL 4.2 fl oz (C)……………	75.4 e	30.9 a	4.9 b-g	99.0 a	55.6 a	41.0 a
Topguard 1.04SC 0.69 fl oz + Koverall 75DF 1.65 oz wt + NIS 100SL 4.2 fl oz (BC)…………..	87.0 a-d	38.6 a	7.3 a-f	97.0 a	51.4 a	48.0 a
Proline 480SC 0.24 fl oz (A)……….	94.8 a	35.8 a	5.0 b-g	99.0 a	57.4 a	40.0 a
Serenade Soil 1.34SC 4.4 fl oz (A)...	84.1 b-e	38.0 a	7.8 a-e	93.0 a	44.7 a	49.0 a
Proline 480SC 0.24 fl oz + Serenade Soil 1.34SC 4.4 fl oz (A)..	90.0 abc	33.4 a	5.9 a-g	99.0 a	50.7 a	41.0 a
Serenade Soil 1.34SC 4.4 fl oz (A); Proline 480SC 0.24 fl oz (B)……….	89.3 abc	37.2 a	4.8 c-g	98.0 a	56.0 a	35.0 a
Proline 480SC 0.24 fl oz (B)……….	77.0 de	34.6 a	3.8 fg	98.0 a	61.4 a	36.0 a
Evergol Prime 240FS 0.33 fl oz (A).	83.9 b-e	34.0 a	5.4 b-g	96.0 a	50.7 a	45.0 a
Evergol Prime 240FS 0.33 fl oz (A); Proline 480SC 0.24 fl oz (B)……….	91.3 ab	44.1 a	2.5 g	100.0 a	55.1 a	35.0 a
Headline 2.09EC 0.62 fl oz (A)…….	90.0 abc	35.3 a	4.4 d-g	95.0 a	56.7 a	39.0 a
Priaxor 4.17SC 0.55 fl oz (A)……...	77.7 de	37.7 a	3.4 g	96.0 a	46.4 a	57.0 a
Priaxor 4.17SC 0.55 fl oz (B)………	83.2 b-e	36.5 a	4.1 d-g	96.0 a	38.3 a	59.0 a
Priaxor 4.17SC 0.55 fl oz (A); Priaxor 4.17SC 0.55 fl oz (B)………	89.3 abc	37.4 a	8.5 abc	99.0 a	53.9 a	44.0 a
Priaxor 4.17SC 1.1 fl oz (A); Priaxor 4.17SC 1.1 fl oz (B)………..	80.2 cde	34.8 a	3.0 g	91.0 a	49.6 a	49.0 a
Quadris 2.08FL 0.6 fl oz (A)……….	88.8 abc	37.4 a	3.6 fg	99.0 a	50.7 a	39.0 a
Quadris 2.08FL 0.6 fl oz (B)……….	95.0 a	39.8 a	7.9 a-d	97.0 a	57.0 a	35.0 a
Moncut 70DF 0.74 oz wt (A)………	77.5 de	30.6 a	3.5 fg	96.0 a	47.6 a	48.0 a
A15457 100EC 3.2 fl oz (A)……….	80.7 cde	35.8 a	4.3 d-g	97.0 a	45.0 a	51.0 a
A15457 100EC 2.4 fl oz (A)……….	88.9 abc	36.5 a	4.4 d-g	95.0 a	43.0 a	58.0 a
A15457 100EC 1.6 fl oz (A)……….	81.3 b-e	33.2 a	5.5 a-g	100.0 a	57.1 a	42.0 a
Quadris 2.08FL 0.6 fl oz (A); Topsin 4.5FL 1.38 fl oz (B)………..	81.4 b-e	33.4 a	9.3 a	84.0 a	42.3 a	56.0 a
Topsin 4.5FL 1.38 fl oz (B)………..	81.3 b-e	33.3 a	4.5 d-g	99.0 a	51.6 a	40.0 a
Inoculated Not-treated Check………	79.6 cde	33.1 a	8.6 ab	100.0 a	47.9 a	48.0 a
Not-inoculated Not-treated Check…	80.0 cde	28.7 a	5.6 a-g	91.0 a	40.1 a	55.0 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.
[b] DAP = days after planting on 4 May.
[c] Relative area under the emergence progress curve from planting to 26 days after planting.
[d] Severity of crown and root rot was measured as an index calculated as described in the text.
[e] Application dates; A= 4 May; B= 30 May; C= 4 Jun.
[f] Means followed by same letter are not significantly different at p = 0.05 (Fishers LSD).

Evaluate Application Timings for Control of Cercospora Leaf Spot in Sugarbeets

Using Tolerant and Susceptible Varieties

Elkton, Sandusky and Ruth, MI - 2013

Summary

Cercospora application timing trials were conducted at 4 locations in 2013 (Elkton, Breckenridge, Sandusky and Ruth). The application dates were based on BEETcast DSVs and on fungicide label recommendations. At each site we evaluated a tolerant variety (SX-1291RR) and a susceptible variety (C-RR074NT). With the loss of strobilurin fungicides and the continued popularity of nematode tolerant varieties that are susceptible to leafspot we tightened up the application timings in these trials. The Cercospora disease level in 2013 was lower than normal due to the late planting and a dry summer. The trial at Breckenridge did not work out because too many plots were damaged by early season flooding. **Elkton Location:** Cercospora has been a significant problem in this area for several years. Elkton is in a Red Zone and has a high risk of Cercospora. All of the treatments, whether based on DSVs or label days, provided good leafspot control. We tested some treatments with a high number of spray dates to make sure we did not stretch the spray intervals past what the fungicide labels call for. Those treatments (6 to 8 applications) did not provide better leafspot control than treatments with 4 to 6 applications. Most of the treatments consisted of a triazole (tank mixed) followed by a protectant (Super Tin or an EBDC) followed by another triazole treatment Several treatments with only EBDCs were somewhat less effective but did provide effective control. SX-1291RR tolerated Cercospora better than C-RR074NT. Yields at the Elkton site were not obtained due to an uneven stand. The Cercospora level in this trial was moderate to high. **Sandusky Location:** This trial was located in a lower Cercospora risk zone (Green) but still had a significant leafspot level. We evaluated similar triazole based rotation treatments, straight EBDC treatments and a strobilurin based rotation treatment. All of the treatments except for the strobilurin based treatment gave good Cercospora leafspot control. SX-1291RR had lower disease levels compared to C-RR074NT, however, the C-RR074NT treatments had higher yields and sugar levels. The strobi treatment had about 10% leaf damage and the untreated check had 47% leaf damage, compared to less than 1% damage for the triazole and EBDC treatments. The strobi treatment lost about 1 ton/A and about 1/4 point of sugar while the untreated plots lost about 4 tons and about 1/4 points of sugar. **Ruth Location:** This trial was located in a Yellow zone (moderate Cercospora risk). The trends were similar at this location. The strobi based treatment was less effective than the triazole based treatment or the EBDC based treatments. The Cercospora level was moderate and the untreated check had about 13% leaf damage and lost about 3 tons/A. It should be noted that the strobi based treatments included Super Tin and EBDCs which may have helped with overall disease control.

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using Tolerant and Susceptible Varieties

Wadsworth, Sandusky, MI - 2013

Trial Quality: Good
Variety: SX-1291 & C-074NT
Planted: May 13
Harvested: Oct 11
Plot Size: 6 rows X 38 ft
4 reps
Row Spacing: 22 inches

Soil Info: Loam
5.5% OM: 7.3 pH
Above Opt. Levels: P, K
High: Mn, High: B
Added N: 138 lbs
Prev. Crop: White Kindey Beans

Rhizoc Control: Good
Cerc Risk Zone: Green
Seed Spacing: 4.1 inches
Other Problems: Low Level Cyst Nem
Rainfall: 17.3 inches

No	Treatment	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Triazole/EBDC/ST Rotation Timings based on DSV's	**0.5**	**$1,286**	**7362**	227	**32.3**	15.9	93.7
2	Triazole/EBDC/ST Rotation Timings based on DSV's	**0.6**	**$1,277**	7249	230	31.5	15.9	**94.3**
3	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.6**	**$1,285**	**7406**	**232**	**31.7**	**16.1**	**94.2**
8	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.6**	**$1,328**	**7616**	227	**33.4**	15.9	**93.9**
10	All Manzate Treatments Timings based on Label Days	**0.7**	**$1,288**	**7347**	229	**32.0**	16.1	93.6
4	Triazole/EBDC/ST Rotation Timings based on DSV's	**0.7**	**$1,356**	**7769**	**237**	**32.7**	**16.5**	**94.0**
7	Triazole/EBDC/ST Rotation Timings based on DSV's	**0.7**	$1,250	7147	227	31.4	15.9	93.6
6	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.7**	$1,243	7108	226	31.4	15.8	93.7
9	All Manzate Treatments Timings based on DSV's	**0.8**	**$1,304**	**7433**	226	**32.7**	15.8	93.8
5	Triazole/EBDC/ST Rotation Timings based on DSV's	**1.0**	**$1,345**	**7653**	**232**	**32.8**	**16.3**	93.6
11	Strobi/EBDC/ST Rotation Timings based on Label Days	10.5	$1,204	6956	223	31.1	15.8	93.5
12	Untreated Check	47.1	$1,153	6343	225	28.0	15.9	93.5
	Average	5.4	$1,277	7272	228	31.8	16.0	93.8
	LSD 5%	2.8	81.4	447.7	6.7	1.9	0.4	0.5
	CV %	52.4	6.9	6.7	4.2	5.5	3.3	0.6

Cerc- a lower number is better.
$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Tolerant Variety

Wadsworth, Sandusky, MI - 2013

(First page of this trial)

Trial Quality: Good
Variety: SX-1291RR
Planted: May 13
Harvested: Oct 11
Plot Size: 6 rows X 38 ft
4 reps
Row Spacing: 22 inches

Soil Info: Loam
5.5% OM: 7.3 pH
Above Opt. Levels: P, K
High: Mn, High: B
Added N: 138 lbs
Prev. Crop: White Kidney Beans

Rhizoc Control: Good
Cerc Risk Zone: Green
Seed Spacing: 4.1 inches
Other Problems: Low Level
Cyst Nematodes
Rainfall: 17.3 inches

No	Treatment	Rate/A	Applied		% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSV	Day							
2	Inspire	7 fl oz	55		**0.2**	**$1,159**	**6559**	**224**	**29.3**	**15.5**	**94.3**
	Manzate	1.6 qt	95								
	Super Tin	8 fl oz	115								
	Topguard	14 fl oz	150								
	Manzate	1.6 qt	190								
	Manzate	1.6 qt	210								
7	Manzate	1.6 qt	50		**0.2**	**$1,096**	6253	**219**	28.5	**15.5**	93.6
	Inspire	7 fl oz	65								
	Super Tin	8 fl oz	95								
	Manzate	1.6 qt	120								
	Manzate	1.6 qt	135								
	Manzate	1.6 qt	150								
3	Inspire	7 fl oz	50		**0.4**	**$1,136**	**6560**	**224**	**29.3**	**15.7**	**93.8**
	Manzate	1.6 qt		17							
	Super Tin	8 fl oz		7							
	Topguard	14 fl oz		10							
	Manzate	1.6 qt		17							
	Manzate	1.6 qt		7							
1	Inspire	7 fl oz	50		**0.4**	**$1,117**	**6410**	**220**	**29.2**	**15.4**	**93.8**
	Manzate	1.6 qt	80								
	Super Tin	8 fl oz	95								
	Topguard	14 fl oz	120								
	Manzate	1.6 qt	150								
	Manzate	1.6 qt	165								
8	Manzate	1.6 qt	50		**0.4**	**$1,194**	**6880**	**220**	**31.2**	15.3	**94.2**
	Inspire	7 fl oz		7							
	Super Tin	8 fl oz		17							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Tolerant Variety

Wadsworth, Sandusky, MI - 2013

(Second page of this trial)

No	Treatment	Rate/A	Applied DSV	Applied Day	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Super Tin	8 fl oz	50		**0.4**	**$1,095**	6292	**220**	28.6	**15.5**	93.6
	Manzate	1.6 qt		10							
	Inspire	7 fl oz		7							
	Super Tin	8 fl oz		14							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		7							
4	Inspire	7 fl oz	55		**0.6**	**$1,167**	**6732**	**227**	**29.6**	**15.9**	**93.8**
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Topguard	14 fl oz		14							
	Manzate	1.6 qt		21							
	Manzate	1.6 qt		10							
5	Super Tin	8 fl oz	50		**0.7**	**$1,189**	**6815**	**223**	**30.7**	**15.7**	93.6
	Manzate	1.6 qt	75								
	Inspire	7 fl oz	90								
	Super Tin	8 fl oz	120								
	Manzate	1.6 qt	145								
	Manzate	1.6 qt	160								
10	Manzate	1.6 qt	50		**0.7**	**$1,115**	**6396**	218	**29.4**	**15.5**	93.3
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
9	Manzate	1.6 qt	50		**0.7**	**$1,112**	**6382**	**219**	**29.1**	15.4	**93.8**
	Manzate	1.6 qt	65								
	Manzate	1.6 qt	80								
	Manzate	1.6 qt	95								
	Manzate	1.6 qt	110								
	Manzate	1.6 qt	125								
11	Headline	9.2 fl oz	50		8.8	$1,062	6155	218	28.2	**15.5**	93.4
	Manzate	1.6 qt		17							
	Super Tin	8 fl oz		7							
	Headline	9.2 fl oz		10							
	Manzate	1.6 qt		17							
	Manzate	1.6 qt		7							
12	Untreated Check				37.8	$996	5480	218	25.1	15.4	93.6

	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	4.3	$1,120	6410	221	29.0	15.5	93.7
LSD 5%	4.3	105.8	582.1	8.6	2.4	0.5	0.6
CV %	69.9	6.6	6.3	2.7	5.8	2.3	0.4

Cerc- a lower number is better.

$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Susceptible Variety

Wadsworth, Sandusky, MI - 2013

(First page of this trial)

Trial Quality: Good
Variety: C-RR074NT
Planted: May 13
Harvested: Oct 11
Plot Size: 6 rows X 38 ft
4 reps
Row Spacing: 22 inches

Soil Info: Loam
5.5% OM: 7.3 pH
Above Opt. Levels: P, K
High: Mn, High: B
Added N: 138 lbs
Prev. Crop: White Kidney Beans

Rhizoc Control: Good
Cerc Risk Zone: Green
Seed Spacing: 4.1 inches
Other Problems: Low level
Cyst Nematodes
Rainfall: 17.3 inches

No	Treatment	Rate/A	Applied		% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSV	Day							
1	Inspire	7 fl oz	50		**0.6**	**$1,455**	**8314**	**235**	**35.4**	**16.5**	93.7
	Manzate	1.6 qt	30								
	Super Tin	8 fl oz	15								
	Topguard	14 fl oz	25								
	Manzate	1.6 qt	30								
	Manzate	1.6 qt	15								
10	Manzate	1.6 qt	50		**0.6**	**$1,461**	**8297**	**239**	**34.6**	**16.7**	**93.8**
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
4	Inspire	7 fl oz	55		**0.8**	**$1,544**	**8807**	**246**	**35.8**	**17.0**	**94.1**
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Topguard	14 fl oz		14							
	Manzate	1.6 qt		21							
	Manzate	1.6 qt		10							
9	Manzate	1.6 qt	50		**0.8**	**$1,495**	**8484**	**233**	**36.3**	**16.3**	93.7
	Manzate	1.6 qt	15								
	Manzate	1.6 qt	15								
	Manzate	1.6 qt	15								
	Manzate	1.6 qt	15								
	Manzate	1.6 qt	15								
8	Manzate	1.6 qt	50		**0.8**	**$1,462**	**8352**	**235**	**35.5**	**16.5**	93.7
	Inspire	7 fl oz		7							
	Super Tin	8 fl oz		17							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		7							
	Manzate	1.6 qt		7							
3	Inspire	7 fl oz	50		**0.8**	**$1,435**	**8251**	**241**	**34.2**	**16.5**	**94.7**
	Manzate	1.6 qt		17							
	Super Tin	8 fl oz		7							
	Topguard	14 fl oz		10							
	Manzate	1.6 qt		17							
	Manzate	1.6 qt		7							

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Susceptible Variety

Wadsworth, Sandusky, MI - 2013

(Second page of this trial)

No.	Treatment	Rate/A	Applied		% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSV	Day							
2	Inspire	7 fl oz	55		**1.0**	$1,395	7939	**236**	33.7	16.3	**94.4**
	Manzate	1.6 qt	40								
	Super Tin	8 fl oz	20								
	Topguard	14 fl oz	35								
	Manzate	1.6 qt	40								
	Manzate	1.6 qt	20								
6	Super Tin	8 fl oz	50		**1.0**	$1,392	7925	**231**	**34.3**	16.2	**93.8**
	Manzate	1.6 qt		10							
	Inspire	7 fl oz		7							
	Super Tin	8 fl oz		14							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		7							
7	Manzate	1.6 qt	50		**1.2**	$1,405	8040	**234**	**34.3**	**16.4**	93.7
	Inspire	7 fl oz	15								
	Super Tin	8 fl oz	30								
	Manzate	1.6 qt	25								
	Manzate	1.6 qt	15								
	Manzate	1.6 qt	15								
5	Super Tin	8 fl oz	50		**1.4**	**$1,502**	**8491**	**241**	**35.0**	**16.9**	93.6
	Manzate	1.6 qt	25								
	Inspire	7 fl oz	15								
	Super Tin	8 fl oz	30								
	Manzate	1.6 qt	25								
	Manzate	1.6 qt	15								
11	Headline	9.2 fl oz	50		12.2	$1,345	7758	228	**34.0**	16.1	93.5
	Manzate	1.6 qt		17							
	Super Tin	8 fl oz		7							
	Headline	9.2 fl oz		10							
	Manzate	1.6 qt		17							
	Manzate	1.6 qt		7							
12	Untreated Check				56.5	$1,310	7206	**233**	31.0	**16.4**	93.5

	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	6.5	$1,433	8155.4	236.0	34.5	16.5	93.8
LSD 5%	3.8	113.1	622.2	14.4	2.5	0.7	0.9
CV %	40.3	5.5	5.3	4.2	5	3.1	0.7

Cerc- a lower number is better.

$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using Tolerant and Susceptible Varieties

Roggenbuck, Ruth, MI - 2013

Trial Quality: Good
Variety: SX-1291RR & C-RR074NT
Planted: May 6
Harvested: Oct 16
Plot Size: 6 rows X 38 ft
4 reps
Row spacing: 22 inches

Soil Info: Loam
3.1% OM: 7.6 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: Manure & 62.5 lbs
Prev. Crop: Dry Beans

Rhizoc Control: Good
Cerc Risk Zone: Yellow
Seed Spacing: 4.1 inches
Other Problems: Some gaps, low level of Aph
Rainfall: 15.4 inches

No	Treatment	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
8	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.2**	**$1,539**	**8781**	**268**	**32.7**	**17.5**	**96.9**
4	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.2**	**$1,516**	**8654**	**262**	**33.0**	**17.1**	**97.0**
6	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.2**	**$1,548**	**8810**	**259**	**33.9**	**17.1**	96.5
9	All Manzate Applications Timings based on DSVs	**0.2**	**$1,517**	**8607**	**262**	**32.8**	**17.2**	**96.8**
5	Triazole/EBDC/ST Rotation Timings based on DSVs	**0.2**	**$1,498**	**8537**	**262**	**32.5**	**17.2**	**96.8**
2	Triazole/EBDC/ST Rotation Timings based on DSVs	**0.3**	**$1,493**	**8422**	**259**	**32.4**	16.9	**96.9**
3	Triazole/EBDC/ST Rotation Timings based on Label Days	**0.3**	**$1,469**	**8391**	255	**32.8**	16.7	**96.9**
1	Triazole/EBDC/ST Rotation Timings based on DSVs	**0.3**	**$1,475**	**8407**	257	**32.6**	16.9	**96.9**
7	Triazole/EBDC/ST Rotation Timings based on DSVs	**0.3**	**$1,479**	**8423**	**263**	**32.0**	**17.2**	**96.8**
10	All Manzate Applications Timings based on Label Days	**0.5**	**$1,454**	**8262**	256	**32.2**	16.8	**96.8**
11	Strobilurin/EBDC/ST Rotation Timings based on Label Days	4.3	**$1,478**	**8463**	258	**32.7**	16.9	**96.8**
12	Untreated Check	12.8	$1,373	7550	257	29.4	17.0	96.2
Average		1.6	$1,487	8442	260	32.4	17.0	96.8
LSD 5%		1.6	122.8	675.3	8.8	2.1	0.5	0.4
CV %		108.2	7.6	7.7	3.5	6.8	3.2	0.5

Cerc- a lower number is better.

$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Susceptible Variety

Roggenbuck, Ruth, MI - 2013

(First page of this trial)

Trial Quality: Good
Variety: C-RR074NT
Planted: May 6
Harvested: Oct 16
Plot Size: 6 rows X 38 ft
4 reps
Row Spacing: 22 inches

Soil Info: Loam
3.1% OM: 7.6 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: Manure & 62.5 lbs
Prev Crop: Dry Beans

Rhizoc Control: Good
Cerc Risk Zone: Yellow
Seed Spacing: 4.1 inches
Other Problems: Some gaps, low level of Aph
Rainfall: 15.4 inches

No.	Treatment	Rate/A	Applied		% Leaf Damage	$/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSVs	Days							
8	Manzate	1.6 qt	50		**0.2**	**$1,675**	**9526**	**279**	34.1	**18.2**	**97.0**
	Inspire	7 fl oz		10							
	Super Tin	8 fl oz		21							
	Manzate	1.6 qt		14							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
6	Super Tin	8 fl oz	50		**0.2**	**$1,671**	**9509**	269	**35.4**	17.6	96.6
	Manzate	1.6 qt		12							
	Inspire XT	7 fl oz		8							
	Super Tin	8 fl oz		19							
	Manzate	1.6 qt		12							
	Manzate	1.6 qt		8							
4	Inspire XT	7 fl oz	60		**0.3**	**$1,652**	**9400**	267	**35.3**	17.4	**97.0**
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Topguard	14 fl oz		14							
	Manzate	1.6 qt		21							
5	Super Tin	8 fl oz	50		**0.3**	**$1,638**	**9326**	272	34.3	17.9	96.6
	Manzate	1.6 qt	80								
	Inspire XT	7 fl oz	95								
	Super Tin	8 fl oz	135								
	Manzate	1.6 qt	165								
	Manzate	1.6 qt	180								
9	Manzate	1.6 qt	50		**0.3**	**$1,643**	**9303**	270	34.5	17.7	96.6
	Manzate	1.6 qt	70								
	Manzate	1.6 qt	90								
	Manzate	1.6 qt	110								
	Manzate	1.6 qt	130								
	Manzate	1.6 qt	150								
3	Inspire XT	7 fl oz	50		**0.3**	$1,626	**9281**	269	**34.6**	17.6	96.7
	Manzate	1.6 qt		19							
	Super Tin	8 fl oz		8							
	Topguard	14 fl oz		12							
	Manzate	1.6 qt		19							
	Manzate	1.6 qt		8							

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Susceptible Variety

Roggenbuck, Ruth, MI - 2013

(Second page of this trial)

No.	Treatment	Rate/A	Applied		% Leaf	Net	RWSA	RWST	T/A	%	%
			DSVs	Days	Damage	$/A				Sugar	CJP
1	Inspire XT	7 fl oz	50		**0.3**	$1,556	8892	267	33.2	17.5	**96.8**
	Manzate	1.6 qt	90								
	Super Tin	8 fl oz	105								
	Topguard	14 fl oz	135								
	Manzate	1.6 qt	175								
	Manzate	1.6 qt	190								
2	Inspire XT	7 fl oz	60		**0.3**	**$1,650**	**9324**	270	**34.5**	17.7	96.6
	Manzate	1.6 qt	110								
	Super Tin	8 fl oz	130								
	Topguard	14 fl oz	175								
7	Manzate	1.6 qt	50		**0.4**	$1,580	9006	268	33.6	17.6	96.6
	Inspire XT	7 fl oz	65								
	Super Tin	8 fl oz	105								
	Manzate	1.6 qt	135								
	Manzate	1.6 qt	160								
	Manzate	1.6 qt	185								
10	Manzate	1.6 qt	50		**0.4**	$1,574	8923	265	33.7	17.3	**96.8**
	Manzate	1.6 qt		8							
	Manzate	1.6 qt		8							
	Manzate	1.6 qt		8							
	Manzate	1.6 qt		8							
	Manzate	1.6 qt		8							
11	Headline	9.2 fl oz	50		5.3	$1,573	9010	271	33.2	17.7	96.7
	Manzate	1.6 qt		19							
	Super Tin	8 fl oz		8							
	Headline	9.2 fl oz		12							
	Manzate	1.6 qt		19							
	Manzate	1.6 qt		8							
12	Untreated Check				16.3	$1,394	7668	256	29.9	17.2	95.6
Average					2.0	$1,603	9097	269	33.8	17.6	96.7
LSD 5%					0.7	47.3	260.0	3.7	0.9	0.2	0.2
CV %					108.2	7.7	7.5	3.4	6.6	3.2	0.5

Cerc- a lower number is better.

$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Tolerant Variety

Roggenbuck, Ruth, MI - 2013

(First page of this trial)

Trial Quality: Good
Variety: SX-1291RR
Planted: May 6
Harvested: Oct 16
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inches

Soil Info: Loam, 3.1% OM: 7.6 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: Manure & 62.5 lbs
Prev Crop: Dry Beans

Rhizoc Control: Good
Cerc Risk Zone: Yellow
Seed Spacing: 4.1 inches
Other Problems: Some gaps, low level of Aph
Rainfall: 15.4 inches

No.	Treatment	Rate/A	Applied		% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSVs	Days							
4	Inspire XT	7 fl oz	70		**0.2**	**$1,381**	**7908**	**258**	30.6	**16.8**	97.0
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Topguard	14 fl oz		14							
	Manzate	1.6 qt		21							
8	Manzate	1.6 qt	60		**0.2**	**$1,404**	**8036**	**257**	31.3	**16.8**	96.9
	Inspire	7 fl oz		10							
	Super Tin	8 fl oz		21							
	Manzate	1.6 qt		14							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
7	Manzate	1.6 qt	60		**0.2**	$1,377	7839	**257**	30.4	**16.8**	96.9
	Inspire XT	7 fl oz	85								
	Super Tin	8 fl oz	135								
	Manzate	1.6 qt	180								
2	Inspire XT	7 fl oz	70		**0.2**	$1,336	7520	248	30.3	16.2	**97.2**
	Manzate	14 fl oz	125								
	Super Tin	8 fl oz	150								
9	Manzate	1.6 qt	60		**0.2**	**$1,390**	**7911**	**254**	31.2	16.6	96.9
	Manzate	1.6 qt	85								
	Manzate	1.6 qt	110								
	Manzate	1.6 qt	135								
	Manzate	1.6 qt	160								
	Manzate	1.6 qt	185								
5	Super Tin	8 fl oz	60		**0.2**	$1,359	7748	252	30.7	16.5	97.0
	Manzate	1.6 qt	105								
	Inspire XT	7 fl oz	130								
	Super Tin	8 fl oz	180								
3	Inspire XT	7 fl oz	60		**0.2**	$1,311	7502	242	31.0	15.8	**97.1**
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Topguard	14 fl oz		14							
	Manzate	1.6 qt		21							

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Tolerant Variety

Roggenbuck, Ruth, MI - 2013

(Second page of this trial)

No.	Treatment	Rate/A	Applied DSVs	Applied Days	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Inspire XT	7 fl oz	60		**0.2**	**$1,395**	**7921**	247	**32.0**	16.2	96.9
	Manzate	1.6 qt	110								
	Super Tin	8 fl oz	135								
	Topguard	14 fl oz	180								
6	Super Tin	8 fl oz	60		**0.2**	**$1,425**	**8110**	250	**32.4**	16.5	96.4
	Manzate	1.6 qt		14							
	Inspire XT	7 fl oz		10							
	Super Tin	8 fl oz		21							
	Manzate	1.6 qt		14							
	Manzate	1.6 qt		10							
10	Manzate	1.6 qt	60		**0.6**	$1,334	7600	247	30.7	16.3	96.8
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
11	Headline	9.2 fl oz	60		3.3	**$1,382**	**7916**	245	**32.2**	**16.1**	96.9
	Manzate	1.6 qt		21							
	Super Tin	8 fl oz		10							
	Headline	9.2 fl oz		14							
	Manzate	1.6 qt		21							
12	Untreated Check				9.4	$1,351	7433	**257**	28.9	**16.9**	96.9
Average					1.3	$1,371	7787	251	31.0	16.5	96.9
LSD 5%					0.7	47.3	258.5	3.7	0.9	0.2	0.2
CV %					108.2	7.7	7.5	3.4	6.6	3.2	0.5

Cerc- a lower number is better.

$/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 Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using Tolerant and Susceptible Varieties

Hunger Relief, Elkton, MI - 2013

Trial Quality:	Good For Rating	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	SX-1291RR & C-RR074NT		2.2% OM, 7.5 pH	**Cerc Risk Zone:**	Red
Planted:	May 2		Above Opt. Levels: P, K	**Other Problems:**	Too many gaps for yield
Harvested:	Not harvested for data		High: Mn, Low: B		
Plot Size:	6 rows X 40 ft	**Added N:**	100 lbs	**Seed Spacing:**	4.1 inches
	6 reps	**Prev. Crop:**	Soybeans	**Rainfall:**	16.2 inches
Row Spacing:	22 inches				

No.	Treatment	DSVs or Days	Application Timing	# Appl.	% Leaf Damage Sept 25
1	Triazole Rotation	DSV	43, 68, 86, 94, 121, 148, 159	7	**0.2**
14	Triazole Rotation	DSV	37, 53, 86, 120, 130, 164	6	**0.2**
13	Triazole Rotation	DSV	37, 53, 75, 94, 109, 124, 152	7	**0.2**
2	Triazole Rotation	DSV	43, 72, 109, 121, 154	5	**0.2**
9	Triazole Rotation	DSV	66, 85, 108, 120, 155	5	**0.2**
12	Triazole Rotation	DSV/Days	66 / 23, 12, 10, 14	5	**0.3**
11	Triazole Rotation	DSV/Days	66 / 14, 10, 9, 12, 10, 7	7	**0.3**
16	Triazole Rotation	DSV/Days	37 / 15, 21, 10, 14	5	**0.3**
3	Triazole Rotation	DSV/Days	43 / 13, 10, 8, 13, 10, 7, 7	8	**0.4**
10	Triazole Rotation	DSV	66, 96, 124, 148	4	**0.4**
4	Triazole Rotation	DSV/Days	43 / 20, 14, 10, 24	5	**0.5**
7	Triazole Rotation	DSV/Days	53 / 13, 11, 6, 14, 7, 7	7	**0.7**
8	Triazole Rotation	DSV/Days	53 / 20, 14, 10, 21	5	**0.7**
15	Triazole Rotation	DSV/Days	37 / 9, 13, 11, 6, 13, 10, 7	8	**0.8**
5	Triazole Rotation	DSV	53, 75, 94, 109, 130, 157	6	**1.0**
6	Triazole Rotation	DSV	53, 86, 120, 132, 164	5	**1.3**
18	All Manzate	DSV	53, 75, 94, 114, 130, 154	6	**1.6**
17	All Manzate	DSV	53, 75, 94, 114, 124, 148, 154	7	**1.8**
20	All Manzate	DSV/Days	53 / 7, 7, 7, 7, 7, 7, 7	8	**2.0**
19	All Manzate	DSV	53 / 77, 95, 124, 154	5	2.4
21	All Manzate	DSV/Days	53 / 9, 11, 10, 10, 11, 10	7	2.5
22	Untreated Check				40.7

Average	2.7
LSD 5%	2.2
CV %	71.6

Cerc- a lower number is better.

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

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Tolerant Variety

Hunger Relief, Elkton, MI - 2013

Trial Quality: Good For Rating
Variety: SX-1291RR
Planted: May 2
Harvested: Not harvested for data
Plot Size: 6 rows X 40 ft
6 reps
Row Spacing: 22 inches

Soil Info: Sandy Clay Loam
2.2% OM, 7.5 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: Good
Cerc Risk Zone: Red
Other Problems: Too many gaps for yield
Seed Spacing: 4.1 inches
Rainfall: 16.2 inches

No.	Treatment	DSV or Days	Application Timing	# Appl.	% Leaf Damage Sept 25
2	Triazole Rotation	DSV	43, 72, 109, 121, 154	5	**0.1**
11	Triazole Rotation	DSV/Days	66 / 14, 10, 9, 12, 10, 7	7	**0.2**
1	Triazole Rotation	DSV	43, 68, 86, 94, 121, 148, 159	7	**0.2**
14	Triazole Rotation	DSV	37, 53, 86, 120, 130, 164	6	**0.2**
13	Triazole Rotation	DSV	37, 53, 75, 94, 109, 124, 152	7	**0.2**
9	Triazole Rotation	DSV	66, 85, 108, 120, 155	5	**0.2**
12	Triazole Rotation	DSV/Days	66 / 23, 12, 10, 14	5	**0.2**
10	Triazole Rotation	DSV	66, 96, 124, 148	4	**0.2**
4	Triazole Rotation	DSV/Days	43 / 20, 14, 10, 24	5	**0.2**
3	Triazole Rotation	DSV/Days	43 / 13, 10, 8, 13, 10, 7, 7	8	**0.3**
7	Triazole Rotation	DSV/Days	53 / 13, 11, 6, 14, 7, 7	7	**0.4**
8	Triazole Rotation	DSV/Days	53 / 20, 14, 10, 21	5	**0.4**
15	Triazole Rotation	DSV/Days	37 / 9, 13, 11, 6, 13, 10, 7	8	**0.4**
16	Triazole Rotation	DSV/Days	37 / 15, 21, 10, 14	5	**0.4**
5	Triazole Rotation	DSV	53, 75, 94, 109, 130, 157	6	**0.8**
6	Triazole Rotation	DSV	53, 86, 120, 132, 164	5	**0.9**
18	All Manzate	DSV	53, 75, 94, 114, 130, 154	6	**1.2**
17	All Manzate	DSV	53, 75, 94, 114, 124, 148, 154	7	**1.3**
20	All Manzate	DSV/Days	53 / 7, 7, 7, 7, 7, 7, 7	8	**1.7**
19	All Manzate	DSV	53 / 77, 95, 124, 154	5	**1.8**
21	All Manzate	DSV/Days	53 / 9, 11, 10, 10, 11, 10	7	**2.1**
22	Untreated Check				33.3

Average	2.1
LSD 5%	2.2
CV %	71.6

Cerc- a lower number is better.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Application Timings for Control of Cercospora Leafspot in Sugarbeets

Using a Susceptible Variety

Hunger Relief, Elkton, MI - 2013

Trial Quality: Good For Rating
Variety: C-RR074NT
Planted: May 2
Harvested: Not harvested for data
Plot Size: 6 rows X 40 ft
6 reps
Row Spacing: 22 inches

Soil Info: Sandy Clay Loam
2.2% OM, 7.5 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev. Crop: Soybeans

Rhizoc Control: Good
Cerc Risk Zone: Red
Other Problems: Too many gaps for yield
Seed Spacing: 4.1 inches
Rainfall: 16.2 inches

No.	Treatment	DSVs or Days	Application Timing	# Appl.	% Leaf Damage Sept 25
1	Triazole Rotation	DSV	43, 68, 86, 94, 121, 148, 159	7	**0.2**
14	Triazole Rotation	DSV	37, 53, 86, 120, 130, 164	6	**0.2**
13	Triazole Rotation	DSV	37, 53, 75, 94, 109, 124, 152	7	**0.2**
9	Triazole Rotation	DSV	66, 85, 108, 120, 155	5	**0.2**
16	Triazole Rotation	DSV/Days	37 / 15, 21, 10, 14	5	**0.3**
12	Triazole Rotation	DSV/Days	66 / 23, 12, 10, 14	5	**0.3**
2	Triazole Rotation	DSV	43, 72, 109, 121, 154	5	**0.3**
11	Triazole Rotation	DSV/Days	66 / 14, 10, 9, 12, 10, 7	7	**0.4**
3	Triazole Rotation	DSV/Days	43 / 13, 10, 8, 13, 10, 7, 7	8	**0.5**
10	Triazole Rotation	DSV	66, 96, 124, 148	4	**0.7**
4	Triazole Rotation	DSV/Days	43 / 20, 14, 10, 24	5	**0.8**
7	Triazole Rotation	DSV/Days	53 / 13, 11, 6, 14, 7, 7	7	**1.0**
8	Triazole Rotation	DSV/Days	53 / 20, 14, 10, 21	5	**1.0**
15	Triazole Rotation	DSV/Days	37 / 9, 13, 11, 6, 13, 10, 7	8	**1.2**
5	Triazole Rotation	DSV	53, 75, 94, 109, 130, 157	6	**1.3**
6	Triazole Rotation	DSV	53, 86, 120, 132, 164	5	**1.8**
18	All Manzate	DSV	53, 75, 94, 114, 130, 154	6	**2.1**
20	All Manzate	DSV/Days	53 / 7, 7, 7, 7, 7, 7, 7	8	**2.3**
17	All Manzate	DSV	53, 75, 94, 114, 124, 148, 154	7	**2.4**
21	All Manzate	DSV/Days	53 / 9, 11, 10, 10, 11, 10	7	2.8
19	All Manzate	DSV	53, 77, 95, 124, 154	5	3.0
22	Untreated Check				48.0

Average	3.2
LSD 5%	2.2
CV %	71.6

Cerc- a lower number is better.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Fungicides and Application Timings for Cercospora Control

Blumfield, MI - 2013 (This trial Page 1 of 3)

Trial Quality:	Fair	**Soil Info:**	Sandy Clay Loam	**Rhizoc. Control:**	Good
Variety:	C-RR074NT		2.7% OM, 7.7 pH	**Cerc. Control:**	by Trt
Plant:	May 6		Above Opt Levels: P, K	**Other Problems:**	Low Cerc level
Harvest:	Sept 26		High: Mn, Low: B		
Plot Size:	6 rows X 38 ft, 4 reps	**Added N:**	100 lbs	**Seed Spacing:**	4.1 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans	**Rainfall:**	15.2 inches

No	Treatment	Rate/A	Applied		% Leaf Damage Sept 18	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSVs	Days							
12	Manzate	1.6 qt	35		**0.2**	**$1,013**	6020	286	21.1	19.7	**93.9**
	Inspire + Manzate	7 fl oz, 1.6 qt	50								
	Manzate	1.6 qt	15								
	Super Tin	8 fl oz	15								
	Topguard + Manzate	14 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	40								
16	Manzate	1.6 qt	35		**0.2**	**$1,130**	**6669**	**302**	**22.1**	**20.5**	**94.3**
	Manzate	1.6 qt	50								
	Inspire + Manzate	7 fl oz, 1.6 qt	18								
	Super Tin	8 fl oz	30								
	Topguard + Manzate	14 fl oz, 1.6 qt	15								
	Super Tin	8 fl oz	30								
2	Inspire + Manzate	7 fl oz,1.6 qt	50		**0.2**	**$1,057**	**6222**	**295**	21.1	**20.1**	**94.2**
	Manzate	1.6 qt	40								
	Super Tin	8 fl oz	18								
	Topguard + Manzate	14 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	40								
4	Inspire + Manzate	7 fl oz, 1.6 qt	50		**0.2**	$1,041	**6130**	**302**	20.3	**20.6**	**94.2**
	Manzate	1.6 qt		18							
	Super Tin	8 fl oz		10							
	Topguard + Manzate	14 fl oz, 1.6 qt		14							
	Super Tin	8 fl oz		18							
11	Manzate	1.6 qt	35		**0.3**	**$1,123**	**6629**	**294**	**22.6**	**20.2**	**94.0**
	Inspire + Manzate	7 fl oz, 1.6 qt	50								
	Manzate	1.6 qt	30								
	Super Tin	8 fl oz	15								
	Topguard + Manzate	14 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	30								
14	Manzate	1.6 qt	35		**0.3**	**$1,143**	**6735**	279	**24.1**	19.0	**94.5**
	Super Tin	8 fl oz	50								
	Inspire + Manzate	7 fl oz, 1.6 qt	22								
	Manzate	1.6 qt	30								
	Topguard + Manzate	14 fl oz,1.6 qt	22								
	Super Tin	8 fl oz	30								
9	Manzate	1.6 qt	50		**0.3**	$1,013	**6485**	**297**	**21.9**	**20.2**	**94.3**
	Inspire + Manzate	7 fl oz, 1.6 qt	15								
	Super Tin	8 fl oz	30								
	Topguard + Manzate	14 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	30								

Evaluate Fungicides and Application Timings for Cercospora Control

Blumfield, MI - 2013

No	Treatment	Rate/A	Applied		% Leaf Damage Sept 18	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSVs	Days							
1	Inspire + Manzate	7 fl oz, 1.6 qt	50		0.3	$983	5815	297	19.6	20.2	94.5
	Manzate	1.6 qt	30								
	Super Tin	8 fl oz	18								
	Topguard + Manzate	14 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	30								
10	Manzate	1.6 qt	50		0.3	$1,127	6608	300	22.0	20.4	94.4
	Inspire + Manzate	7 fl oz, 1.6 qt		10							
	Super Tin	8 fl oz		18							
	Topguard + Manzate	14 fl oz, 1.6 qt		14							
	Super Tin	8 fl oz		18							
13	Manzate	1.6 qt	35		0.4	$1,146	6756	292	23.1	20.0	94.1
	Inspire + Manzate	7 fl oz, 1.6 qt	50								
	Manzate	1.6 qt		18							
	Super Tin	8 fl oz		10							
	Topguard + Manzate	14 fl oz, 1.6 qt		14							
	Super Tin	8 fl oz		18							
15	Manzate	1.6 qt	35		0.6	$1,118	6597	300	22.0	20.4	94.3
	Super Tin	8 fl oz	50								
	Inspire + Manzate	7 fl oz, 1.6 qt		14							
	Manzate	1.6 qt		18							
	Topguard + Manzate	14 fl oz, 1.6 qt		12							
	Super Tin	8 fl oz		12							
8	Super Tin	8 fl oz	50		0.6	$1,037	6110	300	20.4	20.5	94.1
	Inspire + Manzate	7 fl oz, 1.6 qt		14							
	Manzate	1.6 qt		18							
	Topguard + Manzate	14 fl oz, 1.6 qt		10							
	Super Tin	8 fl oz		18							
6	Super Tin	8 fl oz	50		0.6	$1,017	5998	300	20.1	20.6	93.9
	Inspire + Manzate	7 fl oz, 1.6 qt	22								
	Manzate	1.6 qt	30								
	Topguard + Manzate	14 fl oz, 1.6 qt	18								
	Super Tin	8 fl oz	30								
7	Super Tin	8 fl oz	50		0.8	$1,050	6180	299	20.8	20.5	93.9
	Inspire + Manzate	7 fl oz, 1.6 qt	27								
	Manzate	1.6 qt	30								
	Topguard + Manzate	14 fl oz, 1.6 qt	18								
	Super Tin	8 fl oz	30								
17	Manzate	1.6 qt	35		0.9	$1,058	6268	293	21.4	20.2	93.8
	Manzate	1.6 qt	50								
	Inspire + Manzate	7 fl oz, 1.6 qt		10							
	Super Tin	8 fl oz		18							
	Topguard + Manzate	14 fl oz, 1.6 qt		15							
	Super Tin	8 fl oz		15							

Evaluate Fungicides and Application Timings for Cercospora Control

Blumfield, MI - 2013

No	Treatment	Rate/A	Applied		% Leaf Damage Sept 18	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
			DSVs	Days							
19	Manzate	1.6 qt	50		1.3	**$1,082**	**6171**	**291**	21.2	**20.1**	93.7
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
	Manzate	1.6 qt		10							
18	Manzate	1.6 qt	50		1.3	**$1,177**	**6695**	**300**	**22.3**	**20.5**	**94.1**
	Manzate	1.6 qt	20								
	Manzate	1.6 qt	20								
	Manzate	1.6 qt	20								
	Manzate	1.6 qt	20								
3	Headline + Manzate	9.2 fl oz, 1.6 qt	50		2.5	$1,045	**6200**	**294**	21.1	**20.2**	**94.0**
	Manzate	1.6 qt	30								
	Super Tin	8 fl oz	18								
	Manzate	1.6 qt	18								
	Headline + Manzate	9.2 fl oz, 1.6 qt	22								
	Super Tin	8 fl oz	30								
5	Headline + Manzate	9.2 fl oz, 1.6 qt	50		3.0	$939	5569	**297**	18.8	**20.4**	**93.9**
	Manzate	1.6 qt		18							
	Super Tin	8 fl oz		10							
	Headline + Manzate	9.2 fl oz, 1.6 qt		14							
	Super Tin	8 fl oz		18							
20	Untreated Check				9.7	$929	5107	288	17.8	19.9	93.8

Average	1.2	$1,066	6248	295	21.2	20.2	94.1
LSD 5%	0.8	127.9	703.5	13.5	2.4	0.7	0.6
CV %	49.7	8.0	8.0	3.2	8.1	2.5	0.5

Comments: Different fungicide sequences were evaluated for Cercospora leaf spot in this small plot replicated trial. Most treatments consisted of triazoles + EBDCs, Super Tin and EBDCs. The most effective treatments started early (35 DSVs) with an EBDC application followed by a triazole tank mix, an EBDC and Super Tin. All of the treatments, including EBDCs alone, gave good leafspot control, with the exception of strobilurin based treatments. The leafspot pressure was moderate and the untreated plots suffered about 3 tons/A yield loss.

Cerc- a lower number is better

$/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 Cercospora Leafspot Control with Approved and Experimental Fungicides

Hunger Relief, Elkton, MI - 2013

Trial Quality: Fair
Variety: B-18RR4N
Planted: May 3
Harvested: Not Harvested
Plot Size: 6 rows X 40 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
2.2% OM; 7.5 pH
Above Opt. Levels: P,K
High: Mn, Low: B
Added N: 95 lbs
Prev Crop: Soybeans

Rhizoc Control: Good
Cerc Control: by Trts
Other Problems: Soil variation prevented accurate yield
Beets/100 ft: 220
Rainfall: 16.2 inches

No	Treatment	Rate / A	Applied at DSV's	% Leaf Damage Sept 25
2	Inspire + Dithane Manzate	7 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**2.3**
1	Topguard + Dithane Manzate	14 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**2.5**
5	Enable + Dithane + Crop Oil Manzate	8 fl oz + 1.6 qts + 1% v/v 1.6 qts	50, 105 85, 140	**2.7**
6	Super Tin + Dithane Manzate	8 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**2.8**
11	Cuprofix Manzate	2 lb 1.6 qts	50, 90, 130 70, 110, 150	**2.8**
10	Kocide 3000 Manzate	2 lb 1.6 qts	50, 90, 130 70, 110, 150	**3.3**
3	Proline + Dithane + Induce Manzate	5.7 fl oz + 1.6 qts + .13% v/v 1.6 qts	50, 105 85, 140	**3.4**
15	Bravo + Dithane Manzate	3 pts + 1.6 qts 1.6 qts	50, 105 85, 140	**3.7**
8	Dithane Manzate	1.6 qts 1.6 qts	50, 90, 130 70, 110, 150	**3.9**
9	Manzate	1.6 qts	50, 70, 90 110, 130, 150	**4.0**
4	Eminent + Dithane Manzate	13 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**4.0**
14	Priaxor + Dithane Manzate	8 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**5.1**
13	Gem + Dithane Manzate	3.6 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	**6.6**
7	Topsin + Dithane Manzate	20 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	6.8
12	Headline + Dithane Manzate	9.2 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	7.2
17	Vertisan + Dithane + Induce Manzate	24 fl oz + 1.6 qts + .13% v/v 1.6 qts	50, 105 85, 140	8.3
16	Vertisan + Dithane Manzate	24 fl oz + 1.6 qts 1.6 qts	50, 105 85, 140	8.8
18	Untreated Check			47.3

Average	7.0
LSD 5%	4.2
CV %	52.1

Comments: The disease level was moderate to high. The triazole, Super Tin, Bravo, EBDC and Copper trts provided good leafspot control. The strobi trts, Topsin and Vertisan were less effective.

Bold: Results not statistically different from top trt. **Cerc:** lower is better

Evaluate Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

Average of 2 Locations - 2013

Summary

Super Tin, Manzate and Cuprofix were evaluated for control of Cercospora leafspot in small plot replicated trials. The trials were conducted in Red Zones (high Cercospora risk). The Cercospora level was lower than normal due to the late planting and a dry summer. Super Tin and Manzate were applied in sequence with triazole fungicides. Manzate was also applied alone and in combination with Cuprofix (7 applications). The best treatment was Manzate applied early (35 DSV) followed by a triazole + Manzate, Super Tin, triazole + Manzate and Manzate + Cuprofix (5 applications total). Similar treatments but without the early Manzate treatments (4 applications) also gave good leafspot control. Seven applications of Manzate alone or Manzate + Cuprofix was somewhat less effective but leafspot control was still in a good range. Manzate alone gave better results than the tank mix of Manzate + Cuprofix. The Cercospora level was moderate in the trials. The untreated plots sustained about 4% leaf damage and lost about 2 tons per acre. Trials in previous years have given similar results. It appears that starting very early (35 DSV) with an EBDC, then following a normal spray schedule gives the best leafspot control. Six to eight EBDC applications applied about 10 days apart has given adequate Cercospora control even under high leafspot pressure in previous years work. It has also become apparent that tank mixing a triazole with an EBDC improves leafspot control compared to a triazole without the tank mix.

Evaluate Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

Average of 2 Locations - 2013

No	Treatment	Rate/A	Applied	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,516**	**8825**	**267**	**32.9**	**18.0**	**95.2**
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	**$1,497**	**8677**	**266**	**32.4**	**17.9**	**95.1**
8	Manzate	2 lb	35 dsv, 50 dsv 70 dsv, 90 dsv 110 dsv, 130 dsv 150 dsv	**$1,478**	8437	**264**	**31.9**	**17.8**	**95.1**
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,476**	**8603**	**264**	**32.3**	**17.8**	**95.2**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,452**	8438	**265**	**31.6**	**17.8**	**95.4**
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,448**	**8627**	**269**	**31.8**	**18.2**	**95.1**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	**$1,446**	8397	**265**	**31.4**	**17.8**	**95.3**
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	$1,432	**8497**	**264**	**31.9**	17.7	**95.3**
1	Untreated Check			$1,391	7652	256	29.5	17.4	94.9
9	Cuprofix + Manzate	3 lb + 2 lb	35 dsv, 50 dsv 70 dsv, 90 dsv 110 dsv, 130 dsv 150 dsv	$1,337	7966	262	30.2	17.8	94.8
Average				$1,447	8412	264	31.6	17.8	95.1
LSD 5%				70.4	377.0	5.2	1.3	0.3	0.4
CV %				4.0	3.9	1.7	3.6	1.4	0.3

$/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 Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

Average of 2 Locations - 2013

No	Treatment	Rate/A	Applied	Net $/A	% Leaf Damage	Stand B/100’	Vigor 0-10	Color 0-10
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,516**	**0.6**	**194**	**7.8**	7.0
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	**$1,497**	**0.8**	**199**	**7.7**	**7.3**
8	Manzate	2 lb	35 dsv, 50 dsv 70 dsv, 90 dsv 110 dsv, 130 dsv 150 dsv	**$1,478**	**0.8**	**196**	**7.5**	**7.1**
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,476**	**0.8**	**201**	**7.6**	**7.3**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,452**	1.0	**196**	**7.5**	7.0
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	35 dsv 50 dsv, 115 dsv 85 dsv 150 dsv	**$1,448**	**0.7**	**198**	**7.8**	**7.1**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	**$1,446**	**0.8**	**201**	**7.6**	**7.3**
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	50 dsv, 115 dsv 85 dsv 150 dsv	$1,432	**0.7**	**197**	**7.7**	**7.1**
1	Untreated Check			$1,391	4.2	**193**	6.7	6.0
9	Cuprofix + Manzate	3 lb + 2 lb	35 dsv, 50 dsv 70 dsv, 90 dsv 110 dsv, 130 dsv 150 dsv	$1,337	1.2	**197**	**7.5**	**7.5**
	Average			$1,447	1.1	197.2	7.5	7.1
	LSD 5%			70.4	0.3	ns(14.4)	0.5	0.4
	CV %			4.0	24.9	6.3	5.4	4.7

Vigor- a higher number is better. **Color**- a higher number is darker green. **Cerc-** a lower number is better.

$/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 Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

English, Breckenridge, MI - 2013 (Page 1 of 2)

Trial Quality:	Good	**Soil Info:**	Sandy Loam	**Rhizoc Control:**	Fair-Good
Variety:	C-RR059		3.0% OM, 6.9 pH	**Cerc Control:**	by Trt
Planted:	May 7		Above Opt. Levels: P, K	**Other Problems:**	None
Harvested:	Oct 25		High: Mn, Low: B	**Seeding Rate:**	4.1 inch
Plot Size:	6 rows X 38 ft, 6 reps	**Added N:**	Manure + 50 lbs	**Rainfall:**	14.8 inches
Row Spacing:	22 inch	**Prev Crop:**	Wheat/Clover		

No	Treatment	Rate/A	Applied	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**$1,918**	**10994**	**278**	**39.6**	**18.6**	**95.3**
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**$1,910**	**10996**	272	**40.4**	**18.4**	**94.9**
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**$1,858**	**10842**	**275**	**39.5**	**18.4**	**95.4**
8	Manzate	2 lb	Jun 19, Jun 28 Jul, 9, Jul 11 Jul 19, Jul 26 Aug 16	**$1,853**	**10499**	268	**39.2**	18.2	94.7
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**$1,849**	**10657**	**279**	38.2	**18.7**	**95.2**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**$1,841**	**10579**	**275**	**38.5**	**18.4**	**95.4**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**$1,816**	**10435**	**276**	37.8	**18.5**	**95.2**
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	$1,803	**10580**	**277**	38.1	**18.7**	**95.1**
9	Cuprofix + Manzate	3 lb + 2 lb	Jun 19, Jun 28 Jul, 9, Jul 11 Jul 19, Jul 26 Aug 16	$1,717	10060	269	37.4	18.3	**94.8**
1	Untreated Check			$1,791	9852	267	36.8	18.1	**95.0**

	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	$1,836	10549	274	38.6	18.4	95.1
LSD 5%	112.6	619.1	6.9	2.0	0.4	0.6
CV %	5.0	5.0	2.2	4.4	1.8	0.6

$/A: Gross dollars per acre assuming a $50 payment.
Bold: Results are not statistically different from top-ranking variety in each column.

Evaluate Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

English, Breckenridge, MI - 2013

No	Treatment	Rate/A	Applied	Cerc 0-9 Sept 24	Vigor 0-10 Sept 24	Color 0-10 Sept 24	Stand B/100' July 11
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**0.5**	**7.5**	**6.5**	**197**
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**0.5**	**7.5**	**6.8**	**209**
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**0.6**	**7.7**	**6.4**	**196**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**0.6**	**7.5**	**6.8**	**208**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	Jun 19 Jun 28, Jul 16 Jul 11 Aug 5	**0.6**	**7.3**	**6.4**	**202**
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**0.6**	**7.8**	**6.6**	**202**
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	Jun 28, Jul 16 Jul 11 Aug 5	**0.6**	**7.7**	**6.7**	**202**
8	Manzate	2 lb	Jun 19, Jun 28 Jul 9, Jul 11 Jul 19, Jul 26 Aug 16	**0.7**	**7.5**	**6.6**	**198**
9	Cuprofix + Manzate	3 lb + 2 lb	Jun 19, Jun 28 Jul, 9, Jul 11 Jul 19, Jul 26 Aug 16	**0.8**	**7.3**	**6.9**	**199**
1	Untreated Check			3.1	7.2	5.8	**194**

	Cerc 0-9 Sept 24	Vigor 0-10 Sept 24	Color 0-10 Sept 24	Stand B/100' July 11
Average	0.9	7.5	6.5	200
LSD 5%	0.3	0.6	0.6	ns(18.6)
CV %	26.6	6.5	7.7	7.9

Vigor- a higher number is better. **Color**- a higher number is darker green. **Cerc**- a lower number is better.

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

Evaluate Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

Spero, South Saginaw, MI - 2013

Trial Quality: Good
Variety: C-RR059
Planted: May 8
Harvested: Sept 24
Plot Size: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
3.9% OM, 7.3 pH
Above Opt. Levels: P, K
High: M, Low: B
Added N: 125 lbs
Prev Crop: Wheat/Clover

Rhizoc Control: Fair-Good
Cerc Control: by Trt
Other Problems: Moderate Lygus
Seeding Rate: 4.4 inch
Rainfall: 14.3 inches

No	Treatment	Rate/A	Applied	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Beets/ 100 ft
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**$1,121**	**6653**	**263**	**25.3**	**17.6**	**95.6**	**193**
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**$1,102**	**6550**	249	**26.3**	16.9	**95.1**	**193**
8	Manzate	2 lb	Jun 26, Jul 3 Jul 12, Jul 18 Jul 25, Aug 9 Aug 30	**$1,103**	**6375**	**259**	24.6	**17.4**	**95.4**	**194**
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**$1,093**	**6675**	**261**	**25.6**	**17.6**	95.1	**199**
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	**$1,075**	**6360**	**254**	**25.1**	**17.3**	94.9	**197**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	**$1,075**	**6359**	**255**	**25.0**	**17.2**	**95.3**	**193**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**$1,063**	**6296**	**256**	24.6	**17.3**	**95.3**	190
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	$1,005	6151	253	24.4	17.0	**95.3**	**191**
1	Untreated Check			$991	5452	245	22.2	16.7	94.8	**193**
9	Cuprofix + Manzate	3 lb + 2 lb	Jun 26, Jul 3 Jul 12, Jul 18 Jul 25, Aug 9 Aug 30	$956	5871	**255**	23.0	**17.3**	94.9	**195**

	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Beets/ 100 ft
Average	$1,058	6282	255	24.6	17.2	95.2	194
LSD 5%	75.1	451.6	10.1	1.5	0.5	0.5	8.2
CV %	5.6	6.2	3.4	5.3	2.6	0.6	8.6

$/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 Super Tin, Manzate and Cuprofix for Control of Cercospora Leafspot

Spero, South Saginaw, MI - 2013

No	Treatment	Rate/A	Applied	Cerc 0-9 Sept 24	Cerc 0-9 Aug 23	Vigor 0-10 Sept 24	Color 0-10 Sept 24	Lygus 0-10 Sept 24
7	Manzate Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 13 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**0.7**	**0.1**	**7.9**	**7.7**	**8.1**
6	Manzate Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	2 lb 5.7 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**0.8**	**0.0**	**8.0**	**7.8**	**7.8**
3	Proline + nis + Manz Super Tin + Manzate Cuprofix + Manzate	5.7 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	**0.8**	**0.1**	**7.6**	**7.7**	**8.2**
8	Manzate	2 lb	Jun 26, Jul 3 Jul 12, Jul 18 Jul 25, Aug 9 Aug 30	**0.9**	0.4	**7.6**	**7.6**	**7.4**
5	Manzate Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	2 lb 7 fl oz 8 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	**1.0**	**0.1**	**7.8**	**7.9**	**8.2**
2	Inspire + Manzate Super Tin + Manzate Cuprofix + Manzate	7 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	**1.0**	**0.2**	**7.7**	**7.9**	**8.5**
4	Eminent + Manzate Super Tin + Manzate Cuprofix + Manzate	13 fl oz 8 fl oz 3 lb + 2 lb	Jul 3, Jul 30 Jul 16 Aug 29	**1.0**	**0.2**	**7.8**	**7.8**	**8.4**
10	Manzate Super Tin + Manzate Topsin + Manzate Cuprofix + Manzate	2 lb 8 fl oz 20 fl oz 3 lb + 2 lb	Jun 26 Jul 3, Jul 30 Jul 12 Aug 29	1.4	**0.2**	**7.7**	**7.7**	**7.9**
9	Cuprofix + Manzate	3 lb + 2 lb	Jun 26, Jul 3 Jul 12, Jul 18 Jul 25, Aug 9 Aug 30	1.6	0.4	**7.8**	**8.2**	**7.6**
1	Untreated Check			5.3	2.9	6.2	6.2	5.8

	Cerc 0-9 Sept 24	Cerc 0-9 Aug 23	Vigor 0-10 Sept 24	Color 0-10 Sept 24	Lygus 0-10 Sept 24
Average	1.4	0.5	7.6	7.6	8.3
LSD 5%	0.5	0.2	0.7	0.6	3.4
CV %	30.5	40.3	8.0	7.3	35.1

Vigor- a higher number is better. **Color**- a higher number is darker green.
Cerc- a lower number is better. **Lygus**- a lower number is better.
Bold: Results are not statistically different from top-ranking variety in each column.

Control of Cercospora Leafspot in Sugarbeets With Vertisan and Dithane

Average of 2 Locations - 2013

Study Director: Marsha Martin, Bond McInnes, Dupont (Page 1 of 3)

No	Treatment	Rate/A	Appl DSV	Cerc 0-9	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Inspire +	7 fl oz	50, 150	**1.5**	**$1,487**	**8530**	**258**	**32.9**	**17.4**	**95.1**
	Dithane	1.6 qt	50, 150							
	Dithane	1.6 qt	85, 120							
2	Topguard +	14 fl oz	50, 150	**1.5**	**$1,471**	**8462**	**257**	**32.6**	**17.4**	**95.2**
	Dithane	1.6 qt	50, 150							
	Dithane	1.6 qt	85, 120							
3	Proline +	5.7 fl oz	50, 150	**1.7**	**$1,490**	**8700**	**257**	**33.6**	**17.4**	**95.2**
	Dithane +	1.6 qt	50, 150							
	Induce	0.13% v/v	50, 150							
	Dithane	1.6 qt	85, 120							
6	Manzate	1.6 qt	50, 70, 90, 110, 130, 150	2.0	**$1,463**	**8308**	**252**	**32.7**	**17.0**	**95.2**
5	Vertisan +	24 fl oz	50, 150	2.1	**$1,463**	**8485**	**251**	**33.6**	**17.0**	**95.0**
	Dithane +	1.6 qt	50, 150							
	Induce	0.13% v/v	50, 150							
	Dithane	1.6 qt	85, 120							
4	Vertisan +	24 fl oz	50, 150	2.1	**$1,427**	**8366**	**255**	**32.5**	**17.2**	**95.4**
	Dithane	1.6 qt	50, 150							
	Dithane	1.6 qt	85, 120							
8	Kocide 3000	2 lb	50, 70, 90, 110, 130, 150	2.4	**$1,446**	**8216**	**256**	**32.0**	**17.3**	**95.0**
7	Cuprofix	2 lb	50, 70, 90, 110, 130, 150	2.5	**$1,433**	**8143**	249	**32.6**	**16.9**	**95.0**
9	Untreated Check			4.0	$1,416	7786	247	31.3	16.8	94.9
Average				2.2	$1,455	8333	253	32.6	17.2	95.1
LSD 5%				0.5	132.3	727.9	7.9	2.1	0.5	0.4
CV %				10.3	3.8	3.8	1.4	2.8	1.3	0.2

Comments: Vertisan provided effective Cercospora leafspot control in sugarbeets and was superior to copper applications. Triazole and Dithane treatments were somewhat better. An EBDC alone also provided adequate leafspot control.

Cerc- a lower number is better

$/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 Vertisan and Dithane

English, Breckenridge, MI - 2013

Study Director: Marsha Martin, Bond McInnes, Dupont

Trial Quality: Good
Variety: C-059RR
Planted: May 7
Harvested: Oct 25
Plot Size: 6 rows X 38 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam, 3.0% OM; 6.9 pH, Above Opt Levels: P, K, High: Mn, Low: B
Added N: Manure + 50 lbs
Prev Crop: Wheat/Clover

Rhizoc Control: Good
Cerc Control: By Trt
Seeding Rate: 4.1 inches
Other Problems: None
Rainfall: 14.8 inches

No	Treatment	Rate/A	Applied	Cerc 0-9 Sept 13	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
2	Topguard + Dithane Dithane	14 fl oz 1.6 qt 1.6 qt	Jul 1, Aug 16 Jul 9, Jul 16	**1.3**	**$1,866**	**10657**	**269**	39.7	**18.1**	**95.0**
1	Inspire + Dithane Dithane	7 fl oz 1.6 qt 1.6 qt	Jul 1, Aug 16 Jul 9, Jul 16	**1.4**	**$1,871**	**10642**	**267**	**40.0**	**18.1**	**94.8**
3	Proline + Dithane + Induce Dithane	5.7 fl oz 1.6 qt 0.13% v/v 1.6 qt	Jul 1, Aug 16 Jul 9, Jul 16	1.8	**$1,907**	**11019**	**267**	**41.3**	**18.1**	**94.9**
4	Vertisan + Dithane Dithane	24 fl oz 1.6 qt 1.6 qt	Jul 1, Aug 16 Jul 9, Jul 16	1.8	$1,823	10376	**268**	38.7	**18.1**	**95.0**
5	Vertisan + Dithane + Induce Dithane	24 fl oz 1.6 qt 0.13% v/v 1.6 qt	Jul 1, Aug 16 Jul 9, Jul 16	2.0	$1,818	10528	**259**	**40.6**	**17.7**	**94.6**
6	Manzate	1.6 qt	Jul 1, Jul 9 Jul 16, Jul 26 Aug 16, Aug 29	2.2	$1,827	10314	**262**	39.4	**17.7**	**95.2**
8	Kocide 3000	2 lb	Jul 1, Jul 9 Jul 16, Jul 26 Aug 16, Aug 29	2.3	$1,749	9882	**261**	37.9	**17.7**	**94.8**
7	Cuprofix	2 lb	Jul 1, Jul 9 Jul 16, Jul 26 Aug 16, Aug 29	2.4	$1,735	9805	256	38.3	17.4	**94.8**
9	Untreated Check			3.6	$1,753	9640	**258**	37.5	**17.6**	**94.5**
Average				2.1	$1,816	10318	263	39.3	17.9	94.8
LSD 5%				0.3	82.5	453.7	11.5	1.3	0.6	ns(0.7)
CV %				10.3	3.8	3.8	3.7	3.0	2.8	0.7

Cerc- a lower number is better
$/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 Vertisan and Dithane

Spero, South Saginaw, MI - 2013

Study Director: Marsha Martin, Bond McInnes, Dupont

Trial Quality:	Fair-Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	B-17RR32		3.9% OM: 7.3 pH	**Cerc Control:**	By trt
Planted:	May 8		Above Opt. Levels: P, K	**Seeding Rate:**	4.1 inches
Harvested:	Sept 24		High: Mn, Low: B	**Other Problems:**	None
Plot Size:	6 rows X 38 ft	**Added N:**	125 lbs	**Rainfall:**	14.3 inches
	6 reps	**Prev Crop:**	Wheat/Clover		
Row Spacing:	22 inch				

No	Treatment	Rate/A	Applied	Cerc 0-9 Sept 24	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
1	Inspire + Dithane Dithane	7 fl oz 1.6 qt 1.6 qt	Jul 3, Aug 5 Jul 12, Jul 16	**1.6**	**$1,103**	**6419**	**249**	**25.8**	**16.7**	**95.5**
3	Proline + Dithane + Induce Dithane	5.7 fl oz 1.6 qt 0.13% v/v 1.6 qt	Jul 3, Aug 5 Jul 12, Jul 16	**1.7**	$1,072	**6382**	**246**	**25.9**	**16.6**	**95.4**
2	Topguard + Dithane Dithane	14 fl oz 1.6 qt 1.6 qt	Jul 3, Aug 5 Jul 12, Jul 16	**1.7**	**$1,076**	**6268**	**246**	**25.5**	**16.6**	**95.3**
6	Manzate	1.6 qt	Jul 3, Jul 12 Jul 16, Jul 25 Aug 9, Aug 30	**1.9**	**$1,098**	**6303**	**242**	**26.0**	**16.4**	**95.3**
5	Vertisan + Dithane + Induce Dithane	24 fl oz 1.6 qt 0.13% v/v 1.6 qt	Jul 3, Aug 5 Jul 12, Jul 16	2.2	**$1,107**	**6441**	**242**	**26.6**	**16.3**	**95.5**
8	Kocide 3000	2 lb	Jul 3, Jul 12 Jul 16, Jul 25 Aug 9, Aug 30	2.5	**$1,143**	**6550**	**251**	**26.1**	**17.0**	**95.2**
4	Vertisan + 'Dithane Dithane	24 fl oz 1.6 qt 1.6 qt	Jul 3, Aug 5 Jul 12, Jul 16	2.5	**$1,091**	**6355**	**242**	**26.2**	16.3	**95.7**
7	Cuprofix	2 lb	Jul 3, Jul 12 Jul 16, Jul 25 Aug 9, Aug 30	2.6	**$1,130**	**6481**	**242**	**26.8**	**16.4**	95.2
9	Untreated Check			4.3	**$1,078**	5931	236	25.1	16.0	95.2

	Cerc 0-9 Sept 24	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	2.3	$1,100	6348	244	26.0	16.5	95.4
LSD 5%	0.5	68.3	375.8	10.6	1.3	0.6	0.5
CV %	16.8	5.1	5.1	3.7	4.4	3.2	0.5

Cerc- a lower number is better

$/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 + Koverall for Cercospora Control in Sugarbeets

Blumfield, MI - 2013

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	B-17RR32		2.7% OM, 7.7 pH	**Cerc Control:**	by Trt
Planted:	June 6		Above Opt. Levels: P, K	**Problems:**	None
Harvested:	Sept 26		High: Mn, Low: B	**Seed Spacing:**	4.1 inches
Plot Size:	6 rows X 35 ft, 5 reps	**Added N:**	100 lbs	**Rainfall:**	15.2 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		

No	Treatment	Rate/A	Applied		% Leaf	Net	RWSA	RWST	T/A	%	%
			DSVs	Days	Damage	$/A				Sugar	CJP
5	Topguard + Koverall +	10 fl oz, 2 lb	50		**0.3**	**$1,702**	**9989**	**313**	**32.0**	**20.9**	**95.1**
	Induce	0.125 % v/v									
	Super Tin + Koverall +	8 fl oz, 2 lb		14							
	Topguard + Koverall +	10 fl oz, 2 lb		21							
	Induce	0.125 % v/v									
	Super Tin + Koverall	8 fl oz, 2 lb		14							
1	Topguard + Koverall +	14 fl oz, 2 lb	50		**0.4**	$1,487	9056	**300**	30.2	**20.0**	**95.4**
	Induce	0.125 % v/v									
	Topguard + Koverall +	14 fl oz, 2 lb		21							
	Induce	0.125 % v/v									
	Topguard + Koverall +	14 fl oz, 2 lb		21							
	Induce	0.125 % v/v									
	Topguard + Koverall +	14 fl oz, 2 lb		21							
	Induce	0.125 % v/v									
4	Topguard + Koverall +	14 fl oz, 2 lb	50		**0.5**	$1,559	9199	**300**	30.6	**20.1**	**95.2**
	Induce	0.125 % v/v									
	Super Tin + Koverall	8 fl oz, 2 lb		14							
	Topguard + Koverall +	14 fl oz, 2 lb		21							
	Induce	0.125 % v/v									
	Super Tin + Koverall	8 fl oz, 2 lb		14							
2	Topguard + Koverall +	14 fl oz, 2 lb	50		**1.3**	**$1,591**	**9462**	**306**	30.9	**20.6**	**94.8**
	Induce	0.125 % v/v									
	Topsin M + Super Tin	20 oz, 8 fl oz		14							
	Topguard + Koverall +	14 fl oz, 2 lb		14							
	Induce	0.125 % v/v									
	Topsin M + Super Tin	20 oz, 8 fl oz		14							
3	Topguard + Topsin M	14 fl oz, 20 oz	50		**1.9**	$1,554	**9251**	**305**	30.3	**20.5**	**94.9**
	Topguard + Topsin M	14 fl oz, 20 oz		21							
	Topguard + Topsin M	14 fl oz, 20 oz		21							
	Topguard + Topsin M	14 fl oz, 20 oz		21							
6	Untreated Check				14.0	$1,562	8589	293	29.3	**19.8**	**94.7**

	% Leaf Damage	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP
Average	3.1	$1,576	9258	302.7	30.6	20.3	95.0
LSD 5%	2.3	138.7	762.8	17.8	1.0	ns(1.2)	ns(0.7)
CV %	56.2	6.3	6.3	4.5	2.5	4.6	0.6

Comments: Topguard + Koverall (EBDC) based treatments provided good leafspot control. The treatments containing Topsin were less effective. The leafspot level was moderate.

Cerc- a lower number is better

$/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, Frankenmuth - 2013

Trial Quality: Excellent
Variety: B-19RR1N
Planted: May 4
Harv/Samp: Oct 28 / Oct 24
Plot Size: 4 reps
Row Spacing: 28 inch
Seeding Rate: 58,000

Soil Info: Loam
Fertilizer: GPS applied P&K; 2x2: 15 gal. of 19-8-1 w/ 3S, 1pt B, 1qt Mn; SD: 90# N
Prev Crop: Dry beans
Weather:

Rhizoc Control: Good Control: Quadris I.F. & 6-8 Leaf
Cerc Control: See Comments: 4 applications
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Ballad Plus	$1,635	**8991**	**331**	**27.2**	**21.5**	**96.5**
Check	$1,583	**8709**	**325**	**26.8**	**21.2**	**96.2**
Average	$1,609	8850	328	27.0	21.4	96.3
LSD 5%	—	ns (429)	ns (9)	ns (1.3)	ns (0.5)	ns (0.4)
CV %	—	2	2	2.1	1.4	0.3

Comments: Ballad Plus is a biological fungicide that has been promoted as a tank mix partner for the primary fungicides instead of the EBDC fungicides. Both the Ballad Plus and check treatments consisted of fungicide application on 4 different dates. The Ballad Plus treatments were: 1. Proline + EBDC (7/11/13), 2. Gem + Ballad Plus (1 qt/ac) (7/30/13), 3. Inspire + Ballad Plus (1 qt/ac) (8/22/13), 4. Ballad Plus (2 qt/ac) (9/17/13). The check treatments were: 1. Proline + EBDC (7/11/13), 2. Gem + EBDC (7/30/13), 3. Inspire + EBDC (8/22/13), 4. Kocide (2 lb/ac) (9/17/13). Visual observations appeared to show no difference in leafspot control between the Ballad Plus treatment and the check treatment. Very little leafspot was seen in the trial. Further testing of product needs to be done to validate its effectiveness. Use product with caution.

$/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.

MICHIGAN STATE UNIVERSITY

AgBioResearch

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

W. W. Kirk, R. L Schafer, N. Rosenzweig. 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 8 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 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 were recorded in the area on 1 Jul (Ontario Weather Network, Ridgetown, ON, Canada), applications were initiated on 12 Jul and three to five applications were made sa specified in the table below. Fungicides were applied with a hand-held R&D spray boom delivering 25 gal/A (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/A 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$\geq$ 50% severity. Beetroots were machine-harvested on 19 Sep 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 (^{o}F) was 60.7, 65.3, 70.4, 67.1, 58.8 and 51.1 (May, Jun, Jul, Aug, Sep, and Oct, respectively) and the number of days with maximum temperature >90^{o}F over the same period was 0, 0, 5, 0, 1 and 0 (in 2012 there were 12 days for Aug). Average daily relative humidity (%) over the same period was 59.1, 66.1, 68.3, 63.1, 69.0, 68.1 and 70.1. Precipitation over the same period was 3.43, 1.73, 2.03, 1.85, 0.58 and 3.26”. There were 182 Beetcast DSV values accumulated in the Saginaw area from 1 May to 9 Sep at Richville, MI.

Weather conditions during the growing season at Richville, MI were very conducive for the development of Cercospora leaf spot (CLS) for most of the season and of note were the hot and humid conditions during Jul. During Aug, conditions were less conducive for CLS with no days in excess of 90^{o}F. CLS reached an index of about 8.3, 8.8, 8.8, 9.8 and 10.0 in the not-treated control by 16, 23, 29 and 4 and 18 Aug, respectively (not all data not shown in table). CLS severity (%) reached 22.5, 32.5, 38.8, 65.0 and 87.5% in the not-treated control by 16, 23, 29 and 4 and 18 Aug, respectively (not all data not shown in table). Treatments with CLS severity (%) less than 80.0% had significantly less CLS than the not-treated control by 18 Aug. All treatments had significantly less CLS RAUDPC values than the not-treated control (47.9) by 18 Aug. Treatments with CLS indices less than 8.8 had significantly less Cercospora leaf spot than the not-treated control (10.0) by 18 Aug. Several treatments had substantial disease development [CLS indices >6 (proven economic impact)] by 4 Aug and many more by the end of the evaluation period. Treatments with yield greater than 18.0 t/A had significantly greater yield per acre than the untreated control (14.4 t/A). Treatments with recoverable white sucrose per acre greater than 5341 lb had significantly greater yield per acre than the untreated control (4215 lb/A). Transient and minor (~5% of leaf area) foliar phytotoxicity (leaf bronzing) was observed after the first application in some of the triazole treatments but not in subsequent treatments (data not shown).

2013 Research Results 49

MICHIGAN STATE UNIVERSITY
AgBioResearch

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

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

Treatment and rate/A	Cercospora leaf spot						Yield (t/A)		RWSAd (lb)	
	Severity (%) 18 Sep 19 DAFAa		RAUDPCb (0-100) 29 Aug		Bayer 0-10 scalec					
Topguard 1.04SC 10 fl oz (ACEGe)…..	5.3	Klf	8.6	j-n	5.5	h-l	22.2	a-f	6175	a-g
Eminent 11.6SL 13 fl oz (ACEG)…….	4.3	kl	9.9	h-n	5.5	h-l	19.3	c-m	5061	f-o
Inspire XT 2.08SC 7 fl oz (ACEG)…...	4.3	kl	7.0	lmn	4.3	l	20.4	a-j	5493	d-l
Super Tin 4L 8 fl oz (ACEG)…………	38.8	efg	25.7	de	8.8	a-d	17.3	i-p	4699	k-o
Proline 480SC 5.7 fl oz (ACEG)……..	3.8	l	7.5	k-n	4.5	kl	19.6	b-l	5483	d-m
Tilt 3.6EC 4 fl oz (ACEG)…………….	21.3	hi	14.6	f-j	8.0	b-e	19.4	b-m	5406	d-n
Enable 2F 8 fl oz (ACEG)…………….	37.5	fg	26.1	de	8.8	a-d	17.9	g-p	5008	g-o
Eminent 11.6SL 13 fl oz (AG); Super Tin 4L 8 fl oz + NISg(C); Topsin 4.5FL 7.6 fl oz + Manzate 75WG 2 lb (E)………………	12.5	i-l	16.0	f-i	7.0	e-h	18.5	g-o	4970	g-o
Roundup 3AS 32 fl oz + Koverall 75DF 2 lb (AE); Topguard 1.04SC 10 fl oz + Koverall 75DF 1.5 lb + NIS (CG)…….	7.5	jkl	12.6	g-n	6.5	e-i	20.3	a-j	5520	d-l
Topguard 1.04SC 10 fl oz + Koverall 75DF 1.5 lb + NIS (AE); Koverall 75DF 2 lb + NIS (CG)………	5.5	kl	9.7	h-n	5.8	g-l	19.7	b-k	5709	b-k
Topguard 1.04SC 14 fl oz + CHA-064 4.17SC 15 fl oz (ACEG)…..	7.5	jkl	12.1	g-n	6.5	e-i	21.3	a-h	5425	d-m
Inspire XT 2.08SC 7 fl oz + Dithane F45 4F 51 fl oz + NIS (A); Super Tin 4L 8 fl oz + NIS (C); Priaxor 4.17SC 7 fl oz + NIS (E); Enable 2F 8 fl oz + NIS (G)…………...	6.3	kl	10.5	h-n	6.3	f-j	19.9	b-k	5668	c-k
Inspire XT 2.08SC 7 fl oz + Dithane F45 4F 51 fl oz + NIS (A); Dithane F45 4F 51 fl oz + NIS (CE); Enable 2F 8 fl oz + NIS (G)…………...	6.3	kl	10.2	h-n	6.3	f-j	24.0	a	6149	a-h
Inspire XT 2.08SC 7 fl oz + Dithane F45 4F 51 fl oz + NIS (A); Dithane F45 4F 51 fl oz + Priaxor 4.17SC 7 fl oz + NIS (C); Dithane F45 4F 51 fl oz + NIS (E); Enable 2F 8 fl oz + Dithane F45 4F 51 fl oz + NIS (G)……	4.8	kl	7.3	lmn	5.3	i-l	17.1	j-p	4733	k-o
Inspire XT 2.08SC 7 fl oz + Dithane F45 4F 51 fl oz + NIS (A); Dithane F45 4F 51 fl oz+ NIS (C,E); Enable 2F 8 fl oz + Dithane F45 4F 51 fl oz + NIS (G)……	7.5	jkl	9.8	h-n	6.5	e-i	20.2	b-k	5663	c-k
SA-0040104 100SL 13 fl oz + Koverall 75DF 1.5 lb (AG); Super Tin 4L 8 fl oz (C); Headline 2.09SC 9 fl oz (E)………….	4.0	kl	6.3	n	5.3	i-l	19.3	c-m	4734	k-o
SA-0040104 100SL 13 fl oz + Super Tin 4L 8 fl oz (AG); Super Tin 4L 8 fl oz + Topsin 4.5FL 7.6 fl oz (C); Headline 2.09SC 9 fl oz (E)………….	7.5	jkl	11.6	g-n	6.5	e-i	19.3	c-m	5231	d-o

MICHIGAN STATE UNIVERSITY

AgBioResearch

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

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

SA-0040104 100SL 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	7.5 jkl	11.1 g-n	6.5 e-i	19.0 d-n	5199 e-o
SA-0040104 100SL 13 fl oz + Koverall 75DF 1.5 lb (A); Koverall 75DF 1.5 lb + Super Tin 4L 8 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	4.8 kl	6.6 mn	5.3 i-l	22.4 a-e	6056 a-j
SA-0040104 100SL 13 fl oz + Koverall 75DF 1.5 lb (A); Koverall 75DF 1.5 lb + Headline 2.09SC 9 fl oz (C); Super Tin 80WP 8 fl oz (E)…………	10.0 i-l	10.2 h-n	7.0 e-h	20.6 a-j	5616 c-k
SA-0040104 100SL 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Headline 2.09SC 9 fl oz + Koverall 75DF 1.5 lb (C); Super Tin 4L 8 fl oz (E)……………….	67.5 b	38.8 b	10.0 a	15.5 nop	4277 mno
SA-0040104 100SL 13 fl oz + Super Tin 4L 8 fl oz (A); Koverall 75DF 1.5 lb + Headline 2.09SC 9 fl oz (C); Topsin 4.5FL 7.6 fl oz + Super Tin 4L 8 fl oz (E)……………….	11.3 i-l	11.9 g-n	7.3 d-g	19.1 d-n	5424 d-m
SA-0040104 100SL 13 fl oz + Echo 720SC 16 fl oz (A); Echo 720SC 16 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	11.3 i-l	10.8 g-n	7.0 e-h	19.6 b-l	5778 b-k
SA-0040104 100SL 13 fl oz + Echo 100F 24 fl oz (A); Echo 100F 16 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	80.0 a	37.5 b	10.0 a	17.2 i-p	4853 j-o
SA-0040104 100SL 13 fl oz + Echo 100F 16 fl oz (A); Echo 100F 16 fl oz + Topsin 4.5FL 7.6 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	50.0 cde	25.9 de	9.5 ab	18.6 f-o	5399 d-n
SA-0040303 100SL 32 fl oz + Echo 100F 16 fl oz (A); Echo 100F 16 fl oz + Super Tin 4L 8 fl oz + Topsin 4.5FL 7.6 fl oz (C); Super Tin 4L 8 fl oz (E)……………….	10.0 i-l	11.9 g-n	7.0 e-h	20.1 b-k	5211 d-o
SA-0040303 100SL 24 fl oz + Koverall 75DF 1.5 lb (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 7.6 fl oz (C); Super Tin 4L 8 fl oz + Koverall 75DF 1.5 lb (E)……………..	21.3 hi	16.0 f-i	7.8 c-f	18.8 e-n	5008 g-o
SA-0040104 100SL 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 7.6 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	41.3 efg	28.3 cd	8.8 a-d	23.1 ab	6121 a-i
Echo 720SC 24 fl oz (ACEG)…………	30.5 gh	21.1 ef	7.8 c-f	20.6 a-j	5633 c-k
Echo 720SC 18 fl oz (ABCDEFG)……	12.5 i-l	14.8 f-j	7.3 d-g	17.8 h-p	4930 i-o

MICHIGAN STATE UNIVERSITY

AgBioResearch

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

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

Inspire 2.08SC 7 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (E)………	4.3 kl	6.5 mn	5.5 h-l	20.8 a-i	5627 c-k
Proline 480SC 5.7 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (E)………	6.5 jkl	8.8 j-n	5.8 g-l	15.1 op	4187 o
Eminent 11.6SL 13 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Inspire XT 2.08SC 7 fl oz + Manzate Prostick 75DF 2 lb (E)………	5.0 kl	7.9 k-n	6.0 g-k	18.0 g-p	4832 k-o
Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Inspire XT 2.08SC 7 fl oz + Manzate Prostick 75DF 2 lb (E)………	11.3 i-l	13.5 g-l	7.0 e-h	20.1 b-k	5626 c-k
Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Proline 480SC 5.7 fl oz + Manzate Prostick 75DF 2 lb (E)………	10.3 i-l	11.5 g-n	6.5 e-i	18.6 f-o	5561 d-k
Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (A); Manzate Prostick 75DF 2 lb (C); Eminent 11.6SL 13 fl oz + Manzate Prostick 75DF 2 lb (E)………	18.8 hij	17.3 fg	7.8 c-f	18.9 e-n	5341 d-o
Inspire XT 2.08SC 7 fl oz (A); Manzate Prostick 75DF 2 lb (C); Cuprofix Ultra Disperss 40DF 2 lb (E); Inspire XT 2.08SC 7 fl oz (G)………..	7.5 jkl	11.6 g-n	6.5 e-i	17.2 i-p	4813 k-o
Inspire 2.08SC 7 fl oz + Manzate Prostick 75DF 2 lb (A); Cuprofix Ultra Disperss 40DF 2 lb (E); Inspire 2.08SC 7 fl oz (G)……………..	6.3 kl	12.0 g-n	6.3 f-j	20.9 a-i	6266 a-f
Inspire XT 2.08SC 7 fl oz + Manzate Prostick 75DF 2 lb (A); Super Tin 4L 8 fl oz + Manzate Prostick 75DF 2 lb (C); Inspire XT 2.08SC 7 fl oz + Cuprofix Ultra Disperss 40DF 2 lb (G).	16.3 ijk	16.4 fgh	7.8 c-f	16.6 k-p	4609 k-o
CHA064 1.04SC 15 fl oz (ACEG)……	47.5 def	25.2 de	9.0 abc	17.8 h-p	5319 d-o
Headline 2.09SC 9 fl oz (ACEG)……..	60.0 bc	27.7 cde	9.5 ab	15.9 l-p	4329 l-o
IR14360 1ME 13 fl oz (AG); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 9 fl oz (E)…………..	6.8 jkl	11.0 g-n	6.0 g-k	20.6 a-j	5626 c-k
IR14360 1ME 10 fl oz + Super Tin 4L 6 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E); IR14360 1ME 10 fl oz (G)…………….	6.3 kl	11.8 g-n	6.3 f-j	22.9 abc	6885 ab

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

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

IR14360 1ME 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E); IR14360 1ME 13 fl oz (G)…………….	5.0 kl	9.5 i-n	6.0 g-k	18.4 g-o	4955 h-o
IRF168 2.53L 22 fl oz (AG); Super Tin 4L 8 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E)……..	7.5 jkl	10.3 h-n	6.5 e-i	19.2 d-n	5684 b-k
ISF010F 1.5SC 17 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E); ISF010F 1.5SC 17 fl oz (G)…………..	5.5 kl	8.5 j-n	5.8 g-l	22.7 a-d	6418 a-d
ISF010F 1.5SC 14 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (AC); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E); ISF010F 1.5SC 14 fl oz (G)…………..	10.0 i-l	12.9 g-n	6.8 e-i	19.3 c-m	5548 d-k
Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (A); IR14360 1ME 13 fl oz + Super Tin 4L 8 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz (E); IR14360 1ME 13 fl oz (G)…………….	12.5 i-l	15.8 f-i	7.3 d-g	21.3 a-h	6301 a-e
IR14360 1ME 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (AC); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + Badge 2.27L 32 fl oz (E); IR14360 1ME 13 fl oz (G)…………….	5.0 kl	10.3 h-n	6.0 g-k	19.8 b-k	5517 d-l
IR14360 1ME 13 fl oz + Super Tin 4L 8 fl oz (A); Super Tin 4L 8 fl oz + Badge 2.27L 32 fl oz + opsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + Badge 2.27L 32 fl oz (E); IR14360 1ME 13 fl oz (G)…………….	10.0 i-l	14.0 g-k	7.0 e-h	20.9 a-i	6266 a-f
IR14360 1ME 13 fl oz + Super Tin 4L 8 fl oz + Badge 2.27L 32 fl oz (A); Super Tin 4L 8 fl oz + Badge 2.27L 32 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + Badge 2.27L 32 fl oz (E); IR14360 1ME 13 fl oz (G)…………….	7.5 jkl	10.0 h-n	6.5 e-i	18.8 e-n	5647 c-k

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2013.

MICHIGAN STATE UNIVERSITY
AgBioResearch

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

IR14360 1ME 16 fl oz (AG); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz (E)	10.0 i-l	13.7 g-l	6.8 e-i	19.4 b-m	6097 a-i
IR14360 1ME 19.2 fl oz (AG); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz (E)	5.0 kl	8.2 j-n	4.8 jkl	21.6 a-g	6413 a-d
IR14360 1ME 16 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + IRF160 100L 1 qt/a (E); IR14360 1ME 16 fl oz + IRF160 100L 1 qt/a (EG)……………..	7.5 jkl	13.1 g-m	6.5 e-i	19.5 b-m	5642 c-k
IR14360 1ME 13 fl oz (A); Super Tin 4L 8 fl oz + Topsin 4.5FL 10 fl oz (C); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + IRF160 100L 1 qt/a (E); IR14360 1ME 13 fl oz + IRF160 100L 1 qt/a (EG)……………..	10.0 i-l	13.4 g-l	6.8 e-i	20.4 a-j	6284 a-e
Eminent 125SL 13 fl oz + Diffusion 60L 2 gal/a (A); Super Tin 4L 8 fl oz + Diffusion 60L 2 gal/a (C); Topsin 4.5FL 10 fl oz+ Diffusion 60L 2 gal/a (E); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + Diffusion 60L 2 gal/a (G)…………….	6.8 jkl	11.6 g-n	6.0 g-k	24.0 a	6812 abc
Eminent 125SL 13 fl oz + Diffusion 60L 2 gal/a (<u>A</u>); Super Tin 4L 8 fl oz + Diffusion 60L 2 gal/a (<u>C</u>); Topsin 4.5FL 10 fl oz+ Diffusion 60L 2 gal/a (<u>E</u>); Headline 2.09SC 12 fl oz + Manzate Prostick 75DF 32 oz + Diffusion 60L 2 gal/a (<u>G</u>)…………….	8.8 jkl	13.6 g-l	6.8 e-i	22.7 a-d	7105 a
Not treated check……………………..	87.5 a	47.9 a	10.0 a	14.4 p	4215 no

[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 29 Aug, a period of 33 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 $\geq$ 50% severity

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

[e] Application dates: A= 12 Jul; B= 19 Jul; C= 26 Jul; D= 2 Aug; E= 9 Aug; F= 16 Jul; G= 23 Aug; H= 30 Aug. Underlined letters indicate that Diffusion 60L was applied immediately after and separately from the fungicide

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

[g] Induce applied at 0.25% v/v

Evaluation of products for management of Cercospora leaf spot in sugarbeet

Ridgetown, Ontario, Canada

Cheryl Trueman, University of Guelph, Ridgetown Campus

Trial Quality:	Good	**Variety:**	RR074NT
Planted:	May 3	**Location:**	Ridgetown, Ontario, Canada
Harvested:	October 8	**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:	7.6 seeds/foot		

Materials: Inspire (difenoconazole), Headline (pyraclostrobin), Senator (thiophanate-methyl), Parasol WG (copper hydroxide), Manzate Pro-Stick DF (mancozeb), Switch (cyprodinil + fludioxinil), Bravo ZN (chlorothalonil), Luna Tranquility (fluopyram + pyrimethanil), Serenade Max (*Bacillus subtilis* QST 713), Fontelis (penthiopyrad), Taegro (*Bacillus subtilis* var. *amyloliquefaciens* FZB24), 496/A + 497/B (unknown)

Treatment (per acre) [z]	Disease severity rating (0 - 10) [y]					AUDPC [x]	Beets (T/ac)	RWSA
	29 July	8 Aug	20 Aug	13 Sept	29 Sept			
Nontreated control	0.5 a [w]	0.7 a	1.0 b	5.9 bc	6.8 bc	174 bc	25.8 a	6356 ab
Inspire EC 0.70 qt	0.1 a	0.1 a	**0.2 a**	**1.5 a**	**1.3 a**	**39 a**	28.9 a	7931 a
Headline EC 0.35 qt	0.1 a	0.5 a	0.8 ab	6.7 c	7.7 bc	186 bc	26.3 a	6460 ab
Senator 70WP 0.44 lb	0.2 a	0.3 a	0.7 ab	6.9 c	8.0 bc	187 bc	25.4 a	6336 ab
Parasol WG 3.78 lb	0.3 a	0.6 a	0.7 ab	3.3 ab	5.2 ab	110 ab	26.4 a	6885 ab
Manzate Pro-Stick DF 2.00 lb	0.5 a	0.6 a	1.0 b	5.6 bc	6.8 bc	168 bc	24.9 a	5936 ab
Switch 62.5 WG 0.87 lb	0.5 a	0.8 a	1.1 b	6.1 bc	7.1 bc	182 bc	22.3 a	5508 b
Bravo ZN 1.41 qt	0.2 a	0.5 a	1.0 b	5.7 bc	7.0 bc	169 bc	27.7 a	7227 ab
Luna Tranquility 0.35 qt	0.4 a	0.7 a	0.9 ab	4.6 abc	6.2 abc	145 bc	24.3 a	5928 ab
Serenade Max 0.88 qt	0.3 a	0.5 a	0.9 ab	5.5 abc	6.9 bc	163 bc	24.6 a	5928 ab
Fontelis 0.77 qt	0.5 a	0.8 a	1.4 b	7.3 c	7.9 bc	215 c	26.9 a	6457 ab
Taegro WP 0.33 lb + Agral 90 0.125% v/v	0.3 a	0.7 a	0.8 ab	7.1 c	7.6 c	196 c	21.8 a	5209 b
496/A 2.07 qt + 497/B 0.13 qt	0.4 a	0.6 a	0.8 ab	5.9 bc	7.3 bc	174 bc	24.0 a	6109 ab

[z] The applications were applied on 2 July, 30 July, Sept 5, except for Fontelis which was applied on 7 Sept. Timings were equivalent to 53, 62, and 63 DSVs.
[y] Mean severity ratings on a scale of 0 to 10 are presented, where 0 = healthy foliage and 10 = original foliage completely destroyed.
[x] Area under the disease progress curve (AUDPC) represents total disease accumulation over the season.
[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.

Summary: Cercospora leaf spot was first observed on 16 July. Inspire reduced the AUDPC to levels lower than the nontreated control and all other fungicide treatments except Parasol WG. Parasol WG and Luna Tranquility were equivalent to Inspire on 13 and 29 Sept, and Serenade Max was equivalent to Inspire on 13 Sept. Recoverable white sucrose was higher in treatment Inspire than treatments Switch and Taegro + Agral 90. The trial was conducted using Beetcast 55/50/50 for timing of fungicide applications; however, the actual timings were at 53, 62, and 63 DSVs. The extended spray intervals may have limited the effectiveness of some fungicides.

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

Evaluation of products for management of Cercospora leaf spot in sugarbeet

Pain Court, Ontario, Canada

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

Trial Quality:	Very Good	**Variety:**	173RR
Planted:	May 17	**Location:**	Pain Court, Ontario, Canada
Harvested:	October 15	**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		

- The fungicide program consisted of the following fungicides: first application was Proline + Manzate Pro-Stick, second application was Manzate Pro-Stick alone, third application was Proline + Manzate Pro-Stick, and any subsequent applications were Manzate Pro-Stick alone. Proline EC (prothioconazole) was applied at 0.16 qt/A and Manzate Pro-Stick DF (mancozeb) was applied at 2.00 lb/A.

Treatment (# fungicide applications) [z]	Application water volume (gal/A)	DSV Start Date	AUDPC [x]	CJP	Sugar (%)	RWST	Beets (T/ac)	RWSA
Untreated	Untreated	Untreated	106 a	94.1 a	16.1 a	232 a	33.4 a	7771 a
Calendar (9)	12.1	May 1	**27 ef**	94.8 a	16.9 a	247 a	31.2 a	7704 a
Calendar (9)	24.7	May 1	**21 ef**	94.5 a	16.6 a	242 a	34.1 a	8229 a
Calendar (9)	12.1	May 24	**23 ef**	94.7 a	16.4 a	240 a	31.2 a	7487 a
Calendar (9)	24.7	May 24	**18 f**	94.6 a	16.7 a	243 a	34.3 a	8344 a
BEETcast™ 50/35 (5)	12.1	May 1	**39 cde**	94.3 a	16.9 a	246 a	36.1 a	8783 a
BEETcast™ 50/35 (5)	24.7	May 1	**31 de**	94.5 a	17.0 a	247 a	31.8 a	7862 a
BEETcast™ 50/35 (5)	12.1	May 24	**39 cde**	94.5 a	16.9 a	246 a	33.2 a	8166 a
BEETcast™ 50/35 (5)	24.7	May 24	**32 def**	94.4 a	16.5 a	239 a	33.2 a	7889 a
BEETcast™ 55/50 (4)	12.1	May 1	**67 b**	94.4 a	16.7 a	243 a	33.3 a	8081 a
BEETcast™ 55/50 (4)	24.7	May 1	**65 b**	94.6 a	17.2 a	251 a	33.0 a	8316 a
BEETcast™ 55/50 (4)	12.1	May 24	**55 bc**	94.0 a	17.0 a	245 a	32.4 a	7903 a
BEETcast™ 55/50 (4)	24.7	May 24	**48 bcd**	94.1 a	16.4 a	237 a	37.0 a	8755 a
Contrasts								
	12.1	-	**42 a**	94.5 a	16.8 a	245 a	32.9 a	8021 a
	24.7	-	**36 b**	94.5 a	16.7 a	243 a	33.9 a	8233 a
	-	May 1	**42 a**	94.5 a	16.9 a	246 a	33.3 a	8163 a
	-	May 24	**36 b**	94.4 a	16.7 a	242 a	33.6 a	8091 a

[z] Fungicide applications were made on 1 Jul, 15 Jul, 30 Jul, 29 Aug, and 14 Sept for program 50/35 and actual DSVs were 52/34/37/44/35, on 4 Jul, 25 Jul, and 29 Aug for program 55/50 and actual DSVs were 58/51/56, and 4 Jul, 20 Jul, 30 Jul, 13 Aug, 23 Aug, 3 Sept, and 14 Sept with the first application at 58 DSVs.

[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.

Evaluation of products for management of Cercospora leaf spot in sugarbeet

Pain Court, Ontario, Canada

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

Summary: Disease incidence in the trial was moderate and CLS symptoms in the trial were not detected until Aug 12. All programs provided some reduction in disease severity. The Calendar program, which included 9 fungicide applications, provided the greatest reduction in disease, however, the BEETcast™ 50/35 program provided an equivalent reduction in disease using approximately 45% fewer fungicide applications. The CLS severity was relatively higher in the BEETcast™ 55/50 program than the the BEETcast™ 50/35 program and this may be an indication that shorter spray intervals are needed to manage CLS when only two applications of a highly effective fungicide such as Proline are permitted, and additional fungicide applications are made with a protectant fungicide such as Manzate Pro-Stick.

The results also indicate that adjustments made to improve fungicide coverage, such as increasing water volume from 115 to 235 L Ha^{-1} can improve disease management. Furthermore, the finding that disease severity was lower when DSV accumulation began at crop emergence (May 24) compared to the arbitrary start date of May 1 suggests that there is potential to improve timing of DSV accumulation in the BEETcast™ program. This will be explored further in the spore trapping portion of this project.

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

Evaluation of fungicide programs and application water volume for management of Cercospora leaf spot in sugarbeet

Ridgetown, Ontario, Canada

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

Trial Quality:	Good	**Variety:**	RR074NT
Planted:	May 3	**Location:**	Ridgetown, Ontario, Canada
Harvested:	October 9	**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		

- The fungicide program consisted of the following fungicides: first application was Proline + Manzate Pro-Stick, second application was Manzate Pro-Stick alone, third application was Proline + Manzate Pro-Stick, and any subsequent applications were Manzate Pro-Stick alone. Proline EC (prothioconazole) was applied at 0.16 qt/A and Manzate Pro-Stick DF (mancozeb) was applied at 2.00 lb/A.

Treatment (# fungicide applications) [z]	Application water volume (gal/A)	AUDPC [x]	CJP	Sugar (%)	RWST	Beets (T/ac)	RWSA
Untreated (0)	None	175 a	95.1 a	14.2 a	253 a	28.3 a	7878 a
Calendar (7)	12.1	**72 cd**	95.7 a	17.4 a	261 a	30.4 a	7886 a
Calendar (7)	24.7	**58 d**	95.3 a	17.4 a	259 a	31.3 a	8025 a
BEETcast™ 50/35 (5)	12.1	**92 bcd**	95.7 a	17.4 a	260 a	30.9 a	8019 a
BEETcast™ 50/35 (5)	24.7	**83 bcd**	95.7 a	17.8 a	267 a	31.0 a	8257 a
BEETcast™ 55/50 (3)	12.1	126 abc	95.4 a	17.7 a	264 a	27.2 a	7169 a
BEETcast™ 55/50 (3)	24.7	137 ab	95.8 a	18.1 a	272 a	29.5 a	8014 a
Contrast							
	12.1	97 a	95.6 a	17.5 a	262 a	29.5 a	7691 a
	24.7	93 a	95.6 a	17.8 a	266 a	30.6 a	8099 a

[z] Fungicide applications were made on 1 Jul, 15 Jul, 30 Jul, 29 Aug, and 14 Sept for program 50/35 and actual DSVs were 52/34/37/44/35, on 4 Jul, 25 Jul, and 29 Aug for program 55/50 and actual DSVs were 58/51/56, and 4 Jul, 20 Jul, 30 Jul, 13 Aug, 23 Aug, 3 Sept, and 14 Sept with the first application at 58 DSVs.
[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.

Summary: Disease incidence in the trial was moderate and 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 (5 sprays) compared to Calendar spray programs (7 sprays). Disease severity in the BEETcast™ 55/50 program was equivalent to the calendar program and this may be an indication that shorter spray intervals are needed to manage Cercospora leaf spot when only two applications of a highly effective fungicide such as Proline are permitted and additional fungicide applications are made with a protectant fungicide such as Manzate Pro-Stick. Application water volume did not affect disease severity.

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

Spore activity of Cercospora beticola, causal agent of Cercospora leaf spot of sugarbeet, in a commercial sugar beet field

Ridgetown, Ontario, Canada

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

Trial Quality:	Good	**Variety:**	173RR
Planted:	May 17	**Location:**	Pain Court, Ontario, Canada
Harvested:	October 15		

Method: A Burkard 7-day volumetric spore trap was set up on May 17. 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. On some occasions during the trapping period, the spore trap malfunctioned. These events are noted by light gray bars or line sections in the figures. The commercial field and adjacent fungicide trial were scouted weekly for symptoms of Cercospora leaf spot and symptoms were first confirmed on August 12.

Preliminary Conclusions:

- In the early part of the season, the relationship between weather variables, DSV accumulation and spore counts was not apparent, however, spore counts were very low. Additional research is required to understand the role of early season spore activity in disease epidemics.
- In the second half of the season DSV accumulation tended to increase when spore counts increased. Disease symptoms were first observed approximately 3 weeks after the first spore peak and 10 days after the second spore peak in July.

Preliminary Results:

Figure 1. Spore counts and cumulative BEETcast™ DSVs, Pain Court, ON.

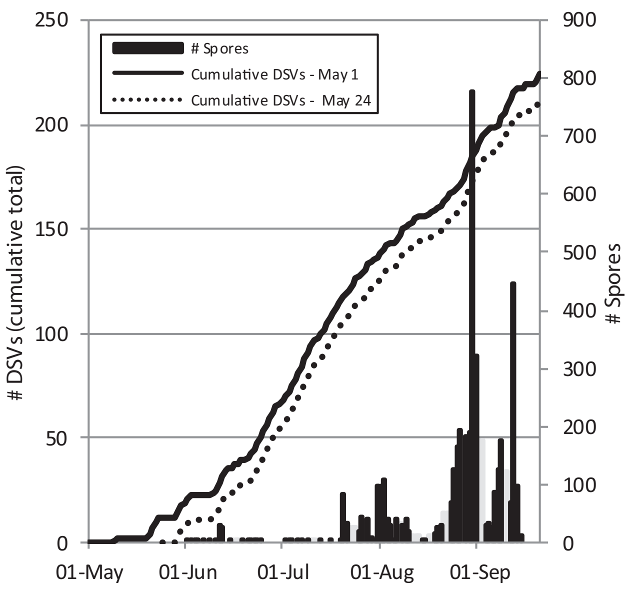
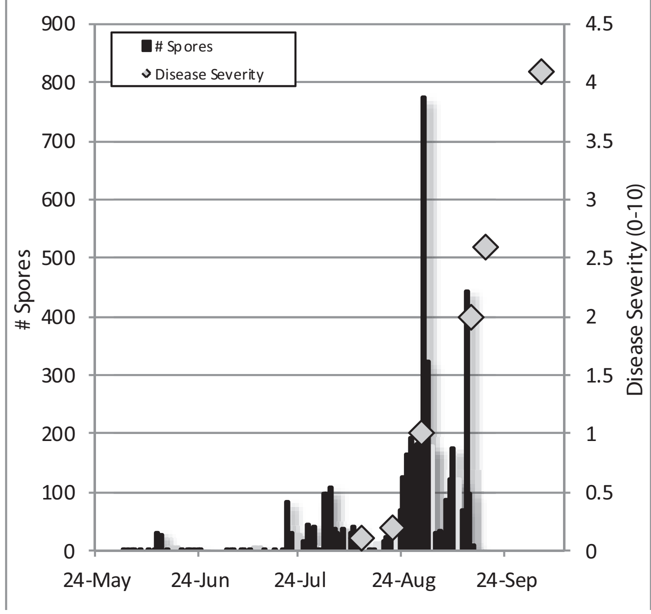


Figure 2. Spore counts and Cercospora leaf spot disease severity, Pain Court, ON.



Spore activity of Cercospora beticola, causal agent of Cercospora leaf spot of sugarbeet, in a commercial sugar beet field

Ridgetown, Ontario, Canada

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

Figure 3. Cercospora beticola spore counts and rainfall (mm), Pain Court, ON.

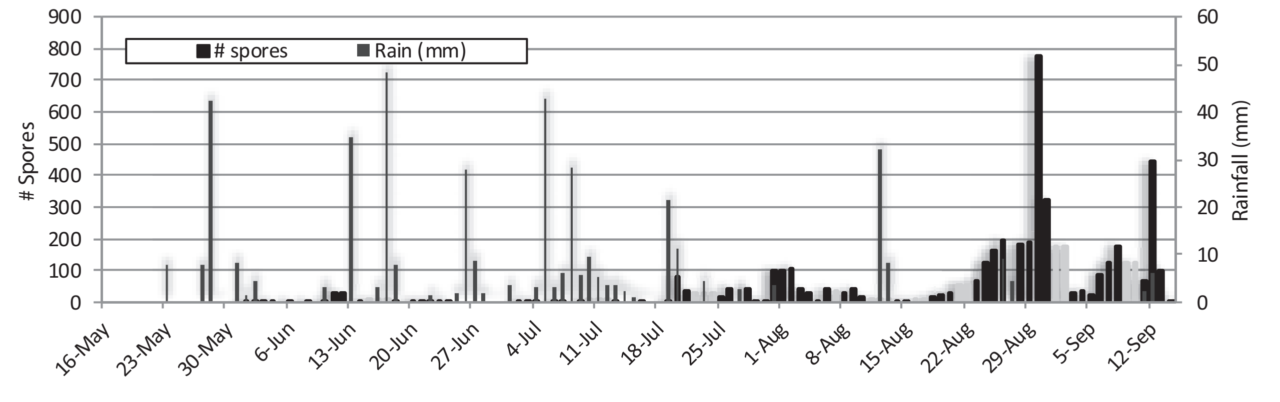


Figure 4. Cercospora beticola spore counts and relative humidity, Pain Court, ON.

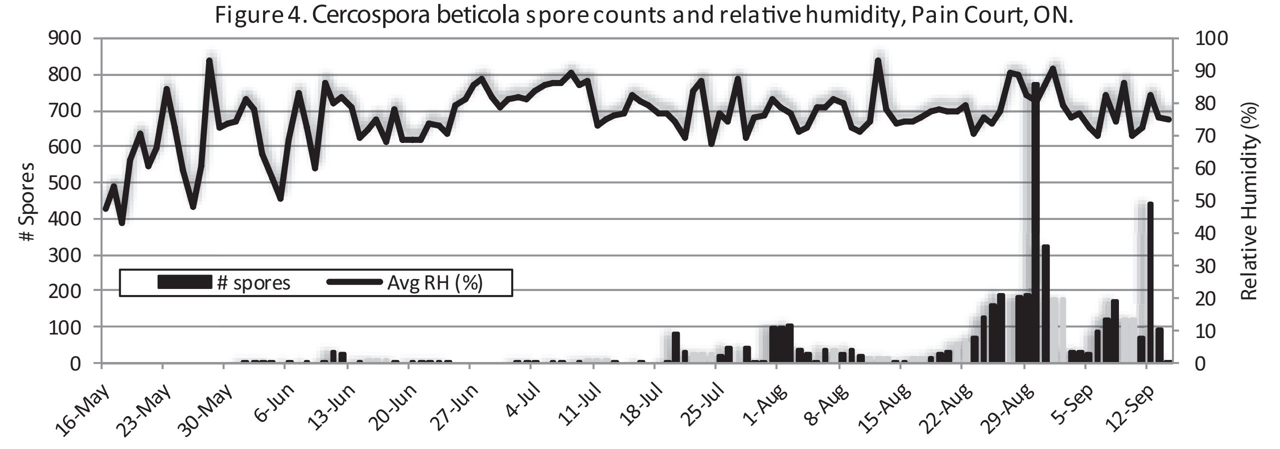
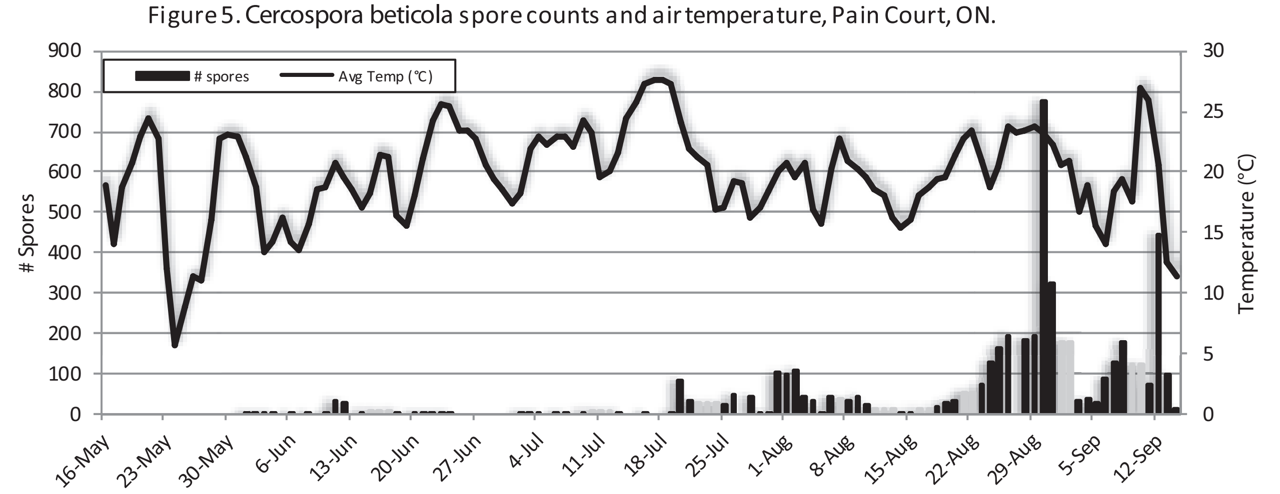


Figure 5. Cercospora beticola spore counts and air temperature, Pain Court, ON.



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

Aphanomyces Quality Experiment

Spartan Acres (Knoerr), Freeland - 2013

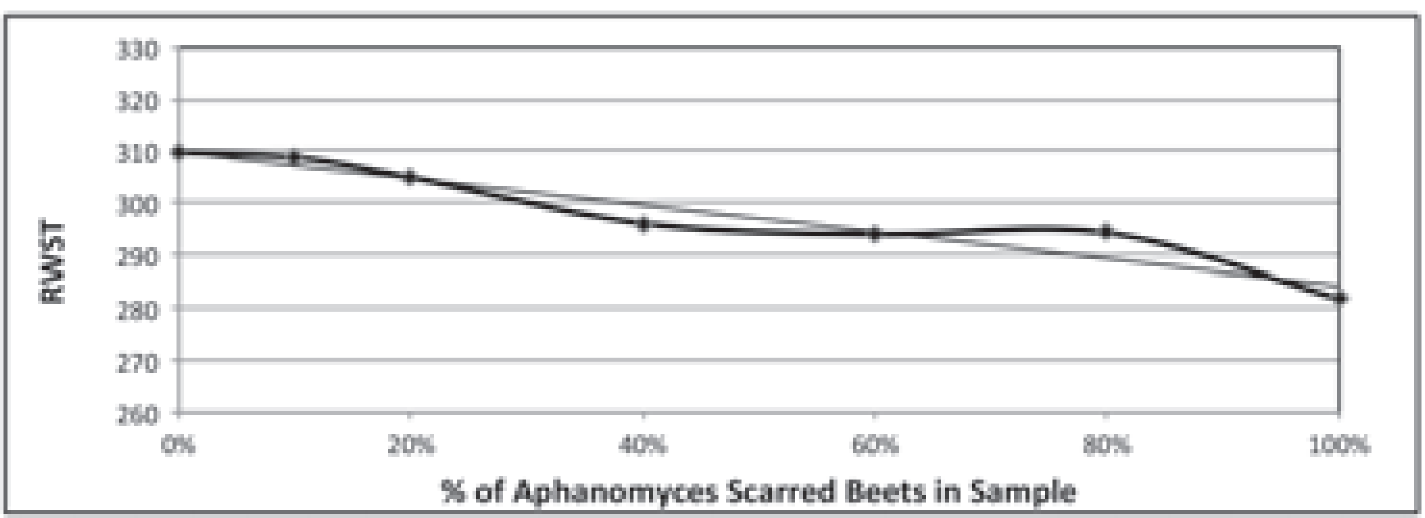
Trial Quality: Good **Planted:** May 8 **Plot Size:** 3 reps

Variety: C-RR074NT **Sampled:** Oct 29 **Prev Crop:** Wheat / Radish

Aphanomyces in the Great Lakes growing area can be a significant problem that will cause die off of sugarbeet seedlings and scarring on roots of mature plants. Currently the disease is managed by early planting, Tachigaron treated seed and plant resistance. This disease is favored by warm wet soil conditions. Plants that are infected as seedlings and survive, have a scarred root (scabby) and wrinkled appearance. Aphanomyces will affect yield and quality depending on the severity.

This study was conducted to examine the impact that Aphanomyces scarred roots (not rotted) have on quality if they are processed. Scarred and healthy beets were collected for beet quality sampling. Each quality sample contained 10 beets. Samples were mixed in 20% increments ranging from zero diseased beets to 100% of the roots having scarring. Aphanomyces scarred roots will significantly affect beet quality as heavier concentrations of diseased beets are included. Recoverable sugar per ton was reduced up to 22 pounds per ton of recoverable sugar and 1.5% in sugar content when all the beets in the sample had significant scarring.

Treatment	RWST	% Sugar	% CJP
0% - No Beets had Significant Scarring	310	20.4	95.8
10% of Beets had Significant Scarring	309	20.4	95.8
20% of Beets had Significant Scarring	305	20.2	95.7
40% of Beets had Significant Scarring	296	19.6	95.7
60% of Beets had Significant Scarring	294	19.5	95.8
80% of Beets had Significant Scarring	294	19.7	95.1
100% of Beets had Significant Scarring	282	18.9	95.2
LSD 5%	14	0.8	0.7
CV %	3	2.4	0.4



Evaluate Seed Treatments (Kabina, Metlock, Rizolex, Maxim) for Rhizoctonia Control in Sugarbeets

Summary

We have been evaluating Kabina (penthiopyrad), Metlock, Rizolex and Maxim seed treatments in sugarbeets for Rhizoctonia control. In general these seed treatments provide effective Rhizoctonia control but will not stand up to heavy Rhizoctonia pressure, and Quadris applications will still be needed in problem areas. Kabina: This product has been tested in Michigan for 5 years. We have determined the rate needed (7 to 14 grams per unit of seed). The 14 gram rate has been better than the 7 gram rate. Results from the Red River Valley and Southern Minnesota have been more positive than our results, however, we feel that Kabina will help control Rhizoctonia, especially in combination with Quadris. Metlock + Rizolex: These fungicide seed treatments from Valent also provide control of Rhizoctonia in sugarbeets. We have less experience with Metlock and Rizolex. This treatment has been reported to slow down emergence and reduce stand, however, we have not found it to be a problem in our trials. In one trial is appeared that emergence was reduced but the late season stand was higher than other treatments, indicating that the Metlock + Rizolex treatment kept more beets from dying. Quadris will be needed in areas with a significant Rhizoctonia problem. We have also tested Maxim from Syngenta. This is another fungicide that controls Rhizoctonia in sugarbeets. We do not have a lot of experience with this product. Overall: These new seed treatments will help control Rhizoctonia in sugarbeets, however, for fields with a history of Rhizoctonia problems Quadris will also be needed.

Evaluate Kabina Seed Treatments For Control Of Rhizoctonia Solani

Crumbaugh, Breckenridge, MI - 2013

Trial Quality:	Fair	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	by Trt
Variety:	by Trt		3.0% OM; 7.1 pH	**Cerc Control:**	Good
Planted:	May 17		Above Opt. Levels: P, K	**Seeding Rate:**	4.1 inch
Harvested:	Sept 17		High: Mn, Low: B	**Other Pests:**	None
Plot Size:	6 rows X 50 ft, 6 reps	**Added N:**	100 lbs	**Rainfall:**	12.3 inches
Row Spacing:	22 inch	**Prev Crop:**	Soybeans		

No	Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
8	Kabina 14 g Quadris IF Apron+Thiram+Tach 20	**$713**	**3919**	**217**	**18.0**	**15.1**	**94.3**
7	Kabina 14 g Apron+Thiram+Tach 20	**$694**	**3815**	**219**	**17.4**	**15.2**	**94.3**
9	Kabina 14 g Quadris IF + Foliar Apron+Thiram+Tach 20	**$693**	**3810**	**216**	**17.6**	**15.1**	**94.0**
2	Quadris IF Apron+Thiram+Tach 20	**$666**	**3663**	**211**	**17.2**	**14.8**	**93.9**
3	Quadris IF + Foliar Apron+Thiram+Tach 20	**$653**	**3590**	**215**	**16.6**	**15.2**	**93.7**
6	Kabina 7 g Quadris IF + Foliar Apron+Thiram+Tach 20	**$615**	**3381**	**211**	**16.0**	**14.9**	**93.6**
5	Kabina 7 g Quadris IF Apron+Thiram+Tach 20	**$610**	**3356**	**211**	**15.9**	**14.8**	**94.1**
4	Kabina 7 g Apron+Thiram+Tach 20	**$586**	**3220**	**210**	**15.3**	**14.8**	**93.8**
1	Apron+Thiram+Tach 20	$578	3182	209	**15.2**	**14.7**	**93.7**
	Average	$642	3533	213	16.5	15.0	94.0
	LSD 5%	133.2	732.3	9.2	ns(3.0)	ns(0.5)	ns(0.7)
	CV %	18.0	18.0	3.8	15.5	2.7	0.6

Evaluate Kabina Seed Treatments
For Control Of Rhizoctonia Solani

Crumbaugh, Breckenridge, MI - 2013

No	Treatment	Total Dead 100 ft	Dead 100 ft Aug 2	Dead 100 ft Aug 30	Stand 100 ft May 30	Stand 100 ft Aug 2	Stand Loss %	Vigor 0-10 July 24	Vigor 0-10 Sept 12
9	Kabina 14 g Quadris IF + Foliar Apron+Thiram+Tach 20	**25.5**	**8.5**	**17.0**	122	**114**	**6.3**	**7.0**	**7.2**
3	Quadris IF + Foliar Apron+Thiram+Tach 20	**28.8**	**12.7**	**16.2**	125	**117**	**6.8**	**6.5**	**7.0**
8	Kabina 14 g Quadris IF Apron+Thiram+Tach 20	**29.5**	**13.5**	**16.0**	**150**	**120**	19.7	**6.5**	**7.2**
6	Kabina 7 g Quadris IF + Foliar	**29.5**	**14.0**	**15.5**	128	**121**	**5.4**	**6.5**	**7.0**
7	Kabina 14 g Apron+Thiram+Tach 20	**33.8**	**14.5**	**19.3**	**145**	**110**	22.7	**6.8**	**6.8**
2	Quadris IF Apron+Thiram+Tach 20	**36.0**	**15.3**	**20.7**	**154**	**110**	28.6	**6.3**	**6.9**
5	Kabina 7 g Quadris IF	**38.0**	19.7	**18.3**	**147**	**111**	24.2	**6.1**	**6.8**
4	Kabina 7 g Apron+Thiram+Tach 20	42.5	18.0	24.5	**148**	**110**	25.3	**6.8**	**7.0**
1	Apron+Thiram+Tach 20	47.5	19.8	27.7	**143**	92	35.8	5.6	**6.3**
	Average	36.6	16.4	20.2	138	109	20.2	6.4	6.8
	LSD 5%	14.7	7.3	8.9	14.0	13.3	8.7	1.1	ns(1.0)
	CV %	34.7	38.8	38.2	8.8	10.6	37.4	14.3	12.6

Comments: We have been evaluating Kabina (penthiopyrad) seed treatment for Rhizoctonia control for several years. The 14 gm rate has provided better results than the 7 gm rate. Kabina reduces Rhizoctonia problems in sugarbeets but Quadris is also needed in areas with significant Rhizoctonia infections. Kabina does not reduce sugarbeet emergence.

Vigor- a higher number is better

$/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 Metlock and Rizolex Seed Treatments in Sugarbeets

Helmreich, Bay City, MI - 2013

Trial Quality: Fair
Variety: by Company
Planted: May 16
Harvested: Sept 16
Plot Size: 6 rows X 50 ft, 5 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam, 2.5 % OM: 7.6 pH, Above Opt. Levels: P, K, High: Mn: Low B
Added N: 95 lbs
Prev. Crop: Soybeans

Rhizoc Control: by trt
Cerc Control: Good
Seed Spacing: 4.1 inches
Problems: Aphanomyces
Rainfall: 10.0 inches

No.	Seed Treatment	Rate	Unit	$/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Metlock	0.016	fl oz/unit	**$725**	**3988**	**226**	**17.5**	**15.3**	**95.7**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
7	Apron XL	0.031	fl oz/unit	**$692**	**3804**	**227**	**16.8**	**15.4**	**95.4**
	Maxim	0.003	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
2	Allegiance	0.016	fl oz/unit	**$632**	**3474**	**227**	**15.3**	**15.2**	**96.0**
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
5	Metlock	0.016	fl oz/unit	**$595**	**3274**	**230**	14.2	**15.4**	**96.1**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	10.69	fl oz/a						
3	Metlock	0.016	fl oz/unit	$563	3097	**218**	14.2	14.7	**95.9**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
4	Metlock	0.016	fl oz/unit	$554	3049	**223**	13.6	**14.9**	**96.2**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	7.125	fl oz/a						
1	Allegiance	0.016	fl oz/unit	$526	2893	217	13.3	**14.9**	95.1
	Tachigaren	1.59	oz wt/unit						
Average				$612	3368	224.0	15.0	15.1	95.8
LSD 5%				142.3	782.8	12.4	3.0	0.6	1.0
CV %				17.8	17.8	4.2	15.4	15.1	95.8

$/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 Metlock and Rizolex Seed Treatments in Sugarbeets

Helmreich, Bay City, MI - 2013

No	Seed Treatment	Rate	Unit	$/A	Early Stand B/100 ft	Final Stand B/100 ft	Early - Final 100 ft	Dead Beets 100 ft	Vigor Rating 0-10
6	Metlock	0.016	fl oz/unit	**$725**	**155**	**144**	**10.2**	**7.2**	**7.6**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
7	Apron XL	0.031	fl oz/unit	**$692**	**167**	**138**	29.2	**13.3**	**7.5**
	Maxim	0.003	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
2	Allegiance	0.016	fl oz/unit	**$632**	**155**	**142**	**12.8**	**11.9**	**7.1**
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
5	Metlock	0.016	fl oz/unit	**$595**	**165**	**157**	**8.5**	**9.4**	**7.2**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	10.69	fl oz/a						
3	Metlock	0.016	fl oz/unit	$563	**159**	**141**	**17.9**	**18.9**	**6.9**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
4	Metlock	0.016	fl oz/unit	$554	**151**	**149**	**1.5**	**16.2**	**6.9**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	7.125	fl oz/a						
1	Allegiance	0.016	fl oz/unit	$526	**169**	**136**	32.4	26.8	**6.8**
	Tachigaren	1.59	oz wt/unit						
Average				$612	160.0	143.9	16.1	14.8	7.1
LSD 5%				142.3	ns(23.6)	ns(21.1)	24.0	14.5	ns(0.8)
CV %				17.8	11.3	11.2	114.7	75.0	8.1

Vigor: a higher number is better

$/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 Metlock and Rizolex Seed Treatments in Sugarbeets

Bebow, Breckenridge, MI - 2013 (Page 1 of 2)

Trial Quality: Good
Variety: by Company
Planted: May 20
Harvested: Oct 23
Plot Size: 6 rows X 50 ft, 4 reps
Row Spacing: 22 inches

Soil Info: Sandy Loam, 2.7 % OM, 6.7 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 120 lbs
Prev Crop: Soybeans

Rhizoc Control: by trt
Cerc Control: Good
Seed Spacing: 4.2 inches
Problems: Some flooding
Rainfall: 14.5 inches

No.	Seed Treatment	Rate	Unit	$/A	RWSA	RWST	T/A	% Sugar	% CJP
6	Metlock	0.016	fl oz/unit	**$1,561**	**8583**	**234**	**36.7**	**15.8**	**95.6**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
5	Metlock	0.016	fl oz/unit	**$1,472**	**8097**	**235**	**34.5**	**16.1**	**94.9**
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	10.69	fl oz/a						
2	Allegiance	0.016	fl oz/unit	**$1,424**	**7833**	**241**	32.4	**16.2**	**95.7**
	Tachigaren	1.59	oz wt/unit						
	Quadris	14.25	fl oz/a						
4	Metlock	0.016	fl oz/unit	$1,404	7723	230	33.6	**15.8**	94.8
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
	Quadris	7.125	fl oz/a						
1	Allegiance	0.016	fl oz/unit	$1,403	7716	228	**33.8**	**15.8**	94.3
	Tachigaren	1.59	oz wt/unit						
7	Apron XL	0.031	fl oz/unit	$1,321	7267	**235**	31.0	**16.0**	94.9
	Maxim	0.003	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
3	Metlock	0.016	fl oz/unit	$1,318	7250	226	32.1	15.4	95.0
	Rizolex	0.031	fl oz/unit						
	Sebring	0.016	fl oz/unit						
	Tachigaren	1.59	oz wt/unit						
Average				$1,415	7781	233	33.4	15.9	95.0
LSD 5%				152.6	839.3	9.5	2.9	0.5	0.6
CV %				7.3	7.3	2.8	5.8	2.1	0.4

$/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.

Evaluate Metlock and Rizolex Seed Treatments in Sugarbeets

Bebow, Breckenridge, MI - 2013

No.	Seed Treatment	Rate	Unit	$/A	Stand Beets / 100 ft June 12	Stand Beets / 100 ft July 9	Stand Beets / 100 ft Aug 1	Dead Beets / 100 ft Aug 1
6	Metlock Rizolex Sebring Tachigaren Quadris	0.016 0.031 0.016 1.59 14.25	fl oz/unit fl oz/unit fl oz/unit oz wt/unit fl oz/a	**$1,561**	152	138	132	**3.3**
5	Metlock Rizolex Sebring Tachigaren Quadris	0.016 0.031 0.016 1.59 10.69	fl oz/unit fl oz/unit fl oz/unit oz wt/unit fl oz/a	**$1,472**	170	148	138	**4.3**
2	Allegiance Tachigaren Quadris	0.016 1.59 14.25	fl oz/unit oz wt/unit fl oz/a	**$1,424**	150	147	134	**4.3**
4	Metlock Rizolex Sebring Tachigaren Quadris	0.016 0.031 0.016 1.59 7.125	fl oz/unit fl oz/unit fl oz/unit oz wt/unit fl oz/a	$1,404	151	138	138	**3.3**
1	Allegiance Tachigaren	0.016 1.59	fl oz/unit oz wt/unit	$1,403	**191**	**176**	**166**	**8.0**
7	Apron XL Maxim Tachigaren	0.031 0.003 1.59	fl oz/unit fl oz/unit oz wt/unit	$1,321	158	132	123	**6.5**
3	Metlock Rizolex Sebring Tachigaren	0.016 0.031 0.016 1.59	fl oz/unit fl oz/unit fl oz/unit oz wt/unit	$1,318	163	151	131	9.0
Average				$1,415	162.0	147.2	137.5	5.5
LSD 5%				152.6	16.0	17.2	18.8	5.1
CV %				7.3	6.7	7.8	9.2	62.2

$/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 Metlock Seed Treatments in Sugarbeets

Crumbaugh, Breckenridge, MI - 2013

Trial Quality: Fair
Variety: by Company
Planted: May 9
Harvested: Sept 17
Plot Size: 6 rows X 50 ft, 3 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam, 3.1% OM: 7.0 pH, Above Opt. Levels: P, K, High: Mn, Low: B
Added N: 95 lbs
Prev Crop: Soybeans

Rhizoc Control: by trt
Cerc Control: Good
Seed Spacing: 4.1 inches
Problems: None
Rainfall: 12.3 inches

No.	Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
4	Metlock + Rizolex Apron XL Thiram Tachigaren Quadris IF and Foliar	**$671**	**3693**	**211**	**17.4**	**14.8**	**93.9**
2	Metlock + Rizolex Apron Thiram Tachigaren	**$616**	**3386**	**213**	**15.9**	**15.0**	**94.0**
3	Metlock + Rizolex Apron Thiram Tachigaren Quadris IF	**$615**	**3381**	**215**	**15.6**	**15.1**	**94.1**
1	Apron Thiram Tachigaren	**$578**	**3182**	**209**	**15.2**	**14.7**	**93.7**
	Average	$620	3411	212.1	16.0	14.9	93.9
	LSD 5%	ns(136.7)	ns (752)	ns (9.0)	ns (3.2)	ns (0.4)	ns (0.9)
	CV %	17.9	17.9	3.5	16.2	2.1	0.8

$/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 Metlock Seed Treatments in Sugarbeets

Crumbaugh, Breckenridge, MI - 2013

No.	Treatment	$/A	Stand Beets / 100 ft May 30	Stand Beets / 100 ft Aug 2	Stand Loss % Aug 2	Dead Beets / 100 ft Aug 2	Dead Beets / 100 ft Aug 30	Vigor Rating 0-10 Sept 12
4	Metlock + Rizolex Apron Thiram Tachigaren Quadris IF and Foliar	**$671**	108.3	**98.2**	**9.8**	**14.3**	**16.5**	**7.0**
2	Metlock + Rizolex Apron Thiram Tachigaren	**$616**	**147.3**	**106.2**	27.2	24.8	27.3	**6.8**
3	Metlock + Rizolex Apron Thiram Tachigaren Quadris IF	**$615**	**140.2**	**96.7**	31.1	**21.7**	**23.8**	**6.4**
1	Apron Thiram Tachigaren	**$578**	**143.0**	**91.5**	35.8	**19.8**	27.7	**6.3**
	Average	$620	134.7	98.1	26.0	20.2	23.8	6.6
	LSD 5%	ns(136.7)	15.3	ns(17.2)	9.8	7.6	9.8	ns(1.0)
	CV %	17.9	9.3	14.3	30.5	30.7	33.6	12.1

Vigor: a higher number is better

$/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.

Metlock Suite Seed Treatment
Hrabal Farms, Breckenridge - 2013

Trial Quality: Excellent
Variety: SX-1211NRR
Planted: May 6
Harv/Samp: Oct 2 / Oct 2
Plot Size: 4 reps
Row Spacing: 30 inch
Seeding Rate: 53,500

Soil Info: Loam
Fertilizer: 2x2: 275# 12-12-12 w/ 2 Mn & 0.5 B; Pre: 120# N by 28%; Variable: Potash
Prev Crop: Corn
Weather: Excessive early rain, dry July

Rhizoc Control: Fair Control: See treatments & 6-8 leaf on all
Cerc Control: Good Control: 1. Eminent + EBDC, 2. Tin + EBDC, 3. Inspire XT + EBDC
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							19 Day	28 Day	
No Metlock & Quadris I.F.	$1,033	**5676**	**278**	**20.4**	**18.3**	**96.4**	**129**	**217**	**41**
Metlock Suite & Quadris I.F.	$995	**5478**	**272**	**20.1**	**18.0**	**96.1**	96	**216**	**38**
No Metlock & No Quadris I.F.	$976	**5367**	**278**	**19.3**	**18.4**	**96.1**	**121**	187	99
Metlock Suite & No Quadris I.F.	$954	**5251**	**278**	**18.9**	**18.3**	**96.1**	**139**	**196**	95
Average	$989	5443	276	19.7	18.2	96.2	121	204	68
LSD 5%	—	ns (375)	ns (9)	ns (1.5)	ns (0.6)	ns (0.3)	34	28	51
CV %	—	4	2	4.6	1.9	0.2	18	9	47

Comments: Trial was conducted to compare Metlock Suite with Rhizolex to the industry standard Apron XL/Thiram seed treatment. The seed was all from the same seed lot and both the Metlock Suite treatments and the No Metlock treatments received Apron XL/Thiram. Both seed treatments were compared with and without Quadris in-furrow (3-4 inch T band, 5.25 oz/acre). Trial received heavy rainfall shortly after emergence causing saturated soil conditions and heavy seedling disease. All treatments did receive Quadris (10.5 oz/acre) at the 6-8 leaf stage. At early emergence (19 day) Metlock Suite combined with in-furrow Quadris did appear to slow emergence. At final emergence both Metlock Suite and standard treatment with in-furrow applied Quadris had better stands than no in-furrow treatments. Early observations indicated less seedling disease with Quadris in-furrow treatments. Rhizoctonia counts in July and August both showed a significant decrease in Rhizoctonia when in-furrow Quadris was used with either seed treatment. Highest tonnage occurred with in-furrow 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.

Metlock Suite Seed Treatment
Wegener Farms, Auburn - 2013

Trial Quality: Excellent
Variety: SX-1211NRR
Planted: May 3
Harv/Samp: Oct 24 / Oct 14
Plot Size: 6 reps
Row Spacing: 30 inch
Seeding Rate: 52,200

Soil Info: Loam
Fertilizer: 2x2: 20 gal. 19-17-0 + Mn; Sidedress: 100# N by 28%
Prev Crop: Corn
Weather: Excess rain early, dry late summer

Rhizoc Control: Excellent Control: See treatments & 6-8 leaf on all
Cerc Control: Good Control: 1. Inspire XT + EBDC, 2. Headline + EBDC, 3. Enable + EBDC
Other Pests: Nematode & Root Aphid

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							10 Day	34 Day	
No Metlock & Quadris I.F.	$1,077	**5930**	**240**	**24.7**	**15.8**	**96.7**	**91**	**248**	**7**
Metlock Suite & No Quadris I.F.	$1,078	**5929**	**241**	**24.6**	**15.9**	**96.8**	**87**	239	**11**
Metlock Suite & Quadris I.F.	$1,068	**5880**	**246**	**23.9**	**16.3**	**96.5**	52	**242**	**8**
No Metlock & No Quadris I.F.	$1,036	**5692**	**238**	**24.0**	**15.7**	**96.6**	**99**	232	**9**
Average	$1,065	5858	241	24.3	15.9	96.6	82	240	9
LSD 5%	—	ns (265)	ns (9)	ns (1.1)	ns (0.6)	ns (0.4)	27	9	ns (8)
CV %	—	4	3	3.6	3.0	0.3	31	4	84

Comments: Trial was conducted to compare Metlock Suite with Rhizolex to the industry standard Apron XL/Thiram seed treatment. The seed was all from the same seed lot and both the Metlock Suite treatments and the No Metlock treatments received Apron XL/Thiram. Both seed treatments were compared with and without Quadris in-furrow. The in-furrow Quadris was applied at 5.5 ounces/acre in 8 gallons/acre of water with 2.5 ounces per acre of Mustang. All treatments did receive Quadris at the 6-8 leaf stage. This trial had fairly low seedling disease. Overall, the stands were excellent. The Metlock Suite & Quadris I.F. treatment slowed early emergence, but did not reduce final stand. The best final emergence was seen with the Quadris I.F. treatments. With excellent stands and very low Rhizoctonia, no significant differences were measured in yield or 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.

Metlock Suite Seed Treatment
Randy Sturm Farms, Pigeon - 2013

Trial Quality: Good
Variety: SX-1211NRR
Planted: May 2
Harv/Samp: Oct 11 / Oct 1
Plot Size: 6 reps
Row Spacing: 28 inch
Seeding Rate: 56,000

Soil Info: Clay Loam
Fertilizer: Broadcast P & K; Pre Broadcast: 55# N + micros; Sidedress: 55#N
Prev Crop: Soybeans
Weather: Wet early, dry summer

Rhizoc Control: Good Control: Quadris 6-8 Leaf
Cerc Control: Good Control: 1: Proline + EBDC, 2. Gem + EBDC, 3. Eminent
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of Row		Dead Beets / 1200 Ft
							12 Day	28 Day	
Metlock Suite	$1,255	**6894**	**272**	**25.4**	**18.0**	**96.1**	**53**	**236**	**15**
Check	$1,257	**6853**	**279**	**24.8**	**18.5**	**96.0**	**29**	**230**	**15**
Average	$1,256	6874	276	25.1	18.2	96.1	41	233	15
LSD 5%	—	ns (813)	ns (11)	ns (2.6)	ns (0.6)	ns (0.3)	ns (41)	ns (14)	ns (13)
CV %	—	7	3	5.9	2.2	0.2	68	4	67

Comments: Trial was conducted to compare Metlock Suite with Rhizolex to the industry standard Apron XL/Thiram seed treatment. The seed was all from the same seed lot and both the Metlock Suite treatment and the No Metlock treatment (check) received Apron XL/Thiram. Quadris was applied only at the 6-8 leaf stage. Observations and stand counts indicated no significant differences in speed of emergence, seedling disease or final stand. There was no difference in yield, quality or Rhizoctonia counts taken in August.

$/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.

Planting Rate on Sandy Soil

LAKKE Ewald Farms, Akron - 2013

Trial Quality: Good
Variety: B-18RR4N
Planted: May 8
Harv/Samp: Oct 28 / Oct 10
Plot Size: 6 reps
Row Spacing: 20 inch
Seeding Rate: See Treatments

Soil Info: Sandy Loam
Fertilizer: 2x2: 39-0-0-9S + 1 qt Mn, 1 pt B; PP: 125# N
Prev Crop: Corn
Weather: Dry summer

Rhizoc Control: Good Control: Quadris I.F. (7 oz) & Foliar (14)
Cerc Control: Good Cont: 1. Proline + EBDC, 2. Super Tin + EBDC, 3. Inspire + EBDC, 4. Super Tin
Other Pests: Mustang I.F. & Foliar

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 45 Day
Low Rate 55,500 (5.65 inch)	$1,301	**7152**	**293**	**24.5**	**19.1**	**96.4**	157
Mid Rate 65,500 (4.79 inch)	$1,267	**6982**	**291**	**24.0**	**19.0**	**96.5**	195
High Rate 75,500 (4.15 inch)	$1,248	**6882**	**293**	**23.4**	**19.2**	**96.5**	218
Average	$1,272	7005	292	24.0	19.1	96.5	190
LSD 5%	—	ns (592)	ns (10)	ns (2.0)	ns (0.5)	ns (0.3)	11
CV %	—	7	3	6.5	2.2	0.2	5

Comments: Trial was conducted to evaluate the effect of different populations on sandy type soils. Some field/soil type variation was in the trial area. Emergence at 45 days averaged about 75% of the planted seeding rate. The low rate established 41,625, mid rate 49,125 and high rate 56,625 plants/acre in 20 inch rows. No significant differences in yield or quality were shown between the populations. High population beets can produce more small beets (carrots) which may not be recovered at harvest.

$/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.

Lime Trial

Average 6 Locations, 2012-2013

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 0-10
12 Tons/Acre	**$1,571**	**7482**	**269**	**27.5**	**17.9**	**95.8**	**205**	**1.6**	**8.3**
8 Tons/Acre	**$1,563**	**7396**	**268**	**27.3**	**17.8**	**95.8**	**203**	**2.1**	**8.1**
4 Tons/Acre	**$1,520**	7163	**269**	26.3	**17.9**	**95.7**	**197**	**2.4**	**8.2**
6 Tons/Acre	**$1,517**	7165	**270**	26.2	**17.9**	**95.8**	**198**	**2.9**	**8.2**
2 Tons/Acre	$1,504	7080	**267**	26.3	**17.8**	**95.8**	**194**	**2.4**	**8.1**
0 Tons/Acre	$1,449	6775	**266**	25.2	**17.7**	**95.7**	191	**2.3**	8.0
Average	$1,521	7177	268	26.5	17.8	95.8	198	2.3	8.2
LSD 5%	68.6	313.4	ns(3.6)	1.2	ns(0.2)	ns(0.1)	9.3	ns(1.4)	0.2
CV %	3.8	3.7	1.1	3.7	1.0	0.2	3.9	52.5	2.5

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test					
					Percent				ppm	
		Year 1	Year 2	Change	P	K	Mg	Ca	Mn	Bn
12 Tons/Acre	**$1,571**	**7.7**	**8.0**	**0.29**	**0.22**	**4.6**	**0.24**	0.78	**11.8**	**30.4**
8 Tons/Acre	**$1,563**	**7.6**	**7.9**	0.27	**0.23**	**4.7**	**0.23**	**0.83**	**11.9**	**31.0**
4 Tons/Acre	**$1,520**	**7.6**	**7.8**	0.17	**0.22**	**4.6**	**0.23**	**0.85**	**12.2**	30.3
6 Tons/Acre	**$1,517**	**7.7**	**7.9**	0.26	0.21	**4.5**	**0.23**	**0.86**	11.7	**30.7**
2 Tons/Acre	$1,504	**7.7**	7.7	0.04	**0.22**	**4.6**	**0.24**	**0.82**	**12.6**	30.1
0 Tons/Acre	$1,449	**7.6**	7.4	-0.02	**0.22**	4.3	**0.23**	0.79	**13.9**	**30.4**
Average	$1,521	7.6	7.8	0.01	0.22	4.6	0.23	0.82	12.4	30.5
LSD 5%	55.0	ns(.07)	0.5	0.25	0.01	0.2	ns(0.02)	0.1	0.8	0.6
CV %	3.8	0.8	0.6	161.7	4.65	3.4	6.3	6.0	5.42	1.6

Comments: We have been evaluating factory lime in sugarbeets for the past 2 years (6 trials). Another 3 trials were established in the fall of 2013 for a total of 9 trials over 3 years. The lime rates are: 0, 2, 4, 6, 8 and 12 tons of lime per acre. The trials will be evaluated until sugarbeets are planted again. The lime treatments improved sugarbeet emergence and yield (6 trials). The soil pH increased marginally (.02 points at 12 tons). Manganese levels in sugarbeet petioles decreased from 15 to 13 ppm. Sugarbeet yield increases were rate related with 12 tons having the highest yields.

Vigor- a higher number is better

$/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.

Lime Trial

Average 3 Locations - 2013

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 0-10
12 Tons/Acre	**$1,090**	**6144**	**242**	**25.4**	**16.4**	**95.3**	**206**	2.2	**8.2**
2 Tons/Acre	**$1,081**	**5972**	**241**	**24.9**	**16.3**	**95.3**	187	**3.2**	7.8
8 Tons/Acre	**$1,075**	**6013**	**243**	**24.8**	**16.3**	**95.5**	**197**	**3.5**	**8.0**
4 Tons/Acre	**$1,069**	**5930**	**244**	**24.3**	**16.5**	95.3	187	**4.2**	**7.9**
6 Tons/Acre	**$1,054**	5875	**244**	24.1	**16.5**	**95.4**	**191**	**5.2**	**7.9**
0 Tons/Acre	$1,016	5588	**237**	23.5	16.1	**95.3**	180	**3.6**	7.5
Average	$1,064	5920	242	24.5	16.4	95.4	191	3.7	7.9
LSD 5%	56.6	311.5	ns(6.7)	1.2	0.4	0.2	16.3	2.7	0.4
CV %	4.5	4.4	2.3	4.0	1.9	0.2	7.2	61.3	4.7

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test					
					Percent				ppm	
		2012	2013	Change	P	K	Mg	Ca	Mn	Bn
12 Tons/Acre	**$1,090**	**7.6**	**8.0**	**0.35**	**0.19**	**5.4**	**0.25**	0.84	13.2	**31.5**
2 Tons/Acre	**$1,081**	**7.6**	7.6	0.05	**0.19**	**5.3**	**0.25**	0.83	13.7	**31.6**
8 Tons/Acre	**$1,075**	**7.6**	**7.9**	**0.33**	**0.19**	**5.3**	**0.24**	**0.91**	13.2	**32.0**
4 Tons/Acre	**$1,069**	**7.6**	**7.8**	0.24	**0.19**	**5.3**	**0.24**	**0.92**	13.6	**31.4**
6 Tons/Acre	**$1,054**	**7.6**	**7.9**	**0.34**	**0.19**	**5.3**	**0.25**	**0.92**	12.5	**31.3**
0 Tons/Acre	$1,016	**7.6**	7.2	-0.36	**0.19**	4.9	**0.24**	**0.87**	**15.1**	**31.4**
Average	$1,064	7.6	7.8	0.16	0.19	5.2	0.24	0.88	13.5	31.5
LSD 5%	56.6	ns(.05)	0.1	0.06	ns(.02)	0.4	ns(.04)	ns(.06)	1.1	ns(1.0)
CV %	4.5	0.6	0.6	31.5	8.40	6.7	9.15	6.13	6.6	2.8

Vigor- a higher number is better

$/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

Lime Trial

Spero, South Saginaw, MI - 2013

Trial Quality:	Very Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc. Control:**	Good
Variety:	HM-28RR		3.9% OM: 7.3 pH	**Cerc. Control:**	Good
Planted:	May 8		Above Opt Levels: P, K	**Problems:**	None
Harvested:	Sept 24		High: Mn, Low: B	**Seed Spacing:**	4.4 inches
Plot Size:	6 rows X 50 ft, 6 reps	**Added N:**	125 lbs.	**Rainfall:**	14.3 inches
Row Spacing:	22 inch	**Prev Crop:**	Wheat/Clover		

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 0-10
8 Tons/Acre	**$1,351**	**7534**	**253**	**29.8**	**16.8**	**96.0**	**160**	**0.1**	**8.3**
6 Tons/Acre	**$1,320**	**7335**	**254**	**28.9**	**16.9**	**96.0**	**155**	**0.1**	**8.1**
12 Tons/Acre	**$1,316**	**7389**	**248**	**29.8**	**16.7**	**95.6**	**171**	0.0	**8.3**
4 Tons/Acre	**$1,315**	**7281**	**258**	28.3	**17.1**	**96.0**	**162**	0.0	**8.2**
2 Tons/Acre	**$1,297**	**7159**	244	**29.3**	16.4	**95.7**	**162**	0.0	**8.1**
0 Tons/Acre	$1,258	6918	**249**	27.9	**16.6**	**95.9**	**163**	**0.3**	**8.2**
Average	$1,310	7269	251	29.0	16.8	95.9	162	0.1	8.2
LSD 5%	69.6	383.0	11.4	1.4	0.6	ns(0.6)	ns(25.4)	0.3	ns(0.7)
CV %	4.5	4.4	3.8	4.1	3.0	0.5	13.1	300.7	7.5

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test- August 19					
		Nov 15 2012	Aug 13 2013	Change	Percent				ppm	
					P	K	Mg	Ca	Mn	Bn
8 Tons/Acre	**$1,351**	**7.9**	8.1	**0.28**	**0.15**	**4.5**	**0.28**	0.62	11.5	**30.5**
6 Tons/Acre	**$1,320**	**7.8**	8.1	**0.35**	**0.13**	**4.2**	**0.35**	**0.68**	12.0	**29.2**
12 Tons/Acre	**$1,316**	**7.9**	**8.2**	**0.38**	**0.15**	**4.6**	**0.33**	0.60	12.0	**29.9**
4 Tons/Acre	**$1,315**	**7.8**	8.0	0.20	**0.14**	**4.2**	**0.30**	0.63	**12.7**	**29.0**
2 Tons/Acre	**$1,297**	**7.8**	8.0	0.13	0.11	**4.6**	**0.35**	**0.76**	**13.0**	**30.0**
0 Tons/Acre	$1,258	**7.8**	7.8	0.00	0.12	**4.1**	**0.28**	0.70	**14.2**	**30.2**
Average	$1,310	7.8	8.1	0.22	0.13	4.4	0.31	0.66	12.6	29.8
LSD 5%	69.6	ns(0.1)	0.1	0.12	0.02	ns(0.7)	ns(.07)	0.10	1.7	ns(1.8)
CV %	4.5	0.9	1.0	42.9	14.8	14.1	19.2	12.6	11.1	5.0

Comments: The addition of lime improved sugarbeet yields in this trial. Lime was applied Nov 2012 and sugarbeets were planted the spring of 2013. The soil pH increased and manganese levels decreased in the lime treatments. The sugarbeet stand was not affected by lime treatments. The disease level was low and there were no differences between treatments.

Vigor- a higher number is better

$/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.

Lime Trial

Crumbaugh, Breckenridge, MI 2013

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc. Control:**	Fair
Variety:	HM-28RR		3.1% OM, 7.0 pH	**Cerc. Control:**	Good
Planted:	May 17		Above Opt Levels: P, K	**Problems:**	None
Harvested:	Sept 21		High: Mn, Low: B	**Seed Spacing:**	4.1 inches
Plot Size:	6 rows X 50 ft, 6 reps	**Added N:**	100 lbs	**Rainfall:**	12.3 inches
Row Spacing:	22 inches	**Prev Crop:**	Soybeans		

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 0-10
12 Tons/Acre	**$1,085**	**6120**	**230**	**26.6**	**15.5**	**95.6**	**223**	**4.3**	**8.5**
2 Tons/Acre	**$1,064**	**5876**	**228**	**25.8**	**15.6**	**95.1**	178	**7.2**	7.7
8 Tons/Acre	**$1,037**	**5805**	**225**	**25.9**	**15.3**	**95.2**	**206**	**8.2**	**8.0**
4 Tons/Acre	**$1,022**	**5671**	**225**	**25.2**	**15.4**	94.9	180	**10.5**	**8.0**
6 Tons/Acre	**$1,003**	5596	**230**	24.4	**15.6**	**95.2**	191	13.3	**7.9**
0 Tons/Acre	$957	5265	**220**	23.9	**15.1**	94.8	162	**7.5**	6.9
Average	$1,028	5722	226	25.3	15.4	95.1	190	8.5	7.8
LSD 5%	91.7	504.4	ns(13.5)	1.8	ns(0.7)	0.6	26.2	7.4	0.7
CV %	7.5	7.4	5.0	6.1	4.1	0.5	11.6	74	7.2

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test - August 12					
					Percent				ppm	
		Nov 15 2012	Sep 9 2013	Change	P	K	Mg	Ca	Mn	Bn
12 Tons/Acre	**$1,085**	**7.4**	**7.8**	**0.40**	**0.18**	4.8	**0.25**	1.22	**18.5**	**35.8**
2 Tons/Acre	**$1,064**	**7.4**	7.1	-0.22	**0.17**	**4.9**	0.24	1.09	**19.2**	**34.2**
8 Tons/Acre	**$1,037**	**7.4**	**7.8**	**0.37**	**0.15**	**5.3**	**0.27**	**1.42**	**19.5**	**37.0**
4 Tons/Acre	**$1,022**	**7.4**	**7.7**	**0.32**	**0.17**	**5.0**	**0.27**	**1.40**	**19.7**	**35.8**
6 Tons/Acre	**$1,003**	**7.4**	**7.8**	**0.42**	**0.15**	**5.1**	**0.26**	**1.41**	16.9	**35.5**
0 Tons/Acre	$957	**7.4**	6.3	-1.10	**0.16**	4.6	**0.27**	1.21	**19.0**	32.2
Average	$1,028	7.4	7.4	0.03	0.16	5.0	0.26	1.29	18.8	35.1
LSD 5%	93.8	ns(0.1)	0.2	0.18	ns(.03)	0.4	0.03	0.19	2.1	2.0
CV %	7.5	0.9	1.8	482.6	16.6	6.3	8.7	12.4	9.3	4.8

Comments: Sugarbeet yield, quality and stand increased with lime applications. Lime was applied Nov 2012 and sugarbeets were planted spring of 2013. There were no differences in disease levels. pH levels increased in the lime treatments.

Vigor- a higher number is better

$/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.

Lime Trial
Helmreich, Bay City, MI 2013

Trial Quality: Fair
Variety: HM-28RR
Planted: May 16
Harvested: Sept 16
Plot Size: 6 rows X 50 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Loam
2.5% OM, 7.6 pH
Above Opt Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev Crop: Soybeans

Rhizoc. Control: Good
Cerc. Control: Good
Problems: None
Seed Spacing: 4.1 inches
Rainfall: 10.0 inches

Treatment	Net $/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100'	Dead B/100'	Vigor 0-10
2 Tons/Acre	**$882**	**4879**	**250**	**19.5**	**16.9**	**95.2**	**220**	**2.4**	**7.7**
4 Tons/Acre	**$870**	**1834**	**249**	**19.4**	**16.9**	**94.9**	**220**	**2.1**	**7.5**
12 Tons/Acre	**$868**	**4924**	**249**	**19.8**	**16.9**	**94.9**	**224**	**2.4**	**7.8**
6 Tons/Acre	**$840**	**4693**	**247**	**18.9**	**16.8**	**94.9**	**226**	**2.3**	**7.7**
8 Tons/Acre	**$836**	**4700**	**250**	**18.8**	**16.9**	**95.3**	**226**	**2.3**	**7.7**
0 Tons/Acre	**$833**	**4579**	**244**	**18.7**	**16.6**	**95.1**	**217**	**3.2**	**7.4**
Average	$855	4768	248	19.2	16.9	95.1	222	2.4	7.6
LSD 5%	ns(121)	ns(663)	ns(7.8)	ns(2.2)	ns(0.5)	ns(0.5)	ns(22.7)	ns(2.6)	0.4
CV %	11.9	11.7	2.7	9.8	2.3	0.5	8.6	91	4.5

Lime Trial - pH & Nutrients

Treatment	Net $/A	pH			Tissue Test - August 12					
		Nov 15 2012	Aug 13 2013	Change	Percent				ppm	
					P	K	Mg	Ca	Mn	Bn
2 Tons/Acre	**$882**	**7.6**	**7.9**	**0.23**	**0.29**	**6.3**	**0.16**	**0.65**	8.8	**30.5**
4 Tons/Acre	**$870**	**7.6**	**7.8**	0.22	**0.27**	**6.7**	**0.15**	**0.72**	8.5	29.5
12 Tons/Acre	**$686**	**7.7**	**7.9**	**0.28**	**0.24**	**6.6**	**0.18**	**0.71**	9.0	28.6
6 Tons/Acre	**$840**	**7.6**	**7.9**	**0.27**	**0.28**	**6.5**	**0.15**	**0.66**	8.7	29.2
8 Tons/Acre	**$836**	**7.6**	**7.9**	**0.33**	**0.28**	**6.0**	**0.16**	**0.69**	8.5	28.6
0 Tons/Acre	**$833**	**7.6**	7.6	0.02	**0.28**	**6.1**	**0.17**	**0.70**	**12.0**	**32.0**
Average	$855	7.6	7.8	0.23	0.27	6.4	0.16	0.69	9.3	29.7
LSD 5%	ns(121)	0.1	0.1	0.10	ns(.06)	ns(1.05)	ns(.03)	ns(.16)	1.8	1.8
CV %	11.9	1.2	1.1	38.7	18.8	13.9	15.3	20.1	16.2	5.1

Comments: There was a trend towards lime treatments having higher yields, quality and stand but the differences were not statistically significant. It appeared that pH levels were higher with lime treatments and manganese and boron levels were somewhat lower with lime treatments.

Vigor- a higher number is better

$/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.

Gypsum Application Over the Row at Planting

Average of 5 Locations - 2012-2013

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand B/100’
No Gypsum	**$1,304**	**5955**	**244**	**24.6**	**16.8**	**94.4**	**171**
Gypsum	**$1,244**	**5690**	**245**	**23.6**	**16.9**	**94.2**	**170**
Average	$1,274	5823	245	24.1	16.8	94.3	171
LSD 5%	ns(75.5)	ns(332.4)	ns(2.6)	ns(1.5)	ns(0.2)	ns(0.2)	ns(13.3)
CV %	3.4	3.3	0.6	3.6	0.8	0.1	4.5

Comments: The five trials over two years have shown no advantage to spreading gypsum over the row at planting for emergence or final production. Some locations had easy emergence conditions but two locations were more challenging and there was also no benefit at these locations.

$/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.

Gypsum Application Over Row at Planting
Blumfield, MI - 2013

Trial Quality: Good
Variety: B-17RR32
Planted: May 6
Harvested: Sept 25
Plot Size: 4 rows X 35 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
2.7% OM; 7.7 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev Crop: Soybeans

Rhizoc Control: Good, Quadris 6-8 lf
Cerc Control: Good Control, 4 Applications
Seeding Rate: 4.4 inches
Other Pests: None
Rainfall: 15.2 inches

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Emerg B/100' May 31	Emerg B/100' June 14	Emerg B/100' Aug 20	Dead B/100' Sept 9
No Gypsum	**$730**	**4017**	**316**	**12.7**	**20.9**	**95.6**	**130**	**132**	**171**	**1.0**
2 Ton/A Gypsum	**$671**	**3689**	**313**	**12.1**	**20.6**	**95.5**	**128**	**128**	**169**	**2.0**
Average	$701	3853	314	12.4	20.8	95.6	129	130	170	1.5
LSD 5%	ns(99)	ns(547)	ns(22.5)	ns(1.2)	ns(1.1)	ns(0.8)	ns(12.4)	ns(12.9)	ns(17.5)	ns(1.7)
CV %	8.9	8.9	4.5	6.4	3.3	0.5	6.5	6.7	7.0	78.4

Gypsum Application Over Row at Planting
Maust, Pigeon, MI - 2013

Trial Quality: Good
Variety: B-18RR4N
Planted: June 20
Harvested: Oct 1
Plot Size: 4 rows X 35 ft, 6 reps
Row Spacing: 22 inch

Soil Info: Sandy Clay Loam
3.2% OM; 7.0 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev Crop: Wheat/Clover

Rhizoc Control: Good, Quadris 6-8 lf
Cerc Control: Low level disease
Seeding Rate: 4.4 inches
Other Pests: Low level Cyst nematodes
Rainfall: 9.0 inches

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Emerg B/100' May 31	Emerg B/100' June 14	Dead B/100' Sept 9
2 Ton/A Gypsum	**$1,010**	**5553**	**201**	**27.8**	**14.6**	**92.4**	**109**	**112**	**0.2**
1 Ton/A Gypsum	**$1,009**	**5550**	**211**	**26.4**	**15.1**	**93.0**	**108**	**112**	**1.7**
No Gypsum	**$990**	**5446**	**205**	**26.6**	**14.8**	**92.9**	**98**	**95**	**0.5**
Average	$1,003	5516	206	27.0	14.8	92.8	105	107	0.8
LSD 5%	ns(322)	ns(1774)	ns(19.6)	ns(9.8)	ns(1.0)	ns(1.7)	ns(23.5)	ns(29.8)	ns(3.8)
CV %	18.6	18.6	5.5	21.1	3.8	1.1	12.9	16.2	266.1

$/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.

Evaluate Redline Applied In-Furrow and 2 X 2 in Sugarbeets

Average of 2 Locations - 2013 (Page 1 of 3)

Trial Quality:	Good	**Rhizoc Control:**	Good
Variety:	SX-1291RR	**Cerc Control:**	Good, 4 Apps
		Seeding Rate:	4.1 inches

No No	Treatment	Rate/A	Appl Code	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino	Beets/ 100 ft	Vigor 0-10
7	UAN 28% N 10-34-0 UAN 28% N	13 gal 7 gal 34 gal	2X2 2X2 4-6 lf	**$1,371**	**7542**	**249**	**30.1**	**16.7**	**95.8**	3.4	206	**8.4**
6	Redline SourceMan 5 UAN 28% N 10-34-0 UAN 28% N	2 gal 1 qt 13 gal 7 gal 26 gal	In-Fur In-Fur 2X2 2X2 4-6 lf	**$1,326**	**7295**	**252**	**28.7**	**16.9**	**95.6**	4.1	207	**8.7**
1	UAN 28% N 10-34-0 UAN 28% N	13 gal 7 gal 26 gal	2X2 2X2 4-6 lf	**$1,300**	**7152**	**250**	**28.2**	**16.8**	**95.7**	3.3	200	**8.3**
2	Redline SourceMan 5 UAN 28% N UAN 28% N	3 gal 1 qt 13 gal 28 gal	2X2 2X2 2X2 4-6 lf	**$1,286**	**7076**	**249**	**28.2**	**16.7**	**95.6**	3.3	**213**	**8.7**
5	WC101 SourceMan 5 UAN 28% N	10 fl oz 1 qt 42 gal	In-Fur In-Fur 4-6 lf	**$1,282**	**7050**	**252**	**27.9**	**16.8**	**95.8**	3.2	**217**	**8.2**
4	Redline SourceMan 5 UAN 28% N	3 gal 1 qt 41 gal	In-Fur In-Fur 4-6 lf	**$1,265**	**6959**	**251**	**27.6**	**16.8**	**96.0**	**2.6**	**212**	**8.4**
9	UAN 28% N Nitrogen Stabilizer	42 gal	4-6 lf 4-6 lf	**$1,261**	**6938**	**250**	**27.6**	**16.7**	**95.9**	2.9	210	**8.3**
3	Redline SourceMan 5 UAN 28% N	2 gal 1 qt 41 gal	In-Fur In-Fur 4-6 lf	$1,223	6724	247	**27.1**	16.6	**95.8**	3.1	**217**	**8.4**
8	UAN 28% N	42 gal	4-6 lf	$1,222	6719	**249**	26.8	**16.7**	**95.7**	3.0	**223**	**8.4**
10	Untreated Check			$1,170	6438	**257**	24.8	**17.1**	**96.0**	**1.8**	**216**	7.8
Average				$1,271	6989	251	27.7	16.8	95.8	3.1	212	8.4
LSD 5%				129.6	713.0	9.5	3.1	0.5	ns(0.4)	0.9	11.2	0.5
CV %				4.5	4.5	1.7	4.9	1.4	0.2	13.5	2.3	2.9

Comments: Redline is a starter fertilizer that is used in other regions. Redline contains 6% N, 12% P, 2% K and chelated micro-nutrients. Redline appeared to improve sugarbeet yield in these trials and did not lower sugarbeet emergence.

Vigor- a higher number is better

$/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 Applied In-Furrow and 2 X 2 in Sugarbeets

Hunger Relief, Elkton, MI - 2013

Trial Quality:	Good	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	SX-1291RR		2.2% OM; 7.5 pH	**Cerc Control:**	Good, 4 Apps
Planted:	May 4		Above Opt. Levels: P, K	**Seeding Rate:**	4.1 inches
Harvested:	Oct 1		High: Mn, Low: B	**Other Problems:**	None
Plot Size:	6 rows x 40 ft, 6 reps	**Added N:**	Treatments		
Row Spacing:	22 inch	**Prev Crop:**	Soybeans	**Rainfall:**	16.2 inches

No	Treatment	Rate/A	Appl	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino	Beets/ 100 ft	Vigor 0-10
1	UAN 28% N	13 gal	2X2	**$1,589**	**8740**	**275**	**31.7**	**18.4**	**95.6**	**3.5**	166	**8.3**
	10-34-0	7 gal	2X2									
	UAN 28% N	26 gal	4-6 lf									
7	UAN 28% N	13 gal	2X2	**$1,584**	**8714**	266	**32.8**	17.9	95.3	4.5	**182**	**8.6**
	10-34-0	7 gal	2X2									
	UAN 28% N	34 gal	4-6 lf									
6	Redline	2 gal	In-Fur	**$1,581**	**8697**	268	**32.4**	18.0	**95.4**	4.5	**183**	**8.8**
	SourceMan 5	1 qt	In-Fur									
	UAN 28% N	13 gal	2X2									
	10-34-0	7 gal	2X2									
	UAN 28% N	26 gal	4-6 lf									
2	Redline	3 gal	2X2	**$1,498**	**8237**	**274**	30.1	**18.3**	**95.5**	**3.7**	**192**	**8.5**
	SourceMan 5	1 qt	2X2									
	UAN 28% N	13 gal	2X2									
	UAN 28% N	28 gal	4-6 lf									
9	UAN 28% N	42 gal	4-6 lf	$1,475	8114	**270**	30.0	18.0	**95.8**	**3.3**	**184**	**8.3**
	Nitrogen Stabilizer		4-6 lf									
8	UAN 28% N	42 gal	4-6 lf	$1,460	8032	267	30.1	17.9	**95.4**	**3.8**	**200**	**8.3**
5	WC101	10 fl oz	In-Fur	$1,441	7928	**274**	28.9	**18.2**	**95.8**	**3.7**	**191**	**8.1**
	SourceMan 5	1 qt	In-Fur									
	UAN 28% N	42 gal	4-6 lf									
4	Redline	3 gal	In-Fur	$1,438	7908	**274**	28.9	**18.2**	**95.8**	**3.4**	**186**	**8.1**
	SourceMan 5	1 qt	In-Fur									
	UAN 28% N	41 gal	4-6 lf									
3	Redline	2 gal	In-Fur	$1,399	7696	269	28.6	18.0	**95.6**	**3.7**	**190**	**8.1**
	SourceMan 5	1 qt	In-Fur									
	UAN 28% N	41 gal	4-6 lf									
10	Untreated Check			$1,354	7445	**278**	26.8	**18.5**	**95.7**	**2.9**	**189**	7.5
	Average			$1,482	8151	272	30.0	18.1	95.6	3.7	186	8.2
	LSD 5%			112.9	620.7	8.2	2.1	0.5	0.5	1.0	19.0	0.7
	CV %			6.5	6.5	2.6	6.0	2.2	0.5	23.7	8.8	7.2

Vigor- a higher number is better

$/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 Applied In-Furrow and 2 X 2 in Sugarbeets

Roggenbuck, Ruth, MI - 2013

Trial Quality: Good
Variety: SX-1291RR
Planted: June 4
Harvested: Oct 16
Plot Size: 6 rows X 38 ft, 4 reps
Row Spacing: 22 inch

Soil Info: Loam
3.1% OM: 7.6 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: Manure + Tmts
Prev Crop: Dry Beans

Rhizoc Control: Good
Cerc Control: Good, 4 Apps
Other Problems: None
Seeding Rate: 4.1 inches
Rainfall: 11.4 inches

No	Treatment	Rate/A	Appl	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino	Beets/ 100 ft	Vigor 1-10	Color 1-10
7	UAN 28% N 10-34-0 UAN 28% N	13 gal 7 gal 34 gal	2X2 2X2 4-6 lf	**$1,158**	**6370**	**232**	**27.4**	**15.5**	**96.3**	2.3	230	8.2	**6.6**
5	WC101 SourceMan 5 UAN 28% N	10 fl oz 1 qt 42 gal	In-Fur In-Fur 4-6 lf	**$1,122**	**6172**	**230**	**26.9**	**15.5**	95.8	2.7	**242**	**8.4**	6.0
4	Redline SourceMan 5 UAN 28% N	3 gal 1 qt 41 gal	In-Fur In-Fur 4-6 lf	**$1,093**	**6009**	**229**	**26.2**	**15.3**	**96.3**	**1.8**	**238**	**8.6**	6.0
2	Redline SourceMan 5 UAN 28% N UAN 28% N	3 gal 1 qt 13 gal 28 gal	2X2 2X2 2X2 4-6 lf	**$1,075**	**5915**	**224**	**26.4**	**15.1**	95.8	2.9	234	**8.8**	6.1
6	Redline SourceMan 5 UAN 28% N 10-34-0 UAN 28% N	2 gal 1 qt 13 gal 7 gal 26 gal	In-Fur In-Fur 2X2 2X2 4-6 lf	**$1,071**	**5893**	**236**	24.9	**15.9**	95.8	3.6	232	**8.6**	**6.3**
9	UAN 28% N N Stabilizer	42 gal	4-6 lf 4-6 lf	$1,048	5762	**229**	25.2	**15.3**	**96.1**	2.6	236	**8.3**	**6.3**
3	Redline SourceMan 5 UAN 28% N	2 gal 1 qt 41 gal	In-Fur In-Fur 4-6 lf	$1,046	5752	**226**	25.5	**15.2**	**96.0**	2.5	**245**	**8.7**	**6.2**
1	UAN 28% N 10-34-0 UAN 28% N	13 gal 7 gal 26 gal	2X2 2X2 4-6 lf	$1,012	5565	**226**	24.7	**15.2**	95.8	3.0	235	**8.3**	**6.3**
10	Untreated			$987	5430	**236**	22.9	**15.8**	**96.2**	**0.8**	**244**	8.1	5.3
8	UAN 28% N	42 gal	4-6 lf	$983	5406	**230**	23.5	**15.5**	**96.0**	2.2	**246**	**8.6**	6.0
Average				$1,060	5827	229.8	25.6	15.4	96.0	2.4	238	8.5	6.1
LSD 5%				104.2	572.9	ns(14)	1.2	ns(0.8)	0.5	1.3	9.8	0.6	0.5
CV %				6.8	6.8	4.2	3.2	3.6	0.3	36.0	6.8	0.4	0.3

Vigor- a higher number is better. **Color**- a higher number is darker green.
$/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.

Phosphorus Rates in Strip Till

Huron Soil Conservation District, Elkton - 2013

Trial Quality: Good
Variety: HM-28RR
Planted: May 6
Harv/Samp: Oct 4 / Oct 1
Plot Size: 4 reps
Row Spacing: 30 inch
Seeding Rate: 53,000

Soil Info: Loam
Fertilizer: Strip Till: See treatments; 2x2: 30# of N; I.F.: Zn and Mn; S.D.: 30# of N
Prev Crop: Soybeans
Weather: Dry summer

Rhizoc Control: Good Control: Quadris 6-8 leaf
Cerc Control: Fair/Good Control: 1. Inspire XT + Kocide, 2. Headline + EBDC, 3. Eminent
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Population 100 Ft. 31 Day
No P 15-0-15	$1,623	**8922**	**284**	**31.4**	**18.7**	**96.2**	**194**
High Rate of P 15-40-16	$1,619	**8906**	**272**	**32.7**	**18.0**	**96.2**	**188**
Low Rate of P 15-14-16	$1,578	**8682**	**276**	**31.5**	**18.1**	**96.4**	**190**
Average	$1,607	8837	277	31.9	18.3	96.3	191
LSD 5%	—	ns (948)	ns (12)	ns (3.2)	ns (0.7)	ns (0.6)	ns (25)
CV %	—	6	2	5.8	2.0	0.4	8

Comments: Trial was established by the Huron County Soil Conservation District to look at reducing phosphorus rates on medium/high testing P soils. Field was zone tilled in the fall of 2012 with an established cereal rye cover crop. A burn down herbicide was applied to the cereal rye 4 days before planting. On the day of planting, a strip tiller was used on the field which placed the 3 different P rate treatments 6 inches deep in the soil. The three P rates were 0, 14, and 40 pounds per acre of P_2O_5. Later that same day, the field was planted into the strips. The planter applied the same 2x2 starter to all three treatments which contained no phosphorus (only 30# N). Average Bray P1 soil levels are as follows: No applied P strips 41.6 ppm, Low Rate strips 47.3 ppm and High Rate strips 45.6 ppm. Nitrate soil test averaged a 50 lb/acre N credit. Total nitrogen available was 125 lbs/acre from fertilizer and N credit. No visual differences in growth seen during the season. No significant differences shown on yield or 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.

Lucros Foliar Treatment
LAKKE Ewald Farms, Akron - 2013

Trial Quality: Good
Variety: C-RR074NT
Planted: April 4
Harv/Samp: Oct 22 / Oct 10
Plot Size: 6 reps
Row Spacing: 20 inch
Seeding Rate: 64,000

Soil Info: Loam
Fertilizer: 2x2: 39-0-0-9S + 1 qt Mn, 1 pt B; PP: 100# N
Prev Crop: Wheat
Weather: Wet in April, dry summer

Rhizoc Control: Good Control: Quadris I.F. (7 oz) & Foliar (14)
Cerc Control: Good Control: 1. Proline + EBDC, 2. Super Tin + EBDC, 3. Inspire + EBDC, 4. Super Tin + EBDC
Other Pests: Mustang I.F. & Foliar

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Check	$1,832	**10075**	**303**	**33.2**	**19.7**	**96.8**
Lucros - Once	$1,780	**9789**	**303**	**32.3**	**19.6**	**96.9**
Lucros - Twice	$1,756	**9656**	298	**32.4**	**19.4**	**96.7**
Average	$1,790	9840	301	32.6	19.6	96.8
LSD 5%	—	ns (460)	4	ns (1.6)	ns (0.3)	ns (0.2)
CV %	—	4	1	3.8	1.1	0.2

Comments: Trial was conducted to look at the effect of foliar application(s) of Lucros F on yield and quality of sugarbeets. Lucros is described to be a foliar-applied liquid nutrient product that is designed to increase beet sugar. The only guaranteed nutrient on the label is boron at 2% of the analysis. Lucros was applied as a single treatment (one pint/acre) mid-summer. In the two treatment strips Lucrose was applied mid-summer (one pint) followed by a second application late summer (one pint). Check strips had no Lucrose applied. No increase in yield or quality was found in the Lucrose applied 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.

Lucros Foliar Treatment
Richmond Brothers Farms, Pigeon - 2013

Trial Quality: Fair - only 2 reps
Variety: C-RR827
Planted: May 5
Harv/Samp: Nov 5 / Oct 30
Plot Size: 2 reps
Row Spacing: 22 inch
Seeding Rate: 70,000

Soil Info: Loam
Fertilizer: 2x2: 43-32-0 + 9S, 2 qt Mn, 1 qt Zn, 1 qt B; Sidedressed 130# N
Prev Crop: Wheat
Weather: Wet early

Rhizoc Control: Good Control: Quadris I.F. & 6-8 Leaf
Cerc Control: 1. EBDC alone, 2. Proline + EBDC, 3. Gem + EBDC, 4. Inspire + EBDC, 5. Eminent
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP
Lucros	**$1,776**	**9768**	**329**	**29.7**	**21.5**	**96.2**
Check	**$1,696**	**9330**	**331**	**28.2**	**21.6**	**96.2**
Average	$1,736	9549	330	29.0	21.5	96.2
LSD 5%	—	ns (5152)	ns (59)	ns (10.3)	ns (2.8)	ns (2.0)
CV %	—	4	1	2.8	1.0	0.2

Comments: Trial was conducted to look at the effect of a foliar application(s) of Lucros F on yield and quality of sugarbeets. Lucros is described to be a foliar-applied nutrient product that is designed to increase beet sugar. The only guaranteed nutrient on the label is boron at 2% of the analysis. Lucros was applied mid-summer (one pint/acre) followed by a second application late summer (one pint/acre). Check strips had no Lucros applied. Trial results insignificantly favor the Lucros strips, but the trial was only 2 reps. A second trial at a different location showed opposite 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.

Report: Starter Nitrogen and Phosphorous on Sugarbeets: What's the Benefit?

Dr. Laura L. Van Eerd, Jessica Turnbull, and Mike Zink
University of Guelph, Ridgetown Campus Ontario 2013

Trial quality: Fair **Sugarbeet Variety:** 28 RR

Weather 2013: Excess rainfall in spring lowered plant stands-harvest area adjusted accordingly

Previous Crop: Range 7 - corn; Range 19 & Lambton - soybeans

Typical fungicide program: 5-6 fungicide sprays at Ridgetown Campus

Site	Planting	Early harvest	Late harvest
R7	6-May	18-Sep	5-Nov
R19	2-May	17-Sep	30-Oct
Lambton	7-May	2-Oct	28-Oct

Preliminary Summary:

- Results from 2013 only and need to be summarized in terms of grower payment.
- Late harvest (Nov. 05, Oct. 28-30) sugarbeet had 26% higher root yields, 1.5 point higher %sugar, and 34% higher RWSA compared to early harvest (Sept. 17- 18 and Oct. 02).
- Root yield and RWSA response to starter/pop-up fertilizers did not change with harvest date.
- Therefore you do not have to change your starter program based on harvest date.
- N starter in 2x2 band was beneficial to sugarbeet root yield and RWSA
- P starter did not have as positive of an influence on sugarbeet as N starter.

Table 1: Effect of nitrogen and phoshorous starter fertilizer on sugarbeets (average 3 sites)

Trt#	Treatment	Yield (ton/ac)	sugar (%)	RWSA (lb/ac)
7	2.5 gal/ac **10-34-0** in furrow & 97 lb/ac N. sidedress	33.1 ab	17.0 ab	**8372 a**
6	40 lb/ac **P.** (2x2) & 40 lb/ac **N.** broadcast at planting & 60 lb/ac **N.** sidedress	32.7 ab	17.0 ab	8251 ab
3	40 lb/ac **N.** (2x2) & 60 lb/ac N. sidedress	**33.3 a**	16.7 bc	8217 abc
5	40 lb/ac **N. & P.** (2x2) & 60 lb/ac **N.** sidedress	32.1 ab	16.5 c	7899 abc
2	No starter, 100 lb/ac **N.** sidedress	32.0 ab	16.4 c	7874 abc
8	2.5 gal/ac **10-34-0** in furrow & 37 **N.** 29 **P.** lb/ac (2x2) & 60 lb/ac **N.** sidedress	31.3 ab	16.5 c	7713 bc
4	40 lb/ac **P.** (2x2) & 100 lb/ac **N.** sidedress	30.9 b	16.7 bc	7604 cd
1	No fertilizer	27.7 c	**17.1 a**	7032 d

z Different letters represent statistical differences between treatments over all 3 sites ($p<0.05$)

Funding by Ontario Sugarbeet Growers Association and Michigan Sugar Company.

Preliminary Report: Nitrogen Requirement Based on Row Spacing.

Dr. Laura L. Van Eerd, Jessica Turnbull, and Mike Zink
University of Guelph, Ridgetown Campus Ontario 2013

Trial quality: Fair. Excess rainfall in spring lowered plant stands but harvest area adjusted (plot size: 20'x33')

Previous Crop: Range 7 - corn; Range 19 - soybeans

Spray Program on both trials:

Quadris 400 ml/ac: June 26 (Range19), July 11.

Senator 225 gr/ac: July 30.

Sugarbeet Variety: 28 RR

Roundup 600 ml/ac

Headline 350 ml/ac: July 16.

Proline 700 ml/ac: Aug. 14 and Aug. 30.

Objectives:

1. To determine if there are N requirement differences based on row spacing and harvest date.
2. To evaluate how crop emergence, stand counts, yield and RWSA

Preliminary Summary:

- Results are from 2013 only and need to be summarized in terms of grower payment.
- Based on root yield and RWSA, you don't need to change N rate for different row spacing (22.5" vs. 30")
- Based on root yield and RWSA, you don't need to change N rate for different harvest dates
- Lower N rates result in higher %sugar depending on site and row width
- 37% higher root yield and 42 % higher RWSA with late (30 Oct, 7 Nov) than early harvest (19, 24 Sept)
- There was a harvest date, row width, and location interaction, which suggests that the two sites responded differently to harvest date and row width. For instance, Range7 had highest RWSA in the narrow rows but there was no difference between row width for the other location-harvest date combinations. Thus, changing to narrow rows does not necessarily increase RWSA.

Table 1: Impact of harvest date and row width on sugarbeet production in 2013 at Ridgetown Campus

Site	Early Harvest (19, 24 Sept.) 22.5"	Early Harvest (19, 24 Sept.) 30"	Late Harvest (30 Oct., 7 Nov.) 22.5"	Late Harvest (30 Oct., 7 Nov.) 30"
	Yield (ton/acre)			
Range7[z]	23.4 e[y]	23.6 e	50.8 a	42.3 b
Range19	31.2 d	26.3 e	36.7 c	37.4 c
	Sugar (%)			
Range7	17.7 ab	16.4 de	18.1 a	17.6 ab
Range19	16.8 cd	15.9 e	17.9 a	17.2 bc
	RWSA (lb/acre)			
Range7	6045 de	5544 e	13734 a	11142 b
Range19	7781 cd	6232 de	9836 b	9548 bc

z Planting date at Range 7 was 06 May 2013 and at Range 19 was 03 May 2013.
y For each measurement, different letters represent statistical differences ($p<0.05$).
There was a site*harvest date*row width interaction for yield and RWSA but not %sugar.

Funding by Ontario Sugarbeet Growers Association and Michigan Sugar Company.

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY

AgBioResearch

Sugarbeet Nitrogen Response Following Wheat

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center
Planting Date: May 2, 2013 (Harvest 10/18/13)
Soil Type: Clay loam; 2.7 OM; 7.8 pH; 38 ppm P; 203 ppm K
Variety: Hilleshog 9042 Roundup Ready

Tillage: Conventional
N Rates: See below
Population: 4 ¼ in. spacing
Replicated: 4 replications

N Trt. (Total lb. N/A)	RWSA	RWST	Tons/A	% Sugar	% CJP	NH2	Amino-N
0 – Check	7208	304	23.7	20.0	95.9	57	3.3
40	8028	295	27.2	19.7	95.3	73	4.5
80	8264	296	27.9	20.0	94.9	94	5.5
120	7326	279	26.3	19.0	94.4	141	8.4
160	8537	287	29.7	19.4	94.8	144	8.7
200	8632	287	30.1	19.4	94.7	110	6.4
240	8835	278	31.9	19.0	94.4	175	10.5
LSD$_{(0.10)}$[a]	**894**	**14**	**2.7**	**0.8**	**0.5**	**32**	**2.0**

[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 ($/A)[c]
0 – Check	1316	1316	1227
40	1465	1446	1344
80	1508	1470	1365
120	1337	1280	1181
160	1558	1481	1370
200	1575	1479	1367
240	1613	1497	1378
LSD$_{(0.10)}$[a]	**163**	**163**	**155**

[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 $51/ton payment, an average RWST equal to the company average, an N price of $0.48/lb., and trucking costs of $3.75/T

Summary: Trial was conducted to more accurately determine sugarbeet nitrogen fertilizer needs and nitrogen response following wheat. All treatments received 40 lbs. N/A as 28%, 20 lbs. P_2O_5/A, 50 lbs. K_2O/A. and 2 lbs. Mn/A as starter placed 2x2 on May 2 (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 June 11 and were coated with Agrotain to avoid N volatilization.

Wet, cool spring conditions delayed planting, caused uneven emergence, and slowed beet seedling development for 4-6 weeks after planting. These conditions also resulted in about a 30-40 lb N/A loss across a large portion of the state. Keep this 30-40 lb N loss in mind when evaluating 2013 N rates against other years. Treatments consisting of 160 lb. N or more tended to yield greater but when factoring in the economics of N price and trucking, 40 lbs. N as a 2x2 at planting may have been the best option given the shortened, wet season. The tendency of both NH_2 and amino-N concentrations to increase up to 160 lbs N, decrease at 200 lbs N, and again increase at 240 lbs N was similar this year as in 2012 and 2011. This may indicate that treatments consisting of 160 or more lbs N/A were set-up to do well in the field but likely ran short on bulking time. Given a few extra weeks of growing season, 160 lbs N/A or greater treatments may have added significant tonnage to significantly impact net economic returns.

So what can growers take away from a less than stellar sugarbeet season? In wet seasons with significant planting delays, 40 lbs N/A as a 2x2 may be the only and most economical investment in N. Net economic return is based on a $51/ton payment, an average RWST equal to the company average, an N price of $0.48/lb., and trucking costs of $3.75/T.

Polymer-Coated Urea Blending Ratios for Sugarbeet Production

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY AgBioResearch

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center
Planting Date: May 2, 2013 (Harvest 10/18/13)
Soil Type: Clay loam; 2.7 OM; 7.8 pH; 38 ppm P; 203 ppm K
Variety: Hilleshog 9042 Roundup Ready

Tillage: Conventional
N Trts: See below
Population: 4 ¼ in. spacing
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	9112	289	31.6	19.3	95.3	95	5.6	1663
75:25	7884	282	28.0	19.2	94.4	154	9.2	1439
50:50	7394	276	26.8	18.9	94.2	137	8.2	1349
25:75	7899	268	29.5	18.5	93.9	137	8.5	1442
0:100	8537	287	29.7	19.4	94.8	144	8.7	1558
$LSD_{(0.10)}$[a]	**1365**	**13**	**4.7**	**0.6**	**0.8**	**45**	**2.7**	**249**

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

[b] Gross grower payment based upon a $51/ton payment and an average RWST equal to the company average.

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 2. 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 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 100% urea treatment was applied at sidedress on June 11. The source of PCU was ESN, Environmentally Smart Nitrogen.

Wet, cool spring conditions likely increased the time period of N loss yet few significant differences were noticed between treatments. Either 100% PCU or 100% urea produced the greatest yield and % sugar with a slight advantage to 100% PCU for RWSA and gross grower payment. The 100% PCU treatment did produce lower NH2 and amino-N concentrations as compared to treatments including urea but this may be due to greater residual soil nitrate after harvest (data still being analyzed). Slow emergence and delayed spring plant development may have hindered treatment differences as a few additional weeks of bulking may have added significant tonnage to further separate out treatment differences. Net economic return is based on a $51/ton payment and an average RWST equal to the company average.

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY AgBioResearch

Impacts of Organic Sources of Nitrogen on Sugarbeet Production

Kurt Steinke and Andrew Chomas, Michigan State University

Location: Saginaw Valley Research and Extension Center
Planting Date: May 2, 2013 (Harvest 10/18/13)
Soil Type: Clay loam; 2.7 OM; 7.8 pH; 38 ppm P; 203 ppm K
Variety: Hilleshog 9042 Roundup Ready

Tillage: Conventional
N Trts: See below
Population: 4 ¼ in. spacing
Replicated: 4 replications

N Trt. 160 lb N/A Total	RWSA	RWST	Tons/A	% Sugar	% CJP	NH2	Amino-N	% Total N (12 lf.)
40 UAN 2x2 120 Urea Sd	8524	287	29.7	19.4	94.8	144	8.7	3.9
1 T/A Biotic 40 UAN 2x2 13 Urea Sd	8632	283	30.5	19.1	94.8	118	7.1	5.0
1 T/A Herbrucks 40 UAN 2x2 66 Urea Sd	9645	282	34.2	19.2	94.6	119	7.0	4.4
2 T/A Herbrucks 40 UAN 2x2 13 Urea Sd	8868	278	31.9	18.9	94.4	153	9.1	4.7
$LSD_{(0.10)}$[a]	**----**	**15**	**3.7**	**0.8**	**0.5**	**38**	**2.5**	**0.4**

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

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 2. 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 urea sidedress on June 11, 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.

At 1 T/A, the Herbrucks product produced significantly greater tonnage and greater RWSA as compared to other treatments. The organic-based products did not suffer large decreases in % sugar at the 1 T/A rate and had similar NH2 and amino-N concentrations as the industry-standard 100% soluble N treatment. At 2 T/A, the Herbrucks product began to show signs of increased N impurities, lower tonnage, and decreased RWST. The economics of organic N applications will need to be further investigated but in 2013 the fear of these products reducing beet quality was not substantiated.

Best management practices for Warrant in Roundup Ready sugarbeet

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY AgBioResearch

Christy Sprague and Gary Powell, Michigan State University

Location: Saginaw Valley Research and Extension Center
Planting Date: May 2, 2013
Soil Type: Clay loam; 3.2 OM; pH 8.0
Replicated: 4 times
Tillage: Conventional
Herbicides: see treatments
Varieties: HM-173RR
Population: 48,000 seeds/A

Table 1. Sugarbeet injury, weed control, sugarbeet yield and recoverable white sugar per acre (RWSA) for various herbicide programs.

		WEED CONTROL (at Harvest)		SUGARBEET	
Herbicide treatments a	Injuryb	Common lambsquarters	Redroot pigweed	Yield	RWSA
	__ % __	_______ % control ________		_ ton/A _	__ lb/A __
Roundup - applied 2X (32 oz fb. 22 oz)	0	99	99	20.5	5893
Roundup + Warrant fb. Roundup	2	99	99	21.0	6184
Roundup + Outlook fb. Roundup	3	99	99	21.4	6299
Roundup + Dual II Magnum fb. Roundup	1	99	99	20.5	6100
Roundup + Betamix (3 pt) fb. Roundup	15	99	99	20.2	5999
Roundup fb. Roundup + Warrant	0	99	99	21.3	6431
Roundup fb. Roundup + Outlook	2	99	99	19.9	6049
Roundup fb. Roundup + Dual II Magnum	0	99	99	20.9	6412
Norton (PRE) fb. Roundup + Warrant fb. RUP	14	99	99	20.8	6238
Norton (PRE) fb. Roundup fb. RUP + Warrant	3	99	99	20.6	6097
LSD$_{0.05}$[c]	7	n.s.	n.s.	n.s.	n.s.

[a] POST herbicides were applied when sugarbeet were at the 2- and 6-leaf stages. Roundup PowerMax was applied at 32 fl oz/A for the 2-leaf application and 22 fl oz/A for the 6-leaf application. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.

[b] Injury was evaluated June 13 (10 d after the 2-leaf application timing)

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

Summary: Warrant is a new encapsulated acetochlor product that is being examined as a potential tank-mix partner with glyphosate in Roundup Ready sugarbeet. This trial was conducted to determine best management practices with Warrant and to compare it to other commercialized products. Early in the season there was significant sugarbeet injury when Betamix was applied with Roundup and from Nortron PRE followed by Roundup + Warrant applied to 2-leaf sugarbeet. There initially were some differences in weed control between the herbicide treatments; however by harvest overall weed control was excellent with all treatments. Sugarbeet yield and recoverable white sugar per acre (RWSA) was similar for all treatments. Overall there were no difference between the different treatments. For the different tank-mixtures, including other products once sugarbeet was past the two-leaf stage has generally had little effect on yield. However in the future, different tank-mix partners may need to be included in earlier applications depending on different herbicide-resistant weed situations. Tank-mixture combinations with the 2nd glyphosate application may help reduce the risk of the development of herbicide-resistant weeds.

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY

AgBioResearch

Replanted sugarbeet tolerance to Warrant

Christy Sprague and Gary Powell, Michigan State University

Location: Saginaw Valley Research and Extension Center

Planting Dates: see treatments

Soil Type: Clay loam; 3.2 OM; pH 8.0

Replicated: 4 times

Tillage: Conventional

Herbicide Application Date: May 2, 2013

Varieties: HM-173RR

Population: 48,000 seeds/A

Table 1. Main effect of herbicide for sugarbeet planted in to herbicide residues at various weeks after application. Stand counts were taken 6 wks after planting and at harvest, yield, and recoverable white sugar per acre (RWSA) are also presented.

MAIN EFFECT[a]	STAND (6 WAT)	STAND (FINAL)	YIELD	RWSA
HERBICIDE[b]	__ plants/100 ft __	__ plants/100 ft __	_____ ton/A ____	_____ lb/A _____
No herbicide	213 Ac	196 A	19.3 B	5525 B
Warrant 3 pt	196 B	189 AB	19.3 B	5505 B
Warrant 6 pt	183 C	184 B	19.6 AB	5657 AB
Dual Magnum	199 B	190 A	19.7 A	5728 A

[a] Main effect of herbicide are averaged over planting dates; sugarbeet were planted weekly for 7 weeks, including the day of application.
[b] Herbicides were applied on May 2 into a weed-free seed bed; the application rate of Dual Magnum was 1.33 pt/A.
[c] Means within a column with different letters are significantly different from each other.

Table 2. Main effect of planting date for sugarbeet planted in to herbicide residues at various weeks after application. Stand counts were taken 6 wks after planting and at harvest, yield, and recoverable white sugar per acre (RWSA) are also presented.

MAIN EFFECT[a]	STAND (6 WAT)	STAND (FINAL)	YIELD	RWSA
PLANTING DATE[b]	__ plants/100 ft __	__ plants/100 ft __	_____ ton/A ____	_____ lb/A _____
Week-0	225 Bc	212 B	20.2 A	6182 A
Week-1	195 C	187 C	20.3 A	6154 A
Week-2	225 B	213 B	20.1 A	6005 A
Week-3	92 E	93 D	18.5 D	4923 D
Week-4	180 D	178 C	18.9 BC	5256 C
Week-5	253 A	232 A	19.3 B	5530 B
Week-6	216 B	212 B	18.8 CD	5179 CD

[a] Main effect of planting dates are averaged over herbicides; herbicides were applied on April 4 into a weed-free seed bed; the application rate of Dual Magnum was 1.33 pt/A.
[b] Sugarbeet were planted weekly for 7 weeks, including the day of application.
[c] Means within a column with different letters are significantly different from each other.

Summary: Warrant is a new encapsulated acetochlor product that is being examined as a potential tank-mix partner with glyphosate in Roundup Ready sugarbeet. Preemergence applications of Warrant have been shown to cause significant sugarbeet injury and in some cases reductions in yield. If sugarbeet needs to be replanted after a lay-by application of Warrant sugarbeet injury, reductions in stand, and potential reductions of yield may be a concern. This study was conducted to determine the time interval needed between Warrant applications and replanting sugarbeet. In 2011, if sugarbeet were planted into the 1X rate of Warrant or Dual Magnum prior to the 4 week after application planting, sugarbeet stand was significantly lower than the no herbicide treatment. For the 2X Warrant application rate sugarbeet stand was lower until the 5 week planting. Sugarbeet stand averaged over all planting dates was reduced by Warrant (1X and 2X) in 2012. This year early sugarbeet stand was reduced by all herbicide treatments. But these applications did not affect yield or RWSA compared to the no herbicide control either year. Averaged over all herbicide applications, planting date significantly affected sugarbeet stand, yield, and RWSA. There was not a planting date by herbicide application interaction in 2012 or 201, and replanting sugarbeet into Warrant residues did not significantly reduce yield or RWSA compared with the no herbicide control. However, under conditions with more moisture this may be more apparent similar to the 2011 results.

Evaluation of V-10206 in Roundup Ready sugarbeet

Christy Sprague and Gary Powell, Michigan State University

Location: Saginaw Valley Research and Extension Center
Planting Date: May 2, 2013
Soil Type: Clay loam; 3.2 OM; pH 8.0
Replicated: 4 times

Tillage: Conventional
Herbicides: see treatments
Varieties: HM-173RR
Population: 48,000 seeds/A

Table 1. Sugarbeet injury, weed control, sugarbeet yield and recoverable white sugar per acre (RWSA) for various herbicide programs.

	INJURY		WEED CONTROL (at Harvest)		SUGARBEET	
Herbicide treatments a	10 DAT	30 DAT	Common lambsquarters	Redroot pigweed	Yield	RWSA
	_____ % _____		______ % control ______		__ ton/A __	__ lb/A __
Roundup (32 oz)	0	0	71	99	21.1	6299
Roundup + Warrant (3 pt)	3	2	84	99	21.0	6212
Roundup + Dual II Magnum (1.33 pt)	2	1	92	99	21.3	6374
Roundup + V-10206 (1.5 oz)	21	4	96	99	19.7	5780
Roundup + V-10206 (2.0 oz)	23	4	96	99	21.2	6299
Roundup + V-10206 (2.5 oz)	24	5	92	99	20.6	6345
Roundup + V-10206 (3.0 oz)	26	7	99	99	19.7	5585
Untreated	0	0	0	0	15.7	4603
$LSD_{0.05}$[b]	4	2	9	n.s.	3.4	977

[a] POST herbicides were applied when sugarbeet were at the 2-leaf stage and weeds were 2-inches tall. Roundup PowerMax was applied at 32 fl oz/A and treatments included ammonium sulfate at 17 lb/100 gal.
[b] Means within a column greater than least significant difference (LSD) value are different from each other.

Summary: V-10206 (pyroxasulfone) is a new active ingredient that is commercially available in corn and soybean. This trial was conducted to determine if there is a potential fit for V-10206 for lay-by applications in sugarbeet. This product would be potentially used similarly to Dual II Magnum in sugarbeet. We compared one POST application of each of these products with four rates of V-10206. The key objective was to compare sugarbeet injury and yield and determine the residual activity on these products. Initially when V-10206 was tank-mixed with Roundup PowerMax there was over 20% sugarbeet injury. By 30 DAT sugarbeet had recovered, however sugarbeet injury was still significant with these treatments ranging from 4 to 7%. Residual control of common lambsquarters was greater with tank-mixtures with Dual II Magnum or V-10206 at any rated compared to Roundup alone or in some cases the tank-mixture with Warrant. Yield and RWSA was only reduced by the untreated plot which was 26% lower for yield and 28% lower for RWSA than the highest yielding treatment. V-10206 may be a new potential herbicide option; however more research needs to be conducted to determine if that injury will equate to reduced yield under different environments.

Volunteer corn effects on Roundup Ready sugarbeet yield and quality planted in wide- and narrow-rows

Amanda Harden and Christy Sprague, Michigan State University

MICHIGAN STATE UNIVERSITY Extension

MICHIGAN STATE UNIVERSITY AgBioResearch

Location: East Lansing/SVREC (Richville)
Planting Dates: May 2 (EL); May 3 (SVREC)
Soil Type: Loam (EL); Clay loam (SVREC)
Herbicides: Roundup PowerMax (22 fl oz/A) + AMS
Variety: HM-173RR, Roundup Ready
Row widths: 30- & 15-inches
Volunteer corn: 'F₂' DeKalb 46-61 "SmartStax"
Tillage: Conventional
Population: 52,000 seeds/A
Replicated: 4 times

Table 1. Main effect of row width on sugarbeet yield and recoverable white sugar per acre (RWSA) averaged over volunteer corn populations.

	EAST LANSING		SVREC	
ROW WIDTH	Yield	RWSA	Yield	RWSA
	__tons/A__	__lbs/A__	__tons/A__	__lbs/A__
Wide (30-inches)	30.1 Aa	7785 A	14.0 A	4170 B
Narrow (15-inches)	30.4 A	7739 A	15.7 A	4769 A

[a] Means within a column with different letters are significantly different from each other

Table 2. Main effect of volunteer corn population on sugarbeet yield and recoverable white sugar per acre (RWSA) averaged over row widths.

	EAST LANSING		SVREC	
VOUNTEER CORN POPULATION	Yield	RWSA	Yield	RWSA
_____ plants/150 ft2 _____	__tons/A__	__lbs/A__	__tons/A__	__lbs/A__
0	29.1 BCa	7058 C	17.1 A	5088 A
3	31.9 AB	8360 AB	18.0 A	5321 A
6	34.1 A	8890 A	17.0 A	5199 A
12	31.0 AB	7721 BC	15.2 A	4621 A
24	29.1 BC	7722 BC	11.4 B	3174 B
48	26.0 C	6820 C	10.5 B	3413 B

[a] Means within a column with different letters are significantly different from each other

Summary: This trial was conducted to determine: 1) the effect volunteer glyphosate-resistant corn has on glyphosate-resistant sugarbeet yield and quality, and 2) how row width affects corn competition with sugarbeet. Sugarbeet were planted in 15" and 30" row widths. A range of volunteer corn populations were planted the same day using 'F2' seed. Due to poor germination, volunteer corn was replanted at the 2-leaf stage of sugarbeet at East Lansing. All plots were kept weed-free with applications of glyphosate.

Canopy closure was quicker in narrow rows at both locations (data not shown). At SVREC, narrow rows resulted in higher RWSA. Sugarbeet yields were similar for narrow and wide rows at both locations in 2013. At East Lansing, volunteer corn growth was delayed and sugarbeet were able to withstand volunteer corn populations of 24 plants per 150 ft2. Sugarbeet yields were similar between 0 and 12 plants per 150 ft2 at SVREC. Glyphosate-resistant volunteer corn needs to be controlled at populations greater than 12 plants per 150 ft2 in order to maximize sugarbeet yield and quality.

MICHIGAN STATE UNIVERSITY Extension
MICHIGAN STATE UNIVERSITY AgBioResearch

Control of volunteer Roundup Ready corn in Roundup Ready sugarbeet

Amanda Harden and Christy Sprague, Michigan State University

Location: East Lansing/SVREC (Richville)
Planting Dates: May 2 (EL); May 3 (SVREC)
Soil Type: Loam (EL); Clay loam (SVREC)
Replicated: 4 times

Variety: HM-173RR, Roundup Ready
Volunteer corn: ‘F2’ DeKalb 46-61 “SmartStax”
Tillage: Conventional
Population: 52,000 seeds/A

Table 1. Effect of application timing on volunteer corn control and sugarbeet yield and quality at SVREC.

Removal Timing[a]	DAP[b]	Volunteer corn		Sugarbeet	
		Control[c]	Final biomass	Yield	RWSA
		%	g/A	tons/A	lbs/A
No corn	0	--	0 C	21.9 A	6729 A
V2	32	99 A[d]	0 C	20.2 AB	6063 AB
V4	42	99 A	0 C	19.8 B	6012 B
V6	47	99 A	0 C	19.4 B	5979 B
V8	55	91 B	0 C	19.3 B	5875 B
V11	76	39 C	1358 B	14.4 C	4396 C
Untreated	--	0 D	3398 A	13.7 C	4103 C

[a] Weeds were controlled at these volunteer corn stages using SelectMax or Assure II + Roundup PowerMax (22 fl oz/A) + AMS (17 lb/100 gal). There were no differences between the different herbicide treatments so results were combined.
[b] Days after planting, application time.
[c] Control was evaluated 2 weeks after the last application timing.
[d] Means within a column with different letters are significantly different from each other.

Table 2. Effect of application timing on volunteer corn control and sugarbeet yield and quality at East Lansing.

Removal Timing[a]	DAP[b]	Volunteer corn		Sugarbeet	
		Control[c]	Final biomass	Yield	RWSA
		%	g/A	tons/A	lbs/A
No corn	0	--	0 C	31.7 A	8469 A
V2	55	99 A[d]	0 C	30.6 A	7723 ABC
V4	59	99 A	0 C	30.5 A	7898 AB
V6	66	97 A	0 C	30.4 A	7906 AB
V8	78	71 B	102 C	29.0 AB	7478 BC
V10	97	43 C	483 B	28.7 AB	7375 BC
Untreated	--	0 E	1154 A	27.4 B	6993 C

[a] Weeds were controlled at these volunteer corn stages using SelectMax or Assure II + Roundup PowerMax (22 fl oz/A) + AMS (17 lb/100 gal). There were no differences between the different herbicide treatments so results were combined.
[b] Days after planting, application time.
[c] Control was evaluated 2 weeks after the last application timing.
[d] Means within a column with different letters are significantly different from each other.

Summary: This trial was conducted to determine the impact of different volunteer corn control timings with Assure II and SelectMax on volunteer corn control, sugarbeet yield and recoverable white sugar per acre. Volunteer corn was planted at 24 plants per 150 ft2. Volunteer corn was controlled at various stages with either Assure II or SelectMax. Assure II and SelectMax were equally effective at controlling volunteer corn so results were combined. At East Lansing, volunteer corn was replanted at the 2-leaf stage of sugarbeet due to poor initial germination. Delayed corn growth significantly improved sugarbeet competitiveness with volunteer corn. Sugarbeet yield and quality were reduced if volunteer corn was not controlled. At SVREC, sugarbeet yield and quality were significantly reduced at the V4 corn growth stage. Early-season control resulted in complete removal of volunteer corn. Volunteer corn needs to be controlled prior to the V4 growth stage to maximize removal, sugarbeet yield and recoverable white sugar per acre.

MICHIGAN STATE UNIVERSITY

AgBioResearch

Effects of rotation crops on soil health and reproduction of sugar beet cyst and other nematodes

Zin Maung (MSU), Mitch McGrath (USDA/ARS), Steve Poindexter (MSUE), Greg Clark, James Stewart and Lee Hubbell (MSC), and Haddish Melakeberhan (MSU, Department of Horticulture; melakebe@msu.edu)

Interpretive Summary: Crop rotation is among the important cultural practices in the management of sugar beet cyst nematode (SBCN), the primary nematode problem in sugar beets. Naturally, the rotation crops and associated tillage practices have direct and/or indirect impacts on non-target nematodes like root-lesion (Pratylenchus spp.), a serious crop pest, soil health, a major industry priority, and varying by soil type. Since there are no SBCN-resistant sugar beet cultivars commercially available, understanding how a broad range of sugar beet cultivars perform in a rotation system and their influence on all harmful nematodes and soil biology (measured through the food web structure and function) will be helpful to the Michigan Sugar Beet Industry (MSBI). Project GREEEN in 2012 and MSC in 2013 funded this study to determine the effects of rotation crops in different soil types on (a) all nematodes and (b) soil health.

In 2012, five sugar beet (EL53, EL57, EL59, EL61 and EL64) cultivar from the USDA/ARS laboratory at MSU from MSC, corn (cv P9910) and SCN-susceptible soybean (cv 92M91) as controls were planted in four replicates on the same location at MSU HORT Farm. In 2013, an SBCN-susceptible (BTS10RR34) and -tolerant (BTS18RR4N) were added to the experiment at MSU and at a silt loam field in Saginaw County. Planting, plot maintenance and harvesting at the Saginaw County location was done by MSC. Soil samples were collected every 4-6 weeks during the growing seasons. Nematodes were extracted from 100 cc of soil and identified to herbivore (cyst and other PPN), bacteriovore, fungivore, predator and omnivore trophic groups, and data processed to extract changes on bio-ecological, nutrient cycling potential, and soil food web structure and function. Yield was measured at the end of the season.

Preliminary analyses of some of the 2012 and 2013 data at the MSU farm show: a) Soil food web structure improving with time across crops (data not shown). b) There were 24 and 8 cysts/100 cc of soil and 17 and 19 herbivore genera present in 2012 and 2013, respectively. c) While cyst population density was higher in 2012 than in 2013, there was no statistical difference among the crops in both seasons (Fig. 1, top). Root-lesion nematode was observed in low numbers in all, but plots planted with the sugar beet cv EL53 (Fig. 1, bottom). On-going are extensive analyses on the relationships among the measured parameters across time and the efficiency of the cropping systems on bio-ecological changes. A more complete report will be submitted when these analyses are done.

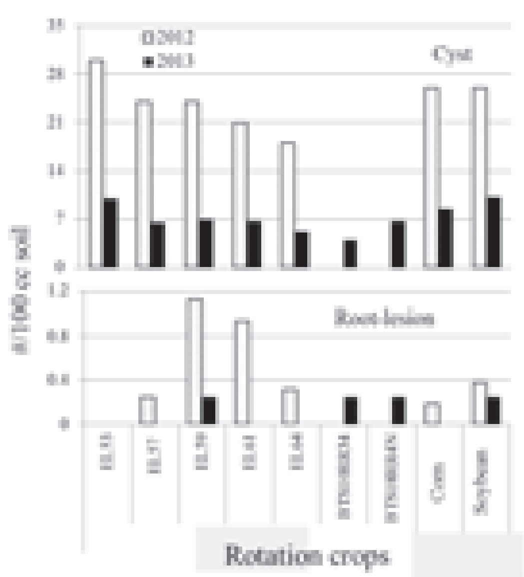


Figure 1. Number of cysts (top) and root-lesion (Pratylenchus spp., bottom) nematodes recovered from different sugar beet (EL53, EL57, EL59, EL61, EL64, BTS10RR34 and BTS18RR4N) cultivars, corn and soybean in 2012 and 2013 growing seasons in MSU HORT Farm. Means with no letters across crops by year are not statistically different from one another.

MICHIGAN STATE UNIVERSITY

AgBioResearch

First Year Progress Report: Effects of mustard and oil seed radish crops on reproduction of sugar beet cyst

Zin Maung (MSU), Steve Poindexter (MSUE), Greg Clark, James Stewart and Lee Hubbell (MSC), and Haddish Melakeberhan (MSU, Department of Horticulture; melakebe@msu.edu)

Statement of problem and the gaps: Reducing the impact of sugar beet cyst nematode (SBCN) and improving soil health (organic matter, biological, physiochemical, nutritional and water holding priorities) are two of the critical research priorities for the Michigan Sugar Beet Industry (MSBI). Use of mustard and radish as resistant-, cover-, green manure- and/or trap-crops are among the cultural practices that could potentially address both MSBI priorities as well as suppression of other plant-parasitic nematodes (PPN). However, consistent suppression of SBCN and increase of crop yield from use of these crops has been elusive due to many factors. These include lack of integrated knowledge on the performance of these crops in different soil conditions and their impact on other PPN of economic significance in the sugar beet production landscape. MSC funded this project in 2013 to identify and to understand these complex relationships using resistant and susceptible cultivars of each of radish (Defender and Tillage), mustard (Pacific Gold and Ida Gold) and soybean (92Y80 and 92M91), respectively, and SBCN-tolerant (BTS18RR4N) and –susceptible (BTS10RR34) sugar beet along with corn (P9910R) as controls in a Huron (A, loam) and Saginaw (B, silt loam) county fields.

Objectives: The research objectives were to determine the: (1) effects of the above specified crops on **SBCN** and other PPN at the two locations; and (2) relationships between changes in SBCN population density and soil quality as a function of the multiple interacting organisms and environments. A third objective is to deliver educational materials to stakeholders.

Approaches: The crops were planted at each location with treatments replicated six times. Soybean and corn are added as controls for production systems. Planting, plot maintenance and harvesting was done by MSC to local standards. Soil samples were collected every 4-6 weeks during the growing season and nematodes extracted and identified to herbivore (cyst and other PPN), bacteriovore, fungivore, predator and omnivore trophic groups. Soil physiochemical, at planting and at harvest, and yield (biomass and seed) and sugar contents, at harvest were measured.

Results and Discussion: Preliminary analyses of pre-plant and harvest data show the following highlights: a) There were 4.4 and 12.2 cysts/100 cc of soil and 19 and 15 herbivore genera present in the silt loam and loam soils, respectively, suggesting potential problems than the target nematodes. b) While the levels of cysts were higher in the loam than in the silt loam soil, statistically similar numbers of cysts were recovered in the pairs of resistant/tolerant and susceptible crops in both soils (Fig. 1, top). Also, similar numbers of root-lesion nematode, one of the serious pests in the sugar beet production landscape, were recovered in soils planted with all of the crops in the loam soil while fewer root-lesion nematodes were found in plots of the susceptible radish, mustard and sugar beet than in the resistant radish in the silt loam soil (Fig. 1, bottom). The population density of root-lesion nematodes was lower in the silt loam and it slightly decreased than in the loam soil. However, the presence of root-lesion nematodes from the crops with known resistance to cyst nematodes suggests that management decisions need to consider broad spectrum of harmful nematodes. c) Soil food web structure, as described by nematode community analysis, varied by field (soil) and across crops than within crops (data not shown), suggesting location-specific interactions. d) Both resistant and susceptible mustard increased N compared to the other treatments in both soils (Fig. 2, top) while b radish and mustard cultivar significantly increased K compared to the sugar beet, soybean, and corn crops in the loam soil (Fig. 2, bottom).

First Year Progress Report: Effects of mustard and oil seed radish crops on reproduction of sugar beet cyst

Zin Maung (MSU), Steve Poindexter (MSUE), Greg Clark, James Stewart and Lee Hubbell (MSC), and Haddish Melakeberhan (MSU, Department of Horticulture; melakebe@msu.edu)

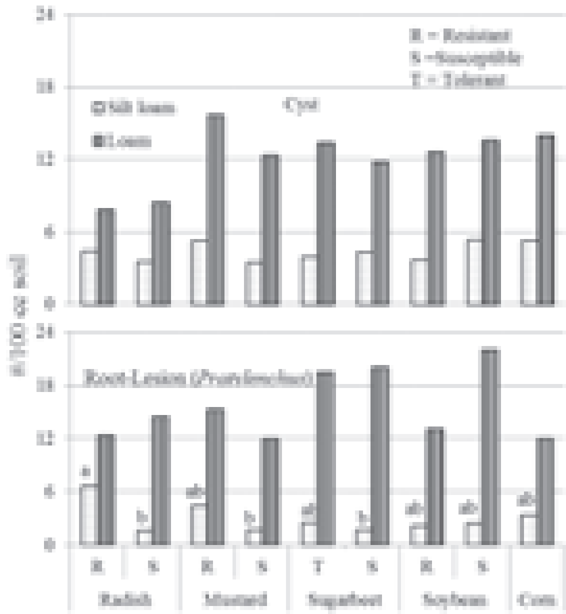


Figure 1. Number of cysts (top) and root-lesion (bottom, *Pratylenchus* spp.) nematodes recovered from different radish, mustard, sugarbeet, soybean and corn crops in silt loam (Saginaw County, shaded) and loam (Huron County, solid) soils. R = resistant, S = susceptible, and T = tolerant. Means with no or same letters across crops by soil are not statistically different from one another.

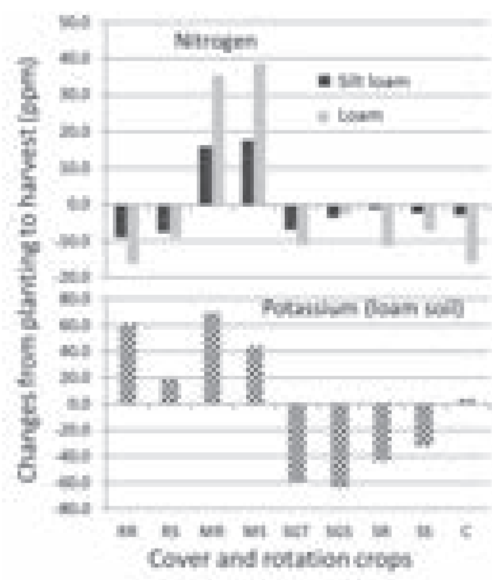


Figure 2. Changes in nitrogen in silt (dark) and loam (gray) soils (top) and potassium in loam soil (bottom) between planting and harvest under radish (RR and RS), mustard (MR and MS), sugar beet (SGT and SGS), soybean (RS and SS), and corn (C) crops. RR, MR, and SR = resistant; RS, MS, SGS, and SS = susceptible: and SGT = tolerant. Silt loam is in Saginaw County and loam soil in Huron County. Positive values show increase and negative values show decrease.

A combination of cyst and other PPN population dynamics, soil physiochemistry and soil food web data support the hypothesis that there are distinct interactions among the crops, SBCN and soil conditions. If verified through second year results, the data provide basis for explaining variabilities masking accurate use of mustard and radish crops for managing nematodes and soil health in Michigan sugar beet production soils.

Planting Date - Effect of Planting Date & Population on Sugarbeet Yield & Quality

Sylvester, Quanicassee, MI - 2013

Trial Quality:	Fair	**Soil Info:**	Sandy Clay Loam	**Rhizoc Control:**	Good
Variety:	HM-28RR		3.6% OM: 7.9 pH	**Cerc. Control:**	Good
Planted:	May 2, May 15, June 4		Above Opt. Levels: P, K	**Other Problems:**	None
Harvested:	Oct 21		High: Mn, Med: B	**Seed Spacing:**	2.0 inches
Plot Size:	6 rows X 38 ft	**Added N:**	120 lbs	**Rainfall:**	Date:
	6 reps	**Prev. Crop:**	Cucumber/Radish		1 10.1 inches
Row Spacing:	22 inch				2 13.5 inches
					3 14.1 inches

Effect of Planting Date on Sugarbeet Yield & Quality

Averaged over all Beet Populations							
Planting Date	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino
May 2	**$1,406**	**7734**	**274**	**28.1**	**18.0**	**96.6**	**3.1**
May 15	$1,245	6847	264	25.9	17.4	96.3	3.7
June 4	$1,047	5760	251	22.9	16.7	96.3	3.7
Average	$1,233	6780	263	25.6	17.4	96.4	3.5
LSD 5%	74	388	5.9	1.1	0.3	0.2	0.5

Effect of Population on Sugarbeet Yield & Quality

Averaged over all Planting Dates							
Population	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino
250	**$1,333**	**7332**	**265**	**27.5**	17.4	**96.7**	**2.8**
200	**$1,328**	**7304**	**270**	**26.9**	**17.7**	**96.5**	3.7
150	**$1,284**	**7064**	**271**	25.9	**17.9**	**96.4**	**3.4**
100	**$1,275**	**7014**	**266**	**26.3**	**17.6**	**96.4**	**3.5**
75	$1,166	6410	262	24.4	17.3	96.3	**3.6**
50	$1,011	5558	243	22.8	16.3	95.9	3.9
Average	$1,233	6780	263	25.6	17.4	96.4	3.5
LSD 5%	87	460	7.1	1.5	0.5	0.3	0.9

Comments: The earlier planting dates produce better as in previous trials. Each date is significantly better than the next. Each thicker population is better than the next but they are statistically the same from 100-250 beets. Using the results to recommend replanting, if you have 75 beets per 100 feet leave them. This is the same as previous trials. Our trials would be the same as working up the first planting. Most growers replant down the row or plant spots and that could change the 75 beet recommendation.

$/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.

Planting Date - Effect of Planting Date & Population on Sugarbeet Yield & Quality

Sylvester, Quanicassee, MI - 2013

All Dates & Populations

Planting Date	Beets/ 100'	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Amino
May 2	250	**$1,567**	**8617**	**276**	**31.2**	18.0	**96.9**	**2.6**
May 2	200	**$1,522**	**8373**	**284**	**29.4**	**18.5**	**97.0**	**2.8**
May 2	150	**$1,512**	**8317**	**287**	**29.0**	**18.8**	96.3	**3.5**
May 15	250	$1,392	7655	272	28.1	17.7	**96.9**	**2.9**
May 2	100	$1,351	7433	272	27.3	17.8	**96.7**	**3.4**
May 15	200	$1,351	7429	273	27.1	**18.1**	96.2	4.9
May 15	100	$1,325	7342	268	27.4	17.7	96.3	**3.3**
May 2	75	$1,307	7190	267	26.9	17.6	**96.4**	**3.0**
May 15	75	$1,218	6698	264	25.3	17.4	96.4	**3.4**
May 15	150	$1,194	6569	268	24.5	17.6	**96.6**	**2.9**
May 2	50	$1,177	6472	259	25.0	17.2	96.1	**3.3**
June 4	150	$1,146	6304	259	24.3	17.1	96.3	**3.7**
June 4	100	$1,140	6268	259	24.1	17.2	96.2	**3.7**
June 4	200	$1,111	6110	252	24.2	16.7	**96.4**	**3.5**
June 4	250	$1,041	5723	248	23.1	16.4	**96.5**	**2.9**
May 15	50	$980	5390	237	22.8	16.0	95.6	4.5
June 4	75	$971	5343	256	20.9	17.0	96.2	4.4
June 4	50	$875	4813	234	20.5	15.7	95.9	4.0
Average		$1,233	6780	263	25.6	17.4	96.4	3.5
LSD 5%		145	803.7	12.4	2.6	0.8	0.6	1.4
CV %		10	10.3	4.1	8.9	3.9	0.5	35.8

$/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.

Early Harvest - Influence on Sugarbeet Yield, Quality and Grower Income

Average of 4 Years, 8 Locations

Harvest: 6 dates **Seeding Rate:** 4.1 inches

Plot Size: 6 rows X 38 ft, 6 reps

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Amino	Beets 100'
Oct 15	**$2,182**	$70	9557	**294**	32.6	**19.6**	**95.4**	8.7	**186**
Sept 15	**$2,176**	**$83**	6718	250	27.0	17.0	94.9	8.4	**179**
Nov 1	**$2,159**	$65	**10383**	**297**	**35.1**	**19.7**	**95.6**	**5.5**	177
Oct 1	**$2,088**	$78	7595	274	27.8	18.7	94.6	**7.2**	**181**
Sept 1	$1,997	**$84**	5447	225	24.1	15.8	93.8	11.4	**181**
Aug 15	$1,745	**$84**	4108	196	21.0	14.0	93.4	10.8	176
Average	$2058	$77	7301	256	27.9	17.5	94.6	8.7	180
LSD 5%	161.3	4.6	483.4	13.0	1.6	0.8	0.5	2.7	8.4
CV %	7.7	5.9	6.5	5.0	5.6	4.4	0.6	26.4	4.3

Comments: The dates listed were the intended dates. The actual date varied a couple days in some trials. The early premium system compensates well. The payment per ton is significantly higher for the first three dates than the last three. Each year and location will be different but the payment per acre is statistically the same for the last four dates. A grower in deciding to harvest early can have other benefits such as; good weather, balance out fall work and planting wheat.

$/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.

Early Harvest - Influence on Sugarbeet Yield, Quality and Grower Income

Average of 2 Locations - 2013

Trial Quality: Fair
Variety: C-RR059
Plant: Quanicassee, May 15
Blumfield, May 4
Harvest: 6 dates
Plot Size: 6 rows X 38 ft, 6 reps

Rhizoc Control: Good control
Quadris, T-Band and
6-8 lf
Cerc Control: Good control
4 applications
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Beets 100'
Oct 17	**$2,072**	$64	**10513**	**325**	**32.3**	**21.3**	**96.1**	**153**
Sep 15	**$2,037**	$77	7216	275	26.7	18.6	94.9	136
Sep 1	**$2,006**	$82	6446	260	24.5	17.6	95.0	**143**
Oct 30	**$1,950**	$60	**10725**	**328**	**32.8**	**21.4**	**96.1**	137
Sept 30	**$1,934**	$72	8044	301	26.7	20.3	94.8	135
Aug 15	$1,625	**$88**	4547	246	18.6	17.0	94.1	137
Average	$1,937	$74	7915	289	26.9	19.4	95.2	140
LSD 5%	202.7	2.4	785.9	9.6	2.9	0.5	0.4	15.3
CV %	13.4	4.0	12.2	4.0	13.4	3.1	0.5	13.4

$/A: Gross dollars per acre assuming a $50 payment.

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

Early Harvest - Influence on Sugarbeet Yield, Quality and Grower Income

Sylvester, Quanicassee, MI - 2013

Trial Quality: Good
Variety: C-RR059
Plant: May 15
Harvest: 6 dates
Plot Size: 6 rows X 38 ft, 6 reps

Soil Info: Sandy Clay Loan, 3.6% OM, 7.9 pH, Above Opt. Levels: P, K, High: Mn, Med: B
Added N: 100 lbs
Prev Crop: Pickles/Radish

Rhizoc Control: Good Control, Quadris, T-Band and 6-8 lf
Cerc Control: Good Control, 4 Applications
Problems: Dry late summer
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Beets 100'	GDD*	Rain Inch*
Sept 1	**$2,223**	**$88**	7074	281	25.2	18.9	95.0	**156**	36.5	0.07
Oct 17	**$2,087**	$65	**10590**	**329**	**32.3**	**21.4**	**96.4**	**150**	23.7	0.13
Sept 15	**$2,045**	$80	7343	287	25.6	19.4	94.7	**141**	29.4	0.04
Sept 30	**$2,044**	$75	8503	313	27.1	**21.0**	94.9	**141**	22.9	0.05
Oct 30	$1,983	$60	**10906**	**332**	**32.8**	**21.6**	**96.3**	**141**	8.7	0.01
Aug 15	$1,772	**$89**	4958	250	19.9	17.1	94.7	**146**	31.1	0.08
Average	$2,026	$76	8229	299	27.2	19.9	95.3	146	25.4	0.06
LSD 5%	219.2	3.4	967.3	13.7	2.8	0.8	0.5	ns(19.2)		
CV %	9.1	3.7	9.9	3.9	8.8	3.2	0.5	11.1		

* GDD (Growing Degree Days) and Rainfall: an average daily amount for the 2 weeks prior to that harvest data

Comments: It was extremely dry at this location. The Sept 1 date had the highest $/Acre. Because it was dry the tonnage did not increase normally after this and the % sugar was already high.

$/A: Gross dollars per acre assuming a $50 payment.

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

Early Harvest - Influence on Sugarbeet Yield, Quality and Grower Income

Blumfield, MI - 2013

Trial Quality: Fair
Variety: C-RR059
Plant: May 4
Harvest: 6 dates
Plot Size: 6 rows X 38 ft, 6 reps

Soil Info: Sandy Clay Loam
2.3% OM, 7.7 pH
Above Opt. Levels: P, K
High: Mn, Low: B
Added N: 100 lbs
Prev Crop: Radish

Rhizoc Control: Good Control
Quadris, T-Band and 6-8 lf
Cerc Control: Good Control
4 Applications
Seeding Rate: 4.1 inches

Harvest Date	$/A	$/Ton	RWSA	RWST	T/A	% Sugar	% CJP	Beets 100'	GDD*	Rain Inch*
Oct 17	**$2,057**	$63	**10436**	**322**	**32.4**	**21.2**	**95.8**	**156**	24.2	0.09
Sept 15	**$2,029**	$73	7285	263	27.8	17.8	95.1	**132**	29.3	0.01
Oct 30	**$1,917**	$59	**10545**	**324**	**32.8**	**21.3**	**95.9**	**132**	8.5	0.03
Sept 30	**$1,823**	$70	7586	289	26.2	19.6	94.6	129	23.5	0.03
Sept 1	**$1,790**	$75	5697	240	23.8	16.4	95.0	130	36.7	1.06
Aug 15	$1,477	**$86**	4137	242	17.2	16.9	93.6	128	30.4	0.82
Average	$1,849	$71	7614	280	26.7	18.9	95.0	135	25.4	0.34
LSD 5%	270.3	3.4	1010	13.3	3.8	0.6	0.7	24.0		
CV %	12.29	4.1	11.2	4.0	11.9	2.9	0.6	15.0		

* GDD (Growing Degree Days) and Rainfall: an average daily amount for the 2 weeks prior to that harvest data

Comments: There was more variation in this trial. All dates except Aug 15 were statistically the same. Oct 17 and 30 had a higher RWST.

$/A: Gross dollars per acre assuming a $50 payment.

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

MICHIGAN STATE UNIVERSITY Extension

Cover Crops Prior to Beets

Burk Farms, Bay City - 2013

Trial Quality: Good
Variety: C-RR074NT
Planted: May 3
Harv/Samp: Oct 19 / Oct 9
Plot Size: 3 reps
Row Spacing: 30 inch
Seeding Rate: 52,000

Soil Info: Loam
Fertilizer: Fall: 150# K_2O, 2x2: 27-40-0 + Micros; Sid-edress: 75# N
Prev Crop: Wheat w/ Cover
Weather: Heavy rain after planting

Rhizoc Control: Good Control: Quadris I.F. & Foliar
Cerc Control: Good Control: 1. Eminent + EBDC, 2. Headline + EBDC, 3. Tin + EBDC
Other Pests: None

Treatment	$/A	RWSA	RWST	T/A	% Sugar	% CJP	Stand / 100 Ft. 45 Day	Dead Beets / 100 Ft
Oil Seed Radish	$1,203	**6621**	**262**	**25.2**	**17.5**	**95.8**	**208**	**1**
Sorghum / Sudan Grass	$1,152	**6348**	**260**	**24.3**	**17.4**	**95.7**	**191**	**2**
Clover	$1,117	**6152**	**249**	**24.7**	**16.8**	**95.2**	**168**	**0**
Pea & Radish Mix	$1,105	**6088**	**256**	**23.8**	**17.2**	**95.5**	**205**	**5**
Oats	$1,077	**5944**	**250**	**23.7**	**16.9**	**95.3**	**190**	**11**
Average	$1,131	6231	255	24.3	17.2	95.5	192	4
LSD 5%	—	ns (827)	ns (22)	ns (1.6)	ns (1.2)	ns (0.8)	ns (38)	ns (16)
CV %	—	7	5	3.4	3.7	0.4	10	232

Comments: This trial was conducted by Paul Gross, Cover Crop Educator MSUE, to evaluate the impact that cover crops planted after wheat have on sugarbeets. Using cover crops in rotation is a long term soil improvement practice. Cover crops were planted in strips after wheat harvest and fall tilled. The cover crops were planted by broadcasting into wheat stubble and incorporating with a Turbo-Till vertical tillage tool. Sugarbeets were then planted the following spring. In this trial, no significant yield/quality improvements were seen. Though not statistically significant this year, this is the second year in a row that we have had a sugar reduction when clover is the previous crop. In this trial, nitrogen rates were kept constant with each treatment. It is suggested that nitrogen rates be reduced by 30-40 lbs per acre when following clover to minimize the detrimental impact on quality. The oil seed radish variety was Defender. Sugarbeet growers need to be careful to use the proper oil seed radish varieties since some radish varieties will cause an increase in sugarbeet cyst nematode.

$/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.

An Automated System for Plant-level Disease Rating in Real Fields

Muhammad Jamal Afridi[1], Xiaoming Liu[1], and J. Mitchell McGrath[2]

[1]Department of Computer Science and Engineering, Michigan State University
[2]ARS Sugar Beet and Bean Research Unit, U.S. Department of Agriculture
[1,2]{afridimu,liuxm,mitchmcg}@msu.edu

***Abstract*—Cercospora leaf spot (CLS) is the most serious disease in sugar beet plants that significantly reduces the sugar yield throughout the world. Therefore the current focus of the researchers in agricultural domain is to find sugar beet cultivars that are highly resistant to CLS. To measure their resistance, CLS is manually observed and rated in a large varieties of sugar beet by different human experts over a period of a few months. Unfortunately, this procedure is laborious and subjective. Therefore, we propose a novel computer vision system, CLS Rater, to automatically and accurately rate CLS of plant images in the real field to the "USDA scale" of 0 to 10. Given a set of plant images captured by a tractor-mounted camera, CLS Rater extracts multi-scale superpixels, where in each scale a novel histogram of importances feature representation is proposed to encode both the within-superpixel local and across-superpixel global appearance variations. These features at different superpixel scales are then fused for learning a bagging M5P regressor that estimates the rating for each plant image. We test our system on the field data collected over a period of three months under different day lighting and weather conditions. Experimental results show that CLS Rater has a rating error of 0.76, which is substantially smaller than the error of 1.25 by the human experts.**

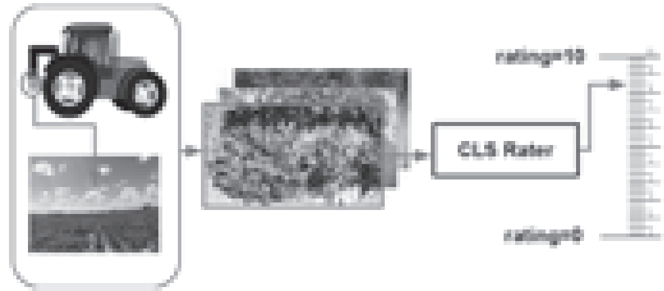


Fig. 1: A camera mounted to a field tractor records the plant videos from top view. CLS Rater then performs automated analysis and assigns a rating of "USDA scale" to each image extracted from that video.

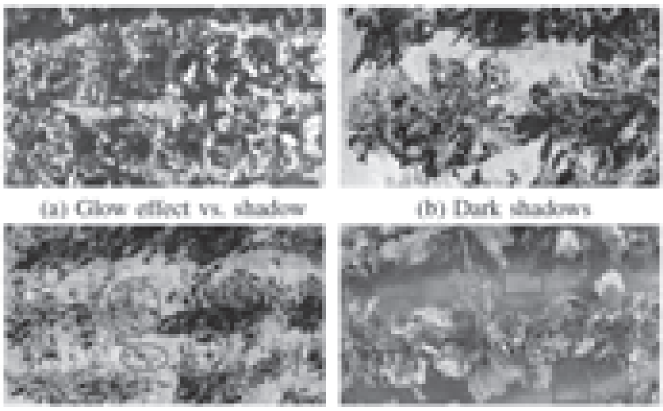
I. Introduction

As a plant with a high concentration of sucrose in its roots, sugar beet accounts for 55% of the total sugar produced in the U.S. [1]. However, despite using control strategies, the yield from this crop is significantly reduced by various diseases, among which Cercospora Leaf Spot (CLS) [19] is the most serious one. This disease adversely affects about 33% of the world's sugar beet cultivation area [8]. One effective way to tackle CLS is to plant more resistant cultivars of sugar beet. To study the resistance property, scientists grow a large number of genetically selected cultivars of sugar beet in the real field. The resistance of each cultivar to CLS is observed and rated by experts over a course of a few months. To facilitate rating, Ruppel and Gaskill define a well-known 11-level rating system adopted by U.S. Department of Agriculture (USDA) [16], named "USDA scale". However, manual rating system has three critical drawbacks: *subjective* where multiple experts can have different ratings for the same plant, *laborious* where it requires enormous time from experts for frequent and large-scale rating, and *relatively insensitive* where the human eye is not sufficiently sensitive to the subtle variation of the leaf appearance. Therefore, an improved automated rating system addressing these drawbacks is highly desired.

Given the popularity and low cost of visual sensors such as cameras, a computer vision based system can be an excellent choice for the rating system where the images of plants are analyzed and rated in an *automated*, *consistent*, and *efficient* manner. Unfortunately, the agricultural industry appears to lack such types of commercial systems. In the research community, most of the prior work focuses only on detecting or classifying CLS from the zoom-in view of the leaf images [2], [3], [15], [17]. Although such leaf-level approaches make the classification problem easier, they are practically more challenging to adopt due to the requirement on the image acquisition.

Alternatively, the plant-level images can be more conveniently acquired in the field via a fly-over UAV or drive-through tractor as shown in Fig. 1. However, automatic rating on plant-level images is challenging, as illustrated in Fig. 2. The varying light conditions in different weather contribute to a large amount of appearance variations in the images. Dark shadows tend to hide the details making it tough to analyze the appearance patterns of diseased spots. In the higher ratings of CLS, the dead plants mix up with the soil and hence not confusing them with soil is challenging. Similarly a bright glow in healthy leaves due to sunlight displays a yellowish color that is normally present around the diseased leaves.

To fulfill the application need and address the technical challenges, we propose a novel system, CLS Rater, for the automated rating of CLS disease in plant-level images captured by a conventional tractor-mounted camera. Notably, this application requires our system to make a global rating estimate of a plant image by analyzing diverse appearance patterns of disease in its local regions. We tackle this challenge with our novel technical contribution of superpixel-based Histogram of Importances (HoI) features that describe the local patterns of each superpixel at the global image level. We then utilize these



(a) Glow effect vs. shadow (b) Dark shadows (c) Plant mixed in soil color (d) Variations in soil

Fig. 2: Appearance variations of plant images.

features for learning image level regression models. Although, superpixels are frequently used in image segmentation problems [5], [10], [20], they have not been explicitly used to learn image level regression models. With an input image, we first extract superpixels at a pre-defined scale, e.g., M superpixels. Since each superpixel is a collection of neighboring pixels with similar appearance, a D-dimensional feature vector, e.g., a color histogram, is extracted to capture the local appearance variations of a superpixel. Given the $M \times D$ feature matrix extracted from all superpixels of an image, we describe the appearance variations across all superpixels, by computing a T-dimensional histogram for each column of this matrix. This results in a DT-dimensional vector, where each element describes the distribution of relative importance of one feature, e.g., one representative color, among the individual superpixel.

Furthermore, depending on the rating of a plant, the distinctive region of diseased leaves can have a large scale variation, from a tiny spot to an extensive area of dead leaves. Hence, the superpixels extraction is conducted at multiple scales, ranging from hundreds to thousands of superpixels, and the proposed HoI feature is extracted at each scale. Finally the features from multiple scales are fused, from which a regressor is learned based on a set of images and their manual labels of USDA scale. We test CLS Rater on a dataset collected over a three-month period under different outdoor weather conditions. Experimental results show that our system can predict the rating with an average rating error of 0.76, while the error of experts' label is 1.25.

In summary, our paper makes three main contributions:

◦ We design and test a practical computer vision system that conveniently consumes plant-level images of a real field and automatically rate the CLS resistance according to the USDA scale.

◦ We propose a novel histogram of importances feature over the multi-scale superpixels representation. We demonstrate its effectiveness in the regressor learning and compare it with a baseline approach.

◦ We collect an image dataset of 458 cultivars of sugar beet with various degrees of CLS disease and the associated manual labels of USDA scale, over a period of three months. We will make this dataset publically available to the research community.

II. Prior Work

Related research in our application mainly focuses on detecting or classifying CLS disease in sugar beet. These approaches utilize zoom-in leaf-level images to detect the diseased segments and classify a leaf as diseased or healthy. Such approaches address a less challenging problem than ours due to the leaf-level images, and a 2-class classification task, while we perform regression from plant-level images. Furthermore, these approaches are hard to adopt in practices because it is inconvenient to regularly obtain leaf-level detail of each plant in a large field. For instance, in [3], authors classify different diseases in sugar beat leaves, where the plants are grown under controlled laboratorial conditions. In [15], one goal of their study is to use leaf images to differentiate a leaf having CLS from the healthy one by a SVM classifier. Similarly, [2] and [17] also use leaf images and utilize a threshold based strategy to monitor the diseased part of the leaf. In contrast, we collect plant-level images in a real field over a three-month period under different weather conditions. Further, our system is based on learning a regression technique that predicts the severity of CLS disease in a 11-level USDA scale. To the best of our knowledge, this is the first study to utilize the plant-level real field images of sugar beet and automatically predict the fine-grained severity of CLS disease.

Since our feature representation builds upon the superpixel, we provide a brief overview of the related work in superpixels. With time, superpixel based methods are becoming more advanced. For example in [9], authors discuss how the superpixels resulting from different techniques can be combined to achieve better image segmentation. Similarly, various studies utilize superpixels for classifying local segments of images. In [6], authors use a multi-scale superpixel classification approach for tumor segmentation. Furthermore, superpixels have been utilized in various other applications as shown in [5], [10], [20]. Note that in our study, CLS rating needs to be conducted globally for an entire image, while superpixels only capture local characteristics of an image. Hence, we need to address *how* the local characteristics of superpixels can be summarized for image-level representation, which unfortunately has not been explicitly studied before and is the novelty of our technical approach.

III. Our Approach of CLS Rater

The input data to our system can be the plant-level images captured by a camera mounted on either a fly-over UAV or a horizontal pole of a regular field tractor. Specifically in this paper we use the latter, as illustrated in Fig. 1. Given a plant image, superpixels are extracted and the pixels within a superpixel are used to describe the local characteristics. Although there are many types of features for representing a local region, we decide to focus on the color and texture based features. The reason is that, when a plant is going through different stages of CLS infection, the amount as well as the color of healthy leaf, diseased leaf, and visible soil regions in plant images are changing accordingly. Thus, color can be very useful in discriminating these three types of regions and further predicting the rating. Similarly, texture also exhibits distinct patterns on these different regions.

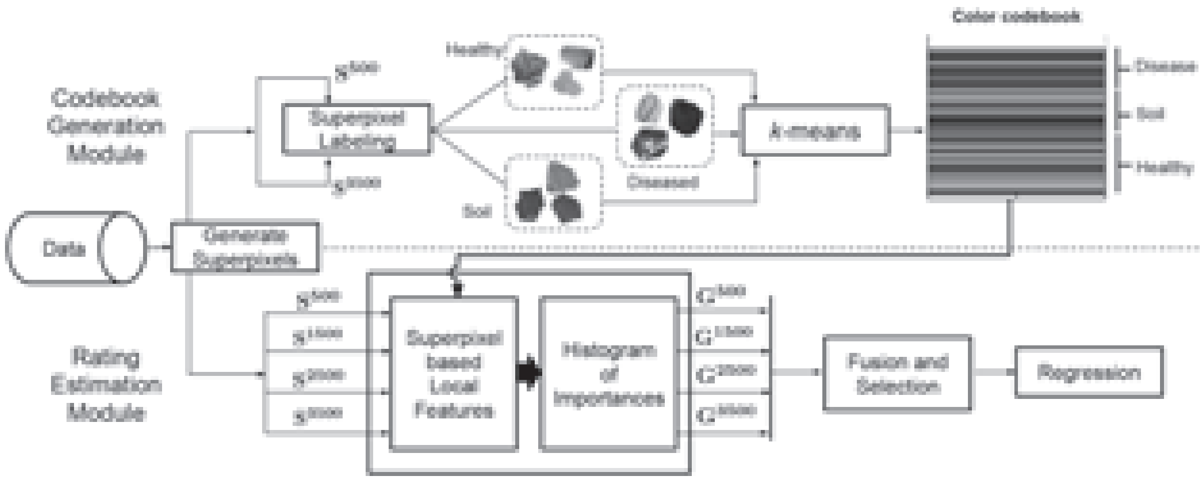


Fig. 3: High-level architecture of our CLS Rater system.

Like any learning based computer vision system, CLS Rater has the training stage and the testing stage. During the training stage, a regressor is learned from a set of plant images with manual labels of "USDA scale", with the goal that the predicted rating from the regressor is as close to the labeled rating as possible. While in the testing stage, the learned regressor is applied to an unseen plant image for automatically predicting its rating. As shown in Fig. 3, the training stage includes two modules: codebook generation module (CGM) and rating estimation module (REM). The goal of CGM is to model the representative colors in three different types of regions. In CGM, we manually label diverse sets of superpixels into each of the three regions, to which k-means clustering is applied independently for generating the codewords of these three regions. In REM, superpixels are extracted from a set of images at four scales, where at each scale a novel feature representation is used to describe both the local and global feature distribution. Features at all scales are then fused and a regressor is learned from the selected features. Processing in the testing stage is similar to REM except that it only takes one image as input. We describe the key components of the training step as follows.

A. Superpixel Extraction

CLS appears as diseased segments in sugar beet plants and depending on the rating of disease, these segments show large scale variations ranging from a tiny spot to a large segment. As a popular middle-level representation, a superpixel is a local segment in an image containing a group of neighboring pixels with similar appearance. Normally a scale is specified so that a pre-determined number M of superpixels can be generated for one image. To capture the local characteristics of diseased spots at all rating levels, we generate superpixels $\mathbf{S}^M = \{s_1, s_2, \cdots, s_M\}$ of an image at four different scales where $M = [500, 1500, 2500, 3500]$. Using the standard implementation of [11], we observe that superpixels at each scale cover local characteristics of an image in a unique way, as shown in the zoom-in views of the smallest and largest scales in Fig. 4. For example, small sized superpixels, obtained with a large M, can completely fit to a small diseased spot developed in the early CLS stage. Although a larger sized superpixel cannot restrict its boundary to a small segment

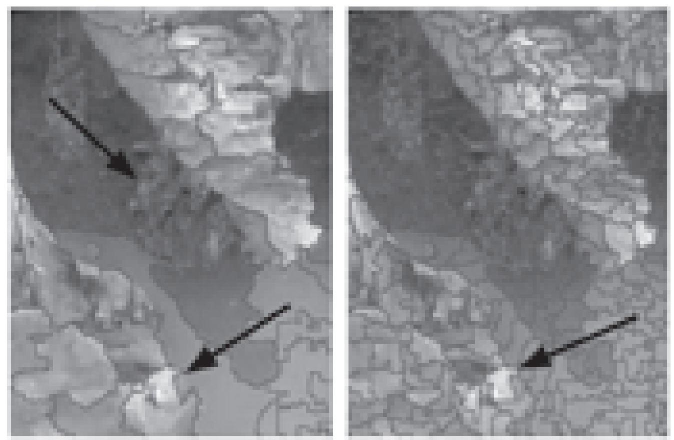


Fig. 4: Superpixels at $M = 500$ (left) and 3500 (right).

present in low rating images, it covers the surrounding of such a small spot and hence provides useful neighborhood contextual information, as indicated by the two arrows at the bottom of Fig. 4. On the other hand, in high rating images, larger superpixels can cover an entire large spot and provide a more confident indication of the severity of CLS (the arrow at the top of Fig. 4).

B. Codebook Generation Module

Motivated by the BoW type approaches [4], we first learn a color codebook to estimate the representative colors (codewords) in our plant images. From our dataset we select a diverse set of $B = 33$ images with various severities of CLS. For each image, $\mathbf{I}_i$, superpixels at multiple scales $\{\mathbf{S}_i^M\}$ are generated. Using our GUI, the superpixels $\mathbf{S}_i^M$ of image $\mathbf{I}_i$ is displayed on the screen, where a user may select superpixels belonging to healthy, diseased and soil regions via mouse clicks. The selected subsets are denoted as $\mathbf{S}_i^h$, $\mathbf{S}_i^e$, and $\mathbf{S}_i^s$ respectively. We perform this step for all B images to form $\mathbf{S}_H = \{\mathbf{S}_1^h, \mathbf{S}_2^h, ..., \mathbf{S}_B^h\}$, $\mathbf{S}_E = \{\mathbf{S}_1^e, \mathbf{S}_2^e, ..., \mathbf{S}_B^e\}$ and $\mathbf{S}_S = \{\mathbf{S}_1^s, \mathbf{S}_2^s, ..., \mathbf{S}_B^s\}$. We collect about 150 superpixels for each of three categories. We perform this superpixel selection procedure at two scales only. To select clean diseased spots,

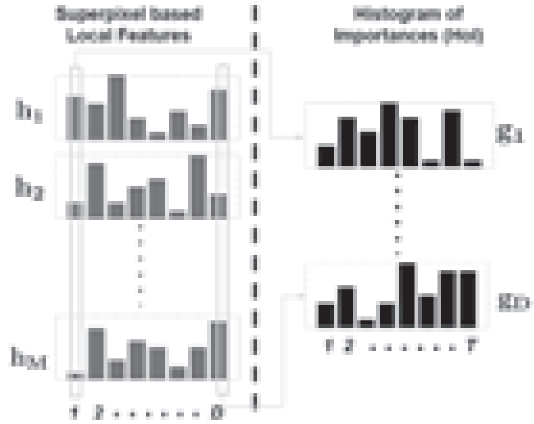


Fig. 5: Computing the Histogram of Importances (HoI).

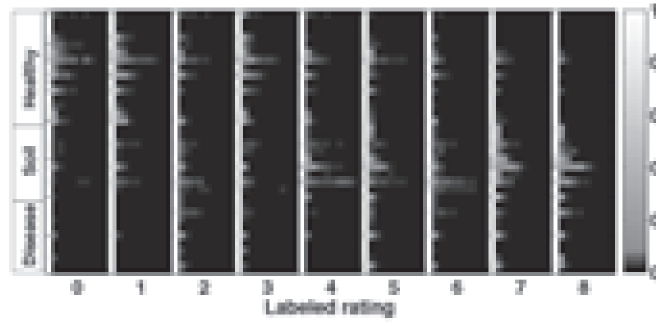


Fig. 6: Color-based HoI of 9 images with different ratings.

we use $\{\mathbf{S}_i^{3500}\}$ containing smaller superpixels, whereas it is convenient to use $\{\mathbf{S}_i^{500}\}$ for healthy plants and soil.

The RGB pixel values of all pixles within the superpixels of $\mathbf{S}_H$, $\mathbf{S}_E$, and $\mathbf{S}_S$ are fed to the k-means clustering for extracting codewords of each category. We extract 10 codewords for disease and soil respectively, and denote them as $\mathbf{C}_E$ and $\mathbf{C}_S$. Since the healthy part shows high variations and also responds with lighter variants in regions around the diseased part, we select 15 codewords $\mathbf{C}_H$. We combine $\mathbf{C}_H$, $\mathbf{C}_E$, and $\mathbf{C}_S$ to obtain a codebook with $D = 35$ codewords $\mathbf{C} = \{\mathbf{c}_1, \mathbf{c}_2, ..., \mathbf{c}_{35}\}$, which will be used in the rating estimation module that is explained next. An alternative approach to our codebook learning is to directly learn the color codewords from the images, which is not preferred because the resulting codewords will mainly cover the variations in healthy and soil parts, hence creating an unbalanced codebook.

C. Rating Estimation Module

Based on the superpixels of an image set, this module performs two main tasks: 1) feature representation, and 2) feature selection and regressor learning.

1) Feature Representation: Feature representation is critical for any computer vision system. In our work, we strive to design an image-level feature that captures both the local pixel statistics, such as the small diseased spots, and the global image regularity, such as a large region of dead leaves. This leads to our proposed approach to compute our novel histogram of importances feature in two steps.

In the first step, a histogram feature is extracted to represent the color variation of all pixels within each superpixel. Given that an image $\mathbf{I}$ contains a set of M superpixels $\mathbf{S}^M = \{\mathbf{s}_1, \mathbf{s}_2, \cdots, \mathbf{s}_M\}$, we compute a set of color histograms $\mathbf{H} = [\mathbf{h}_1, \mathbf{h}_2, ..., \mathbf{h}_M]$. For each superpixel $\mathbf{s}_m \in \mathbf{S}^M$, we have $\mathbf{h}_m(d) = \frac{h_d}{|\mathbf{s}_m|}$, where h_d indicates the number of pixels $\mathbf{u}$ within a superpixel whose color is most similar to $\mathbf{c}_d$ among all 35 codewords, i.e., $h_d = \sum_{\mathbf{u} \in \mathbf{s}_m} \delta(d = argmin_d \|\mathbf{I}(\mathbf{u}) - \mathbf{c}_d\|_2)$ and $\delta()$ is the indicator function.

Although $\mathbf{h}_m$ is a good descriptor of local appearance at each superpixel, it cannot be applied to regression learning directly because superpixels between two images are not matching with each other, as well as it depends on the superpixel scale M. Hence, we aim to extract an image-level feature independent to superpixel locations or M. Specifically, by observing the matrix $\mathbf{H}$ of an image, each element $\mathbf{h}_m(d)$ indicates the relative importance of the color feature d within the superpixel $\mathbf{s}_m$. Such an importance value can vary between 0 and 1. By collecting all the importance values belong to the same feature d, i.e., one column of $\mathbf{H}$, we can form a T-dimensional histogram of importance (HoI) $\mathbf{g}_d$, where $\mathbf{g}_d(t) = \sum_m \delta(\frac{t-1}{T} \leqslant \mathbf{h}_m(d) < \frac{t}{T})$, and $1 \leqslant t \leqslant T$ where both t and T are integer values. We show this procedure diagrammatically in Fig. 5. By collecting the HoI of all D color codewords, we have a $D \times T$ feature representation $\mathbf{G}^M = \{\mathbf{g}_d\}$ for one superpixel scale M.

Similar HoI features are also computed for the LBP-based texture features [12] $\mathbf{L}^M$, where $D = 256$. In our study, we use $T = 10$ for color features and $T = 5$ for LBP features. Thus, for each image at one superpixel scale, we have a total of $1,630$ features. To visualize the HoI features, Fig. 6 plots $\mathbf{G}^M$ of 9 randomly selected images at $M = 500$. We can clearly see a decrease of importances in healthy features and a slight increase of importances in soil features, as we move to higher ratings.

2) Feature Fusion, Selection and Regression: As mentioned before, superpixels at different scale cover local characteristics in different ways and provide different advantages over each other. Therefore, to get the best from every scale, we compute the color and LBP based HoI, $\mathbf{G}^M$ and $\mathbf{L}^M$, at all four scales of each image, which results in a feature vector with the length of $1,630 \times 4$. However, since not all feature elements have a high discriminative power, we perform feature selection by the correlation-based approach [22], which is based on two measures: the high predictive ability and low correlation with already selected features. We then provide the selected feature set to bagging M5P regressor [13], [21]. M5P decision tree learns different regression functions for each leaf node of the tree. Experiments in the next section provide a comparative study of different regression schemes on our features. Our results show the performance of bagging M5P to be superior to other well-known regressions paradigms.

IV. Experimental Results

In this section we design experiments to answer the following questions: 1) how does CLS Rater perform in comparison to manual human rating? 2) how do different regression schemes perform at different superpixel scales? 3) is there any relation between the type of the regression methods and the type of our appearance features? 4) how do our discriminative

TABLE I: Label distribution w.r.t. different ratings.

Labeled rating	0	1	2	3	4	5	6	7	8	9	10
# of images	3	18	27	57	64	54	45	12	6	0	0

TABLE II: Rating error (e) at different superpixel scales.

Regression	S^{500}	S^{1000}	S^{2000}	S^{3000}	BoW	S^{all}
M5P	0.82	0.81	0.84	0.81	0.97	**0.76**
SVM	1.07	1.03	1.26	1.13	1.07	0.92
Linear	1.13	1.32	1.54	1.51	1.04	0.91
M5Rules	0.83	0.83	0.85	0.83	0.98	0.77
LMS	1.27	1.31	1.54	1.52	1.05	0.87

features vary across different CLS ratings? We now discuss different aspects of our experiments to provide answers to these questions.

Dataset To record the progress of CLS disease, we collect 220 videos of a sugar beet field from July 30, 2013 to September 12, 2013 on 10 different dates. Our field is of a rectangular shape at 135×168 meters, and plants a total of 458 sugar beet cultivars. Along the short edge of this rectangle there are 22 field lines, where our tractor drives along each of the field lines for data collection. For each field line, our system captures a video of about 3 minutes at 30 FPS, with a frame size of $1,080 \times 1,920$. We reduce the frame size to 540×960 for improved computational efficiency. Our tractor captures these videos from a height of 1.2 meters. For performance evaluation, we utilize a diverse set of 306 images extracted from all videos as the training and testing set. Using the USDA scale, one expert labels all images, and two additional experts label half of these images. The overall distribution of all labeled images across different ratings is tabulated in Tab. I.

In our experiments, we randomly split the 306-image set into two equal parts and use one for training and the other for testing. This is repeated to generate three partitions of training and testing sets. For a set of K image $\mathbf{I}_i$, $i = 1, 2, ..., K$, given the manual rating from one expert as r_i and the estimated rating of $\hat{r}_i$ from CLS Rater, we compute the *rating error* of our system as $e = \frac{1}{K}\sum_i |r_i - \hat{r}_i|$.

Regression Results Using our data, we evaluate a diverse set of regression methods belonging to three categories: (1) functional regression (SVM [18], Least Median Squared Linear (LMS) [14], Linear), (2) decision tree learning based regression (M5P) [21], and (3) rule learning based regression (M5Rules) [7]. We use bagging with each of these methods to enhance their predictive ability. To remove the bias in coding, we utilize the standard implementations in [22]. The manual labels used in both training and testing are from a single expert. Regressor training and testing are conducted on all three partitions and the average results are shown in Tab. II. We observe that while features at different superpixel scales are preferred by different regression methods, the fused feature scale ($\mathbf{S}^{all}$) achieves the best performance regardless of the method. Also in general M5P performs the best among all regression methods. Therefore, our CLS Rater will utilize the fused feature with a M5P regressor. One baseline method to compare with our HoI feature is the BoW features [4] based on the 35 color codewords and 256 LBP codewords of each image. As shown in the *BoW* column of Tab. II, none of the regression methods based on BoW is superior to CLS Rater.

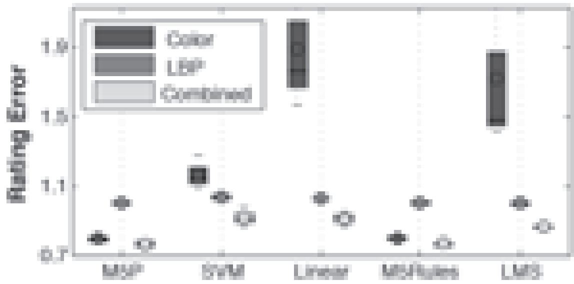


Fig. 7: Regression performance with different feature types.

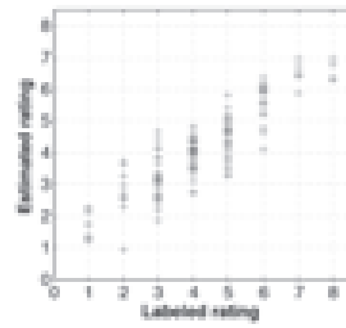


Fig. 8: Labeled rating vs. the estimated rating of CLS Rater.

We further explore how the regression methods perform w.r.t. different types of appearance features, i.e., color and LBP. We provide fused features of each type to the regression methods and observe that none of these schemes have a bias towards the LBP features. However, decision tree and rule based regression perform better than functional regression using color features, as shown in Fig. 7.

In order to investigate how CLS Rater performs across different ratings, we plot its performance on one of the test partitions in Fig. 8. The figure shows that the rating error is comparatively higher at very low or in very high rating levels. We attribute this to the unbalanced label distribution shown in Tab. I. The table shows that we have far less labeled images for the lower and higher ratings compared to the middle level ratings.

Feature Analysis In this section we analyze the features selected by the bagging M5P regressor method during its training process. Note that M5P is a tree-based regressor where each nodes is associated with a selected feature. Due to limited space, we only analyze the top hierarchy nodes (features) and select four nodes, each with a different type of features, i.e., the color features from the disease, soil and healthy region and one LBP-based texture feature. In order to see how effective these four selected features are on the testing images, we perform the following computation. We first partition all testing images into 8 groups based on their labeled ratings from 1 to 8. Then for each of the four selected features, we compute its average feature values from images within the same group. This leads to a 8-dimensional vector, which is further normalized by dividing with the maximal element in the vector. We plot the resulting four vectors in Fig. 9. We clearly see a trend for each

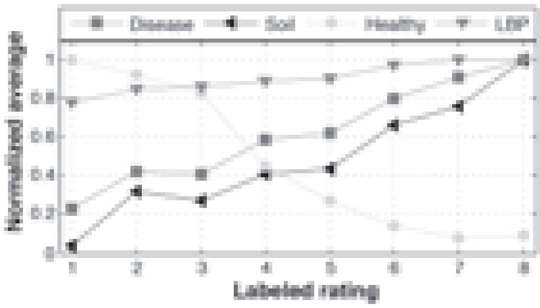


Fig. 9: Top hierarchy features of bagging M5P regressor.

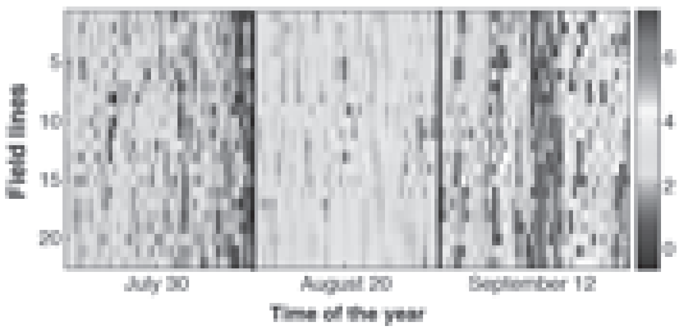


Fig. 10: CLS ratings of our field over three months.

of these four features. For example, there is an overall increase in the values of the disease and soil features as we move to higher ratings, which is consistent with the real observation on the plant images.

CLS Rater vs. Human Rating In general, it takes about 5 seasons to train an unskilled individual for rating CLS disease and at least 1 season to train a pathologist. However, it is still well known that human experts do not provide consistent rating for CLS. Hence, it is interesting to compare the rating error of CLS Rater to the error observed in human estimation. The minimal estimation error for CLS Rater is 0.76, as shown in Tab. II. To compare this with human error, we utilize the half set of our data that is rated by three human experts. For an image $\mathbf{I}_i$, we consider the mean of three ratings, $\hat{r}_i^1$, $\hat{r}_i^2$ and $\hat{r}_i^3$, as the ground truth rating r_i. We then calculate the human rating error using the similar equation as our system error e, i.e., $e^h = \frac{1}{3K}\sum_{i=1}^{K}\sum_{j=1}^{3}|r_i - \hat{r}_i^j|$. Based on all testing images, the error of human rating e^h is 1.25. The superior performance of our system over the experts indicates the great potential of applying CLS Rater in practices.

CLS Resistance Patterns in the Field Using our CLS Rater system, we can also study how the disease grows in different sections of our field over a period of three months. Since each section corresponds to a known sugar beet cultivar, this study provides many insights to the domain experts about the CLS resistances of various cultivars. As shown in Fig. 10, each box is made of 22×40 subunits where 22 is the number of field lines and 40 represents the number of evenly sampled images along each field line (or video). We clearly observe that cultivars in the middle sections of our field show far less resistant to CLS, while some cultivars at the left of the field are very resistant even till the end of the season.

V. Conclusions

This paper introduced a novel computer vision system, CLS Rater, that uses plant-level images for the automated rating of the CLS disease in sugar beet plants. We tested our system on a practical field under different lighting and weather conditions over a period of three months. CLS Rater utilizes a novel HoI feature to represent the local characteristics of superpixels at the image level and predicts the rating with an error of 0.76, which is substantially better in comparison to manual rating performed by human experts. We will work toward using CLS Rater as an integral part of CLS disease monitoring and studying in real fields. Furthermore, our technical approach does not depend on the specific disease or plant, and therefore is potentially applicable to a wide range of precision agriculture applications.

References

[1] http://www.ers.usda.gov/topics/crops/sugar-sweeteners/background.aspx#.UpfNwuIwBZ8.
[2] H. Al Hiary, S. Bani Ahmad, M. Reyalat, M. Braik, and Z. ALRahamneh. Fast and accurate detection and classification of plant diseases. *IJCA*, 17(1):31–38, 2011.
[3] S. Bauer, F. Korc, and W. Förstner. Investigation into the classification of diseases of sugar beet leaves using multispectral images. *Precision agriculture*, pages 229–238, 2009.
[4] L. Fei-Fei and P. Perona. A bayesian hierarchical model for learning natural scene categories. In *CVPR*, volume 2, pages 524–531, 2005.
[5] B. Fulkerson, A. Vedaldi, and S. Soatto. Class segmentation and object localization with superpixel neighborhoods. In *ICCV*, pages 670–677, 2009.
[6] Z. Hao, Q. Wang, H. Ren, K. Xu, Y. K. Seong, and J. Kim. Multiscale superpixel classification for tumor segmentation in breast ultrasound images. In *ICIP*, pages 2817–2820, 2012.
[7] G. Holmes, M. Hall, and E. Frank. *Generating rule sets from model trees*. Springer, 1999.
[8] B. Holtschulte, M. Asher, M. Molard, F. Rosso, G. Steinrücken, R. Beckers, et al. Cercospora beticola-worldwide distribution and incidence. *Cercospora beticola Sacc. biology, agronomic influence and control measures in sugar beet.*, pages 5–16, 2000.
[9] Z. Li, X.-M. Wu, and S. Chang. Segmentation using superpixels: A bipartite graph partitioning approach. In *CVPR*, 2012.
[10] H. Liu, Y. Qu, Y. Wu, and H. Wang. Class-specified segmentation with multi-scale superpixels. In *ACCV Workshops*, pages 158–169, 2013.
[11] M.-Y. Liu, O. Tuzel, S. Ramalingam, and R. Chellappa. Entropy rate superpixel segmentation. In *CVPR*, pages 2097–2104, 2011.
[12] T. Ojala, M. Pietikäinen, and D. Harwood. A comparative study of texture measures with classification based on featured distributions. *Pattern Recognition*, 29(1):51–59, 1996.
[13] R. J. Quinlan. Learning with continuous classes. In *5th AI*, pages 343–348, 1992.
[14] P. J. Rousseeuw and A. M. Leroy. *Robust regression and outlier detection*, volume 589. Wiley, 2005.
[15] T. Rumpf, A.-K. Mahlein, U. Steiner, E.-C. Oerke, H.-W. Dehne, and L. Plümer. Early detection and classification of plant diseases with support vector machines based on hyperspectral reflectance. *Computers and Electronics in Agriculture*, 74(1):91–99, 2010.
[16] E. Ruppel and J. Gaskill. Techniques for evaluating sugarbeet for resistance to cercospora beticola in the field. *Amer Soc Sugar Beet Technol J*, 1971.
[17] W. Shen, Y. Wu, Z. Chen, and H. Wei. Grading method of leaf spot disease based on image processing. In *Int. Conf. Computer Science and Software Engineering, IEEE*, volume 6, pages 491–494, 2008.
[18] S. K. Shevade, S. S. Keerthi, C. Bhattacharyya, and K. R. K. Murthy. Improvements to the SMO algorithm for SVM regression. *IEEE Trans. Neural Netw.*, 11(5):1188–1193, 2000.
[19] G. N. Skaracis, O. I. Pavli, and E. Biancardi. Cercospora leaf spot disease of sugar beet. *Sugar Tech*, 12(3-4):220–228, 2010.
[20] J. Tighe and S. Lazebnik. Superparsing: scalable nonparametric image parsing with superpixels. In *ECCV*, pages 352–365, 2010.
[21] Y. Wang and I. H. Witten. Induction of model trees for predicting continuous classes. In *ECML*, 1997.
[22] I. H. Witten and E. Frank. Data mining: Practical machine learning tools and techniques. 2. *Diane Cerra*, pages 187–99, 2005.

Glyphosate resistant marestail

Glyphosate resistant canola

Variety difference from water damage in Canada

Variety difference in topping

Hail damage

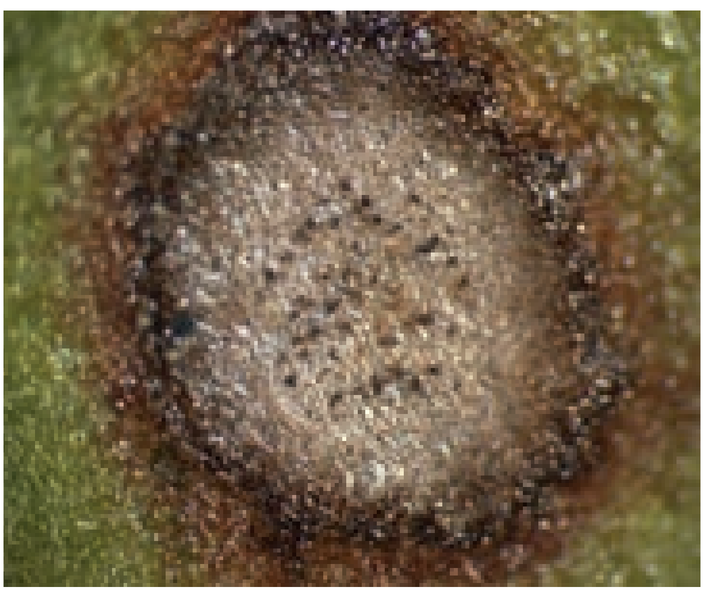
Hail damage 3 weeks later

Lygus damage

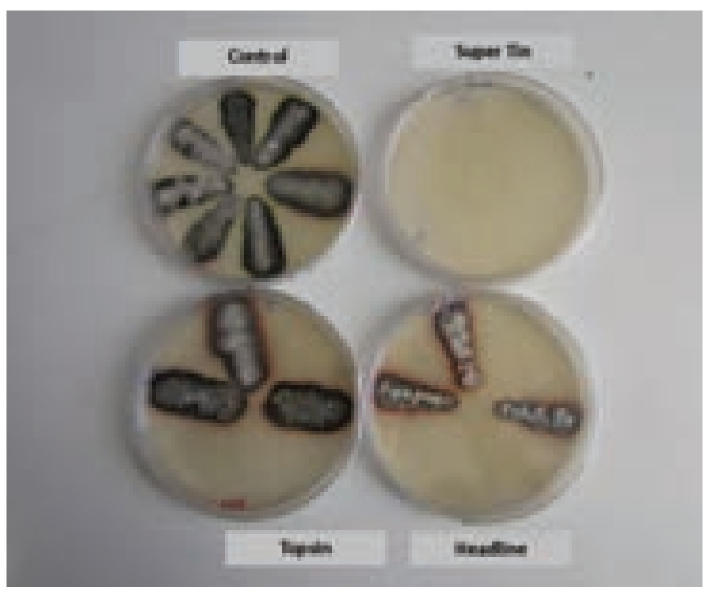
Aphids

White Grub

Tiger Moth larvae



Cercospora Leafspot under microscope



Testing for Cercospora fungicide resistance

Damage on the right from Copper + Glyphosate

Glyphosate + Kocide Damage

Storage rots

Chimera

Making Cercospora Inoculum

Powdery Mildew


Spraying Rhizoctonia in plots


Self-propelled harvester field day


Research Farm Tour


Seed salesmen helping top


Cyst nematode nursery


Checking seed depth

PRESENTED IN PARTNERSHIP

EDUCATION

Publications, meetings
seminars, web resources, clinics,
reporting sessions.

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