MICHIGAN SUGARBEET REACh
Research & Education Advisory Council

2023 Research Results

Presented In Partnership

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PIONEER • BIG CHIEF MICHIGAN SUGAR

Sugarbeet Advancement

MICHIGAN SUGARBEET REACh

Research & Education Advisory Council

Education

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

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.

MICHIGAN STATE UNIVERSITY | AgBioResearch

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MICHIGAN SUGARBEET REACh
Research Education Advisory Council

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PIONEER • BIG CHIEF
MICHIGAN SUGAR

2023 Research Results

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Rhizoctonia Crown Rot Product Efficacy Trial

Yoder - Pigeon, MI - 2023

Trial Quality: Good
Variety: SX-2294
Planted: May 22nd
Harvested: October 3rd
Plots: 6 rows X 38 ft., 5 reps
Row Spacing: 22 in.

Soil Info: Sandy Loam
% OM: 2.4 **pH:** 7.7 **CEC:** 12.9
P: Very High **K:** Very High
Mn: Very High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Prev Crop: Wheat

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 15.76 in.
Beets/100 ft: 208

Application: JD 3520 tractor mounted plot sprayer, compressed air, 30 psi, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets/ 100 ft	Vigor*	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					16-Aug	31-Aug						
4	Quadris	10 fl oz	At Plant	In-Furr	**0.9**	**9.1**	**2408**	**8229**	**281**	**29.3**	**19.0**	95.0
	Quadris	14.25 fl oz	6 lf	Banded								
24	Minuet Quadris	12 fl oz 9.2 fl oz	At Plant	In-Furr	**1.7**	**9.3**	**$2,230**	**7680**	**270**	**28.5**	**18.5**	94.4
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
2	Quadris	10 fl oz	At Plant	In-Furr	**2.4**	**8.9**	$2,012	6819	**280**	24.4	**18.5**	96.0
15	Quadris	10 fl oz	At Plant	In-Furr	**2.4**	**9.3**	$1,931	6645	250	**26.6**	**18.2**	92.1
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
20	Quadris	14.25 fl oz	At Plant	In-Furr	**2.8**	**9.1**	**$2,305**	**7903**	**271**	**29.2**	**18.7**	94.1
	Excalia	2 fl oz	6 lf	Broadcast								
10	Quadris Serifel	10 fl oz 4 fl oz	At Plant	In-Furr	**3.9**	**9.1**	**$2,233**	**7630**	**281**	**27.1**	**19.1**	94.6
11	Propulse	13.6 fl oz	At Plant	In-Furr	**5.2**	**9.0**	**$2,236**	**7777**	**271**	**28.7**	**18.6**	94.4
	Quadris	14.25 fl oz	6 lf	Banded								
12	Propulse	13.6 fl oz	At Plant	In-Furr	**5.8**	**9.1**	$2,035	7022	**277**	**25.3**	**18.7**	95.0
18	Excalia	2 fl oz	6 lf	Broadcast	**6.0**	8.6	$1,953	6664	**266**	**25.0**	**18.3**	94.3
8	Proline 480 SC	5.7 fl oz	At Plant	In-Furr	**6.3**	**8.9**	$1,937	6604	**273**	**24.2**	**18.5**	95.0
19	Excalia Quadris	2 fl oz 15.5 fl oz	6 lf	Broadcast	**6.3**	**8.8**	$1,959	6742	**264**	**25.5**	**18.2**	93.9
13	Quadris Topsin 4.5 FL**	10 fl oz 20 fl oz	At Plant	In-Furr	**6.5**	**9.4**	**$2,177**	**7407**	**279**	**26.7**	**18.9**	94.8
14	Quadris Topsin 4.5 FL**	10 fl oz 20 fl oz	At Plant	In-Furr	**8.4**	**9.2**	**$2,219**	**7655**	**279**	**27.4**	**19.0**	94.5
	Quadris Topsin 4.5 FL**	14.25 fl oz 20 fl oz	6 lf	Banded								
21	Quadris Proline 480 SC	9.2 fl oz 5.7 fl oz	At Plant	In-Furr	**8.4**	**9.1**	**$2,066**	**7171**	**272**	**26.3**	**18.5**	94.8
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
9	Proline 480 SC	5.7 fl oz	At Plant	In-Furr	**9.7**	**9.6**	**$2,299**	**7899**	**273**	**28.9**	**18.5**	94.8
	Quadris	14.25 fl oz	6 lf	Banded								
6	Quadris	12 fl oz	6 lf	Broadcast	**11.0**	**8.9**	$1,941	6609	**263**	**25.1**	**18.4**	93.4
17	Excalia Quadris	0.64 fl oz 14.25 fl oz	6 lf	Banded	**11.0**	8.4	$1,769	6057	**260**	23.3	**18.3**	93.1

***Vigor** 0 to 10 ratings, 10 is best.

****Topsin is not labeled for in-furrow applications.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Rhizoctonia Crown Rot Product Efficacy Trial

Yoder - Pigeon, MI - 2023

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets/ 100 ft	Vigor*	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					16-Aug	31-Aug						
5	Quadris	15.5 fl oz	6 lf	Broadcast	12.3	8.1	$1,730	5912	256	23.0	17.8	**93.8**
22	Excalia Quadris	2 fl oz 14 fl oz	6 lf	Banded	12.9	7.9	$1,664	5740	249	23.3	17.3	**93.9**
23	Quadris	9.2 fl oz	At Plant	In-Furr	13.4	**9.0**	$1,923	6614	259	**25.5**	18.0	**93.6**
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
3	Quadris	14.25 fl oz	6 lf	Banded	13.4	8.6	$1,625	5555	254	21.9	17.6	**93.8**
1	Inoculated Check				14.4	7.9	$1,503	5067	253	20.0	17.9	92.8
16	Excalia	0.64 fl oz	6 lf	Banded	18.1	**8.9**	$1,600	5435	258	21.2	**18.2**	93.1
7	Quadris	15.5 fl oz	18 lf	Broadcast	19.0	8.0	$1,395	4783	255	18.8	17.9	93.1
Average					8.4	8.8	$1,965	6734	267	25.2	18.4	94.1
LSD 5%					10.5	0.9	352.5	1188.0	20.5	4.3	1.0	2.4
CV%					88.9	6.9	12.7	12.5	5.5	12.0	3.8	1.8

***Vigor** 0 to 10 ratings, 10 is best.

****Topsin is not labeled for in-furrow applications.**

Comments: Study was designed to test products for efficacy on Rhizoctonia crown and root rot. All treatments were inoculated in this study.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Rhizoctonia Crown Rot Product Efficacy Trial

Maust - Pigeon, MI - 2023

Trial Quality: Good
Variety: SX-2294
Planted: May 23rd
Harvested: September 29th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Sandy Loam
% OM: 3.0 **pH:** 7.4 **CEC:** 18.7
P: Very High **K:** Very High
Mn: High **B:** High
Added N: 35 lbs. 2x2, 120 lbs. sidedress
Prev Crop: Soybean

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 15.66 in.
Beets/100 ft: 218

Application: JD 3520 tractor mounted plot sprayer, compressed air, 30 psi, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets/ 100 ft	Vigor*	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					17-Aug	31-Aug						
2	Quadris	10 fl oz	At Plant	In-Furr	**0.0**	**9.4**	**$2,255**	**7378**	252	**29.2**	17.4	94.1
15	Quadris	10 fl oz	At Plant	In-Furr	**0.0**	**9.4**	$2,014	6686	**266**	25.2	**18.2**	**94.4**
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
20	Quadris	14.25 fl oz	At Plant	In-Furr	**0.0**	**9.3**	**$2,337**	**7736**	**258**	**29.9**	**17.8**	94.3
	Excalia	2 fl oz	6 lf	Broadcast								
4	Quadris	10 fl oz	At Plant	In-Furr	**0.2**	**9.4**	**$2,397**	**7912**	**264**	**29.9**	**18.1**	**94.4**
	Quadris	14.25 fl oz	6 lf	Banded								
13	Quadris Topsin 4.5 FL**	10 fl oz 20 fl oz	At Plant	In-Furr	**0.7**	**9.3**	**$2,460**	**8073**	**263**	**30.7**	**18.0**	**94.4**
9	Proline 480 SC	5.7 fl oz	At Plant	In-Furr	**0.9**	**9.4**	**$2,384**	**7905**	**263**	**30.1**	**18.0**	**94.5**
	Quadris	14.25 fl oz	6 lf	Banded								
10	Quadris Serifel	10 fl oz 4 fl oz	At Plant	In-Furr	**1.3**	**9.3**	**$2,325**	**7669**	**269**	**28.5**	**18.3**	**94.7**
24	Minuet Quadris	12 fl oz 9.2 fl oz	At Plant	In-Furr	**1.3**	**9.4**	**$2,321**	**7713**	**267**	**28.9**	**18.2**	**94.6**
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
14	Quadris Topsin 4.5 FL**	10 fl oz 20 fl oz	At Plant	In-Furr	**1.7**	**9.4**	**$2,337**	**7779**	**265**	**29.3**	**18.1**	**94.7**
	Quadris Topsin 4.5 FL**	14.25 fl oz 20 fl oz	6 lf	Banded								
25	Non-Inoculated Check				**1.9**	**9.3**	**$2,289**	**7451**	**268**	**27.8**	**18.3**	**94.5**
11	Propulse	13.6 fl oz	At Plant	In-Furr	**3.0**	**9.3**	**$2,384**	**7993**	**267**	**30.0**	**18.2**	**94.5**
	Quadris	14.25 fl oz	6 lf	Banded								
12	Propulse	13.6 fl oz	At Plant	In-Furr	**3.2**	**9.5**	**$2,200**	**7319**	256	**28.6**	**17.5**	**94.7**
21	Quadris Proline 480 SC	9.2 fl oz 5.7 fl oz	At Plant	In-Furr	**3.2**	**9.4**	**$2,277**	**7610**	**272**	**28.1**	**18.3**	**95.2**
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
23	Quadris	9.2 fl oz	At Plant	In-Furr	**3.2**	**9.5**	$2,048	6794	254	26.7	17.5	**94.4**
	Proline 480 SC	5.7 fl oz	6 lf	Banded								
8	Proline 480 SC	5.7 fl oz	At Plant	In-Furr	5.6	**9.2**	$2,111	6945	**259**	26.7	**17.8**	**94.4**
18	Excalia	2 fl oz	6 lf	Broadcast	5.6	8.4	$2,083	6859	257	26.7	**17.6**	**94.5**

***Vigor** 0 to 10 ratings, 10 is best.

****Topsin is not labeled for in-furrow applications.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Rhizoctonia Crown Rot Product Efficacy Trial

Maust - Pigeon, MI - 2023

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets/ 100 ft	Vigor*	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					17-Aug	31-Aug						
22	Excalia Quadris	2 fl oz 14 fl oz	6 lf	Banded	6.0	8.9	$1,878	6243	249	25.1	17.4	93.7
17	Excalia Quadris	.64 fl oz 14.25 fl oz	6 lf	Banded	6.9	8.6	$2,031	6703	251	26.6	17.4	93.9
6	Quadris	12 fl oz	6 lf	Broadcast	8.0	8.6	$1,904	6264	249	25.1	17.3	93.8
3	Quadris	14.25 fl oz	6 lf	Banded	9.7	8.5	$1,981	6523	250	26.1	17.3	94.1
16	Excalia	.64 fl oz	6 lf	Banded	9.7	8.7	$1,833	6009	257	23.4	**17.7**	94.1
19	Excalia Quadris	2 fl oz 15.5 fl oz	6 lf	Broadcast	10.3	8.9	$1,859	6185	250	24.5	17.2	94.3
5	Quadris	15.5 fl oz	6 lf	Broadcast	11.0	8.8	$1,885	6215	251	24.8	17.4	94.0
7	Quadris	15.5 fl oz	18 lf	Broadcast	11.9	8.1	$1,765	5823	235	24.5	16.6	93.4
1	Inoculated Check				13.8	7.9	$1,748	5691	239	23.7	16.6	94.0
Average					4.8	9.0	2124.2	7019.1	257.4	27.2	17.7	94.3
LSD %					4.2	0.5	341.4	1111.4	13.2	3.8	0.7	0.8
CV 5%					62.6	4.3	11.4	11.2	3.7	9.8	2.9	0.6

***Vigor** 0 to 10 ratings, 10 is best.

****Topsin is not labeled for in-furrow applications.**

Comments: Study was designed to test products for efficacy on Rhizoctonia crown and root rot. All treatments except for treatment 25 were inoculated in this study.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Rhizoctonia Crown Rot Product Efficacy Trial

Yoder & Maust - 2023

No.	Treatment	Applic Timing	Applic Method	Yoder		Maust	
				Stand B/100 ft	Dead B/100 ft	Stand B/100 ft	Dead B/100 ft
				27-Jun	16-Aug	22-Jun	17-Aug
1	Innoculated Check			159	14	187	14
2	Quadris	At Plant	In-Furr	**244**	**2**	**237**	**0**
3	Quadris	6 lf	Banded	167	**13**	186	10
4	Quadris	At Plant	In-Furr	**233**	**1**	**250**	**0**
	Quadris	6 lf	Banded				
5	Quadris	6 lf	Broadcast	153	**12**	194	11
6	Quadris	6 lf	Broadcast	177	**11**	201	8
7	Quadris	18 lf	Broadcast	173	19	177	12
8	Proline 480 SC	At Plant	In-Furr	**248**	**6**	**229**	6
9	Proline 480 SC	At Plant	In-Furr	**236**	**10**	**239**	**1**
	Quadris	6 lf	Banded				
10	Quadris Serifel	At Plant	In-Furr	**233**	**4**	**231**	**1**
11	Propulse	At Plant	In-Furr	**224**	**5**	**238**	**3**
	Quadris	6 lf	Banded				
12	Propulse	At Plant	In-Furr	**247**	**6**	**235**	**3**
13	Quadris Topsin 4.5 FL*	At Plant	In-Furr	**222**	**6**	**241**	**1**
14	Quadris Topsin 4.5 FL*	At Plant	In-Furr	**228**	**8**	**241**	**2**
	Quadris Topsin 4.5 FL*	6 lf	Banded				
15	Quadris	At Plant	In-Furr	**239**	**2**	**253**	**0**
	Proline 480 SC	6 lf	Banded				
16	Excalia	6 lf	Banded	184	18	203	10
17	Excalia Quadris	6 lf	Banded	171	**11**	186	7
18	Excalia	6 lf	Broadcast	158	**6**	182	6
19	Excalia Quadris	6 lf	Broadcast	168	**6**	194	10

***Topsin is not labeled for in-furrow applications.**

Rhizoctonia Crown Rot Product Efficacy Trial

Yoder & Maust - 2023

No.	Treatment	Applic Timing	Applic Method	Yoder		Maust	
				Stand B/100 ft	Dead B/100 ft	Stand B/100 ft	Dead B/100 ft
				27-Jun	16-Aug	22-Jun	17-Aug
20	Quadris	At Plant	In-Furr	**225**	**3**	**238**	**0**
	Excalia	6 lf	Broadcast				
21	Quadris Proline 480	At Plant	In-Furr	**237**	**8**	**248**	**3**
	Proline 480	6 lf	Banded				
22	Excalia Quadris	6 lf	Banded	181	**13**	169	**6**
23	Quadris	At Plant	In-Furr	**244**	**13**	**239**	**3**
	Proline 480	6 lf	Banded				
24	Minuet Quadris	At Plant	In-Furr	**241**	**2**	**244**	**1**
	Proline 480	6 lf	Banded				
25	Non-Inoculated Check			N.A	N.A	N.A	**2**

Average	208	8	218	5
LSD	27.8	10.5	29.4	4.2
CV 5%	9.5	88.9	9.5	62.6

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

***Topsin is not labeled for in-furrow applications.**

Inoculated Rhizoctonia

Blumfield West - Richville, MI - 2023

Trial Quality: Good
Variety: SX-2294
Planted: April 27th
Harvested: September 21st
Plots: 6 Rows X 38 ft., 4 Reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 1.9 **pH:** 7.3 **CEC:** 15.4
P: Very High **K:** Medium
Mn: High **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 16.58 in.
Beets/100 ft: 98

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets / 100 ft	Vigor* 0-10	Net $/A	RWSA	RWST	T/A	% SUC	% CJP	B/100 ft	
					10-Aug	21-Aug							12-May	25-May
5	Quadris	10 fl oz	At Plant	In-Fur	**7.4**	**6.3**	**$2,098**	**6280**	**224**	**27.9**	**16.0**	**92.9**	**51**	**94**
	Quadris	10 fl oz	**6 If	Banded										
1	Non Inoculated Check				**7.4**	**6.7**	**$2,599**	**7676**	**217**	**35.1**	**15.5**	**93.0**	**57**	**112**
10	Howler EVO	1.25 lb	At Plant	In-Fur	**11.2**	**6.5**	$1,862	5577	**197**	**28.2**	**14.8**	91.2	36	77
	Howler EVO	1.25 lb	**6 If	Banded										
6	Howler EVO	2.5 lb	At Plant	In-Fur	**11.6**	**6.4**	**$2,095**	**6245**	**203**	**30.9**	**14.9**	**91.9**	**60**	**102**
12	Companion Maxx	8 oz	At Plant	In-Fur	**14.0**	**6.3**	$1,848	5489	**205**	**26.6**	**15.3**	91.3	36	**86**
11	Howler EVO	1.25 lb	**6 If	Banded	**16.0**	**5.9**	**$2,010**	**6020**	**223**	**27.2**	**16.2**	**92.1**	**78**	**115**
	Quadris	10 fl oz		Banded										
3	Quadris	10 fl oz	At Plant	In-Fur	**16.7**	**7.0**	**$2,045**	**6069**	**199**	**30.1**	14.5	**92.4**	**74**	**131**
4	Quadris	10 fl oz	**6 If	Banded	**17.6**	**5.6**	$1,621	4838	**210**	23.5	**15.5**	**91.5**	37	**81**
7	Howler EVO	2.5 lb	**6 If	Banded	24.5	4.7	$1,305	3933	183	21.8	13.9	91.0	**44**	**87**
8	Howler EVO	1.25 lb	At Plant	In-Fur	26.2	**6.0**	**$2,020**	**5993**	**208**	**28.9**	**15.5**	91.2	**68**	**110**
9	Howler EVO	1.25 lb	**6lf	Banded	29.0	3.3	$1,186	3552	184	19.0	13.9	90.9	**53**	**90**
2	Inoculated Check				31.0	3.5	$815	2406	186	12.9	14.2	90.3	**61**	**90**
Average					17.7	5.7	$1,792	5340	203	26.0	15.0	91.6	54	98
LSD 5%					13.2	1.7	709.4	2094.6	26.8	9.6	1.6	1.6	34.1	36.2
CV%					58.3	24.1	31.1	30.8	10.4	29.1	8.2	1.4	49.0	29.1

***Vigor** 0 to 10 ratings, 10 is the best

****6 If application:** 6/2

Comments: This study was designed to test products for efficacy on Rhizoctonia crown and root rot. This trial was inoculated with disease.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Inoculated Rhizoctonia

Yoder - Pigeon, MI - 2023

Trial Quality: Good
Variety: SX-2294
Planted: May 22nd
Harvested: October 2nd
Plots: 6 Rows X 38 ft., 4 Reps
Row Spacing: 22 in.

Soil Info: Sandy Loam
% OM: 2.4 **pH:** 7.7 **CEC:** 12.9
P: Very High **K:** Very High
Mn: Very High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 15.76 in.
Beets/100 ft: 178

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	Dead Beets / 100 ft	Vigor* 0-10	Net $/A	RWSA	RWST	T/A	% SUC	% CJP	B/100 ft
					21-Jul	31-Aug							27-Jun
14	Elatus	7.1 oz	At Plant	In-Fur	**1.7**	**9.1**	**$2,291**	**8268**	**259**	**31.9**	**17.5**	**95.2**	**207**
	Quadris	14.3 fl oz	**6 lf	Banded									
13	Quadris	14.3 fl oz	At Plant	In-Fur	**1.9**	**9.1**	**$2,355**	**8499**	**269**	**31.6**	**17.6**	**96.9**	**208**
	Elatus	7.1 oz	**6 lf	Banded									
1	Non Inoculated Check				**2.6**	**9.3**	**$2,391**	**8522**	**265**	**32.2**	**17.5**	**96.4**	**236**
15	Zironar	9 fl oz	At Plant	In-Fur	**5.6**	**9.1**	**$2,482**	**8936**	**275**	**32.6**	**17.9**	**96.9**	**224**
	Quadris	9.5 fl oz											
3	Quadris	10 fl oz	At Plant	In-Fur	**6.0**	**9.0**	**$2,229**	**7984**	**278**	**28.7**	**18.1**	**97.0**	**208**
16	Zironar	9 fl oz	At Plant	In-Fur	**6.5**	**8.8**	**$2,256**	**8173**	**266**	**30.6**	17.2	**97.6**	177
	Quadris	14.3 fl oz	2-4 lf	Banded									
6	Howler EVO	2.5 lb	At Plant	In-Fur	**6.9**	**9.1**	**$2,078**	**7478**	**262**	**28.3**	**17.7**	**95.4**	**205**
5	Quadris	10 fl oz	At Plant	In-Fur	**9.1**	**8.8**	**$2,246**	**8108**	**273**	**29.7**	**17.6**	**97.5**	183
	Quadris	10 fl oz	**6 lf	Banded									
17	Quadris	9.5 fl oz	At Plant	In-Fur	**10.3**	**8.1**	**$2,055**	**7360**	**287**	**26.7**	**18.9**	**96.3**	195
8	Howler EVO	1.25 lb	At Plant	In-Fur	**12.3**	**8.4**	$1,939	6945	229	**29.8**	17.1	90.9	192
10	Howler EVO	1.25 lb	At Plant	In-Fur	**12.3**	**8.3**	$1,766	6390	**252**	25.3	16.4	**97.3**	167
	Howler EVO	1.25 lb	**6 lf	Banded									
18	Quadris	14.3 fl oz	2-4 lf	Banded	**13.4**	**7.9**	$1,917	6912	**261**	26.5	16.9	**97.3**	145
4	Quadris	10 fl oz	**6 lf	Banded	17.5	7.4	$1,916	6893	**265**	25.9	**17.6**	**96.0**	130
12	Companion Maxx	8 oz	At Plant	In-Fur	18.8	7.4	$1,618	5807	245	23.5	17.0	**94.4**	175
19	VBC-0062B	10 fl oz	At Plant	In-Fur	19.2	**8.0**	$1,865	6672	**260**	25.6	16.8	**97.4**	180
9	Howler EVO	1.25 lb	**6 lf	Banded	21.6	6.9	$1,309	4727	220	21.1	15.2	**94.8**	1447
11	Howler EVO	1.25 lb	**6 lf	Banded	23.1	7.5	$1,623	5883	243	23.9	17.1	**94.0**	132
	Quadris	10 fl oz											
7	Howler EVO	2.5 lb	**6 lf	Banded	23.9	6.8	$1,467	5324	248	21.1	16.9	**95.4**	127
2	Inoculated Check				36.9	6.1	$1,091	3887	**261**	14.7	17.0	**97.1**	137
	Average				12.8	8.2	$1,947	7010	258	27.0	17.3	95.7	178
	LSD 5%				12.5	1.2	514.2	1832.4	34.4	6.0	1.5	4.3	31.4
	CV%				69.0	10.6	18.7	18.5	9.4	15.6	5.9	3.2	12.5

***Vigor** 0 to 10 ratings, 10 is the best

****6 lf application:** 6/2

Comments: This study was designed to test products for efficacy on Rhizoctonia crown and root rot. This trial was inoculated with disease.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluation of in-furrow and banded fungicide applications to manage Rhizoctonia root and crown rot, 2023

Chris Bloomingdale and Jaime Willbur, Michigan State University

Location: Frankenmuth (SVREC)	**Treatment Timings:** In-Furrow & Banded (6-8 leaf stage)
Planting Dates: May 10, 2023	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Sugar Beet Variety:** BTS-1065

Summary: Significant differences in the percent stand loss were observed among tested programs ($P < 0.0001$). All programs had lower rates of stand loss, ranging from 0 to 13.8%, than the inoculated control (program 1), which had 26.9% loss. Stand reduction in programs 5 to 14 and 16 did not differ from the non-inoculated control (program 2). Disease index values also differed significantly among fungicide programs ($P < 0.0001$). Programs 6, 8-11, 13, 14, and 16 all had significantly lower disease indices than the inoculated control. Yield estimates also were significantly different among programs ($P < 0.001$). Fungicide programs 5, 6, 8-11, and 14-16 had significantly greater yield than the inoculated control.

Table 1. End-of-season stand loss, Rhizoctonia root rot index, and yield from the tested fungicide programs.

No.	Treatment, Rate[a]	Application Type[b]	Stand Loss (%)[c,d]	Disease Index (%)[e]	Yield (t/A)
1	Inoculated Control[f]	-	26.9 a	48.6 ab	2.8 d
2	Non-Inoculated Control[f]	-	0.0 e	15.2 f	9.2 bc
3	Experimental 1, 32.1 fl oz	In-Furrow	13.8 b	52.9 a	5.3 cd
4	Quadris, 13.9 fl oz	In-Furrow	11.6 bc	42.3 abc	8.2 bd
5	Experimental 1, 32.1 fl oz Experimental 1, 32.1 fl oz	In-Furrow Banded	0.9 e	38.8 bcd	11.7 ab
6	Quadris, 13.9 fl oz Quadris, 13.9 fl oz	In-Furrow Banded	0.0 e	23.6 ef	17.5 a
7	Experimental 1, 32.1 fl oz	Banded	1.3 e	37.9 bcd	9 bd
8	Quadris, 13.9 fl oz	Banded	0.4 e	24.3 ef	13.5 ab
9	Experimental 1, 32.1 fl oz Quadris, 13.9 fl oz	In-Furrow Banded	0.6 e	28 def	14.2 ab
10	Quadris, 13.9 fl oz Experimental 1, 32.1 fl oz	In-Furrow Banded	0.0 e	32.9 cde	11.6 ab
11	Quadris, 13.9 fl oz Experimental 2, 18.9 fl oz	In-Furrow Banded	0.0 e	23.1 ef	16.8 a
12	Zironar, 9 fl oz Quadris, 9.5 fl oz	In-Furrow In-Furrow	3.2 de	44.6 abc	5.1 cd
13	Zironar, 9 fl oz Quadris, 14.3 fl oz	In-Furrow Banded	0.0 e	19.6 ef	9.3 bd
14	Experimental 3, 9 fl oz Quadris, 14.3 fl oz	In-Furrow Banded	0.0 e	18.7 f	11.3 abc
15	Quadris, 9.5 fl oz	In-Furrow	8.2 cd	50 ab	12.4 ab
16	Quadris, 14.3 fl oz	Banded	0.0 e	32.6 cde	12.4 ab

[a] All rates are listed as a measure of a product per acre.
[b] In-furrow treatments were applied at planting (May 10), banded applications were applied at the 6-8 leaf stage (Jun 21).
[c] Stand loss percentages calculated from initial stand counts collected Jun 8 and final dead beet counts collected Aug 11.
[d] Column values followed by the same letter were not significantly different based on Fisher's Protected LSD (α=0.05).
[e] Disease index was calculated by multiplying the Rhizoctonia root rot incidence (0-100%) by the mean symptomatic root severity (1-7) and dividing by 7.
[f] Non-treated control.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Evaluation of banded and broadcast fungicide applications to manage Rhizoctonia root and crown rot of sugar beet in Michigan, 2023

Chris Bloomingdale and Jaime Willbur, Michigan State University

Location: Frankenmuth (SVREC)	**Treatment Timings:** Banded & Broadcast (6-8 leaf stage)
Planting Dates: May 10, 2023	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Variety:** BTS-1065

Summary: Significant differences in the percent stand loss were observed among treatments ($P < 0.0001$). All treatments, including the non-inoculated control, had significantly lower stand loss than the inoculated control. Percent stand loss ranged between 0 and 11% in programs 2-8, while the inoculated control had a stand loss of 40.3%. There were no significant differences among root disease index ($P > 0.05$) or yield ($P > 0.05$) in the programs. All programs had numerically lower DX than the inoculated control (57.0%). The relatively high DX for the non-inoculated control (44.8%) suggests that there was natural pressure that influenced these results. The lowest yield was observed in the inoculated control, with a value of 1.9 t/A. All treated programs and the non-inoculated control resulted in greater values of 12.2-16.1 t/A. All fungicide programs resulted in significantly greater sugar content ($P < 0.01$) and RWST than the control ($P < 0.01$).

Table 1. End-of-season stand loss, Rhizoctonia root rot index, and yield from the tested fungicide programs.

No.	Treatment, Rate[a]	Application Type[b]	Stand Loss (%)[c, d]	Disease Index (%)[e]	Yield (t/A)	Sugar (%)	RWST[f]
1	Inoculated Control[g]	-	40.3 a	57.0	1.9	11.7 c	163.3 c
2	Non-inoculated Control[g]	-	1.7 b	44.8	13.7	13.8 a	198.9 ab
3	Quadris, 13.9 fl oz	Banded	0.0 b	38.2	16.1	13.8 a	200.6 a
4	Elatus, 7.1 oz	Banded	0.0 b	34.5	12.2	13.5 ab	195.0 ab
5	Excalia, 0.47 fl oz	Banded	0.4 b	41.1	12.4	13.2 ab	186.6 b
6	Quadris, 13.9 fl oz	Broadcast	1.8 b	46.4	13.4	13.1 ab	186.0 b
7	Elatus, 7.1 oz	Broadcast	11.0 b	45.7	12.7	12.9 b	185.6 b
8	Excalia, 2.0 fl oz	Broadcast	0.3 b	44.9	13.7	13.3 ab	189.9 ab

[a] All rates are listed as a measure of a product per acre.
[b] Banded and broadcast applications were applied at the 6-8 leaf stage (Jun 21).
[c] Stand loss percentages calculated from initial stand counts collected Jun 8 and final dead beet counts collected Aug 11.
[d] Column values followed by the same letter were not significantly different based on Fisher's Protected LSD (α=0.05).
[e] Disease index was calculated by multiplying the Rhizoctonia root rot incidence (0-100%) by the mean symptomatic root severity (1-7) and dividing by 7.
[f] Pounds of recoverable white sugar per ton of beets.
[g] Non-treated control.

Screening *Fusarium* isolates for use in Michigan sugar beet variety selection

K. D. Pollok[1] and L. E. Hanson[2]

[1]Dept. of Plant, Soil and Microbial Sciences, Michigan State University
[2] Sugarbeet and Bean Research Unit, USDA

Introduction

While there are cultural practices to manage Fusarium yellows of sugar beet, the best strategy to minimize losses is through selection of resistant sugar beet varieties. At present, sugar beet varieties used in MI are screened for Fusarium yellows response in Minnesota fields using *Fusarium* spp. isolates native to MN. There are no isolates from the Great Lakes Region included in this screening. This presents a dilemma, as it has been widely observed that *F. oxysporum* is a species complex with distinct pathogenic and nonpathogenic strains in varied production regions (Harveson and Rush 1997, Hill et. al. 2011). As such, a sugar beet variety that is resistant to *Fusarium* spp. strains in one region may not be resistant to strains in another. To optimize resistance screening for MI sugar beet fields, there is an interest in identifying pathogenic *Fusarium* spp. isolates native to MI for use in a MI *Fusarium* nursery. These could be used for breeders in greenhouse screenings to identify germplasm with regional or broad-spectrum resistance. Stains also would be useful in screening other management options.

Materials and Methods

Michigan isolates were screened against a moderately susceptible and moderately resistant USDA sugar beet germplasm, C869 and F1042 respectively. Both had shown varied response to isolates from several different production regions in greenhouse tests (unpublished data). The green house was maintained at 25-30^{o}C with a 16-hour photoperiod. Sugar beets were inoculated at the six to eight leaf growth stage via root dip in 4x10^{4} hyphal fragments and macroconidia/ml (Hanson and Hill 2004). There were three plants per pot and three pots per treatment. After inoculation, plants were watered as needed for optimal plant growth for two weeks to allow for recovery from transplant stress, after which plants were watered biweekly to simulate optimal disease conditions. Foliar disease ratings were taken on a weekly basis for six weeks, using the USDA foliar rating scale of 0-5 (Hanson et. al. 2009) where 0 is no symptoms and 5 is plant death. On week six after taking the final set of foliar ratings, sugar beet roots were dug up, washed with tap water, and cross sectioned. From this, root disease ratings were assigned. The root rot disease scale was a range of 0 – no symptoms, to 5 – the majority of the root was necrotic or functionally dead.

To determine pathogenicity, the foliar ratings and the root rot ratings were compared to control plants (water alone), with a statistically significant difference indicating pathogenicity, and a lack of statistical difference indicating avirulence. The approximate virulence level of each pathogenic isolate was determined by comparing those same disease ratings to two positive controls representing highly virulent (F19) and moderately virulent (F0B220a) isolates from the *F. oxysporum* species complex. Low virulence was assigned to isolates that were statistically different from the water control and significantly lower than the moderately virulent control. Moderate virulence and high virulence were assigned to isolates that were not statistically different from either the moderately or highly virulent controls, respectively. Statistical significance was determined using Fisher's protected LSD post hoc (α=0.05) through R studio. Isolates that were classified as moderately virulent or higher were run through the greenhouse screening a second time to confirm consistency. To save resources and time, avirulent isolates were not tested again. One of the low virulence isolates (F10-58) was selected at random to run a second time, to ensure that results were consistent across low virulence isolates. Pathogenicity was confirmed by isolation from symptomatic tissue and confirming the isolates by morphological and molecular comparison to the strain used in inoculation.

Results

Of the 20 *Fusarium* isolates screened to date, 6 were avirulent, and 14 were pathogenic. Of the pathogenic isolates, 11 were classified with low virulence, and 3 were classified with moderate virulence. The low virulence isolate, F10-58 was determined to show low virulence across both experiment runs, confirming that an isolate initially found to show low virulence does not need to be run again. Thus far, no MI isolates have been identified as highly virulent. The moderately virulent isolates are promising for downstream research and industry applications. Efforts to identify additional moderately virulent and highly virulent isolates are ongoing.

Table 1. Pathogenicity and virulence levels of screened MI *Fusarium* isolates

	Isolate	Foliar Symptoms		Root Symptoms		Experimental Replicates
		Pathogenicity	Virulence	Pathogenicity	Virulence	
Controls	F19	Yes	MV/HV	Yes	HV	∞
	Fob220a	Yes	MV/HV	Yes	MV/HV	∞
	F05-284	Yes	LV	Yes	LV	1
	Water	No	--	No	--	∞
Trials	F09-87	No	--	Yes	LV	1*
	F11-67	No	--	No	--	1
	F12-12	No	--	No	--	1
	F12-36	No	--	No	--	1
	F21-8	No	--	No	--	1
	F22-35	No	--	No	--	1
	F09-16	Yes	LV	Yes	LV	1
	F10-58	Yes/Yes	LV/LV	Yes/No	LV/--	2
	F11-2	Yes	LV	Yes	LV	1
	F11-63	Yes	LV	No	--	1
	F12-44	Yes	LV	No	--	1
	F14-22	Yes	LV	Yes	LV	1
	F21-22	Yes	LV	Yes	LV	1
	F21-76	Yes	LV	Yes	LV	1
	F22-7	Yes	LV	No	--	1
	F23-11	Yes	LV	Yes	LV	1
	F23-7	Yes	LV	No	--	1
	F07-48	Yes	MV	Yes	LV	1*
	F08-207	Yes/Yes	MV/MV	Yes/No	MV/--	2
	F13-10	Yes	MV	Yes	LV	1*

* Indicates isolates that have been screened once and are in the process of being screened a second time for validation or clarification of results.

[a] F05-284 is a known low virulence pathogen. It was included in the first experimental run to ensure the experimental design could detect a range of virulence levels.

Literature Cited

Hanson L.E. and Hill A.L. 2004. *Fusarium* species causing Fusarium yellows of sugar beet. Journal of Sugar Beet Research. 41:163-178.

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Harveson R.M. and Rush C.M. 1997. Genetic variation among *Fusarium oxysporum* isolates from sugar beet as determined by vegetative compatibility. Plant Disease. 81:85-88.

Hill A.L., Reeves P.A., Larson R.L., Fenwick A.L., Hanson L.E. and Panella L. 2011. Genetic variability among isolates of *Fusarium oxysporum* from sugar beet. Plant Pathology. 60:496-505.

Evaluating Fungicide Application Timings (BEETcast) for control of Cercospora Leafspot - Answer Plot, Bach - 2023

Trial Quality: Good
Variety: C-G021, SX-2296
Planted: May 15th
Harvested: October 23rd
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 22.37 in.
Beets/100 ft: 192

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment	Variety	# of Applic	CLS* Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
8	More Aggressive	C-G021	4	**2.0**	$3,341	13374	293	**45.7**	18.2	95.8
10	55/55/55	C-G021	3	**2.2**	**$3,611**	**14460**	**311**	**46.5**	**18.8**	97.3
7	Standard	C-G021	4	**2.5**	$3,408	13649	300	**45.6**	18.6	96.0
9	Less Aggressive Early	C-G021	2	2.8	$3,229	12933	294	44.0	18.6	94.9
6	Untreated Check	C-G021	0	4.8	$3,145	12611	290	43.4	18.3	95.2
3	More Aggressive	SX-2296	7	**2.5**	$3,020	12100	**316**	38.3	**19.1**	97.3
2	35/35/35	SX-2296	6	3.3	$3,099	12419	**317**	39.1	**19.2**	97.3
4	1st and 15th	SX-2296	7	3.5	$2,961	11867	303	39.2	**19.2**	94.6
5	Less Aggressive	SX-2296	5	4.5	$2,883	11561	300	38.6	**19.1**	94.3
1	Untreated Check	SX-2296	0	8.4	$1,989	8018	260	30.8	17.1	93.0
Average				3.6	$3,068	12299	298	41.1	18.6	95.6
LSD 5%				0.5	169.7	678.3	12.4	2.0	0.5	1.9
CV %				12.7	4.8	4.7	3.6	4.2	2.2	1.7

***Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

Comments: Study was designed to compare a CR+ variety to a conventional variety with multiple spray timings.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluating Fungicide Application Timings (BEETcast) for control of Cercospora Leafspot - Answer Plot, Bach - 2023

RWSA						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	12611	1	0	8018
Standard	7	4	13649	X	X	X
More Aggr	8	4	13374	3	7	12100
Less Aggr	X	X	X	5	5	11561
Less Aggr Early	9	2	12933	X	X	X
1st and 15th	X	X	X	4	7	11867
35/35/35	X	X	X	2	6	12419
55/55/55	10	3	**14460**	X	X	X

RWST						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	290	1	0	260
Standard	7	4	300	X	X	X
More Aggr	8	4	293	3	7	**316**
Less Aggr	X	X	X	5	5	300
Less Aggr Early	9	2	294	X	X	X
1st and 15th	X	X	X	4	7	303
35/35/35	X	X	X	2	6	**317**
55/55/55	10	3	**311**	X	X	X

% Leaf Damage October 6th						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	4.8	1	0	8.4
Standard	7	4	**2.5**	X	X	X
More Aggr	8	4	**2.0**	3	7	**2.5**
Less Aggr	X	X	X	5	5	4.5
Less Aggr Early	9	2	2.8	X	X	X
1st and 15th	X	X	X	4	7	3.5
35/35/35	X	X	X	2	6	3.3
55/55/55	10	3	**2.2**	X	X	X

Evaluating Fungicide Application Timings (BEETcast) for Control of Cercospora Leafspot - Parr, Brown City - 2023

Trial Quality: Good
Variety: C-G021, SX-2296
Planted: May 10th
Harvested: October 9th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 20.99 in.
Beets/100 ft: 220

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment	Variety	# of Applic	CLS* Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
10	55/55/55	C-G021	3	**0.0**	**$3,088**	**12831**	270	**47.6**	18.1	95.4
8	More Aggressive	C-G021	4	**0.1**	**$3,103**	**12982**	269	**48.3**	18.1	95.1
7	Standard	C-G021	4	**0.6**	**$3,063**	**12796**	268	**47.8**	18.1	94.9
9	Less Aggressive Early	C-G021	2	1.2	**$3,083**	**12642**	271	**46.6**	18.2	95.5
6	Untreated Check	C-G021	0	1.3	**$3,021**	**12085**	269	**44.9**	18.1	95.1
4	1st and 15th	SX-2296	7	**0.0**	**$2,739**	**11850**	267	**44.4**	18.0	95.3
5	Less Aggressive	SX-2296	5	**0.3**	$2,588	11070	261	42.2	17.6	95.3
3	More Aggressive	SX-2296	7	**0.3**	**$2,800**	**12090**	273	**44.4**	18.3	95.4
2	35/35/35	SX-2296	7	**0.5**	$2,680	**11368**	262	**43.4**	17.7	95.0
1	Untreated Check	SX-2296	0	2.1	$2,531	10124	262	38.6	17.9	94.7
Average				0.6	$2,870	11984	267	44.8	18.0	95.2
LSD 5%				0.6	409.3	1637.4	N.S.	5.8	N.S.	N.S.
CV %				63.3	9.8	9.4	4.5	8.9	3.2	0.8

***Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

Comments: Study was designed to compare a CR+ variety to a conventional variety with multiple spray timings.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluating Fungicide Application Timings (BEETcast) for control of Cercospora Leafspot - Parr, Brown City - 2023

RWSA						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	**12085**	1	0	10124
Standard	7	4	**12796**	X	X	X
More Aggr	8	4	**12982**	3	7	**12090**
Less Aggr	X	X	X	5	5	11070
Less Aggr Early	9	2	**12642**	X	X	X
1st and 15th	X	X	X	4	7	**11850**
35/35/35	X	X	X	2	6	**11368**
55/55/55	10	3	**12831**	X	X	X

RWST						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	269	1	0	262
Standard	7	4	268	X	X	X
More Aggr	8	4	269	3	7	273
Less Aggr	X	X	X	5	5	261
Less Aggr Early	9	2	271	X	X	X
1st and 15th	X	X	X	4	7	267
35/35/35	X	X	X	2	6	262
55/55/55	10	3	270	X	X	X

% Leaf Damage October 18th						
Program	**Trt**	**# Sprays**	**021**	**Trt**	**# Sprays**	**2296**
Untreated	6	0	1.3	1	0	2.1
Standard	7	4	**0.6**	X	X	X
More Aggr	8	4	**0.1**	3	7	**0.3**
Less Aggr	X	X	X	5	5	**0.3**
Less Aggr Early	9	2	1.2	X	X	X
1st and 15th	X	X	X	4	7	**0.0**
35/35/35	X	X	X	2	6	**0.5**
55/55/55	10	3	**0.0**	X	X	X

Evaluating Fungicide Application Timings (BEETcast) for control of Cercospora Leafspot - Parr & Answer Plot

No.	Program	Treatment**	App	Rate/A	Parr		Answer	
					Date	DSV	Date	DSV
1	UTC - SX-2296							
2	35/35/35	EBDC*	A	2 lb	30-Jun	42	5-Jul	53
	SX-2296	Proline + EBDC*	B	5.7 fl oz + 2 lb	18-Jul	85	12-Jul	70
		Super Tin + Topsin + EBDC*	C	8 fl oz + 20 fl oz + 2 lb	28-Jul	111	28-Jul	113
		Inspire XT + EBDC*	D	7 fl oz + 2 lb	17-Aug	156	9-Aug	142
		Super Tin + EBDC*	E	8 fl oz + 2 lb	29-Aug	183	28-Aug	186
		EBDC*	F	2 lb	13-Sep	216	11-Sep	216
3	More Aggr	EBDC*	A	2 lb	30-Jun	42	5-Jul	53
	SX-2296	Proline + EBDC*	B	5.7 fl oz + 2 lb	18-Jul	85	18-Jul	87
		Super Tin + Topsin + EBDC*	C	8 fl oz + 20 fl oz + 2 lb	31-Jul	118	31-Jul	122
		Inspire XT + EBDC*	D	7 fl oz + 2 lb	10-Aug	143	11-Aug	146
		Super Tin + EBDC*	E	8 fl oz + 2 lb	28-Aug	181	28-Aug	186
		EBDC* + Badge	F	2 lb + 2 pt	8-Sep	207	11-Sep	216
		Priaxor + Badge	G	8 fl oz + 2 pt	13-Sep	216	14-Sep	222
4	1st and 15th	EBDC*	A	2 lb	30-Jun	42	5-Jul	53
	SX-2296	Proline + EBDC*	B	5.7 fl oz + 2 lb	7-Jul	63	10-Jul	65
		Super Tin + Topsin + EBDC*	C	8 fl oz + 20 fl oz + 2 lb	18-Jul	85	12-Jul	70
		Inspire XT + EBDC*	D	7 fl oz + 2 lb	1-Aug	120	31-Jul	122
		Super Tin + EBDC*	E	8 fl oz + 2 lb	17-Aug	156	14-Aug	153
		EBDC* + Badge	F	2 lb + 2 pt	1-Sep	187	1-Sep	192
		Priaxor + Badge	G	8 fl oz + 2 pt	13-Sep	216	13-Sep	222
5	Less Aggr	Proline + EBDC*	A	5.7 fl oz + 2 lb	30-Jun	42	5-Jul	53
	SX-2296	Super Tin + Topsin + EBDC*	B	8 fl oz + 20 fl oz + 2 lb	18-Jul	85	21-Jul	92
		Inspire XT + EBDC*	C	7 fl oz + 2 lb	8-Aug	138	9-Aug	142
		Super Tin + EBDC*	D	8 fl oz + 2 lb	28-Aug	181	30-Aug	190
		Priaxor + Badge	E	8 fl oz + 2 pt	13-Sep	216	13-Sep	222
6	UTC - C-G021							
7	Standard	EBDC*	A	2 lb	30-Jun	42	5-Jul	53
	C-G021	Delaro + Proline + EBDC*	B	11 fl oz + 1.6 fl oz + 2 lb	7-Jul	63	10-Jul	65
		Super Tin + Topsin + EBDC*	C	8 fl oz + 20 fl oz + 2 lb	1-Aug	120	31-Jul	122
		Provysol + EBDC*	D	5 fl oz + 2 lb	1-Sep	187	1-Sep	192
8	More Aggr	Delaro + Proline + EBDC*	A	11 fl oz + 1.6 fl oz + 2 lb	30-Jun	42	5-Jul	53
	C-G021	Super Tin + Topsin + EBDC*	B	8 fl oz + 20 fl oz + 2 lb	25-Jul	101	21-Jul	92
		Provysol + EBDC*	C	5 fl oz + 2 lb	10-Aug	143	11-Aug	146
		Super Tin + EBDC*	D	8 fl oz + 2 lb	1-Sep	187	1-Sep	192
9	Less Aggr Early	Delaro + Proline + EBDC*	A	11 fl oz + 1.6 fl oz + 2 lb	7-Jul	63	5-Jul	53
	C-G021	Super Tin + Topsin + EBDC*	B	8 fl oz + 20 fl oz + 2 lb	9-Aug	140	9-Aug	142
10	55/55/55	Delaro + Proline + EBDC*	A	11 fl oz + 1.6 fl oz + 2 lb	7-Jul	63	10-Jul	65
	C-G021	Super Tin + Topsin + EBDC*	B	8 fl oz + 20 fl oz + 2 lb	31-Jul	118	28-Jul	113
		Provysol + EBDC*	C	5 fl oz + 2 lb	28-Aug	181	28-Aug	186

*** EBDC = Manzate Pro-stick**

****All Treatments included MasterLock @ 6.4 fl oz**

Cercospora Fungicide Efficacy

Answer Plot - Bach, MI - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: May 15th
Harvested: Oct 23rd
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 22.37 in.
Beets/100 ft: 147

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing	CLS*** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
20	EBDC*	2 lb	A C	**3.6**	$2,512	**10800**	250	**43.2**	**18.6**	90.9
	EBDC* Delaro Luna Privilege Proline	2 lb 11 fl oz 2 fl oz 1.7 fl oz	B D							
22	EBDC*	2 lb	A C	**3.8**	**$2,618**	**11216**	254	**44.2**	**18.8**	91.3
	EBDC* Luna Flex Propulse	2 lb 13.6 fl oz 13.6 fl oz	B D							
10	EBDC*	2 lb	A C	**4.0**	**$2,725**	**11293**	**267**	**42.3**	**18.4**	**94.3**
	EBDC* Super Tin Topsin	2 lb 8 fl oz 20 fl oz	B D							
9	EBDC*	2 lb	A C	4.4	$2,534	10458	254	41.3	**18.3**	92.2
	EBDC* Super Tin	2 lb 8 fl oz	B D							
3	EBDC*	2 lb	A C	4.5	**$2,854**	**11866**	**278**	**42.7**	**18.5**	**95.7**
	EBDC* Proline	2 lb 5.7 fl oz	B D							
6	EBDC*	2 lb	A C	4.6	$2,360	9845	238	41.5	**18.6**	88.9
	EBDC* Minerva	2 lb 13 fl oz	B D							
11	EBDC*	2 lb	A C	4.9	**$2,619**	10893	255	**42.7**	**18.7**	91.7
	EBDC* Minerva Duo	2 lb 16 fl oz	B D							
21	EBDC*	2 lb	A C	5.0	**$2,649**	10939	259	**42.3**	**18.5**	92.5
	EBDC* Luna Flex	2 lb 13.6 fl oz	B D							
16	EBDC*	2 lb	A C	5.0	$2,495	10333	**268**	38.6	**18.2**	**94.9**
	EBDC* Copper*	2 lb 2 pt	B D							
12	EBDC*	2 lb	A C	5.0	$2,425	10358	257	40.5	**18.6**	92.1
	EBDC* Propulse	2 lb 13.6 fl oz	B D							
23	EBDC*	2 lb	A C	5.1	$2,421	10036	257	39.1	**18.3**	**92.7**
	EBDC* GF-4536	2 lb 20.5 fl oz	B D							
4	EBDC*	2 lb	A C	5.1	**$2,993**	**12373**	**299**	41.4	**18.8**	**98.5**
	EBDC* Topguard	2 lb 14 fl oz	B D							

***EBDC = Manzate Pro-Stick, Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

***** Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost. application cost.

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

Cercospora Fungicide Efficacy
Answer Plot - Bach, MI - 2023

No.	Treatment**	Rate/A	Applic Timing	CLS*** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
7	EBDC*	2 lb	A C	5.3	**$2,719**	11346	**272**	**41.7**	**18.4**	**95.1**
	EBDC* Provysol	2 lb 5 fl oz	B D							
24	EBDC*	2 lb	A C	5.4	$2,529	10558	256	41.3	**18.5**	91.9
	EBDC* Chitosan 90+	2 lb .5 gal	B D							
19	EBDC*	2 lb	A-D	5.4	$2,561	10518	**267**	39.1	17.8	**95.6**
2	EBDC*	2 lb	A C	5.4	$2,438	10160	252	40.3	**18.4**	92.2
	EBDC* Inspire XT	2 lb 7 fl oz	B D							
17	EBDC*	2 lb	A C	5.5	$2,564	10853	**264**	41.0	**18.3**	**93.9**
	EBDC* Priaxor Topsin	2 lb 8 fl oz 20 fl oz	B D							
14	EBDC*	2 lb	A C	5.5	**$2,640**	10988	**263**	**41.7**	**18.2**	**94.1**
	EBDC* Lucento	2 lb 5.5 fl oz	B D							
13	EBDC*	2 lb	A C	5.5	**$2,967**	**12367**	**287**	**43.1**	**18.7**	**96.7**
	EBDC* Delaro Proline	2 lb 11 fl oz 1.6 fl oz	B D							
8	EBDC*	2 lb	A C	5.8	$2,204	9339	225	**41.6**	18.0	88.1
	EBDC* Priaxor	2 lb 8 fl oz	B D							
18	EBDC*	2 lb	A C	5.9	$2,258	9563	240	39.8	17.9	90.8
	EBDC* Veltyma	2 lb 10 fl oz	B D							
5	EBDC*	2 lb	A C	6.0	$2,489	10353	255	40.6	**18.3**	92.5
	EBDC* Enable	2 lb 8 fl oz	B D							
15	EBDC*	2 lb	A C	6.4	$2,581	10700	**264**	40.4	17.9	**95.0**
	EBDC* Dexter Max	2 lb 2.1 lb	B D							
1	Untreated Check			9.0	$2,149	8598	241	35.7	16.6	**94.5**
Average				5.2	$2,554	10656	259	41.1	18.3	93.2
LSD 5%				0.7	405.6	1622.5	36.5	2.6	0.7	5.8
CV %				9.2	11.3	10.8	10.0	4.5	2.7	4.4

***EBDC = Manzate Pro-Stick, Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

Comments: Study was designed to test products for Cercospora leafspot efficacy.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Fungicide Efficacy

Parr - Brown City, MI - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: May 10th
Harvested: Oct 9th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 20.99 in.
Beets/100 ft: 215

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing	CLS*** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
10	EBDC*	2 lb	A C	**0.3**	**$3,285**	**11967**	**274**	**43.7**	**17.7**	**94.0**
	EBDC* Super Tin Topsin	2 lb 8 fl oz 20 fl oz	B D							
13	EBDC*	2 lb	A C	**0.5**	**$3,227**	**11852**	**277**	**42.7**	**17.9**	**94.3**
	EBDC* Delaro Proline	2 lb 11 fl oz 1.6 fl oz	B D							
8	EBDC*	2 lb	A C	**0.6**	**$3,267**	**12018**	**277**	**43.4**	**17.8**	**94.6**
	EBDC* Priaxor	2 lb 8 fl oz	B D							
12	EBDC*	2 lb	A C	**0.7**	**$3,252**	**12083**	**272**	**44.4**	**17.9**	93.3
	EBDC* Propulse	2 lb 13.6 fl oz	B D							
24	EBDC*	2 lb	A C	**0.8**	**$3,299**	**12016**	**282**	**42.6**	**17.9**	**94.9**
	EBDC* Chitosan 90+	2 lb .5 gal	B D							
18	EBDC*	2 lb	A C	**0.8**	$3,079	**11361**	**273**	41.6	**17.8**	**93.7**
	EBDC* Veltyma	2 lb 10 fl oz	B D							
14	EBDC*	2 lb	A C	**0.8**	$2,944	10792	**271**	39.8	**17.7**	**93.7**
	EBDC* Lucento	2 lb 5.5 fl oz	B D							
9	EBDC*	2 lb	A C	**0.8**	**$3,295**	**11936**	**273**	**43.8**	**17.8**	**93.8**
	EBDC* Super Tin	2 lb 8 fl oz	B D							
2	EBDC*	2 lb	A C	**0.8**	**$3,262**	**11900**	**274**	**43.5**	**17.8**	**93.9**
	EBDC* Inspire XT	2 lb 7 fl oz	B D							
22	EBDC*	2 lb	A C	**0.8**	$3,036	**11396**	**273**	**41.8**	**17.9**	**93.6**
	EBDC* Luna Flex Propulse	2 lb 13.6 fl oz 13.6 fl oz	B D							
20	EBDC*	2 lb	A C	**0.8**	$3,008	11305	**269**	**42.1**	**17.6**	**93.5**
	EBDC* Delaro Luna Privilege Proline	2 lb 11 fl oz 2 fl oz 1.7 fl oz	B D							
17	EBDC*	2 lb	A C	**0.8**	$3,057	11339	267	**42.4**	**17.6**	93.3
	EBDC* Priaxor Topsin	2 lb 8 fl oz 20 fl oz	B D							

***EBDC = Manzate Pro-Stick, Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Fungicide Efficacy

Parr - Brown City, MI - 2023

No.	Treatment**	Rate/A	Applic Timing	CLS*** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
16	EBDC*	2 lb	A C	**0.8**	**$3,183**	**11568**	**269**	**43.0**	17.5	**94.0**
	EBDC* Copper*	2 lb 2 pt	B D							
11	EBDC*	2 lb	A C	**0.8**	**$3,227**	**11806**	**275**	**43.0**	**18.0**	**93.7**
	EBDC* Minerva Duo	2 lb 16 fl oz	B D							
4	EBDC*	2 lb	A C	**0.9**	**$3,122**	**11572**	**271**	**42.6**	**17.7**	**93.8**
	EBDC* Topguard	2 lb 14 fl oz	B D							
3	EBDC*	2 lb	A C	**0.9**	**$3,236**	**11842**	**277**	**42.7**	**17.7**	**94.8**
	EBDC* Proline	2 lb 5.7 fl oz	B D							
5	EBDC*	2 lb	A C	**0.9**	**$3,217**	**11726**	**271**	**43.3**	**17.8**	**93.4**
	EBDC* Enable	2 lb 8 fl oz	B D							
15	EBDC*	2 lb	A C	1.0	**$3,295**	**11984**	**275**	**43.6**	**18.2**	93.1
	EBDC* Dexter Max	2 lb 2.1 lb	B D							
7	EBDC*	2 lb	A C	1.0	**$3,321**	**12165**	**274**	**44.3**	**17.8**	**93.9**
	EBDC* Provysol	2 lb 5 fl oz	B D							
6	EBDC*	2 lb	A C	1.1	**$3,165**	**11555**	264	**43.9**	**17.6**	92.8
	EBDC* Minerva	2 lb 13 fl oz	B D							
23	EBDC*	2 lb	A C	1.2	**$3,388**	**12293**	**280**	**43.9**	**17.8**	**94.9**
	EBDC* GF-4536	2 lb 20.5 fl oz	B D							
21	EBDC*	2 lb	A C	1.3	**$3,313**	**12035**	**269**	**44.8**	**17.7**	**93.4**
	EBDC* Luna Flex	2 lb 13.6 fl oz	B D							
19	EBDC*	2 lb	A-D	1.4	**$3,136**	11332	**270**	**42.0**	17.5	**94.0**
1	Untreated Check			2.0	$2,971	10510	263	40.1	17.4	93.0
Average				0.9	$3,191	11681	272	42.9	17.8	93.8
LSD 5%				0.6	268.4	949.2	13.5	3.1	0.6	1.5
CV %				49.0	6.0	5.8	3.5	5.1	2.3	1.2

***EBDC = Manzate Pro-Stick, Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz - Except Treatment 21, 22, 23 (B/D Timing)**

*****Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

Comments: Study was designed to test products for Cercospora leafspot efficacy.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Fungicide Efficacy

Answer Plot, Bach & Parr, Brown City - 2023

No.	Treatment**	Application Timing	Answer Plot Date	Parr Date
1	Untreated Check			
2	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Inspire XT	B D	7/19, 9/1	7/18, 8/28
3	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Proline	B D	7/19, 9/1	7/18, 8/28
4	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Topguard	B D	7/19, 9/1	7/18, 8/28
5	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Enable	B D	7/19, 9/1	7/18, 8/28
6	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Minerva	B D	7/19, 9/1	7/18, 8/28
7	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Proyvsol	B D	7/19, 9/1	7/18, 8/28
8	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Priaxor	B D	7/19, 9/1	7/18, 8/28
9	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Super Tin	B D	7/19, 9/1	7/18, 8/28
10	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Super Tin + Topsin	B D	7/19, 9/1	7/18, 8/28
11	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Minerva Duo	B D	7/19, 9/1	7/18, 8/28
12	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Propulse	B D	7/19, 9/1	7/18, 8/28
13	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Delaro + Proline	B D	7/19, 9/1	7/18, 8/28
14	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Lucento	B D	7/19, 9/1	7/18, 8/28
15	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Dexter Max	B D	7/19, 9/1	7/18, 8/28
16	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Copper*	B D	7/19, 9/1	7/18, 8/28
17	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Priaxor + Topsin	B D	7/19, 9/1	7/18, 8/28
18	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Veltyma	B D	7/19, 9/1	7/18, 8/28
19	EBDC*	A-D	7/5, 7/19, 8/9, 9/1	6/30, 7/18, 8/8, 8/28
20	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Delaro + Luna Privilege + Proline	B D	7/19, 9/1	7/18, 8/28

***EBDC = Manzate Pro-Stick , Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

Cercospora Fungicide Efficacy

Answer Plot, Bach & Parr, Brown City - 2023

No.	Treatment**	Application Timing	Answer Plot Date	Parr Date
21	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Luna Flex	B D	7/19, 9/1	7/18, 8/28
22	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Luna Flex + Propulse	B D	7/19, 9/1	7/18, 8/28
23	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* GF-4536	B D	7/19, 9/1	7/18, 8/28
24	EBDC*	A C	7/5, 8/9	6/30, 8/8
	EBDC* + Chitosan90+	B D	7/19, 9/1	7/18, 8/28

*** EBDC = Manzate Pro-Stick, Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

Cercospora Leafspot Programs Standard

Answer Plot, Bach - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: May 15th
Harvested: October 23rd
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 20.99 in.
Beets/100 ft: 136

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
17	EBDC* + GF-4536	2 lb + 20.5 fl oz	B	**3.0**	**$2,638**	**11151**	**261**	**42.8**	**18.2**	**93.5**
	EBDC* + Super Tin	2 lb + 8 fl oz	C							
	EBDC* + GF-4536	2 lb + 20.5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + GF-4536	2 lb + 20.5 fl oz	F							
12	EBDC*	2 lb	A	**3.0**	$2,130	9410	224	**42.1**	**18.3**	87.4
	EBDC* + Delaro + Proline + NDemand + Boron	2 lb + 11 fl oz + 1.6 fl oz +1 gal +	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol + NDemand + Boron	2 lb + 5 fl oz + 1 gal + 1 qt	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT + NDemand + Boron	2 lb + 7 fl oz + 1 gal + 1 qt	F							
3	EBDC*	2 lb	A	**3.0**	**$2,657**	**11400**	**278**	**41.2**	**18.8**	**95.0**
	EBDC* + Inspire XT	2 lb + 7 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
14	EBDC*	2 lb	A	**3.1**	**$2,629**	**11493**	**266**	**43.4**	**18.6**	**93.4**
	EBDC* + Delaro + Proline + Microthiol Disperss	2 lb + 11 fl oz + 1.6 fl oz + 10 lb	B							
	EBDC* + Super Tin + Topsin + Microthiol Disperss	2 lb + 8 fl oz + 20 fl oz + 10 lb	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin + Microthiol Disperss	2 lb + 8 fl oz + 10 lb	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
5	EBDC*	2 lb	A	**3.1**	**$2,470**	**10631**	256	**41.6**	**18.7**	91.6
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Proline	2 lb + 5.7 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							

***EBDC = Manzate Pro-stick**

****All treatments included MasterLock @ 6.4 fl oz - Except Trt 24**

*****Application dates for all treatments: A-7/5, B-7/12, C-7/26, D-8/9, E-8/30, F-9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Answer Plot, Bach - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
4	EBDC*	2 lb	A	**3.1**	**$2,428**	10519	258	**40.7**	**18.6**	92.0
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin	2 lb + 8 fl oz	C							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Proline	2 lb + 5.7 fl oz	E							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
24	EBDC* + Cohere + Justified + HM1028	2 lb + 4 oz + 4 oz + 12 oz	A	**3.3**	**$2,750**	**11970**	**288**	**41.5**	**18.8**	**96.8**
	EBDC* + Delaro + Proline + Cohere + Justified + HM-1028	2 lb + 11 fl oz + 1.6 fl oz + 4 oz + 4 oz + 12 oz	B							
	EBDC* + Super Tin + Topsin + Cohere + Justified + HM-1028	2 lb + 8 fl oz + 20 fl oz + 4 oz + 4 oz + 12 oz	C							
	EBDC* + Provysol + Cohere + Justified + HM-1028	2 lb + 5 fl oz + 4 oz + 4 oz + 12 oz	D							
	EBDC* + Super Tin + Cohere + Justified + HM-1028	2 lb + 8 fl oz + 4 oz + 4 oz + 12 oz	E							
	EBDC* + Inspire XT + Cohere + Justified + HM-1028	2 lb + 7 fl oz + 4 oz + 4 oz + 12 oz	F							
15	EBDC*	2 lb	A	**3.3**	$2,117	9477	242	39.3	18.0	91.0
	EBDC* + Provysol + Microthiol Disperss	2 lb+ 5 fl oz + 10 lb	B							
	EBDC* + Super Tin + Microthiol Disperss	2 lb + 8 fl oz + 10 lb	C							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Proline + Microthiol Disperss	2 lb + 5.7 fl oz + 10 lb	E							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
13	EBDC*	2 lb	A	**3.3**	**$2,423**	10497	247	**42.5**	**18.9**	89.7
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin	2 lb + 8 fl oz	C							
	EBDC* + Proline	2 lb + 5.7 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	F							
11	EBDC*	2 lb	A	**3.4**	**$2,654**	**11224**	**263**	**42.6**	**18.4**	**93.4**
	EBDC* + Copper*	2 lb + 2 pt	B-F							

***EBDC = Manzate Pro-stick**

****All treatments included MasterLock @ 6.4 fl oz - Except Trt 24**

*****Application dates for all treatments: A-7/5, B-7/12, C-7/26, D-8/9, E-8/30, F-9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
9	EBDC* + Topguard	2 lb + 14 fl oz	B	**3.4**	**$2,470**	**10625**	**270**	39.4	**18.2**	**95.2**
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Eminent VP	2 lb + 13 fl oz	F							
10	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	A	**3.5**	**$2,528**	**11010**	**265**	**41.6**	**18.2**	**94.3**
	EBDC* + Super Tin	2 lb + 8 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
8	EBDC*	2 lb	A	**3.5**	$2,378	10407	250	**41.7**	**18.5**	91.1
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Inspire XT	2 lb + 7 fl oz	D							
	EBDC* + Flint Extra	2 lb + 3.6 fl oz	E							
	EBDC* + Proline	2 lb + 5.7 fl oz	F							
7	EBDC*	2 lb	A	**3.5**	**$2,639**	**11446**	**279**	**41.1**	**18.7**	**95.3**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Inspire XT	2 lb + 7 fl oz	D							
	EBDC* + Copper*	2 lb + 2 pt	E							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
6	EBDC*	2 lb	A	**3.5**	$2,422	10475	259	**40.5**	**18.7**	92.1
	EBDC* + Topguard	2 lb + 14 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Minerva	2 lb + 13 fl oz	F							
2	EBDC*	2 lb	A	**3.5**	$2,235	9714	242	40.1	**18.4**	89.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							

***EBDC = Manzate Pro-stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz - Except Trt 24**

*****Application dates for all treatments: A-7/5, B-7/12, C-7/26, D-8/9, E-8/30, F-9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Answer Plot, Bach - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
18	EBDC*	2 lb	A	3.6	**$2,766**	**11745**	**270**	**43.5**	**18.7**	**94.0**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	E							
	EBDC* Inspire XT	2 lb + 7 fl oz	F							
16	EBDC*	2 lb	A	3.8	$2,419	10565	253	**41.8**	**18.7**	91.0
	EBDC* + Topguard + Microthiol Dispress	2 lb + 14 fl oz + 10 lb	B							
	EBDC* + Super Tin + Topsin + Microthiol Dispress	2 lb + 8 fl oz + 20 fl oz + 10 lb	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin + Microthiol Dispress	2 lb + 8 fl oz + 10 lb	E							
	EBDC* + Minerva	2 lb + 13 fl oz	F							
22	EBDC*	2 lb	A B	4.0	**$2,467**	**11202**	**275**	**40.7**	**18.5**	**95.3**
	VCP-035 + VCP-820	7.6 fl oz + 4.5 qt	C-E							
19	EBDC* + OxiDate 5.0	2 lb + 32 fl oz	A	4.1	**$2,606**	**11352**	**270**	**42.1**	**18.6**	**94.0**
	EBDC* + Delaro + Proline + OxiDate 5.0	2 lb + 11 fl oz + 1.6 fl oz + 32 fl oz	C							
	EBDC* + Super Tin + Topsin + OxiDate 5.0	2 lb + 8 fl oz + 20 fl oz + 32 fl oz	D							
	EBDC* + Provysol + OxiDate 5.0	2 lb + 5 fl oz + 32 fl oz	E							
	EBDC* + Inspire XT + OxiDate 5.0	2 lb + 7 fl oz + 32 fl oz	F							
20	EBDC*	2 lb	A B	4.3	**$2,487**	10470	260	40.0	**18.2**	**93.5**
	Proline	5.7 fl oz	C-E							
21	EBDC*	2 lb	A B	4.4	**$2,748**	**11450**	**271**	**42.5**	**18.3**	**95.4**
	VCP-035	7.6 fl oz	C-E							
23	Chitosan 90+	.5 gal	B-F	6.5	$2,298	9841	257	38.2	17.6	**94.5**
1	Untreated Check			8.5	$1,898	7591	233	32.3	16.9	92.2
Average				3.8	$2,469	10653	260	41.0	18.4	93.0
LSD 5%				0.5	342.6	1370.5	27.3	3.3	0.8	4.2
CV%				9.6	9.8	9.1	7.5	5.7	3.0	3.2

***EBDC = Manzate Pro-stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz - Except Trt 24**

*****Application dates for all treatments: A-7/5, B-7/12, C-7/26, D-8/9, E-8/30, F-9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

Comments: This study was designed to compare fungicide programs in conventional or less tolerant Cercospora leafspot varieties.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Parr, Brown City - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: May 10th
Harvested: October 9th
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 20.99 in.
Beets/100 ft: 212

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
14	EBDC*	2 lb	A	**1.0**	**$2,936**	11250	257	**43.6**	17.1	**96.2**
	EBDC* + Delaro + Proline + Microthiol Disperss	2 lb + 11 fl oz + 1.6 fl oz + 10 lb	B							
	EBDC* + Super Tin + Topsin + Microthiol Disperss	2 lb + 8 fl oz + 20 fl oz + 10 lb	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin + Microthiol Disperss	2 lb + 8 fl oz + 10 lb	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
4	EBDC*	2 lb	A	**1.0**	**$3,163**	**11877**	**262**	**45.2**	**17.9**	**94.8**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin	2 lb + 8 fl oz	C							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Proline	2 lb + 5.7 fl oz	E							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
3	EDDC*	2 lb	A	**1.0**	$2,894	10921	247	**44.2**	17.4	93.2
	EBDC* + Inspire XT	2 lb + 7 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
21	EBDC*	2 lb	A B	**1.1**	**$3,021**	11186	254	**44.0**	17.4	**94.7**
	VCP-035	7.6 fl oz	C-F							
16	EBDC*	2 lb	A	**1.1**	**$2,923**	11215	244	**45.9**	17.1	93.5
	EBDC* + Topguard + Microthiol Disperss	2 lb + 14 fl oz + 10 lb	B							
	EBDC* + Super Tin + Topsin + Microthiol Disperss	2 lb + 8 fl oz + 20 fl oz + 10 lb	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin + Microthiol Disperss	2 lb + 8 fl oz + 10 lb	E							
	EBDC* + Minerva	2 lb + 13 fl oz	F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application dates for all treatments: A-6/30, B-7/5, C-7/19, D-8/8, E-8/21, F-9/5**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Parr, Brown City - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
18	EBDC*	2 lb	A	**1.3**	**$3,109**	**11601**	**264**	**44.0**	**17.8**	**95.2**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
17	EBDC* + GF-4536	2 lb + 20.5 fl oz	B,D,F	**1.3**	$2,767	10235	243	42.1	17.1	93.4
	EBDC* + Super Tin	2 lb + 8 fl oz	C,E							
19	EBDC* + OxiDate 5.0	2 lb + 32 fl oz	A	**1.4**	$2,899	11075	248	**44.6**	17.1	**94.5**
	EBDC* + Delaro + Proline + OxiDate 5.0	2 lb + 11 fl oz + 1.6 fl oz + 32 fl oz	C							
	EBDC* + Super Tin + Topsin + Oxidate 5.0	2 lb + 8 fl oz + 20 fl oz + 32 fl oz	D							
	EBDC* + Provysol + OxiDate 5.0	2 lb + 5 fl oz + 32 fl oz	E							
	EBDC* + Inspire XT + OxiDate 5.0	2 lb + 7 fl oz + 32 fl oz	F							
15	EBDC*	2 lb	A	**1.4**	$2,797	10786	245	**44.0**	16.9	**94.3**
	EBDC* + Provysol + Microthiol Disperss	2 lb + 5 fl oz + 10 lb	B							
	EBDC* + Super Tin + Microthiol Disperss	2 lb + 8 fl oz + 10 lb	C							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Proline + Microthiol Disperss	2 lb + 5.7 fl oz + 10 lb	E							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
12	EBDC*	2 lb	A	**1.4**	$2,807	10716	245	**43.7**	17.4	93.1
	EBDC* + Delaro + Proline + NDemand + Boron	2 lb + 11 fl oz + 1.6 fl oz + 1 gal + 1 qt	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol + NDemand + Boron	2 lb + 5 fl oz + 1 gal + 1 qt	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT + NDemand + Boron	2 lb + 7 fl oz + 1 gal + 1 qt	F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application dates for all treatments: A-6/30, B-7/5, C-7/19, D-8/8, E-8/21, F-9/5**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Parr, Brown City - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
7	EBDC*	2 lb	A	**1.4**	$2,837	10820	243	**44.5**	17.4	92.7
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 5 fl oz + 20 fl oz	C							
	EBDC* + Inspire XT	2 lb + 7 fl oz	D							
	EBDC* + Copper*	2 lb + 2 pt	E							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
5	EBDC*	2 lb	A	**1.4**	$2,833	10683	251	42.5	17.3	**94.4**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Proline	2 lb + 5.7 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
2	EBDC*	2 lb	A	**1.4**	**$3,107**	**11674**	**258**	**45.2**	**17.6**	**94.7**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
20	EBDC*	2 lb	A B	1.5	$2,798	10471	242	**43.3**	17.2	93.0
	Proline	5.7 fl oz	C-F							
9	EBDC* + Topguard	2 lb + 14 fl oz	B	1.5	**$3,101**	**11515**	257	**44.8**	17.3	**95.4**
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Eminent VP	2 lb + 13 fl oz	F							
8	EBDC*	2 lb	A	1.5	**$3,181**	**12041**	**267**	**45.2**	**17.8**	**95.7**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Inspire XT	2 lb + 7 fl oz	D							
	EBDC* + Flint Extra	2 lb + 3.6 fl oz	E							
	EBDC* + Proline	2 lb + 5.7 fl oz	F							
22	EBDC*	2 lb	A B	1.6	**$3,020**	**12212**	**271**	**45.1**	**18.1**	**95.7**
	VCP-035 + VCP-820	7.6 fl oz + 4.5 qt	C-F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application dates for all treatments: A-6/30, B-7/5, C-7/19, D-8/8, E-8/21, F-9/5**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Leafspot Programs Standard

Parr, Brown City - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 0-9 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
13	EBDC*	2 lb	A	1.6	$2,827	10712	254	42.1	17.1	**95.4**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Super Tin	2 lb + 8 fl oz	C							
	EBDC* + Proline	2 lb + 5.7 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	F							
6	EBDC*	2 lb	A	1.6	**$2,969**	11196	242	**46.1**	17.0	93.4
	EBDC* + Topguard	2 lb + 14 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Enable	2 lb + 8 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Minerva	2 lb + 13 fl oz	F							
11	EBDC*	2 lb	A	1.8	$2,865	10671	248	**43.1**	17.3	93.7
	EBDC* + Copper	2 lb + 2 pt	B-F							
10	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	A	1.8	$2,856	10897	249	**43.9**	17.4	93.6
	EBDC* + Super Tin	2 lb + 8 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + Provysol	2 lb + 5 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	E							
	EBDC* + Inspire XT	2 lb + 7 fl oz	F							
23	Chitosan 90+	.5 gal	B-F	2.5	**$3,138**	**11540**	**262**	**44.1**	**17.7**	**95.3**
1	Untreated Check			3.1	$2,717	9611	233	41.2	16.6	93.0
	Average			1.5	$2,938	11083	252	44.0	17.3	94.3
	LSD 5%			0.4	270.5	956.7	13.0	3.1	0.6	2.0
	CV%			19.5	6.5	6.1	3.7	5.1	2.4	1.5

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application dates for all treatments: A-6/30, B-7/5, C-7/19, D-8/8, E-8/21, F-9/5**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 5 = up to 25% injury, and 9 = leaves completely dead.**

Comments: This study was designed to compare fungicide programs in conventional or less tolerant Cercospora leafsp
Varieties.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Answer Plot, Bach - 2023

Trial Quality: Good
Variety: BTS-1183
Planted: May 15th
Harvested: Oct 23rd
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 22.37 in.
Beets/100 ft: 169

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
10	EBDC*	2 lb	A	**2.0**	$2,424	10074	219	**45.7**	**18.6**	86.4
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
3	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B	**2.0**	**$2,986**	**12422**	**272**	**45.7**	**19.2**	**93.0**
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	F							
17	EBDC* + Copper*	2 lb + 2 pt	B-F	**2.1**	**$2,785**	**11678**	**259**	45.4	**18.8**	**91.9**
24	EBDC*	2 lb	A	**2.3**	**$3,132**	**13212**	**276**	**47.8**	18.5	**95.5**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
13	EBDC* + Minerva	2 lb + 13 fl oz	C	**2.4**	$2,508	10295	224	**46.0**	18.5	86.9
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
9	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	B	**2.4**	**$2,784**	**11574**	**252**	**45.8**	18.4	**91.8**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	D							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	F							
27	EBDC*	2 lb	A	**2.5**	**$3,045**	**12584**	**273**	**46.1**	**18.8**	**94.2**
	EBDC* + BAS 75211F	2 lb + 6.5 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + BAS 75211F	2 lb + 6.5 fl oz	D							
5	EBDC* + Minerva	2 lb + 13 fl oz	B	**2.5**	**$2,796**	**11580**	**252**	**45.9**	**18.7**	**90.8**
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Enable	2 lb + 8 fl oz	F							
8	EBDC*	2 lb	A	**2.6**	$2,697	11258	**247**	45.5	**18.8**	90.1
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	B							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27**

*****Application dates for all treatments: A - 7/5, B - 7/12, C - 7/26, D - 8/11, E - 8/30, F - 9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Answer Plot, Bach - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
25	EBDC*	2 lb	A	2.8	**$2,912**	**12258**	**261**	**46.9**	**18.7**	**92.5**
	Serifel + Revytek	4 oz + 15 fl oz	B							
	Serifel + Super Tin + Topsin	4 oz + 8 fl oz + 20 fl oz	D							
	Serifel + Revytek	4 oz + 15 fl oz	F							
12	EBDC*	2 lb	A	2.8	**$3,044**	**12509**	**267**	**46.8**	18.4	**94.1**
	EBDC* + Minerva	2 lb + 13 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
26	EBDC*	2 lb	A	2.9	**$2,841**	**11931**	**259**	**46.1**	18.4	**92.7**
	EBDC* + Veltyma	2 lb + 10 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Veltyma	2 lb + 10 fl oz	F							
22	EBDC* + Growthful Foliar	2 lb + 12.8 fl	A	2.9	$2,513	10649	235	45.4	**19.0**	87.7
	EBDC* + Delaro + Proline + Growthful Foliar	2 lb + 11 fl oz + 1.6 fl oz + 12.8 fl oz	B							
	EBDC* + Super Tin + Topsin + Growthful Foliar	2 lb + 8 fl oz + 20 fl oz + 12.8 fl oz	D							
	EBDC* + Provysol + Growthful Foliar	2 lb + 5 fl oz + 12.8 fl oz	F							
16	EBDC*	2 lb	B-F	2.9	**$3,149**	**12935**	**281**	**46.1**	**18.7**	**95.7**
15	EBDC* + Copper*	2 lb + 2 pt	A-F	2.9	**$2,932**	**12373**	**265**	**46.7**	**18.6**	**93.2**
11	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C	2.9	$2,564	10567	232	**45.6**	**18.9**	87.5
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
23	EBDC*	2 lb	A	3.0	$2,676	11159	**248**	45.0	**19.2**	89.5
	EBDC* + Revytek	2 lb + 15 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Revytek	2 lb + 15 fl oz	F							
21	EBDC* + Copper*	2 lb + 2 pt	B D F	3.0	**$2,798**	11513	**248**	**46.3**	**18.8**	90.1
14	EBDC*	2 lb	A-F	3.0	**$3,052**	**12617**	**271**	**46.5**	**18.8**	**93.9**
4	EBDC*	2 lb	A	3.0	**$3,052**	**12670**	**277**	**45.7**	**18.9**	**94.7**
	EBDC* + Minerva	2 lb + 13 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Enable	2 lb + 8 fl oz	F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27**

*****Application dates for all treatments: A - 7/5, B - 7/12, C - 7/26, D - 8/11, E - 8/30, F - 9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Answer Plot, Bach - 2023

No.	Treatment**	Rate/A	Applic Timing***	CLS**** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
7	EBDC* + Provysol	2 lb + 5 fl oz	B	3.1	$2,418	10164	228	44.4	18.4	88.5
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
19	EBDC* + Copper*	2 lb + 2 pt	A B D F	3.4	**$3,089**	**12784**	**281**	45.4	**19.0**	**95.0**
20	EBDC*	2 lb	B D F	3.6	**$2,994**	**12180**	**270**	45.2	**18.8**	**93.6**
6	EBDC*	2 lb	A	3.6	**$2,820**	**11836**	**263**	44.9	**18.7**	**92.8**
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
2	EBDC*	2 lb	A	3.6	$2,595	10926	239	**45.7**	**18.8**	88.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	F							
18	EBDC*	2 lb	A B D F	4.5	$2,458	10102	226	44.6	18.3	87.9
1	Untreated Check			5.0	$2,467	9867	226	43.5	18.2	88.1
Average				2.9	$2,797	11619	254	45.7	18.7	91.4
LSD 5%				0.6	422.5	1689.8	35.1	2.2	0.6	5.4
CV%				15.5	10.7	10.3	9.8	3.4	2.3	4.2

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27**

*****Application dates for all treatments: A - 7/5, B - 7/12, C - 7/26, D - 8/11, E - 8/30, F - 9/13**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

Comments: This study was designed to examine fungicide programs with a CR+ variety.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Parr, Brown City - 2023

Trial Quality: Good
Variety: C-G151
Planted: May 10th
Harvested: Oct 9th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 20.99 in.
Beets/100 ft: 225

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
17	EBDC* + Copper*	2 lb + 2 pt	B-F	**0.0**	$3,498	**12849**	**269**	**47.8**	**18.1**	**95.1**
13	EBDC* + Minerva	2 lb + 13 fl oz	C	**0.0**	$3,522	**12689**	**270**	46.9	**18.2**	**95.2**
	EBDC*+ Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
16	EBDC*	2 lb	B-F	**0.1**	$3,521	**12755**	**267**	**47.9**	**18.1**	95.0
23	EBDC*	2 lb	A	**0.2**	$3,541	**12926**	**269**	**48.0**	**18.2**	94.9
	EBDC* + Revytek	2 lb + 15 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Revytek	2 lb + 15 fl oz	F							
2	EBDC*	2 lb	A	**0.3**	$3,433	**12627**	260	**48.6**	17.7	94.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	F							
24	EBDC*	2 lb	A	**0.3**	$3,515	**13037**	**262**	**49.8**	**17.9**	94.6
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	F							
10	EBDC*	2 lb	A	**0.3**	$3,537	**12844**	260	**49.4**	17.7	94.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
7	EBDC* + Provysol	2 lb + 5 fl oz	B	**0.3**	$3,461	**12676**	**264**	**48.0**	**18.0**	94.7
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
14	EBDC*	2 lb	A-F	**0.4**	$3,543	**12868**	**266**	**48.4**	**18.1**	94.7

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27 & 28**

*****Application dates for all treatments: A - 6/30, B - 7/7, C - 7/18, D - 8/1, E - 8/21, F - 9/1**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Parr, Brown City - 2023

No.	Treatment**	Rate/A	Applic Timing***	CLS**** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
4	EBDC*	2 lb	A	**0.4**	$3,475	**12698**	**264**	**48.1**	**17.9**	95.0
	EBDC* + Minerva	2 lb + 13 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Enable	2 lb + 8 fl oz	F							
3	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B	**0.4**	$3,619	**13223**	**271**	**48.9**	**18.2**	**95.1**
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Provysol	2 lb + 5 fl oz	F							
25	EBDC*	2 lb	A	**0.4**	$3,551	**13098**	**267**	**49.0**	**18.1**	94.9
	Serifel + Revytek	4 oz + 15 fl oz	B							
	Serifel + Super Tin + Topsin	4 oz + 8 fl oz + 20 fl oz	D							
	Serifel + Revytek	4 oz + 15 fl oz	F							
12	EBDC*	2 lb	A	**0.4**	$3,499	**12670**	**267**	**47.4**	**18.0**	**95.3**
	EBDC* + Minerva	2 lb + 13 fl oz	C							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
9	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	B	**0.4**	$3,536	**12896**	**268**	**48.1**	**18.0**	**95.3**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	D							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	F							
28	EBDC* + Cohere + Justified + HM1028	2 lb + 4 oz + 4 oz + 24 oz	A	**0.5**	$3,527	**13237**	**272**	**48.7**	**18.1**	**95.9**
	EBDC* + Delaro + Proline + Cohere + Justified + HM1028	2 lb + 11 fl oz + 1.6 fl oz + 4 oz + 4 oz + 24 oz	B							
	EBDC* + Super Tin + Topsin + Cohere + Justified + HM1028	2 lb + 8 fl oz + 20 fl oz + 4 oz + 4 oz + 24 oz	C							
	EBDC* + Provysol + Cohere + Justified + HM1028	2 lb + 5 fl oz + 4 oz + 4 oz + 24 oz	D							
18	EBDC*	2 lb	A B D F	**0.5**	$3,504	**12634**	259	**48.7**	17.7	94.6
22	EBDC* + Growthful Foliar	2 lb + 12.8 fl oz	A	**0.6**	$3,413	**12598**	**264**	**47.8**	**17.9**	94.9
	EBDC* + Delaro + Proline + Growthful Foliar	2 lb + 11 fl oz + 1.6 fl oz + 12.8 fl oz	B							
	EBDC* + Super Tin + Topsin + Growthful Foliar	2 lb + 8 fl oz + 20 fl oz + 12.8 fl oz	D							
	EBDC* + Provysol + Growthful Foliar	2 lb + 5 fl oz + 12.8 fl oz	F							

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27 & 28**

*****Application dates for all treatments: A - 6/30, B - 7/7, C - 7/18, D - 8/1, E - 8/21, F - 9/1**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs CR+

Parr, Brown City - 2023

No.	Treatment**	Rate/A	Applic Timing ***	CLS**** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
6	EBDC*	2 lb	A	**0.6**	$3,480	**12802**	**265**	**48.3**	**18.0**	94.7
	EBDC* + Provysol	2 lb + 5 fl oz	B							
	EBDC* + Priaxor + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							
5	EBDC* + Minerva	2 lb + 13 fl oz	B	**0.6**	$3,680	**13363**	**267**	**50.0**	**18.1**	94.9
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Enable	2 lb + 8 fl oz	F							
19	EBDC* + Copper*	2 lb + 2 pt	A B D F	**0.7**	$3,555	**12955**	**271**	**47.8**	**18.2**	**95.2**
21	EBDC* + Copper*	2 lb + 2 pt	B D F	**0.8**	$3,648	**13188**	**268**	**49.3**	**17.9**	**95.5**
20	EBDC*	2 lb	B D F	**0.8**	$3,477	12479	**266**	47.0	**18.1**	94.7
11	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C	**0.8**	$3,555	**12846**	**267**	**48.1**	**18.2**	94.6
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	E							
26	EBDC*	2 lb	A	**0.9**	$3,676	**13529**	**268**	**50.5**	**18.0**	**95.2**
	EBDC* + Veltyma	2 lb + 10 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D							
	EBDC* + Veltyma	2 lb + 10 fl oz	F							
27	EBDC*	2 lb	A	**1.0**	$3,489	**12700**	**270**	47.0	**18.4**	94.7
	EBDC* + BAS 75211F	2 lb + 6.5 fl oz	B							
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	C							
	EBDC* + BAS 75211F	2 lb + 6.5 fl oz	D							
1	Untreated Check			**1.1**	$3,528	12479	**264**	47.2	**18.1**	94.5
15	EBDC* + Copper*	2 lb + 2 pt	A-F	1.3	$3,490	**12915**	**267**	**48.4**	17.8	**95.7**
8	EBDC*	2 lb	A	1.5	$3,513	**12840**	**264**	**48.6**	**17.9**	94.8
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	B							
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	D							
	EBDC* + Super Tin	2 lb + 8 fl oz	F							

Average	0.6	$3,528	12872	266	48.3	18.0	95.0
LSD 5%	1.1	N.S.	954.9	9.9	3.1	0.5	0.8
CV%	133.4	5.4	5.3	2.6	4.6	2.2	0.6

***EBDC = Manzate Pro-Stick - Copper = Badge**

****All treatments included MasterLock @ 6.4 fl oz. Except Trt 27 & 28**

*****Application dates for all treatments: A - 6/30, B - 7/7, C - 7/18, D - 8/1, E - 8/21, F - 9/1**

******Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

Comments: This study was designed to examine fungicide programs with a CR+ variety.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs Ontario CR+

Parr, Brown City - 2023

Trial Quality: Good
Variety: C-G151
Planted: May 10th
Harvested: Oct 10th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 21.02 in.
Beets/100 ft: 216

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment*	Rate/A	Applic Date **	CLS*** Rate 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
2	Penncozeb	2 lb	A	**1.0**	$2,793	11633	**261**	**44.7**	**17.4**	95.6
	Penncozeb + Cevya	2 lb + 5 fl oz	C							
	Penncozeb	2 lb	E							
	Penncozeb + Proline	2 lb + 5.7 fl oz	H							
	Penncozeb	2 lb	J							
4	Penncozeb + Cevya	2 lb + 5 fl oz	B	**1.2**	$2,701	11297	**259**	**43.6**	17.4	95.4
	Penncozeb + Topsin + Priaxor	2 lb + 20 fl oz + 8 fl oz	F							
	Penncozeb + Proline	2 lb + 5.7 fl oz	I							
3	Penncozeb	2 lb	A	**1.2**	$2,824	11854	**268**	**44.2**	17.9	95.6
	Penncozeb + Cevya	2 lb + 5 fl oz	B							
	Penncozeb + Topsin + Priaxor	2 lb + 20 fl oz + 8 fl oz	F							
	Penncozeb + Proline	2 lb + 5.7 fl oz	I							
9	Penncozeb + ChampION	2 lb + 2 lb	B	**1.3**	$2,637	10996	252	**43.7**	**17.0**	95.3
	Penncozeb + ChampION	2 lb + 2 lb	D							
	Penncozeb + ChampION	2 lb + 2 lb	F							
	Penncozeb + ChampION	2 lb + 2 lb	G							
	Penncozeb + ChampION	2 lb + 2 lb	I							
8	Penncozeb	2 lb	A	**1.3**	$2,708	11338	**262**	**43.3**	**17.5**	95.6
	Penncozeb + Cevya	2 lb + 5 fl oz	C							
	Penncozeb + ChampION	2 lb + 2 lb	E							
	Penncozeb + Proline	2 lb + 5.7 fl oz	H							
	Penncozeb + ChampION	2 lb + 2 lb	J							

***All treatments included MasterLock @ 6.4 fl oz.**

****Application Dates for all treatments: A-6/30, B-7/7, C-7/7, D-7/18, E-7/26, F-8/1, G-8/17, H-8/17, I-9/1, J-9/5**

*****Cercospora Rating (0-9 scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Cercospora Programs Ontario CR+

Parr, Brown City - 2023

No.	Treatment*	Rate/A	Applic Date **	CLS*** Rate 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
5	Penncozeb	2 lb	A	**1.3**	$2,733	11327	**259**	43.7	**17.4**	95.6
	Penncozeb + Cevya	2 lb + 5 fl oz	B							
	Penncozeb	2 lb	F							
	Penncozeb + Proline	2 lb + 5.7 fl oz	I							
7	Penncozeb + Cevya + ChampION	2 lb + 5 fl oz + 2 lb	B	1.4	$2,634	11070	254	43.5	17.2	95.3
	Priaxor + Topsin + ChampION	8 fl oz + 20 fl oz + 2 lb	F							
	Penncozeb + Proline + ChampION	2 lb + 5.7 fl oz + 2 lb	I							
6	Penncozeb	2 lb	B	1.5	$2,808	11565	**260**	44.5	**17.3**	95.8
	Penncozeb	2 lb	D							
	Penncozeb	2 lb	F							
	Penncozeb	2 lb	G							
	Penncozeb	2 lb	I							
1	Untreated Check			2.4	$2,752	11010	**260**	42.4	**17.4**	95.7
Average				1.4	$2,732	11343	259	43.7	17.4	95.5
LSD 5%				0.3	N.S.	N.S.	11.5	2.0	0.6	N.S.
CV%				21.5	6.7	6.5	3.8	3.9	3.2	0.5

***All treatments included MasterLock @ 6.4 fl oz.**

****Application Dates for all treatments: A-6/30, B-7/7, C-7/7, D-7/18, E-7/26, F-8/1, G-8/17, H-8/17, I-9/1, J-9/5**

*****Cercospora Rating (0-9 scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead**

Comments: Study was designed to test programs for managing Cercospora leafspot that can be used in Ontario.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluate Sticker / Spreaders added to Fungicides for Cercospora

Parr, Brown City - 2023

Trial Quality: Good
Variety: C-G932NT
Planted: May 10th
Harvested: October 10th
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 in.

Soil Info: Loam
%OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Prev Crop: Corn

Rhizoc Control: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 21.02 in.
Beets/100 ft: 224

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Sticker	Rate/A	Applic Timing	CLS*** Rate 14-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
9	WC-618	.25% v/v	A-E	**0.0**	**$3,047**	**11435**	**269**	**42.6**	**17.9**	**95.7**
6	MasterLock + Reguard	6.4 fl oz + 12 fl oz	A-E	**0.1**	**$3,052**	**11638**	**270**	**43.1**	**17.9**	**95.9**
13	Cohere + Justified + HM1028	4 oz + 4 oz + 12 oz	A-E	**0.3**	**$2,968**	**11328**	**265**	**42.7**	**17.6**	**96.1**
4	Reguard	12 fl oz	A-E	**0.3**	**$3,017**	**11436**	**264**	**43.3**	**17.7**	**95.6**
12	BountiFul + Nufilm 17	12.8 fl oz + 16 oz	A-E	**0.4**	**$2,971**	**11328**	**268**	**42.3**	**17.8**	**95.9**
11	WC-250 + WC-634	.25% v/v + 16 fl oz	A-E	**0.4**	**$3,002**	**11315**	**264**	**42.8**	17.5	**96.1**
7	WC-250	.25% v/v	A-E	**0.4**	**$3,087**	**11583**	**270**	**43.0**	**17.9**	**95.9**
5	Reguard + Diligence	12 fl oz + 1.5 fl oz	A-E	**0.4**	$2,885	11036	253	**43.7**	17.0	**95.5**
10	WC-701	4 fl oz	A-E	**0.4**	**$3,010**	**11402**	**268**	**42.5**	**17.8**	**96.1**
3	MasterLock	6.4 fl oz	A-E	0.7	**$2,987**	**11248**	**264**	**42.7**	17.5	**95.9**
2	None		A-E	0.7	**$3,138**	**11732**	**272**	**43.1**	**18.1**	**95.7**
8	WC-450	3 fl oz	A-E	0.8	**$2,986**	**11215**	**262**	**42.8**	17.3	**96.2**
1	Untreated Check			1.7	$2,808	10005	254	39.5	17.1	95.2
Average				0.5	$2,997	11285	265	42.6	17.6	95.8
LSD 5%				0.6	185.3	660.4	9.9	2.1	0.5	0.7
CV%				80.6	4.3	4.1	2.6	3.4	2.2	0.5

Spray Program for treatments**

A. EBDC* (1.6 qt) + Sticker
B. Provysol (5 fl oz) + EBDC* (1.6 qt) + Sticker
C. Supertin (8 fl oz) + EBDC* (2 lb) + Sticker
D. Priaxor (8 fl oz) + EBDC* (2 lb) + Sticker
E. Proline (5.7 fl oz) + EBDC* (2 lb) + Sticker

***EBDC = Manzate Pro-Stick @ 2 lb**

****Application dates for all treatments: A-7/7, B-7/14, C-8/9, D-8/29, E-9/12**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

Comments: This study was designed to test adjuvants for improvement in Cercospora leafspot control with a fungicide program.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Adama Cercospora Fungicide Efficacy

Answer Plot - Bach, MI - 2023

Trial Quality: Good
Variety: SX-2296N
Planted: May 15th
Harvested: October 24th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Soybeans

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in
Rainfall: 22.57 in.
Beets/100 ft: 153

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing***	CLS**** Rate 16-Oct	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
4	EBDC*	2 lb	A	**5.1**	**$2,615**	**10914**	**294**	**37.1**	**18.9**	**97.4**
	Proline 480 SC	5.7 fl oz	B-D							
2	EBDC*	2 lb	A	**5.8**	**$2,644**	**10898**	**283**	**38.5**	**18.5**	**96.6**
	Soratel 250 EC	9.6 fl oz	B-D							
3	EBDC*	2 lb	A	6.0	**$2,442**	**10103**	**277**	**36.5**	**18.1**	**96.9**
	Soratel 250 EC	10.9 fl oz	B-D							
10	EBDC*	2 lb	A C	6.1	**$2,543**	**10564**	**288**	**36.8**	**18.7**	**96.7**
	Proline 480 SC	5.7 fl oz	B D							
6	EBDC*	2 lb	A	6.4	**$2,459**	**10362**	**279**	**37.1**	**18.4**	**96.2**
	Delaro + Proline	11 fl oz + 1.6 fl oz	B-D							
9	EBDC*	2 lb	A C	6.5	**$2,429**	**10031**	**274**	**36.6**	**18.4**	**95.3**
	Soratel 250 EC	10.9 fl oz	B D							
13	EBDC*	2 lb	A C	6.6	**$2,577**	**10557**	**292**	36.2	**18.9**	**96.9**
	Maxentis	15.6 fl oz	B D							
12	EBDC*	2 lb	A C	6.9	**$2,464**	**10294**	**280**	**36.8**	**18.6**	**95.9**
	Delaro + Proline	11 fl oz + 1.6 fl oz	B D							
7	EBDC*	2 lb	A	6.9	**$2,492**	**10205**	**293**	34.8	**18.7**	**97.9**
	Maxentis	15.6 fl oz	B-D							
5	EBDC*	2 lb	A	7.0	$2,104	8794	254	34.6	17.8	93.6
	Topguard	10 fl oz	B-D							
8	EBDC*	2 lb	A C	7.3	**$2,483**	**10236**	**273**	**37.5**	**18.6**	94.7
	Soratel 250 EC	9.6 fl oz	B D							
11	EBDC*	2 lb	A C	8.0	$2,350	9944	**277**	35.9	**18.0**	**96.8**
	Topguard	10 fl oz	B D							
1	Untreated Check			9.0	$2,075	8301	261	31.8	17.5	**95.5**
	Average			6.7	$2,437	10093	279	36.2	18.4	96.2
	LSD 5%			0.7	222.8	890.5	21.8	2.0	1.0	2.2
	CV %			7.5	6.4	6.2	5.5	3.9	3.8	1.6

*** EBDC = Manzate Pro-Stick**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application Dates: A - 7/5, B - 7/19, C - 8/9, D - 8/30**

****** Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

Comments: Study was designed to test Adama fungicides for Cercospora leafspot efficacy.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Adama Cercospora Fungicide Efficacy

Parr - Brown City, MI - 2023

Trial Quality: Good
Variety: SX-2296N
Planted: May 10th
Harvested: October 10th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 21.02 in.
Beets/100 ft: 191

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing***	CLS**** Rate 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
2	EBDC*	2 lb	A	**2.3**	$2,897	10609	268	**39.5**	18.1	**95.2**
	Soratel 250 EC	9.6 fl oz	B-D							
10	EBDC*	2 lb	A C	**2.4**	$2,933	10802	**275**	**39.4**	18.2	**96.0**
	Proline 480 SC	5.7 fl oz	B D							
3	EBDC*	2 lb	A	**2.4**	$2,995	10975	**274**	**40.0**	18.5	**95.1**
	Soratel 250 EC	10.9 fl oz	B-D							
9	EBDC*	2 lb	A C	**2.5**	$2,890	10580	**272**	**39.0**	18.1	**95.7**
	Soratel 250 EC	10.9 fl oz	B D							
8	EBDC*	2 lb	A C	**2.6**	$3,009	10994	**285**	**38.6**	18.6	**96.8**
	Soratel 250 EC	9.6 fl oz	B D							
6	EBDC*	2 lb	A	**2.6**	$3,028	11259	**285**	**39.5**	18.6	**96.7**
	Delaro + Proline	11 fl oz + 1.6 fl oz	B-D							
13	EBDC*	2 lb	A C	**2.9**	$2,949	10732	268	**40.1**	18.2	94.7
	Maxentis	15.6 fl oz	B D							
12	EBDC*	2 lb	A C	**2.9**	$2,953	10913	**284**	**38.4**	18.6	**96.7**
	Delaro + Proline	11 fl oz + 1.6 fl oz	B D							
7	EBDC*	2 lb	A	**2.9**	$2,890	10508	**272**	**38.6**	18.1	**96.0**
	Maxentis	15.6 fl oz	B-D							
4	EBDC*	2 lb	A	**2.9**	$2,933	10854	**277**	**39.2**	18.2	**96.3**
	Proline 480 SC	5.7 fl oz	B-D							
11	EBDC*	2 lb	A C	3.1	$2,793	10440	**272**	**38.3**	18.2	**95.5**
	Topguard	10 fl oz	B D							
5	EBDC*	2 lb	A	3.1	$2,928	10773	263	**41.1**	18.2	93.8
	Topguard	10 fl oz	B-D							
1	Untreated Check			4.6	$2,873	10237	**278**	36.8	18.5	**95.7**
Average				2.9	$2,928	10744	275	39.1	18.3	95.7
LSD 5%				0.7	N.S.	N.S.	15.5	3.2	N.S.	1.9
CV %				17.6	6.9	6.7	3.9	5.7	2.6	1.4

***EBDC = Manzate Pro-Stick**

****All treatments included MasterLock @ 6.4 fl oz**

*****Application Dates: A - 7/7, B - 7/25, C - 8/21, D - 9/5**

******Cercospora Rate (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

Comments: Study was designed to test Adama Fungicides for Cercospora leafspot efficacy.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluating Sipcam Fungicides for Cercospora Leafspot Control
Parr, Brown City - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: May 10th
Harvested: October 10th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.7 **pH:** 6.9 **CEC:** 13.3
P: Very High **K:** High
Mn: Medium **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 21.02 in.
Beets/100 ft: 214

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Timing* ***	CLS*** Rate 28-Sep	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
8	EBDC*	2 lb	A D	**2.4**	**$3,007**	**11180**	264	**42.4**	17.8	95.2
	Cercos + Proline	23 fl oz + 5 fl oz	B C E							
7	EBDC*	2 lb	A D	**2.4**	$2,896	**10893**	258	**42.2**	17.5	95.1
	Minerva + Proline	9.9 fl oz + 5 fl oz	B C E							
10	EBDC*	2 lb	A D	**2.6**	**$3,005**	**11118**	**272**	**40.8**	**18.3**	95.3
	Inspire XT	7 fl oz	B C E							
6	EBDC*	2 lb	A D	**2.8**	**$3,043**	**11333**	264	**42.9**	17.9	94.8
	SA-0650101 + Proline	20.5 fl oz + 5.7 fl oz	B C E							
9	EBDC*	2 lb	A D	**2.9**	**$3,146**	**11646**	**277**	**42.1**	**18.5**	95.6
	Proline	5 fl oz	B C E							
5	EBDC*	2 lb	A D	**3.1**	**$2,999**	**11146**	262	**42.5**	17.7	95.1
	SA-0650101 + Proline	20.5 floz + 5 fl oz	B C E							
2	EBDC*	2 lb	A D	3.4	**$2,968**	**10858**	**271**	40.1	**18.2**	95.2
	SA-0650101	41 fl oz	B C E							
3	EBDC*	2 lb	A D	3.5	**$3,103**	**11339**	**269**	**42.1**	**18.2**	94.9
	SA-0650110	41 fl oz	B C E							
4	EBDC*	2 lb	A D	4.3	**$2,973**	**10875**	259	**42.1**	17.7	94.7
	SA-0650120	41 fl oz	B C E							
1	Untreated Check			4.6	$2,886	10284	261	39.4	17.7	95.0
Average				3.2	$3,003	11067	265.7	41.7	17.9	95.1
LSD 5%				0.7	230.1	819.9	10.4	2.6	0.5	N.S.
CV%				15.7	5.3	5.1	2.7	4.2	2.1	0.7

***EBDC = Manzate Pro-Stick**

****All treatments included MasterLock @ 6.4 fl oz.**

*****Cercospora Rating (0-9 Scale): 0 = no spots, 1 = Very few spots, 5 = up to 25% injury and 9 = leaves completely dead.**

******Application Dates: A-7/7, B-7/25, C-8/9, D-8/28, E-9/12**

Comments: This study was designed to study Sipcam fungicides for Cercospora leafspot.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluation of foliar fungicides to manage Cercospora leaf spot of sugar beet in Michigan, 2023

Chris Bloomingdale and Jaime Willbur, Michigan State University

Location: Frankenmuth (SVREC)	**Treatment Timings:** 14-day interval starting at 35 DSV
Planting Dates: May 12, 2023	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Variety:** SX-1278N

Summary: Significant CLS pressure was observed uniformly throughout this study; all fungicide programs had significantly lower AUDPCs than the non-treated control ($P < 0.0001$). AUDPCs for fungicide programs ranged between 88.8 and 155.0, while the control program had an AUDPC of 245.5. No differences were observed among estimated yields ($P > 0.05$), however, all programs had numerically greater yields (5.1-14.4 t/A) than the control (3.6 t/A). All fungicide programs had significantly greater sugar content ($P < 0.01$) and RWST than the control ($P < 0.01$). Heavy rainfall and high Rhizoctonia root rot pressure severely impacted yield in the trial, overall resulting in the lack of significant differences.

Table 1. Area under the disease progress curve (AUDPC) and yield parameters from the tested fungicide programs.

No.	Treatment, Rate[a], and Timing[b]	AUDPC[c, d]	Yield (t/A)	Sugar (%)	RWST[e]
1	Non-treated Control	254.5 a	3.6	13.3 d	183.4 d
2	Manzate Max (1.6 qt) ACE; Propulse (13.6 fl oz) BD; Super Tin (8 fl oz) CE	104.0 cd	8.3	14.5 bc	204.3 bc
3	Manzate Max (1.6 qt) ACE; Proline (5.7 fl oz) BD; Super Tin (8 fl oz) CE	102.5 cd	12	15.2 ab	217.9 ab
4	Manzate Max (1.6 qt) ACE; Delaro (11 fl oz) BD; Proline (1.71 fl oz) BD; Super Tin (8 fl oz) CE	134.9 bc	5.1	14.6 bc	206.0 bc
5	Manzate Max (1.6 qt) ACE; Delaro (11 fl oz) BD; Luna Privilege (2 fl oz) BD; Proline (1.71 fl oz) BD; Super Tin (8 fl oz) CE	114.6 cd	14.4	14.8 bc	210.0 bc
6	Manzate Max (1.6 qt) ACE; Luna Flex (13.6 fl oz) BD; Super Tin (8 fl oz) CE	155.0 b	13.6	14.3 c	199.9 c
7	Manzate Max (1.6 qt) ACE; Luna Flex (13.6 fl oz) BD; Propulse (13.6 fl oz) BD; Super Tin (8 fl oz) CE	103.1 cd	8.7	14.5 bc	204.5 bc
8	Provysol (4 fl oz) A; Manzate Prostick (2 lb) ACE; Super Tin (8 fl oz) BD; Badge (32 fl oz) B; Proline (5 fl oz) C; Priaxor Xemium (6.7 fl oz) D	121.8 bcd	11.6	15.1 ab	214.3 abc
9	Lucento (5.5 fl oz) A; Manzate Prostick (2 lb) ACE; Super Tin (8 fl oz) BD; Topsin M WSB (10 oz) B; Topguard (14 fl oz) C; Priaxor Xemium (6.7 fl oz) D	92.8 d	10.3	15.8 ab	227.2 a
10	Inspire XT (7 fl oz) A; Badge (32 fl oz) A; Super Tin (8 fl oz) BD; Topsin M WSB (10 oz) B; Proline (5 fl oz) C; Manzate Prostick (2 lb) CE; Priaxor Xemium (6.7 fl oz) D	88.8 d	9.5	15.2 ab	215.5 abc

[a] All rates, unless otherwise specified, are listed as a measure of product per acre. MasterLock was added to all tank mixes at a rate of 0.25 % v/v.
[b] Application letters code for the following dates: A=3 Jul, B=19 Jul, C=1 Aug, D=14 Aug, and E=31 Aug.
[c] Area under the disease progress curve was calculated using disease severity scores (0-10 scale) collected 3 Jul, 23 Jul, 8 Aug, 22 Aug, and 7 Sep.
[d] Column values followed by the same letter were not significantly different based on Fisher's Protected LSD (α=0.05). If no letter, then means were not significantly different.
[e] Pounds of recoverable white sugar per ton of beets.

Fungicide resistance screening of *Cercospora beticola* populations in Michigan, 2022-23

Alexandra Hernandez[1], Sarah Ruth[1], Chris Bloomingdale[1], Mio Sato-Cruz[1], Daniel Bublitz[1], Linda E. Hanson[1,2], and Jaime F. Willbur[1]; [1]Michigan State University; [2]USDA-ARS

Background: Multiple fungicide groups are commonly used and registered for Cercospora leaf spot (CLS) management in sugar beet including methyl benzimidazole carbamates (MBC or benzimidazole, FRAC group 1), quinone outside inhibitors (QoI or strobilurins, FRAC group 11), demethylation inhibitors (DMI or triazoles, FRAC group 3), organo-tins (FRAC group 30), and multi-site contact activity (FRAC group M03) classes. Reduced sensitivity to QoI, MBC, DMI, and organo-tin fungicides has been detected in *C. beticola* populations in Michigan (Weiland and Halloin 2001, Kirk et al. 2012, Bolton et al. 2012a, Rosenzweig et al. 2015, Rosenzweig et al. 2020). Because of the fluctuating levels of resistant isolates, continuous monitoring is necessary for prompt identification and proactive management of shifts in *C. beticola* sensitivities. PCR-based methods to detect mutations associated with fungicide resistance could provide timely and field specific guidance to improve CLS management, but they must provide information that is reliable and relevant to field efficacy of the compounds.

Methods: CLS-symptomatic leaf samples were collected from mid-July through the end of October. In 2021, 2022, and 2023, east-central Michigan sugar beet fields were sampled across nine counties and 29, 30, and 17 locations, respectively. Approximately eight lesions from 8-15 leaves were collected at each timepoint and field site, and mono-conidial isolates were obtained from each lesion.

In vitro fungicide sensitivity testing was conducted using a spiral gradient plating method which determined the effective concentrations required to inhibit mycelial growth by 50% (EC_{50}) for each active ingredient of interest (Förster et al. 2004; Torres-Londoño et al. 2016; Rosenzweig et al. 2020). Isolates were tested for sensitivity to pyraclostrobin, thiophanate-methyl, difenoconazole, tetraconazole, prothioconazole, fenbuconazole (2021 only), mefentrifluconazole, and triphenyltin hydroxide.

In vitro methods were compared to rapid polymerase chain reaction restriction fragment length polymorphism (PCR-RFLP) assays which detect point mutations associated with fungicide resistance. QoI resistance was determined using the G143A point mutation present in the fungal mitochondrial cytochrome b gene of *C. beticola* isolates previously characterized to be resistant to pyraclostrobin, with EC50 values >100 ppm (Rosenzweig et al. 2015). MBC resistance was determined using the E198A point mutation present in the beta-tubulin gene of *C. beticola* isolates previously characterized to be resistant to benzimidazole, with EC_{50} values ≥ 60 ppm (Rosenzweig et al. 2015). DMI resistance was associated with the Glu169 (GAA to GAG) mutation present in the C-14 alpha-demethylase gene of *C. beticola* isolates characterized to be highly resistant to epoxiconazole, with EC_{50} values of 65-115 ppm (Nikou et al. 2009).

Results:
Objective 1 - Monitor levels of resistance to critical fungicide groups across Michigan growing regions.
Isolates with reduced sensitivity were identified for every active ingredient tested. Resistance to DMI fungicides varied by active ingredient; isolates of *C. beticola* exhibited the highest level of resistance to prothioconazole followed by tetraconazole (Figure 1). Mefentrifluconazole and difenoconazole results were significantly positively correlated, indicating that the mechanisms of resistance may be similar between these two active ingredients (Figure 2). High frequencies of resistance to pyraclostrobin were observed across Michigan (Figure 1). Some reduced sensitivity to triphenyltin hydroxide was observed for isolates tested in this study. However, the degree of resistance was lower than that of other fungicide

classes with no isolates having EC_{50} values >10 ppm. Resistance to low doses of organotin fungicides has also been observed in North Dakota and Minnesota (Secor et al. 2019).

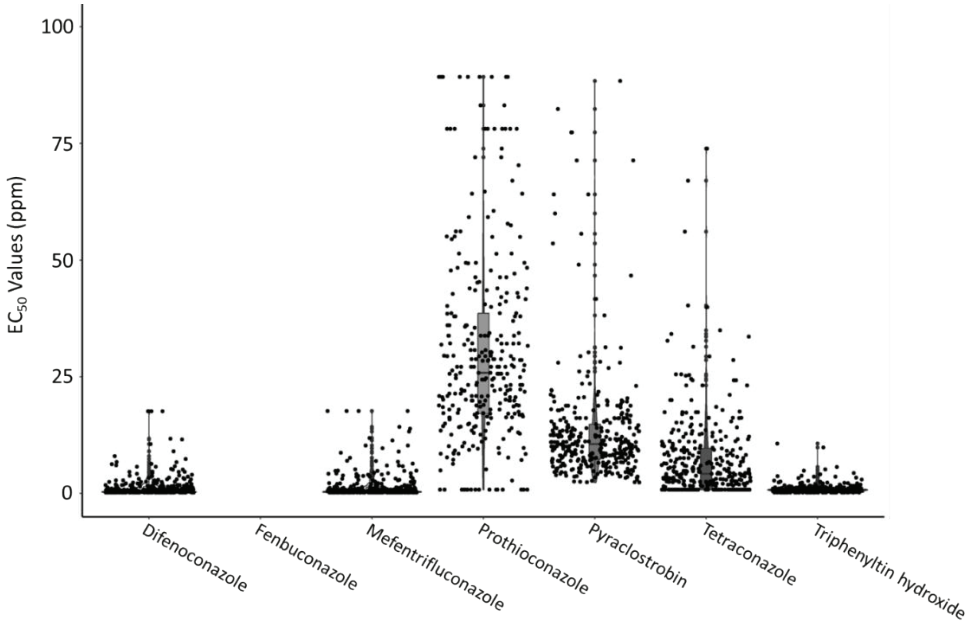


Figure 1. Box plots demonstrating the distribution of *in vitro* fungicide sensitivity to difenoconazole, fenbuconazole, mefentrifluconazole, prothioconazole, pyraclostrobin, tetraconazole, and triphenyltin hydroxide for *C. beticola* isolates collected in 2022. The upper limit of these assays were 17.6 ppm for difenoconazole, 17.9 ppm for fenbuconazole, 17.6 ppm for mefentrifluconazole, 17.8 ppm for prothioconazole, and 17.7 ppm for tetraconazole. The upper limit was 88.4 ppm for pyraclostrobin, 89.3 ppm for thiophanate methyl, and 17.8 ppm triphenyltin hydroxide.

Table 1. Frequencies of *C. beticola* resistance to four triazole active ingredients detected using *in vitro* sensitivity testing in 2022

County	No. locations	No. Samples	% Resistant[a]			
			Difenoconazole	Mefentrifluconazole	Tetraconazole	Prothioconazole
Arenac	3	12	50.0	16.7	33.3	66.7
Bay	22	124	35.8	38.2	70.5	92.3
Clinton	3	18	41.2	42.9	50.0	100.0
Gratiot	4	24	40.0	25.0	57.1	90.9
Huron	11	77	15.0	21.7	90.5	100.0
Midland	1	4	75.0	66.7	50.0	100.0
Saginaw	7	33	46.4	32.3	83.3	93.5
Sanilac	6	40	18.9	23.5	85.7	96.7
Tuscola	7	41	44.1	31.4	84.2	100.0
Total	**64**	**373**	**40.7**	**33.1**	**67.2**	**93.3**

[a] Isolates with EC_{50} values ≥1 ppm were considered resistant (Bolton et al. 2012b). While regions with high frequencies of resistant isolates are at greater risk for reduced efficacy of fungicides with these active ingredients, resistance rates are based on laboratory testing only and are not a direct measure of in-field control.

Table 2. Frequencies of *C. beticola* resistance to QoI, MBC and organotin active ingredients detected using *in vitro* sensitivity testing in 2022

			% Resistant[a]		
County	No. locations	No. Samples	Pyraclostrobin	Triphenyltin hydroxide	Thiophanate methyl
Arenac	3	12	100.0	10.0	-
Bay	22	124	100.0	25.2	91.7
Clinton	3	18	100.0	46.7	27.3
Gratiot	4	24	100.0	15.0	18.2
Huron	11	77	100.0	35.8	100.0
Midland	1	4	100.0	0.0	-
Saginaw	7	33	100.0	15.2	70.0
Sanilac	6	40	100.0	44.4	96.3
Tuscola	7	41	100.0	34.3	83.3
Total	**64**	**373**	**100.0**	**25.2**	**69.5**

[a]Isolates with EC_{50} values ≥1 ppm for pyraclostrobin and triphenyltin hydroxide and ≥5 ppm for thiophanate methyl were considered resistant (Secor et al. 2010, Bolton et al. 2012b). While regions with high frequencies of resistant isolates are at greater risk for reduced efficacy of fungicides with these active ingredients, resistance rates are based on laboratory testing only and are not a direct measure of in-field control.

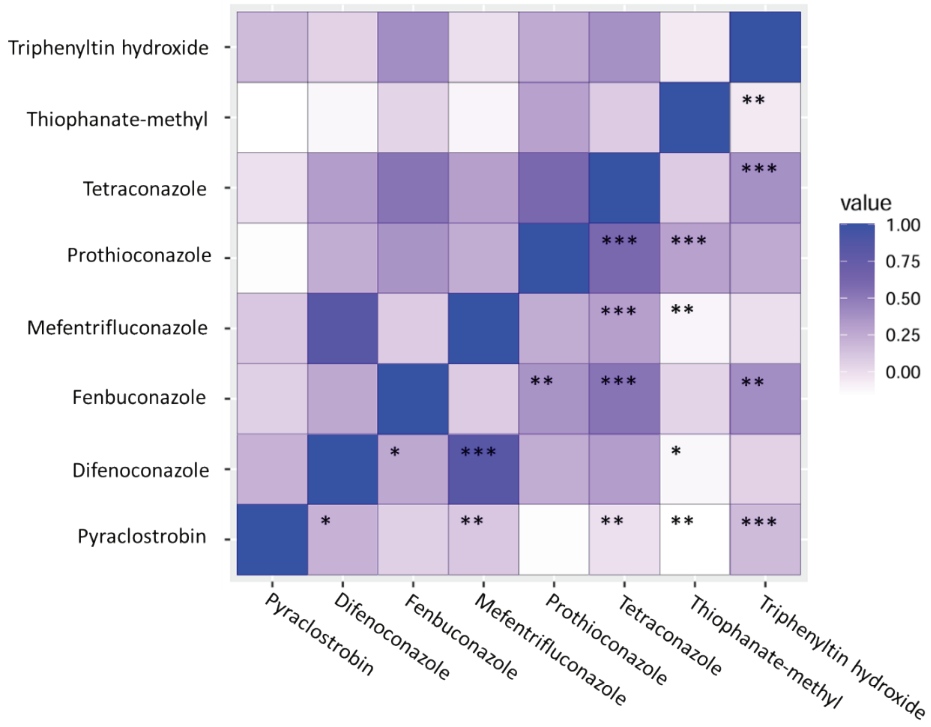


Figure 2. Heat map showing the correlation coefficients for *in vitro* fungicide sensitivity to difenoconazole, fenbuconazole, mefentrifluconazole, prothioconazole, pyraclostrobin, tetraconazole, and triphenyltin hydroxide for *C. beticola* isolates. Significance is denoted by the number of asterisks in the bottom right half of the heat map; a *p*-value < 0.05, < 0.01, and < 0.0001 is represented by '*', '**', and '***', respectively.

Objective 2 - *Evaluate rapid testing as a tool to monitor C. beticola sensitivity to critical fungicide groups.* Results for the three PCR-RFLP assays were successfully obtained from 399 isolates in 2021 and 498 isolates in 2022. A subset of these (63 isolates in 2021 and 370 isolates in 2022) were tested for *in vitro* fungicide sensitivity and compared with the PCR-RFLP results. The benzimidazole PCR marker predicted resistance to thiophanate-methyl with 99% accuracy. In 2021, approximately 68% of isolates had the mutation associated with MBC resistance compared to 74% in 2022 while in 2022. All the tested isolates contained the genetic mutation associated with QoI resistance. However, the pyraclostrobin EC_{50} values measured by spiral plating ranged from 0.79 ppm (lower limit of assay) to 88.37 ppm (upper limit). *In vitro* sensitivity of *C. beticola* isolates was significantly impacted by the presence of the mutation associated with DMI resistance (p <0.0001). However, responses were not consistent between active ingredients. The mutation used in this study successfully predicted levels of insensitivity (> 1 ppm; Bolton et al. 2012b) for the triazoles difenoconazole and mefentrifluconazole but not for tetraconazole or prothioconazole. Resistance to triazoles is a complex trait controlled by multiple genes (Rangel et al. 2020). This study will continue to explore other mutations associated with DMI resistance to tetraconazole and prothioconazole (Spanner et al. 2021) and evaluate the mutations' ability to predict fungicide sensitivity.

Overall Summary:

- The PCR-RFLP rapid detection technique was highly accurate at predicting MBC resistance, and the number of *C. beticola* isolates with resistance is increasing from 2021 to 2022.
- The genetic tests used in this study were not sufficient for accurately predicting QoI or DMI *in vitro* sensitivity for *C. beticola* isolates.
- Insensitivity to active ingredient concentrations above 1 ppm was observed for all active ingredients tested, but resistance was particularly widespread for the DMIs prothioconazole and tetraconazole as well as the QoI pyraclostrobin.

Future Directions:
Isolates collected in 2023 will be tested using the spiral gradient method and compared to 2021 and 2022 resistance levels to assess shifts in *C. beticola* populations. A subset of fields was sampled multiple times over the growing season and seasonal changes in resistance will be tracked and compared to the fungicide programs used. Additional mutations associated with DMI resistance will be tested for their ability to predict isolate sensitivity. Newer qPCR techniques (Shrestha et al. 2020) will also be investigated for rapid screening optimization.

Acknowledgements: We thank the Michigan sugar beet industry for access to these fields and thank Michigan Sugarbeet Advancement and the Michigan Sugar Company for collection of sample materials. This work is supported by the Michigan Sugar Company, Michigan State University Project GREEEN, USDA-ARS, and the Beet Sugar Development Foundation.

Impact of cover crops and pH on *Cercospora beticola* growth and survival for management of Cercospora leaf spot of sugar beet, 2022-23

Alexandra Hernandez[1], JaeJun Park[1], Chris Bloomingdale[1], Sarah Ruth[1], Kim Cassida[1], Linda E. Hanson[1,2], and Jaime F. Willbur[1]; [1]Michigan State University; [2]USDA-ARS

Objective 1: Evaluate the use of cover crops for management of Cercospora leaf spot in sugar beet.

A laboratory inhibition assay was preformed to evaluate the direct impact of cover crop seedlings on the growth on *C. beticola*. In this study, 'Wheeler' rye, crimson clover, yellow mustard, common oat, and oilseed radish seeds (Johnny's Selected Seeds) underwent sterilization, germination, and placed on to sugarbeet leaf extract agar and soil extract agar. This exercise was replicated four times for each seed and media type in combination with two characterized isolates from the USDA-ARS fungal collection. Observations were recorded and compared to negative control by measuring the isolate radial growth on both the seed-bearing and seedless sides at one-week and two-week intervals. After two weeks, all seedling types except mustard significantly reduced *C. beticola* growth for both media types (Fig. 1). Experiments will be repeated in 2024.

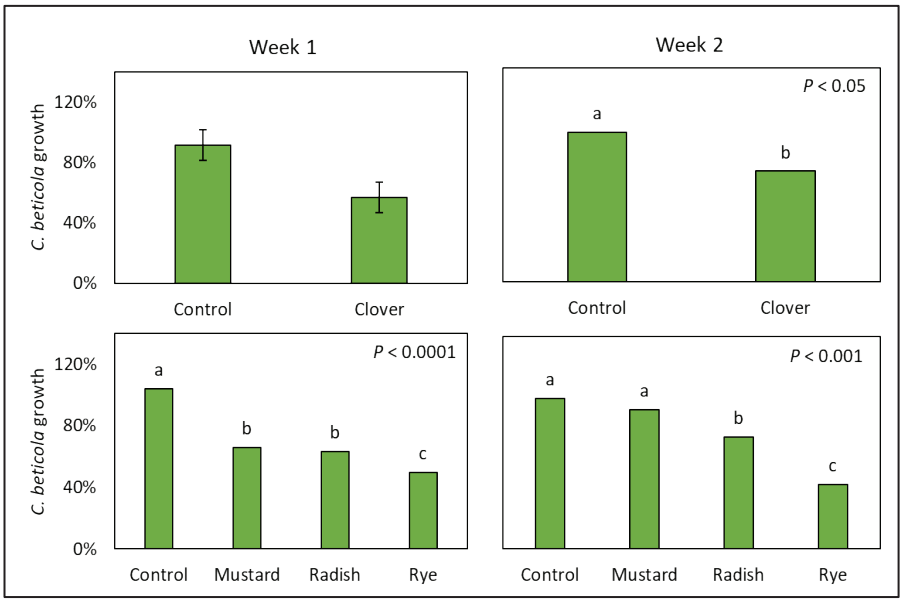


Figure 1. The percentage of *C. beticola* isolate growth on sugar beet leaf extract agar with the cover crop seedling compared to without the seedling after one and two weeks. Bars with the same letter were not significantly different based on Fisher's Protected LSD (α = 0.05).

A small-scale greenhouse experiment will be established in the spring of 2024. Subsamples of infected leaf residue will be weighed, placed in mesh bags, and placed under three inches of soil in 8-inch pots. In the top three inches of soil each cover crop treatment will be planted with 4 replicate pots of each seed type. After one month, *C. beticola* spores will be recovered, observed, and tested for viability.

A field-scale cover crop study was established in 2023 at Saginaw Valley Research and Extension Center in Frankenmuth, MI and has been maintained by the Potato and Sugar Beet Pathology program with direction and guidance by the Forages and Cover Crops program. In the first season, the research field was planted with the beet variety SX-1278. The field was inoculated with a $1x10^4$ *C. beticola* conidia/ml suspension on July 3. The sugar beets were topped and harvested in mid-Sept then CLS infected leaf material was incorporated prior to planting of cover crop treatments on Sept 18. The following cover crop treatments were planted: cereal rye (var. Wheeler), an oats and crimson clover mixture, and oilseed radish (var. Defender). The study was arranged in a randomized complete block design with four replicates

surrounded by 10-ft wheat buffer zones. Cover crop establishment was measured on Oct 19 using plant stand densities and biomass dry weights (data not shown). Soil samples will be collected from each plot area and crops will be terminated as advised in the spring of 2024. Following cover crop termination, rotational corn will be planted. Spore levels will be monitored using highly susceptible sentinel beets (Bublitz, McGrath, and Hanson 2021). A final soil sample will be collected at harvest and will be submitted for pH and nutrient testing and fractions may be submitted for assessment of microbial activity.

Objective 2: Investigate the effects of pH on *C. beticola* infection in sugar beet leaves.

The role of pH on *C. beticola* establishment and survival was tested in laboratory and field experiments. CLS lesions were sampled from infected and non-infected sugar beet varieties from a grower field. Eight different varieties were used for this experiment with 20 leaves collected from each of the three replicate variety plots. Twenty symptomatic and asymptomatic leaf areas from at least five different leaves per field replicate were placed into 2 mL of sterile deionized water, ground, and the pH was measured. Change in pH was not significantly different between varieties (Fig. 2). The pH of healthy tissue was not significantly different from the pH of the CLS lesion tissue ($P > 0.05$).

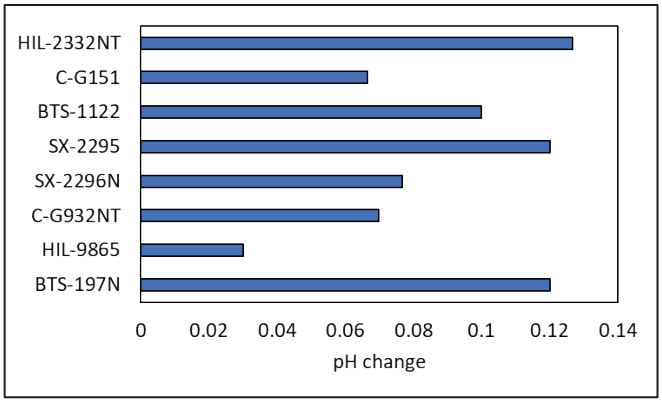


Figure 2. Change in pH of CLS lesion tissue compared to healthy tissue of eight sugar beet varieties from various companies and across CLS resistance levels.

Laboratory experiments were conducted to test the impact of soil and foliar amendments on *C. beticola* isolate growth. Soil extract agar and sugar beet leaf extract agar were amended with Humax and Fulmax (JH Biotech) solutions according to the rates for foliar and soil application for the respective media type. Two *C. beticola* isolates (described above) were placed on amended and non-amended media. The diameter of isolate growth was then measured one and two weeks after inoculation. Humax amendment increased the pH from 6 to 8 and significantly reduced growth of *C. beticola* isolates ($P < 0.001$). Field applications of these products in CLS management will be investigated.

Overall Summary:

- Rye seedlings consistently resulted in the greatest inhibition of *C. beticola* mycelial growth. Mustard, radish, and clover seedlings also inhibited *C. beticola* growth, but to a lesser extent.
- The pH of sugar beet leaf material was consistently greater in CLS-symptomatic tissue compared to healthy tissue. Additionally, *C. beticola* mycelial growth was inhibited for Humax amendments that increased pH in artificial media. Further investigations of the role of pH are necessary.

Acknowledgements: JaeJun Park was a student in the Michigan State University High School Honors Science/Mathematics/Engineering Program (HSHSP) and participated in this research during summer 2023. This work is supported by the Michigan Sugar Company, USDA-ARS, Project GREEEN, and the USDA National Institute of Food and Agriculture, Hatch project 1020281.

Development and validation of a spore-based *Cercospora beticola* risk model for improved application timing and management of Cercospora leaf spot on sugar beets, 2022-23

Alexandra Hernandez[1], Chris Bloomingdale[1], Cheryl Trueman[3], Linda E. Hanson[1,2], and Jaime F. Willbur[1]; [1]Michigan State University; [2]United States Department of Agriculture – Agricultural Research Service; [3]Syngenta Canada

Methods: A preliminary model was created in 2021 to predict elevated *C. beticola* spore numbers using a threshold of 35 spores. The model was created using daily numbers of aerial spores collected in sugar beet fields using a Burkard spore trap in Michigan from 2019, 2020, 2021 and 2022 and from Ontario, Canada 2019, 2020, and 2021 early in the season (May to July). Environmental factors were evaluated for their impact of spore number. Stepwise regression analyses were conducted to assess potential models.

Weather variables highly correlated to spore counts were identified and logistic modeling was used to predict elevated spore levels ($R^2 = 0.18$, $P < 0.0001$). The model predicted the chance that daily spore abundance was ≥35 (Spore35) based on number of hours with leaf wetness (≥ 25%) from 11AM to 10AM (DurLW), average daily air temperature (°C) from 11AM to 10AM (AvgTemp), and maximum daily wind speed (km/h) (MaxWS). The following equation was used to predict risk for elevated aerial spores:

Spore35 = 0.1132*DurLW + 0.1285*AvgTemp + 0.0369*MaxWS - 5.0814

A validation field study was conducted to test the ability of this model to assist in fungicide application timing and improved management (details below). The field treatments were arranged in a randomized complete block design with three treatments applied to a CLS-susceptible variety in 2023.

Location: Frankenmuth, MI (SVREC)	**Treatment Timings:** see table
Planting Dates: May 12, 2023 (Harvest: October 2)	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Variety:** SX-1278

Table 1. Model validation treatment programs tested in 2023. All models were based off of the Spore35 model at using various initiation criteria. After initiation, subsequent spray timings followed a 14-day (calendar) or model-based interval.

Trt	Program	Initiation Criteria [a]	Actual Initiation Date	# App.	App. Interval
1	Non-treated control	-			
2	Model 1	50% + DSV 3 or 4	6/30/23	6	14-day
3	Grower standard [b] + calendar interval	50 DSV	7/10/23	6	14-day
4	Grower standard + model interval	50 DSV	7/10/23	4	After 14 days, apply when 50% + DSV 3 or 4
5	Model 2	50% + DSV 3 or 4 + 40% row closure	7/19/23	5	14-day
6	Model 3	40% + DSV 3 or 4 + 50% row closure	7/25/23	5	14-day

[a] Model 1, 2, and 3 programs were initiated based on the Spore35 model threshold of 50% likelihood of 35 or more *C. beticola* spores paired with a BEETcast DSV value of 3 or 4 on the same day.
[b] Grower standard program as follows: Manzate Max (1.6 qt) ABCDE; Inspire XT (7 fl oz) BD; Badge (1.5 pt) F. Application letters code for the following dates: A=10 Jul, B= 25 Jul, C=8 Aug, D=22 Aug, E=5 Sept, F=16 Aug, and G=30 Aug.

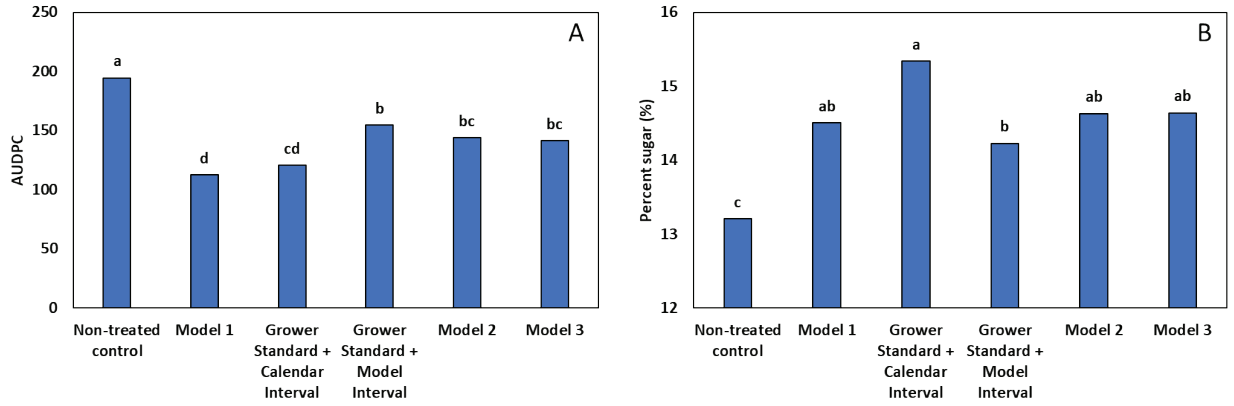


Figure 1. Area under the disease progress curve (A) was calculated using disease severity scores (0-10 scale) collected July 7 to Aug 5, 2023. Percent sugar (B) was measured post-harvest. Significant differences are indicated by different letters based on Fisher's Protected LSD (α=0.05).

Summary: The treatments in this study did not result in any significant differences in yield. All treatments resulted in significantly reduced AUDPC compared to the non-treatment control. The earliest model initiation (Model 1) showed a significant reduction in AUDPC compared to the Grower standard with the extended model interval and the two delayed model initiations (Model 2 and 3). Numerically, Model 1 resulted in the lowest AUDPC, which was not significantly different from the grower standard with calendar interval. The grower standard with the extended model interval had significantly higher disease pressure compared to the grower standard with the calendar interval.

All spray programs resulted in significantly greater sugar content than the non-treated control. The percent sugar was greatest in the grower standard with the calendar spray interval but was not significantly different from treatments based on Model 1, 2, or 3. Percent sugar was significantly reduced in the grower standard program with extended model-based spray interval. In this study, where a highly CLS-susceptible variety was combined with severe CLS pressure, extending the interval between applications based on spore-based risk was not beneficial, as indicated by the increase in AUDPC and the reduction in sugar percentage. Early-season suppression of CLS using model-based initiation thresholds, however, shows potential to improve foliar management. Further model refinement is in progress.

Acknowledgements: This work is supported by the Michigan Sugar Company, USDA-ARS, Project GREEEN, and the USDA National Institute of Food and Agriculture, Hatch project 1020281.

Fungicide resistance screening for *Alternaria* spp. causing Alternaria leaf spot of sugar beet, 2022-23

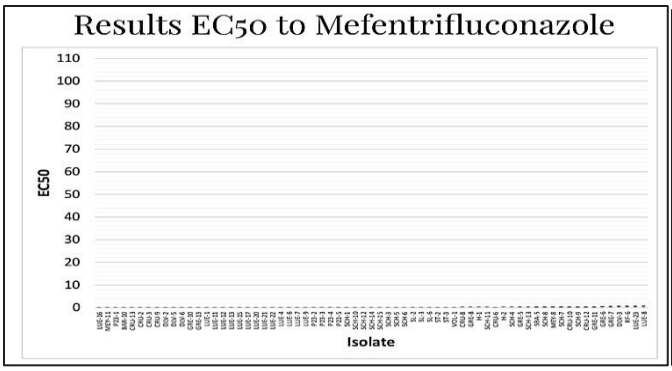
Emily Jordyn Weedon[1], Linda Hanson[1,2], Daniel Bublitz, Jan Byrne, and Laura Miles[1] and Jaime F. Willbur[1]; [1]Michigan State University; [2]USDA-ARS

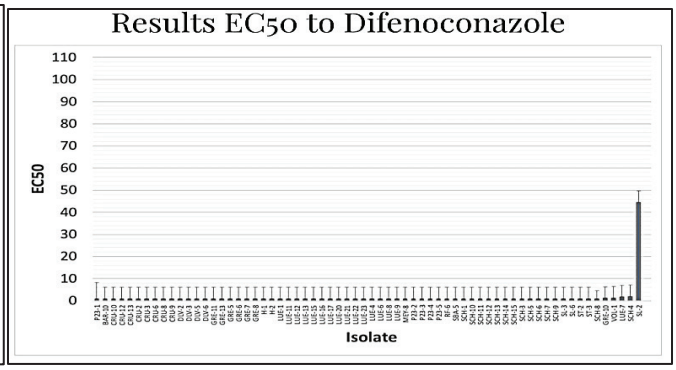
Background: While generally considered a minor disease of sugar beets, reports of Alternaria leaf spot (ALS) disease prevalence and severity have been on the rise. In 2015, Michigan growers reported significant yield reduction because of premature defoliation caused by ALS (Rosenzweig et al., 2017). Increased *in vitro* resistance has subsequently been reported for *Alternaria* spp. from sugar beet (Rosenzweig et al., 2017; Rosenzweig et al., 2019). Interestingly, sensitivity was found to increase after DMI-resistant isolates of *C. beticola* were exposed to prolonged cold temperatures of -20°C (Karaoglanidis and Thanassoulopoulos, 2002; Arabiat et al., 2017). Studies of potential biological trade-offs in resistant *Alternaria* spp. are lacking. Further investigations will improve understanding of pathogen biology and diversity and guide management of beet leaf spot diseases in Michigan.

Objective 1: Characterize virulence and fungicide resistance of *Alternaria* spp. isolates from sugar beet. Spore suspensions were collected from symptomatic sugar beet leaves from Michigan fields across six counties in 2022. Suspensions were adjusted to $1x10^4$ conidia/ml using a hemocytometer. The collected 74 isolates were tested for virulence using a detached leaf-assay using 2-month-old sugar beets grown in the MSU Plant Science Greenhouses of the susceptible beet variety, CR-059. Lesion developments were recorded daily after two days post inoculation for five days. This experiment was repeated twice.

Initial *in-vitro* fungicide sensitivity was collected for six fungicide active ingredients registered for management of leaf spot diseases in sugar beet in Michigan. These included four demethylation inhibitor (DMI) fungicides (FRAC 3) difenoconazole, mefentrifluconazole, prothioconazole, and tetraconazole, as well as triphenyltin-hydroxide (FRAC 30), and thiophanate methyl (FRAC 1) (Rosenzweig et al, 2017; Rosenzweig et. 2019). Plates were fungicide amended using a gradient spiral dilution method (Förster et al, 2004) and spore suspensions were streaked onto them. The effective concentrations to inhibit mycelial growth by 50% (EC_{50}) were determined four days post-inoculation. This experiment was repeated twice.

Results: In the virulence assay, lesion diameters ranged from 0.49 mm to 18.96 mm, and 57 isolates resulted in more severe symptoms than a previously characterized virulent *A. alternata* isolate, P23 (Jayawardana, 2022). In the initial fungicide sensitivity screening, isolates were phenotypically categorized as previously defined by Rosenzweig et al. (2019) as resistant (EC_{50} >100 ppm), insensitive (EC_{50} = 50-100 ppm), moderately insensitive (EC_{50} = 10-50 ppm), reduced sensitive (EC_{50} = 1-10 ppm), and sensitive (EC50 <1 ppm). Percentages of isolates characterized as insensitive were: 0% for difenoconazole, 0% for mefentrifluconazole, 22% for prothioconazole, 37% for tetraconazole, 81% for thiophanate-methyl, and 18% for triphenyltin hydroxide (Figure 1).





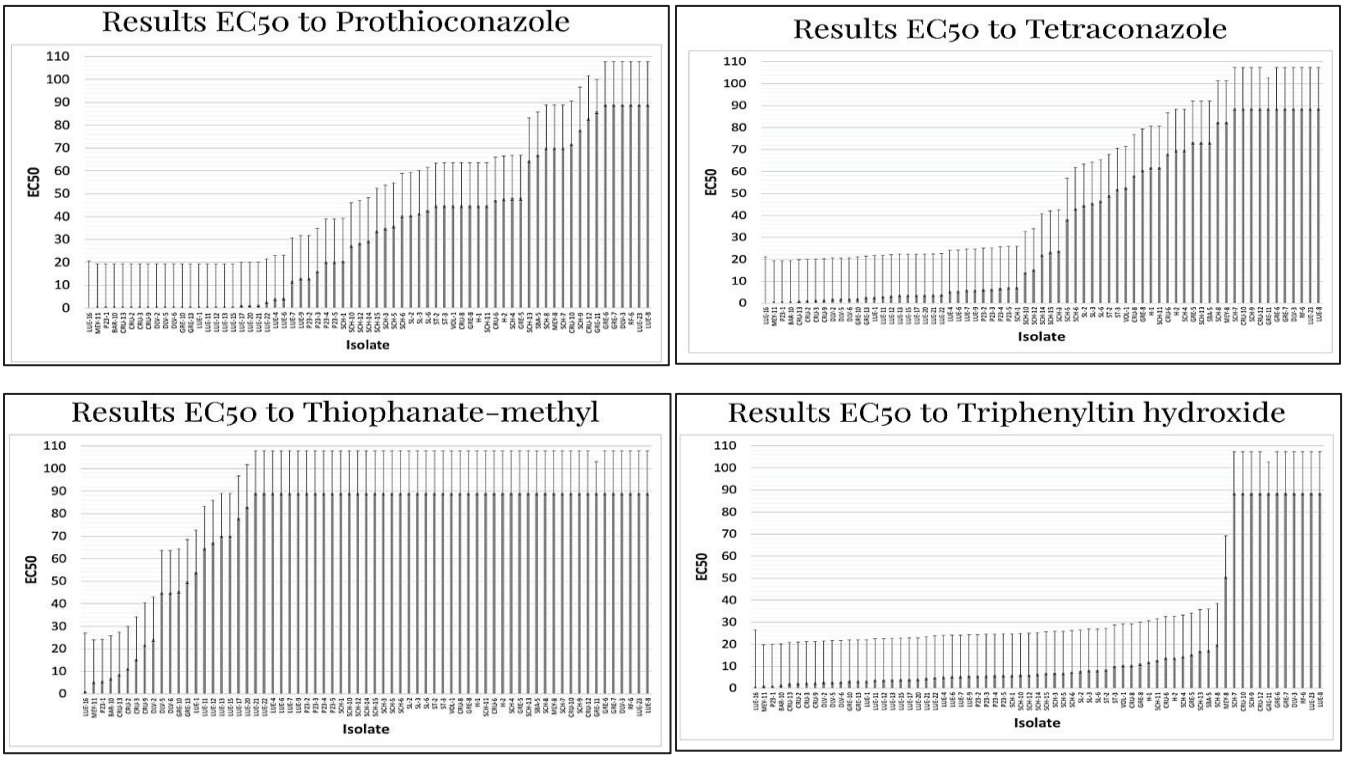


Figure 1: Initial fungicide sensitivity across 74 *Alternaria spp.* from 2022. The p-values denoting differences between isolates were: 0.004 (mefentrifluconazole), 0.5 (difenoconazole), <0.0001 (prothioconazole), <0.001 (tetraconazole), <0.0001(thiophanate-methyl), and <0.001 (triphenyltin hydroxide).

Objective 2: Evaluate potential cold temperature effects on fluctuations in fungicide sensitivity. Seven *Alternaria spp.* isolates (including the previously characterized *A. alternata* isolate P23 (Jayawardana, 2022)), and seven *C. beticola* from 2022 were placed into three temperature-controlled environments (20°C, 4°C, and -20°C) using a split-plot design. Fungicide sensitivity was tested using a gradient spiral dilution method (Förster et al, 2004) against difenoconazole, tetraconazole, thiophanate-methyl, or triphenyltin hydroxide. Screening began an initial two weeks and then continued every subsequent month for seven months.

Results: Preliminary data suggest that exposure to 4°C for two months has significantly increased sensitivity to tetraconazole in *Alternaria* spp. isolates (P=0.003). However, no significant changes were detected in isolate sensitivity to difenoconazole after exposure to any of the temperatures (P=0.145) (shown in Figure 2). As expected, significant differences in sensitivity were also not detected for thiophanate-methyl or triphenyltin hydroxide. Data collection for the remaining timepoints is ongoing for both *Alternaria* spp. and *C. beticola*.

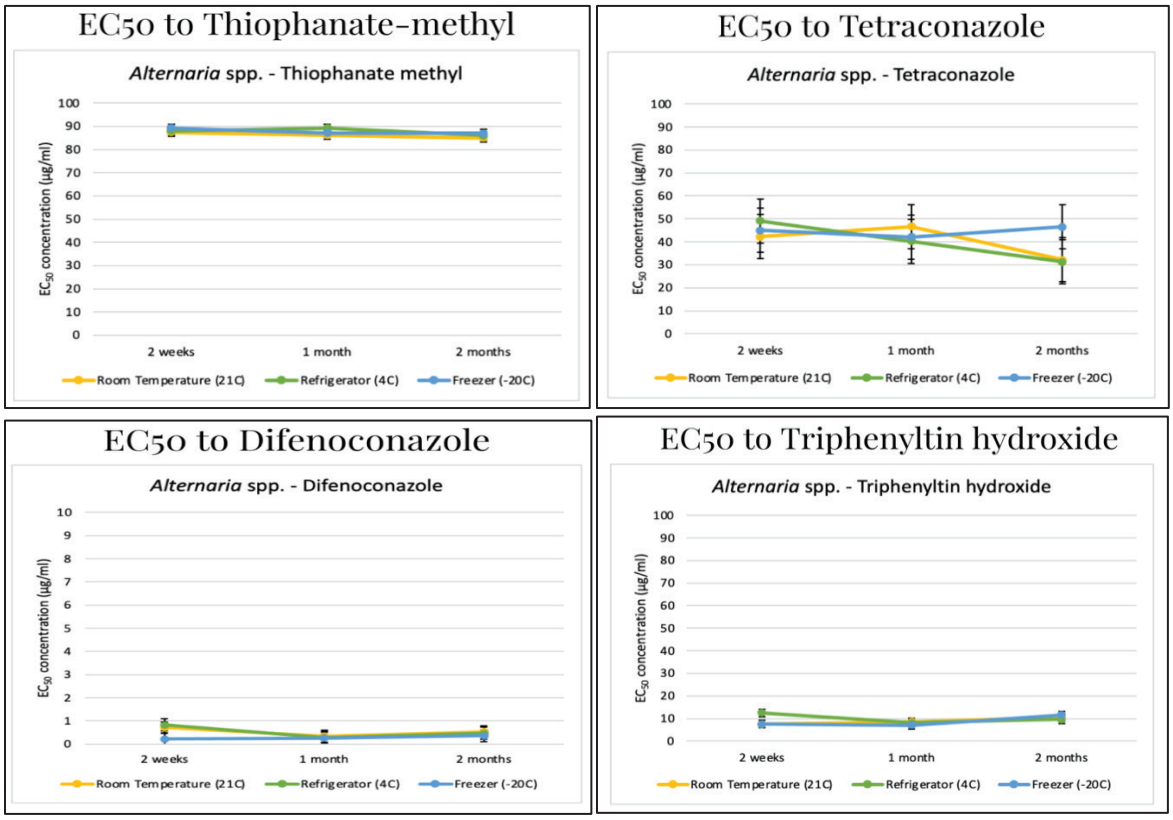


Figure 2: Preliminary EC_{50} values across *Alternaria* spp. isolates after incubation in each environment for two months. Exposure to 4ºC significantly increased sensitivity to tetraconazole in *Alternaria* spp. isolates (P=0.003). Thus far, no significant changes were detected in isolate sensitivity to difenoconazole (P=0.145), thiophanate-methyl (P>0.05), or triphenyltin hydroxide (P>0.05).

Overall Summary:

- Similar levels of insensitivity were observed for tetraconazole and prothioconazole across *Alternaria* spp. isolates. Difenoconazole and mefentrifluconazole also had comparable responses with many isolates being classified as sensitive or reduced sensitive. Most isolates were classified as insensitive for thiophanate-methyl.
- Prolonged cold exposure has potential to significantly affect sensitivity against DMI fungicides according to preliminary results with *Alternaria* species. Further analyses are ongoing for both leaf spot pathogens.

Future Directions: Data collection is ongoing for cold-environment experiments and will be repeated. Both *Alternaria* spp. and *C. beticola* isolates collected from 2023 will be characterized for virulence and fungicide sensitivity. Additionally, *Alternaria* spp. isolates will be further characterized to identify the species present in Michigan fields. Pyraclostrobin (QoI, FRAC 11) with the addition of SHAM (salicylhydroxamic acid), will be added to the fungicide screenings to represent QoI applications used to manage leaf spot diseases.

Acknowledgements: We thank the Michigan sugar beet industry for access to field sites and thank Michigan Sugarbeet Advancement and the Michigan Sugar Company for collection of sample materials. This work is supported by the Michigan Sugar Company, Michigan State University Project GREEEN, and USDA-ARS.

Nematode Trial
Sylvester - Akron, MI - 2023

Trial Quality: Good
Variety: BTS-197N & C-G021
Planted: April 25th
Harvested: September 25th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 3.1 **pH:** 7.6 **CEC:** 18.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 18.35 in
Beets/100 ft: 206

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate	Variety	RWST	Vigor* 0-10		Net $/A	RWSA	T/A	% SUC	% CJP
					21-Aug	21-Jul					
6	1405	1.0 oz/cwt	C-G021	**271**	7.8	8.9	**$3,449**	**10849**	**40.1**	**18.2**	**95.2**
5	Aveo	4.14 ml/unit seed	C-G021	**267**	**8.0**	8.6	**$3,389**	**10662**	**39.9**	**18.0**	**95.3**
2	Aveo	4.14 ml/unit seed	BTS-197N	**265**	**7.9**	8.4	$3,054	9612	36.3	**18.0**	**94.7**
4	Untreated Check		C-G021	**262**	7.7	8.5	$3,224	10113	**38.6**	**17.8**	**94.8**
3	1405	1.0 oz/cwt	BTS-197N	**260**	**7.9**	8.8	$2,894	9110	35.0	**17.8**	94.4
1	Untreated Check		BTS-197N	254	**8.6**	8.8	$2,957	9274	36.6	17.5	94.1
Average				263	8.0	8.6	3161	9937	37.8	17.9	94.7
LSD 5%				10.1	0.7	N.S.	184.3	578.1	2.4	0.5	0.8
CV%				2.6	5.6	6.3	3.9	3.9	4.3	1.7	0.6

***Vigor** 0 to 10 ratings, 10 is the best

Comments: This trial was designed to test products from IndigoAg (1405) and Valent (Aveo) for efficacy on Nematodes.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

FMC Nematode Trial
Sylvester, Akron - 2023

Trial Quality: Good
Variety: C-G021, BTS-197N
Planted: April 24th
Harvested: September 25th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 3.1 **pH:** 7.6 **CEC:** 18.3
P: Very High **K:** High
Mn: HIgh **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 18.35 in.
Beets/100 ft: 199

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	RWST	Eggs + Jv's	Cysts	Eggs	Jv's	Net $/A	RWSA	T/A	% SUC	% CJP
5	Zironar C-G021	6 fl oz	At Plant	In-Fur	268	32.5	1.0	12.5	20.0	**$3,686**	**11593**	**43.2**	18.1	**95.2**
3	Zironar BTS-197N	12 fl oz	At Plant	In-Fur	264	135.5	2.5	100.0	35.5	$2,846	8989	34.1	17.9	**94.7**
6	Zironar C-G021	12 fl oz	At Plant	In-Fur	264	315.0	6.0	245.0	70.0	**$3,216**	**10150**	**38.5**	18.0	**94.7**
4	Untreated Check C-G021				262	N.A	N.A	N.A	N.A	**$3,224**	**10113**	**38.6**	17.8	**94.8**
2	Zironar BTS-197N	6 fl oz	At Plant	In-Fur	261	78.0	1.5	55.0	23.0	$3,145	9897	**38.0**	17.7	**94.9**
1	Untreated Check BTS-197N				254	N.A	N.A	N.A	N.A	$2,957	9274	36.6	17.5	94.1
	Average				262	140.3	2.8	103.0	37.1	$3,179	10003	38.1	17.8	94.7
	LSD 5%				N.S.	N.S.	N.S.	N.S.	N.S.	499.1	1565.4	5.27	N.S.	1.0
	CV%				3.7	151.0	122.0	178.0	88.7	10.4	10.4	9.2	2.4	0.7

Comments: Zironar is a product from FMC that has an effect of managing nematodes and root disease.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

FMC Insecticide

Sylvester, Akron - 2023

Trial Quality: Good
Variety: C-G932NT
Planted: April 24th
Harvested: September 25th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 3.1 **pH:** 7.6 **CEC:** 18.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 18.32 in.
Beets/100 ft: 134

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing*	RWST	Vigor** 0-10 21-Aug	Net $/A	RWSA	T/A	% SUC	% CJP
4	Vantacor	1.2 fl oz	A	**262**	**7.6**	$3,346	10268	39.2	18.0	94.1
	Premium MSO	1 %v	A							
	Mustang Maxx	4 fl oz	B							
	LI 700	0.25 %v	B							
3	Mustang Maxx	4 fl oz	A	**257**	**7.7**	$3,319	10176	39.6	17.8	93.8
	LI 700	0.25 %v	A							
	Mustang Maxx	4 fl oz	B							
	LI 700	0.25 %v	B							
2	Vantacor	1.2 fl oz	A	**253**	**7.6**	$3,377	10373	41.1	17.0	95.4
	Premium MSO	1 %v	A							
	Vantacor	1.2 fl oz	B							
	Premium MSO	1 %v	B							
6	Delegate	3 oz	A	**250**	**7.7**	$3,218	10071	40.3	17.1	94.5
	Premium MSO	1 %v	A							
	Delegate	3 oz	B							
	Premium MSO	1 %v	B							
5	Mustang Maxx	4 fl oz	A	**250**	7.4	$3,292	10103	40.5	17.3	94.1
	LI 700	0.25 %v	A							
	Vantacor	1.2 fl oz	B							
	Premium MSO	1 %v	B							
1	Untreated Check			247	**7.8**	$3,276	9979	40.4	17.0	94.3
Average				253	7.6	$3,305	10162	40.2	17.4	94.4
LSD 5%				11.8	0.3	N.S.	N.S.	N.S.	N.S.	N.S.
CV%				3.1	2.8	5.4	5.3	5.9	3.8	1.1

***Application: A - 2 lf (5/26), B - 6 lf (6/5)**

****Vigor** 0-10 rating: 10 is best

Comments: This study was designed to test Vantacor Insecticide. Insect pressure was low in the study.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Evaluating Cyst Nematode Resistance in Sugar Beet Varieties through Greenhouse Experiments

Ali Yaghoubi and Marisol Quintanilla. Michigan State University, Department of Entomology.

In 2023, several sugar beet varieties were evaluated for resistance to sugar beet cyst nematode (SBCN) infection in a greenhouse trial. The specific varieties and their source companies are outlined in Table 1.

Table 1. Sugar beet varieties and their respective company sources.

No.	Variety	company sources
1	G932NT	ACHSEEDS
2	G151	ACHSEEDS
3	2332NT	Hilleshog
4	HM9865	Hilleshog
5	HM2361	Hilleshog
6	HILL2238NT	Hilleshog
7	SX2296N	SESVANDERHAVE
8	SV101N	SESVANDERHAVE

Sugar beets were planted in 1.5-liter pots at the Michigan State University research greenhouse on June 15, 2023. The experiment utilized a randomized complete block design with five replications per treatment. The pots were filled with a soil mixture of 3 parts sand and 1 part field soil. On June 26, 2023, 2,000 eggs of the sugar beet cyst nematode (SBCN) were inoculated into each pot after seedling germination. After allowing two months for SBCN population establishment and beet growth, the pots were sampled to quantify SBCN females and eggs per 100 cc soil, as well as beet weights.

Beet weights analysis revealed that G932NT exhibited a significantly higher yield compared to G151 and HM2361 (Figure 1).

Analysis of the SBCN cysts in each sugar beet variety after two months of inoculation indicated that G932NT and SX2296N significantly had the lowest number of cysts per 100 cc of soil, while HM9865 and G151 showed the highest number of cysts in the rhizosphere of sugar beet roots (Figure 2).

Furthermore, examination of SBCN eggs after crushing cysts in each sugar beet variety demonstrated that G932NT, SX2296N, HILL2238NT, and SV101N significantly had the lowest number of eggs per 100 cc of soil, whereas G151 exhibited the highest number of eggs in the rhizosphere of sugar beet roots (Figure 3).

This experiment will be repeated in the greenhouse and field microplots to further validate the results.

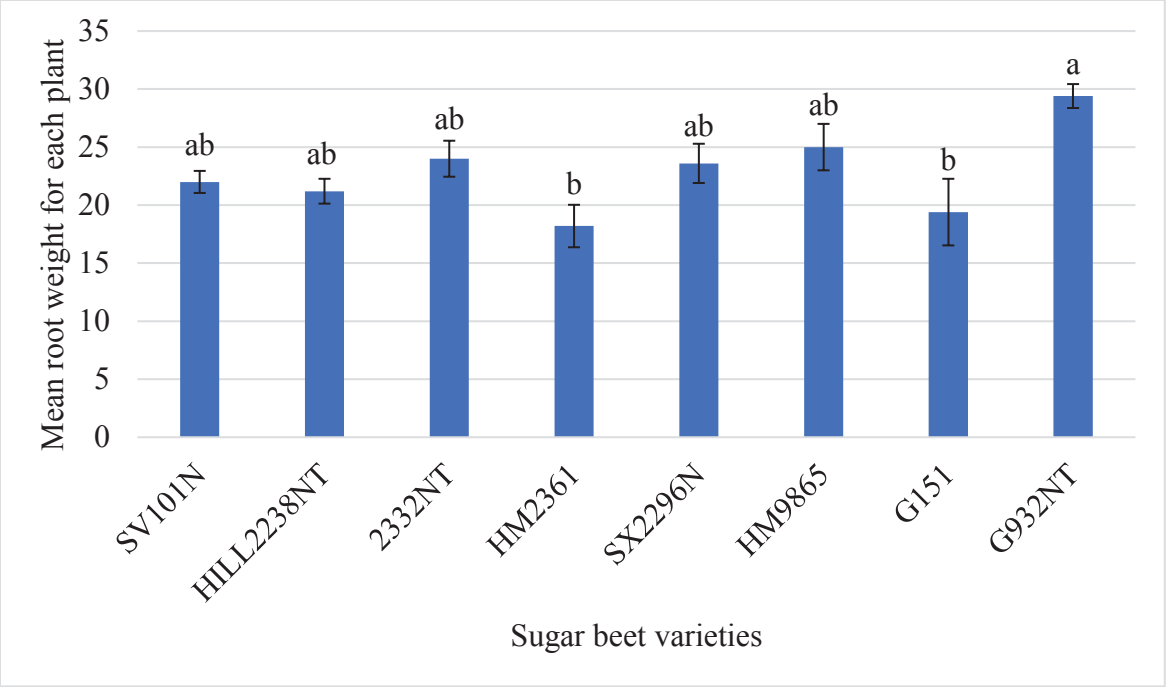


Figure 1. Average sugar beet weight at two months after inoculation. Different letters indicate significant differences in beet weight between varieties based on Tukey's HSD test at $p \leq 0.05$.

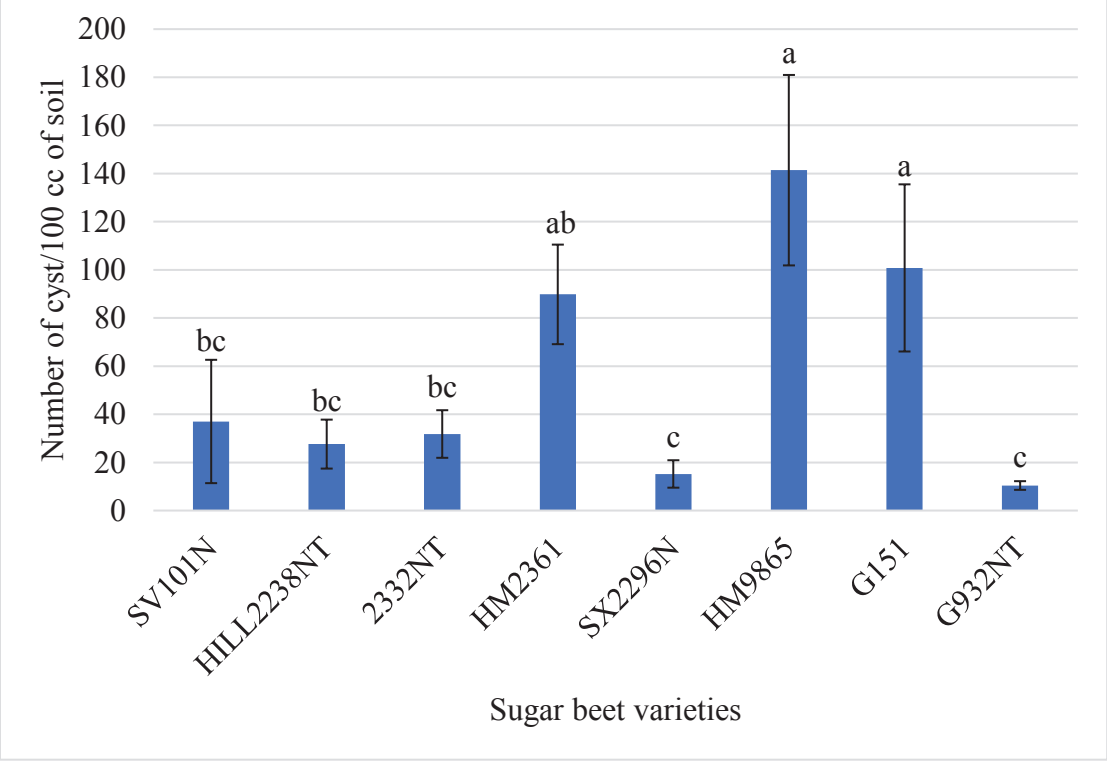


Figure 2. The average number of sugar beet cyst nematode (SBCN) cysts per 100 cc soil recovered from different sugar beet varieties at two months after inoculation. Different letters indicate significant differences between varieties according to Tukey's HSD test at $p \leq 0.05$.

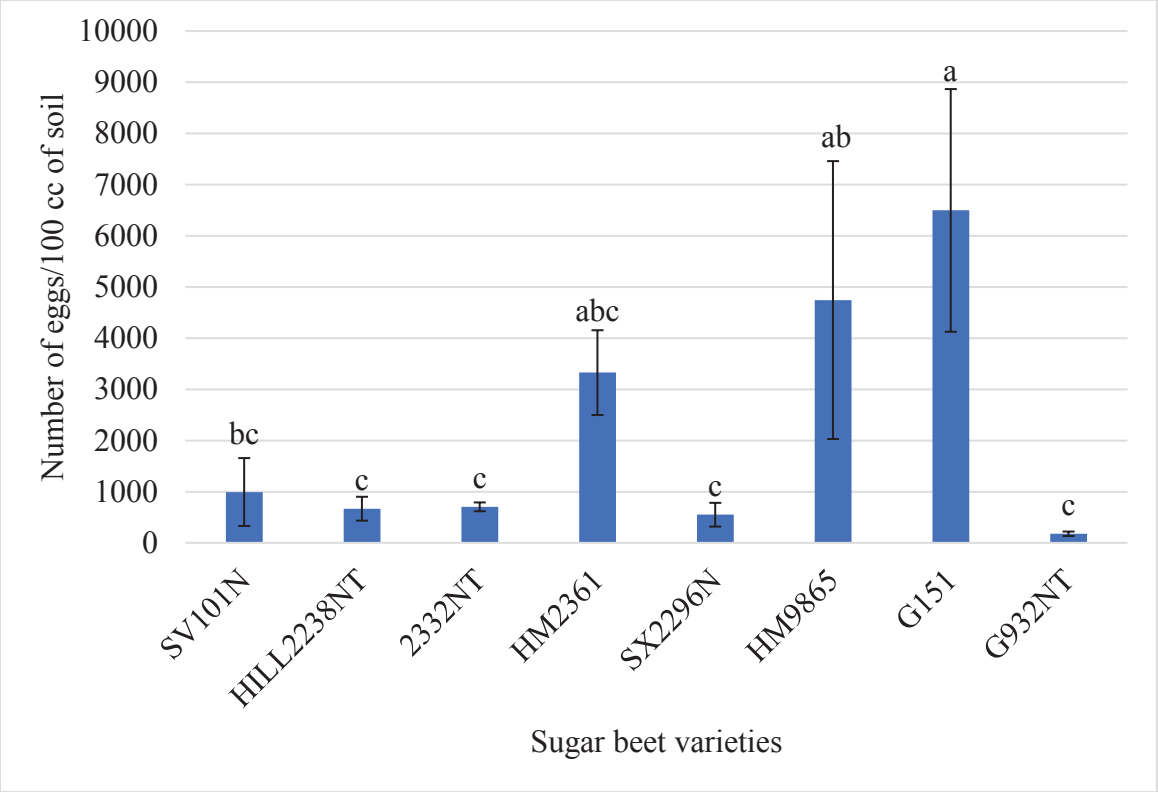


Figure 3. The average number of sugar beet cyst nematode (SBCN) eggs per 100 cc soil recovered from different sugar beet varieties at two months after inoculation. Different letters indicate significant differences between varieties according to Tukey's HSD test at $p \leq 0.05$.

The authors gratefully acknowledge ACHSEEDS, Hilleshog, and SESVANDERHAVE seed companies for generously providing sugar beet variety seeds used in this research. Additionally, we thank Michigan Sugar Company and the USDA-NIFA for providing financial support that made this work possible.

Nitrogen Application Strategies Trial

Blumfield West - Richville, MI - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: April 27th
Harvested: October 31st
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 1.9 **pH:** 7.3 **CEC:** 15.4
P: Very High **K:** Medium
Mn: High **B:** Medium
Added N: See Individual Treatments
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 19.84 in.
Beets/100 ft: 126

Application: Pre-plant was applied broadcast. 2X2 was applied with the planter. 6 and 12 lf applications were applied as a fluted coulter application or streamed on with a sprayer.

No.	Treatment	Rate/A	Applic Timing	Applic Method	Vigor*** 0-10 21-Aug	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
1	Untreated Check				**7.9**	$2,451	9806	**282**	34.9	**19.8**	**93.2**
2	Nitrogen	160 lbs	26-Apr	PPI	**7.3**	$2,717	**11726**	**269**	**43.6**	19.2	**92.4**
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
3	Nitrogen	120 lbs	26-Apr	PPI	**7.0**	$2,571	11206	253	**44.3**	19.1	90.4
	Nitrogen*	40 lbs	At Plant	2X2							
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
4	Nitrogen	60 lbs	26-Apr	PPI	6.1	**$3,113**	**13450**	**288**	**46.8**	19.0	**96.1**
	Nitrogen*	40 lbs	At Plant	2X2							
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	60 lbs + 2.64 fl oz	6 lf	Streamer							
5	Nitrogen*	40 lbs	At Plant	2X2	**7.3**	$2,624	11537	262	**44.5**	19.1	**91.7**
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	60 lbs + 2.64 fl oz	6 lf	Streamer							
	Nitrogen + Anvol	60 lbs + 2.64 fl oz	12 lf	Streamer							
6	Nitrogen*	40 lbs	At Plant	2X2	**7.7**	**$2,916**	**12646**	**282**	**44.8**	18.9	**95.3**
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf	Streamer							
7	Nitrogen	60 lbs	26-Apr	PPI	**7.5**	**$2,859**	**12433**	**268**	**46.3**	**19.4**	**92.0**
	Nitrogen*	40 lbs	At Plant	2X2							
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	60 lbs + 2.64 fl oz	6 lf	Fluted Coulter							

***Treatment includes Sulfur (Thio-Sul, 4 gal) + Phosphorus (10-34-0, 6 gal)**

****Treatment includes Sulfur (Thio-sul, 4 gal)**

*****Vigor** 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Nitrogen Application Strategies Trial

Blumfield West - Richville, MI - 2023

No.	Treatment	Rate/A	Applic Timing	Applic Method	Vigor*** 0-10 21-Aug	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
8	Nitrogen*	40 lbs	At Plant	2X2	**7.8**	$2,653	11590	**264**	43.8	19.1	91.9
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf	Fluted Coulter							
9	Nitrogen*	40 lbs	At Plant	2X2	**7.4**	**$2,950**	**12779**	**268**	**47.7**	18.8	**93.1**
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	12 lf	Streamer							
10	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr	**7.4**	$2,687	11693	**280**	41.7	**19.3**	**93.8**
	Nitrogen + Sulfur + Anvol	160 lbs + 4 gal + 6.57 fl oz	6 lf	Streamer							
11	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr	**8.1**	$2,562	11190	**266**	42.1	**19.2**	91.9
	Nitrogen + Anvol**	160 lbs + 6.57 fl oz	6 lf	Fluted Coulter							
12	Nitrogen*	40 lbs	At Plant	2X2	**7.8**	$2,423	10020	**265**	37.9	**19.5**	91.1
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
13	Nitrogen**	60 lbs	26-Apr	PPI	**7.6**	$2,698	11701	258	**45.3**	**19.3**	90.6
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	100 lbs + 4.26 fl oz	6 lf	Streamer							
14	Nitrogen**	40 lbs	26-Apr	PPI	**7.4**	$2,661	11625	259	**44.9**	**19.3**	90.7
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	80 lbs + 2.64 fl oz	6 lf	Streamer							

***Treatment includes Sulfur (Thio-Sul, 4 gal) + Phosphorus (10-34-0, 6 gal)**

****Treatment includes Sulfur (Thio-sul, 4 gal)**

*****Vigor** 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Nitrogen Application Strategies Trial

Blumfield West - Richville, MI - 2023

No.	Treatment	Rate/A	Applic Timing	Applic Method	Vigor*** 0-10 21-Aug	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
15	Nitrogen	40 lbs	26-Apr	PPI	**7.4**	$2,828	11889	**286**	41.5	**19.3**	**95.0**
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol**	80 lbs + 1.7 fl oz	6 lf	Streamer							
16	Nitrogen	40 lbs	26-Apr	PPI	**7.3**	**$3,131**	**13304**	**280**	**47.5**	19.0	**94.8**
	Nitrogen*	40 lbs	At Plant	2X2							
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf	Streamer							
17	Nitrogen	40 lbs	26-Apr	PPI	**8.1**	$2,760	11719	262	**45.0**	**19.3**	91.1
	Nitrogen*	40 lbs	At Plant	2X2							
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr							
	Nitrogen + Anvol	20 lbs + .84 fl oz	6 lf	Streamer							
Average					7.5	$2,741	11783	270	43.7	19.2	92.7
LSD 5%					1.6	433.8	1735.1	28.9	5.2	0.4	4.5
CV%					14.9	11.1	10.4	7.5	8.4	1.6	3.4

***Treatment includes Sulfur (Thio-Sul, 4 gal) + Phosphorus (10-34-0, 6 gal)**

****Treatment includes Sulfur (Thio-sul, 4 gal)**

*****Vigor** 0 to 10 ratings, 10 is the best

Comments: This trial is designed to examine nitrogen application strategies. Nitrogen was applied as 28% UAN in most cases, unless noted differently above.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

N & K Fertility Trial Early Harvest

Blumfield West - Richville, MI - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: April 27th
Harvested: September 19th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 1.9 **pH:** 7.3 **CEC:** 15.4
P: Very High **K:** Medium
Mn: High **B:** Medium
Added N: See individual treatments
Previous Crop: Wheat/clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 16.4 in.
Beets/100 ft: 181

Application: 2X2 on planter. 6 lf stage incorporated with fluted coulter (between rows).

No.	Treatment	Rate/A	Applic Timing	Applic Method	Vigor*** 0-10		Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					21-Aug	20-Jul						
1	Untreated Check				7.4	8.0	$2,913	8603	247	34.9	16.9	94.7
2	Nitrogen*	40 lbs	At Plant	2x2	**7.5**	8.1	$3,037	9052	249	36.4	17.0	**94.8**
3	Potassium	150 lbs	26-Apr	PPI	**6.9**	**8.0**	$3,200	9539	**259**	36.8	**17.5**	**95.3**
	Nitrogen*	40 lbs	At Plant	2x2								
4	Potassium	300 lbs	26-Apr	PPI	**7.3**	**8.0**	$3,091	9242	**262**	35.2	**17.6**	**95.5**
	Nitrogen*	40 lbs	At Plant	2x2								
5	Nitrogen*	40 lbs	At Plant	2x2	**7.3**	8.1	$3,062	9239	248	37.3	17.0	**94.6**
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf**	Streamer								
6	Potassium	150 lbs	26-Apr	PPI	**7.6**	**8.5**	$3,363	10130	259	39.1	17.5	**95.3**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf**	Streamer								
7	Potassium	300 lbs	26-Apr	PPI	**7.4**	**8.0**	**$3,384**	**10197**	**264**	38.6	**17.7**	**95.6**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf**	Streamer								
8	Nitrogen*	40 lbs	At Plant	2x2	7.5	8.4	$3,110	9381	239	39.3	16.4	**94.6**
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
9	Potassium	150 lbs	26-Apr	PPI	**7.8**	**8.5**	**$3,144**	**9483**	244	**38.8**	16.7	**94.6**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
10	Potassium	300 lbs	26-Apr	PPI	**7.9**	**8.5**	$3,274	9872	255	38.7	**17.2**	95.2
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
11	Nitrogen*	40 lbs	At Plant	2x2	**7.6**	8.3	$3,056	9220	237	**39.0**	16.2	**94.7**
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
12	Potassium	150 lbs	26-Apr	PPI	**7.9**	**8.5**	$3,025	9133	237	**38.4**	16.4	94.2
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
13	Potassium	300 lbs	26-Apr	PPI	**7.8**	**8.5**	**$3,430**	**10331**	244	**42.5**	16.8	**94.5**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
	Average				7.5	8.3	$3,161	9494	250	38.1	17.0	94.9
	LSD 5%				0.9	0.9	309.1	912.6	13.4	3.7	0.7	1.1
	CV%				8.2	7.8	6.8	6.7	3.7	6.8	2.9	0.8

***Treatment includes Sulfur (Thio-Sul, 4 gal) + Phosphorus (10-34-0, 6 gal)**

Conversions: 150 lbs of actual potassium (250 lbs Potash), 300 lbs potassium (500 lbs Potash). 40 lbs of actual nitrogen (13 gal/A UAN 28%), 60 lbs N (20 gal/A UAN 28%), 120 lbs N (40 gal/A UAN 28%), 160 lbs N (53 gal/A UAN 28%).

****6 lf application date:** 6/7

*****Vigor** 0 to 10 ratings, 10 is the best

Comments: This trial compared nitrogen and potassium rates and the impact on yield and sugar when harvested early in the season.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

N & K Fertility Trial Late Harvest

Blumfield West - Richville, MI - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: April 27th
Harvested: October 31st
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 1.9 **pH:** 7.3 **CEC:** 15.4
P: Very High **K:** Medium
Mn: High **B:** Medium
Added N: See Individual Treatments
Previous Crop: Wheat/clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 19.84 in.
Beets/100 ft: 169

Application: 2X2 on planter. 6 lf stage incorporated with fluted coulter (between rows).

No.	Treatment	Rate/A	Applic Timing	Applic Method	Vigor*** 0-10		Net $/A	RWSA	RWST	T/A	% SUC	% CJP
					21-Aug	20-Jul						
1	Untreated Check				**7.6**	**8.5**	**$3,332**	13329	284	46.9	18.9	**95.7**
2	Nitrogen*	40 lbs	At Plant	2x2	**7.4**	**8.0**	**$3,342**	13480	288	46.9	**19.9**	**93.7**
3	Potassium	150 lbs	26-Apr	PPI	**7.8**	**8.6**	$3,182	12851	277	46.4	**20.1**	91.6
	Nitrogen*	40 lbs	At Plant	2x2								
4	Potassium	300 lbs	26-Apr	PPI	**7.5**	**8.8**	**$3,631**	**14651**	**309**	**47.4**	**20.6**	95.4
	Nitrogen*	40 lbs	At Plant	2x2								
5	Nitrogen*	40 lbs	At Plant	2x2	**7.6**	7.6	$3,008	12299	270	45.5	19.8	91.1
	Nitrogen Anvol	40 lbs 1.7 fl oz	6 lf**	Streamer								
6	Potassium	150 lbs	26-Apr	PPI	**7.6**	**8.5**	$3,305	13490	279	**48.3**	19.5	**93.2**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf**	Streamer								
7	Potassium	300 lbs	26-Apr	PPI	**7.5**	**8.5**	$3,171	12961	279	46.5	**20.5**	**91.0**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	40 lbs + 1.7 fl oz	6 lf**	Streamer								
8	Nitrogen*	40 lbs	At Plant	2x2	**7.5**	7.8	$3,154	12884	271	**47.6**	19.4	92.3
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
9	Potassium	150 lbs	26-Apr	PPI	**7.5**	**8.1**	$3,156	12897	269	48.0	19.8	90.9
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
10	Potassium	300 lbs	26-Apr	PPI	**7.6**	**8.5**	$3,203	13087	270	**48.4**	**20.1**	90.6
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	120 lbs + 5.12 fl oz	6 lf**	Streamer								
11	Nitrogen*	40 lbs	At Plant	2x2	**7.8**	8.0	$3,031	12392	260	**47.7**	19.3	90.7
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
12	Potassium	150 lbs	26-Apr	PPI	**7.8**	**8.4**	**$3,385**	**13810**	275	**50.3**	19.8	91.8
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
13	Potassium	300 lbs	26-Apr	PPI	6.9	**7.9**	**$3,635**	**14818**	**307**	**48.2**	**20.5**	**95.3**
	Nitrogen*	40 lbs	At Plant	2x2								
	Nitrogen + Anvol	160 lbs + 6.78 fl oz	6 lf**	Streamer								
Average					7.5	8.2	$3,272	13304	280	47.5	19.9	92.6
LSD 5%					0.7	1.1	318.8	1275.0	18.5	2.9	0.7	2.7
CV%					6.8	9.0	6.8	6.7	4.6	4.2	2.6	2.1

***Treatment includes Sulfur (Thio-Sul, 4 gal) + Phosphorus (10-34-0, 6 gal)**

Conversions: 150 lbs of actual potassium (250 lbs Potash), 300 lbs potassium (500 lbs Potash). 40 lbs of actual nitrogen (13 gal/A UAN 28%), 60 lbs N (20 gal/A UAN 28%), 120 lbs N (40 gal/A UAN 28%), 160 lbs N (53 gal/A UAN 28%).

****6 lf application date:** 6/7

*****Vigor** 0 to 10 ratings, 10 is the best

Comments: This trial compared nitrogen and potassium rates and the impact on yield and sugar when harvested late in the season.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Foliar CHS Plant Health

Yoder, Pigeon - 2023

Trial Quality: Good
Variety: BTS-1183
Planted: May 22nd
Harvested: October 10th
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 in.

Soil Info: Sandy Loam
% OM: 2.4 **pH:** 7.7 **CEC:** 12.9
P: Very High **K:** Very High
Mn: Very High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 15.76 in.
Beets/100 ft: 235

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Applic Method	RWST	Vigor* 0-10 31-Aug	Net $/A	RWSA	T/A	% SUC	% CJP
6	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	281	8.8	$2,271	9437	**33.5**	18.2	97.1
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
	Boron 10% + WC-250	16 fl oz + .25% v/v	8-10 lf	Broadcast							
5	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	279	8.8	$2,271	9436	**33.9**	18.6	95.7
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
	WC-597 + WC-250	16 fl oz + .25% v/v	8-10 lf	Broadcast							
1	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	277	8.8	$2,068	8576	30.9	18.2	96.3
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
3	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	272	8.8	$2,187	9102	**33.5**	18.2	95.6
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
	WC-596 + WC-250	32 fl oz + .25% v/v	8-10 lf	Broadcast							
2	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	268	8.7	$2,162	8989	**33.6**	18.6	93.7
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
	WC-250	.25% v/v	8-10 lf	Broadcast							
4	UAN 28% + 10-34-0 + Thio-Sul	8 gal + 6 gal + 4 gal	At Plant	2X2	267	8.8	$2,341	9732	**36.3**	18.2	94.7
	Azteroid FC 3.3 + Mustang Maxx	6.3 fl oz + 4 fl oz	At Plant	In-Furr							
	WC-772 + WC-250	32 fl oz + .25% v/v	8-10 lf	Broadcast							
Average					274	8.7	$2,217	9212	33.6	18.3	95.5
LSD 5%					N.S.	N.S.	N.S.	N.S.	4.1	N.S.	N.S.
CV%					5.5	1.1	11.6	11.1	8.1	2.3	2.4

***Vigor** 0 to 10 ratings, 10 is the best

Comments: This study was designed to test CHS plant health products for an improvement in sugar and yield.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

CHS Sidedress

Blumfield West, Richville - 2023

Trial Quality: Good
Variety: BTS-197N
Planted: April 27th
Harvested: October 31st
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Sandy Loam
% OM: 1.9 **pH:** 7.3 **CEC:** 15.4
P: Very High **K:** Medium
Mn: High **B:** Medium
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 19.84 in.
Beets/100 ft: 151

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing/ Date	Applic Method	RWST	Vigor* 0-10 21-Aug	Net $/A	RWSA	T/A	% SUC	% PUR	B/100 26-May	B/100 12-May
3	UAN 28%	18 gal	25-Apr	PPI	290	7.1	$3,296	13863	47.7	19.3	95.6	150.3	125.6
	Azteroid 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
	UAN 28% WC 597	17 gal 32 fl oz	6 lf	Streamer									
2	UAN 28%	18 gal	25-Apr	PPI	288	7.0	$3,353	14100	49.0	19.5	94.6	153.9	133.2
	Azteroid 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
	UAN 28% WC 379	17 gal 32 fl oz	6 lf	Streamer									
4	UAN 28%	18 gal	25-Apr	PPI	278	7.3	$3,262	13729	49.4	18.7	95.2	156.0	142.1
	Azteroid 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
	UAN 28% WC 765	17 gal 32 fl oz	6 lf	Streamer									
1	UAN 28%	18 gal	25-Apr	PPI	269	7.4	$3,068	12928	47.9	18.9	93.3	142.7	119.8
	Azteroid 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
	UAN 28%	17 gal	6 lf	Streamer									
Average					281	7.2	$3,245	13655	48.5	19.1	94.7	150.7	130.2
LSD 5%					N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
CV%					7.1	10.5	11.5	10.9	5.0	3.5	2.8	19.6	24.2

***Vigor** 0 to 10 ratings, 10 is the best

Comments: This study was designed to test CHS products applied sidedress with 28% UAN to examine increases in in sugar and yield.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Plant Health Trial

Gruehn - Pigeon, MI - 2023

Trial Quality: Good
Variety: HIL-9865
Planted: May 16th
Harvested: September 28th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.5 **pH:** 7.6 **CEC:** 27.0
P: Very High **K:** Very High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover Mix

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 16.14 in.
Beets/100 ft: 229

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5' band

No.	Treatment	Rate/A	Applic Timing/ Date	Applic Method	RWST	Vigor* 0-10		Net $/A	RWSA	T/A	% SUC	% CJP	Beets/ 100 ft
						31-Aug	24-Jul						8-Jun
8	**Andersons**				229	**9.2**	**9.1**	**$2,273**	**7787**	**34.0**	15.4	**96.0**	216
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz											
	Season Pass	5 gal	At Plant	In-Fur									
	Diamond												
	Biopass	1 pt											
	Korrect Plus	1 gal	5-Jul	Broadcast									
	Korrect Plus	1 gal	28-Aug	Broadcast									
11	**Aqueus**				227	**9.4**	**9.1**	**$2,246**	**7559**	**33.2**	15.4	**95.5**	**227**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Growthful Soil	22 oz											
	Growthful Foliar	12.8 fl oz	10-Aug	Broadcast									
	Growthful Foliar	12.8 fl oz	1-Sep	Broadcast									
3	**Envita**				226	**9.5**	**9.4**	**$2,192**	**7560**	**33.5**	15.4	**95.3**	**220**
	UAN 28%	4 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Envita	3.2 fl oz											
	Envita	3.2 fl oz	6 lf	Broadcast									
10	**Aqueus**				223	9.1	**9.1**	**$2,142**	**7159**	32.0	**15.8**	**93.3**	**231**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Growthful Soil	22 oz											

***Vigor 0 to 10 ratings, 10 is the best**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

No.	Treatment	Rate/A	Applic Timing/ Date	Applic Method	RWST	Vigor* 0-10		Net $/A	RWSA	T/A	% SUC	% CJP	Beets/ 100 ft
						31-Aug	24-Jul						8-Jun
2	**Envita**				220	9.1	**9.0**	**$2,097**	**7302**	**33.4**	**15.9**	**92.4**	**234**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Envita	3.2 fl oz											
	UAN 28%	13.3 gal	6 lf	Broadcast									
	Envita	3.2 fl oz											
4	**Envita**				219	**9.4**	**9.1**	**$2,158**	**7404**	**33.7**	15.5	**93.5**	**235**
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Envita	3.2 fl oz											
	Envita	3.2 fl oz	6 lf	Broadcast									
7	**Andersons**				216	**9.3**	8.6	**$2,082**	**7110**	**32.9**	**16.2**	90.7	**230**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz											
	Season Pass	5 gal	At Plant	In-Fur									
	Diamond												
	Biopass	1 pt											
12	**Aqueus**				215	**9.4**	**9.1**	**$2,179**	**7441**	**34.6**	15.5	**93.0**	**230**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	Growthful Soil	22 oz											
	Growthful Foliar	12.8 fl oz	5-Jul	Broadcast									
	Growthful Foliar	12.8 fl oz	15-Jul	Broadcast									
	Growthful Foliar	12.8 fl oz	1-Aug	Broadcast									
	Growthful Foliar	12.8 fl oz	15-Aug	Broadcast									
	Growthful Foliar	12.8 fl oz	1-Sep	Broadcast									
5	**DPH**				211	**9.3**	**9.0**	**$2,045**	**6940**	**32.9**	15.2	**92.8**	**228**
	UAN 28%	8 gal											
	10-34-0	6 gal	At Plant	2X2									
	Thio-Sul	4 gal											
	Azteroid FC 3.3	6.3 fl oz											
	Mustang Maxx	4 fl oz	At Plant	In-Fur									
	SP-1	3 gal											

***Vigor 0 to 10 ratings, 10 is the best**

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Plant Health Trial

Gruehn - Pigeon, MI - 2023

No.	Treatment	Rate/A	Applic Timing/ Date	Applic Method	RWST	Vigor* 0-10		Net $/A	RWSA	T/A	% SUC	% CJP	Beets/ 100 ft
						31-Aug	24-Jul						8-Jun
9	**Gantac**				208	9.1	**8.8**	**$1,951**	6579	31.6	15.6	91.0	**220**
	UAN 28%	7 gal	At Plant	2X2									
	10-34-0	5 gal											
	Thio-Sul	3 gal											
	Azteroid FC	6.3 fl oz	At Plant	In-Fur									
	Mustang Maxx	4 fl oz											
	Gantac Pro	12 fl oz											
1	UAN 28%	8 gal	At Plant	2X2	206	**9.2**	**9.3**	$1,983	6641	32.2	15.4	91.1	**233**
	10-34-0	6 gal											
	Thio-Sul	4 gal											
	Azteroid FC	6.3 fl oz	At Plant	In-Fur									
	Mustang Maxx	4 fl oz											
6	**DPH**				204	9.0	**9.1**	$1,880	6442	31.5	15.6	90.2	**239**
	UAN 28%	8 gal	At Plant	2X2									
	10-34-0	6 gal											
	Thio-Sul	4 gal											
	Azteroid FC	6.3 fl oz	At Plant	In-Fur									
	Mustang	4 fl oz											
	SP-1	3 gal											
	Companion Max	8 oz											
	Average				217	9.2	9.1	$2,102	7161	33.0	15.6	92.9	229
	LSD 5%				N.S.	0.3	0.7	286.3	923.6	1.9	0.5	4.6	19.2
	CV%				7.9	2.3	5.1	9.5	9.0	4.1	2.4	3.4	5.9

***Vigor 0 to 10 ratings, 10 is the best**

Comments: Study was designed to test products for sugar and yield improvements.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost

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

Plant Health Trial - Sure Crop

Gruehn - Pigeon, MI - 2023

Trial Quality: Good
Variety: HIL-9865
Planted: May 16th
Harvested: September 28th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Loam
% OM: 3.5 **pH:** 7.6 **CEC:** 27.0
P: Very High **K:** Very High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 16.14 in.
Beets/100 ft: 233

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa - Foliar 7" band
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5' band

No.	Treatment	Rate/A	Applic Timing	Applic Method	RWST	Vigor*		Net $/A	RWSA	T/A	% SUC	% CJP	Beets/ 100 ft
						31-Aug	24-Jul						8-Jun
3	UAN 28% 10 - 34 - 0 Thio-Sul Sure Activate Sure Plen-T Sweet Sure Z/Micro	8 gal 6 gal 4 gal 2 qt 1 pt 6 fl oz	At Plant	2X2	222	9.1	9.2	$1,765	7061	31.8	15.7	93.4	228
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
2	UAN 28% 10 - 34 - 0 Thio-Sul	8 gal 6 gal 4 gal	At Plant	2X2	218	9.2	8.8	$1,905	7619	**34.9**	15.3	93.9	229
	Azteroid FC 3.3 Mustang Maxx Sure Crop Pop-Up	6.3 fl oz 4 fl oz 3 gal	At Plant	In-Furr									
1	UAN 28% 10 - 34 - 0 Thio-Sul	8 gal 6 gal 4 gal	At Plant	2X2	206	9.2	9.3	$1,660	6641	32.2	15.4	91.1	233
	Azteroid FC 3.3 Mustang Maxx	6.3 fl oz 4 fl oz	At Plant	In-Furr									
Average					216	9.2	9.1	$1,783	7075	32.7	15.6	92.8	233.0
LSD 5%					N.S.	N.S.	N.S.	N.A	N.S.	2.1	N.S.	N.S.	N.S.
CV%					6.0	3.5	4.3	N.A	9.2	4.2	2.7	2.7	7.8

***Vigor** 0 to 10 ratings, 10 is the best

Comments: This study was designed to test plant health products from Sure Crop for improvements in sugar content and yield.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fertilizer and application cost.

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

Clover vs Radish Trial

Sylvester Farms, Fairgrove - 2023

Trial Quality: Good
Variety: C-G932NT
Planted: April 13th
Harv/Samp: September 28th
Plot Size: 6 reps
Row Spacing: 20 inch
Seeding Rate: 64,000

Soil Type: Loam
Fertilizer: 2x2: 8 gal 28%, 5 gal 10-34-0, 7 gal Thiosul, 1 qt B, 1 qt Mn; PPI: 40 gal 28%
Prev Crop: Wheat - see treatments
Weather: Dry early, Wet late

Rhiz Control: Foliar 4-6 lf (12 oz)
Cerc Control: Low level : 7 applications
Other Pests: Sugarbeet Cyst Nematode

Treatment	Net $/A	Gross $/A	RWSA	RWST	T/A	% Sugar	% CJP	Populations 100 Ft. of 32 Day
Clover	$2,588	$2,613	10453	**276**	37.8	**18.5**	95.3	**189**
Check	$2,559	$2,559	10236	**269**	38.0	**18.1**	95.4	165
Radish	$2,463	$2,551	10205	266	38.3	17.8	95.3	**183**
Average	$2,537	$2,574	10298	271	38.0	18.1	95.3	179
LSD 5%	N.S.	N.S.	N.S.	8.5	N.S.	0.5	N.S.	22.8
CV %	4.5	4.4	4.4	2.5	2.5	2.0	0.2	9.9

Comments: Here in Michigan, a popular crop to have in rotation with sugarbeet is wheat. Often, beets will be planted after wheat that has had some type of cover crop grown after harvest. This trial examined the impact different types of cover crops have on sugarbeet yield. Two of the most common cover crops, red clover and oilseed radish, were compared along with a check which had no cover crop. The clover (50/50 Michigan Mammoth & medium red) was planted into the wheat with a drill in spring of 2022, and the oilseed radish (Defender) was planted with a drill following wheat harvest in the summer of 2022. The check had a herbicide application to control weeds. 2023 was the fourth year this trial was conducted. The results from the first year (2020 beet crop) showed that both cover crops had a positive impact on yield, increasing RWSA, tons per acre, and gross revenue as compared to the check, while in the second year (2021 beet crop), the clover cover treatment had a significantly lower RWSA, RWST, % sugar, and gross revenue as compared to the other two treatments. When expenses were included, there was no significant difference between any of the treatments. For the 2022 beet crop, the radish treatment had significantly higher tons per acre, RWSA, gross revenue, and net revenue than the other two treatments. In the fourth year of trialing (2023 beet crop), % sugar and RWST were significantly higher for the clover and check treatments over the radish treatment. Tonnage trended higher in the radish treatment although not significant. Revenue was not significant between treatments, neither gross or net. Dead beet counts were not taken in 2023, but in the previous three years of testing, the radish treatment had significantly fewer dead beets than the clover treatment. Expenses for each treatment were kept the same year after year, and are as follows: Clover, $25 total per acre, including $20/acre for seed ($2/lb, 10lb/acre) and $5/acre frost seeding with a UTV; Radish, $88.25 total per acre, including $26.25/acre for seed ($1.75/lb, 15lb/acre), $15/acre seeding with grain drill, $15/acre tillage (vertical tillage or high speed disk), and $32/acre nitrogen ($0.36/lb, 75lb/acre, $5/acre application); No Cover Crop Check, $10/acre for herbicide application. To see the results from the first year, go to page 78 of the 2020 REACh Research Results book. To see the results from the second year, go to page 84 of the 2021 REACh Research Results book. For results from 2022, see page 115 of the 2022 REACh Research Results book.

$/A: Gross dollars per acre calculated using $.25 per pound of RWSA; Net includes costs in the comments.

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

N.S. – not significant

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Sugarbeet Yield Response to Intensive Nutrient Management

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See soil.msu.edu for more information

Location: Saginaw Valley Research & Extension Center	**Pre-plant soil:** 7.7 pH, 2.8% OM, 16 CEC, 20 ppm Olsen P, 171 ppm K
Planting Date: 27 April 2023 (Harvest 24 Oct 2023)	**Replications**: 4
Variety and Population: C-G049 (4 in. spacing)	**Tillage:** Conventional, 30-in. row

Table 1. Fertilizer rate, timing, and methods of application.

Treatment Name	Fertilizer	Fertilizer grade	Amount (A^{-1})	Placement	Timing
Standard N (SN)	**Urea ammonium nitrate (UAN)**	**28-0-0**	**13.3 gal**	**2x2**	**Planting**
	UAN	**28-0-0**	**40 gal**	**Side-dress**	**2-4 LF**
SN + in-furrow P	liquid ammonium phosphate	10-34-0	5 gal	In-furrow	Planting
SN + PPI ag. lime	Agricultural lime	32% Ca	2 tons	Broadcast	Pre-planting
SN + SD ATS	UAN	28-0-0	13.3 gal	2x2	Planting
	UAN	28-0-0	37.5 gal	Side-dress	2-4 LF
	ATS	12-0-0-26S	5.6 gal	Side-dress	2-4 LF
SN + Foliar B	Sodium borate	16.5% B	0.5 lb	Foliar	Weekly in July
SN + Band K_2O	K_2O Liquid	0-0-28	30.8 gal	Band	Early July
SN + Late N	UAN	28-0-0	26.7 gal	Side-dress	2-4 LF
	UAN	28-0-0	13.3 gal	Side-dress	2WASD
Intensive (all treatments)	Agricultural lime	32% Ca	2 tons	Broadcast	Pre-planting
	UAN	28-0-0	13.3 gal	2x2	Planting
	liquid ammonium phosphate	10-34-0	5 gal	In-furrow	Planting
	UAN	28-0-0	24.2 gal	Side-dress	2-4 LF
	ATS	12-0-0-26S	5.6 gal	Side-dress	2-4 LF
	UAN	28-0-0	13.3 gal	Side-dress	2WASD
	Sodium pentaborate	14% B	0.5 lb	Foliar	Weekly in July
	K_2O Liquid	0-0-28	30.8 gal	Band	Early July
Nontreated check	No fertilizer added		NA	NA	NA

Summary: As spring weather variability and unpredictability of disease occurrence continue to increase along with better recognition of soil spatial differences, growers are increasingly looking for more intensive nutrient management strategies. While individual added fertilizers associated with sugar beet yield gaps were previously explored, their combined influence with Michigan standard N management (160 lbs. N A^{-1}) to improve root yield and recoverable sugar within an intensive management perspective has not yet been investigated. The objective of this study was to investigate the root yield and recoverable sugar response of sugar beet to different fertilization practices reflecting a stepwise increase in management intensity using as baseline standard N treatment (160 lbs. N A^{-1}). Treatments were arranged in a randomized complete block design with four replications. Treatments represented stepwise increases in management intensity from 1) a baseline of 160 lbs N $acre^{-1}$ (Standard N, SN), 2) SN + in-furrow P, 3) SN + PPI Lime, 4) SN + SD ATS, 5) SN + Foliar B, 6) SN + Liquid K_2O, 7) SN + late-applied N, 8) All treatment combinations SN + in-furrow P + PPI Lime + SD ATS + Foliar B + Liquid K_2O + Late N, and 9) nontreated check (Table 1).

Trial quality was good. Growing season precipitation differed by -19% for 2023 (April – October) from the 30-year mean. June 2023 rainfall was reduced by -55%. July and August precipitation increased by +96% and +55%. The warmer soil temperatures during establishment improved emergence.

Root Yield and Recoverable Sugar

The mean root yield of standard N treatment (SN) was 34.8 tons A^{-1} and significantly increased by pre-plant broadcast lime (SN + PPI ag. lime, +5.3 tons A^{-1}) and in-furrow P (SN + in-furrow P, +6.1 tons A^{-1}) (Table 2). Intensive management also increased root yield by +5.9 tons A^{-1}. All fertilizer treatments except non-treated check surpassed Michigan's root yield average (> 28.8 tons A^{-1}).

The average recoverable sugar of SN was 260.2 lbs. RWST and 9,064.9 lbs. RWSA (Table 2). The intensive management increased recoverable sugar by +14.2 lbs. RWST and +2,078.6 lbs. RWSA. Regarding added individual treatments, SN + PPI ag. lime increased recoverable sugar by +16.8 lbs. RWST and +2,032.4 lbs. RWSA. Also, SN + in-furrow P added +1,950.6 lbs. RWSA.

Another important aspect of recoverable sugar is sugar percentage and purity extraction. All treatments other than banded liquid K_2O increased the % sugar (Table 3). Purity extraction remained comparable across fertilizer treatments (Table 3, $p = 0.8634$).

Using orthogonal contrasts, a group comparison of fertilizer treatments was performed (Table 4). Implementing intensive management increased root yield ($p = 0.0242$) and recoverable sugar ($p = 0.0067$, 0.0067) as compared with standard N treatment.

Expected Economic Profit

The mean treatment costs and potential economic profitability (PEP) of SN were USD 111.2 A^{-1} and USD 2,016.0 A^{-1}, respectively (Table 5). All fertilizer treatments significantly increased the treatment costs (USD 26.9 – 676.6 A^{-1}, $p < 0.0001$) with intensive management having the highest additional cost, followed by SN + Band K (USD 524.1 A^{-1}). Consequently, SN + Band K significantly reduced the PEP by USD -629.16 A^{-1} ($p = 0.002$). Application of pre-plant agricultural lime and in-furrow P increased PEP by USD +448.8 A^{-1} ($p = 0.0194$) and USD +436.4 A^{-1} ($p = 0.0226$), accordingly.

Preliminary Conclusions

Intensive management increased both root yield and recoverable sugar. However, due to the high treatment cost, it did not significantly increase potential profit. The early-season added fertilizers (in-furrow P or pre-plant agricultural lime) increased root yield and recoverable sugar thereby improving potential profit. The presence of precipitation (0.6 inches) and critical soil test P concentrations in the responsive range supported successful in-furrow P fertilization. The limited influence of pre-plant broadcast agricultural lime on root yield and recoverable sugar (2022, no impact; 2023, positive) and early-season Mn deficiency at 6-8 leaf stage demonstrate the variable impacts of liming alkaline soils especially during dry soil conditions. Further investigation might be necessary to determine how long it takes for liming materials to start changing soil properties that may negatively affect sugar beet production.

Table 2. Sugarbeet yield and recoverable sugar (RWST and RWSA) at Richville, MI, 2023. Mean sugarbeet yield and recoverable sucrose of standard nitrogen treatment (SN) displayed. All other treatments display change in sugarbeet yield or recoverable sugar using a single degree of freedom contrasts†.

	Root Yield ‡	**Recoverable Sugar**	
Treatment	**——T A^{-1}——**	**——RWST——**	**——RWSA——**
Standard N (SN)	34.8	260.2	9,064.9
SN + in-furrow P	+6.1**	+9.4	+1,950.6**
SN + PPI Lime	+5.3**	+16.8**	+2,032.4**
SN + SD ATS	+1.9	+7.7	+757.5
SN + Foliar B	-1.7	+10.5	-121.4
SN + Liquid K_2O	-2.3	+4.1	-456.5
SN + Late N	-1.1	+8.2	-31.4
Intensive (all treatments)	+5.9**	+14.2*	+2,078.6**
Nontreated check	**22.1**	**263.3**	**5,874.7**

† Asterisks indicate thresholds of significance (*, P < 0.10; **, P < 0.05; ***, P < 0.001). Nontreated check is not included in the analysis.
‡ Michigan 2022 average sugar beet yield = 28.8 tons A^{-1} Field Crops.pdf (usda.gov)

Table 3. Sugarbeet sucrose percentage and purity extraction as influenced by the multiple fertilizer treatments applied in early and mid-season growth stages at Richville, MI., 2022-2023.§

	Sugar	Purity
Treatment	——%——	
Standard N (SN)	17.5 d	96.1
SN + In-furrow P	18.0 abc	95.9
SN + PPI Ag. lime	18.5 a	95.9
SN + SD ATS	17.9 bc	96.0
SN + Foliar B	18.1 abc	95.9
SN + Band K	17.8 cd	96.0
SN + Late N	18.0 bc	95.9
Intensive	18.3 ab	95.9
P > F	**	NS
Non-treated Check	**17.6**	**95.9**

§ Asterisks indicate thresholds of significance (NS, P> 0.10, *, P < 0.10; **, P < 0.05; ***, P < 0.001). Nontreated check is not included in the analysis.

Table 4. Sugarbeet yield and recoverable sugar using single degree of freedom contrasts at Richville, MI, 2023. §

	Root Yield	Recoverable Sugar	
Treatment	——T A^{-1}——	——RWST——	——RWSA——
SN vs. Intensive	0.0242	0.0067	0.0067

§ Non-treated checks are not included in the analysis.

Table 5. Treatment costs (fertilizer and application) and potential economic profitability at Richville, MI, 2023. Mean treatment costs and potential economic profitability of standard nitrogen treatment (SN) are displayed. All other treatments display change using a single degree of freedom contrasts §.

	Treatment Cost	Potential Profitability
Treatment †	——USD A^{-1}——	
Standard N (SN)	111.2	2,016.0
SN + In-furrow P	+26.9***	+436.4**
SN + PPI Ag. lime	+38.0***	+448.8**
SN + SD ATS	+17.5***	+164.2
SN + Foliar B	+30.1***	-53.6
SN + Band K	+524.1***	-629.2**
SN + Late N	+11.3***	-14.7
Intensive	+676.6***	-180.4
Non-treated Check	**0.00**	**1,380.3**

§ Asterisks indicate thresholds of significance (*, P < 0.10; **, P < 0.05; ***, P < 0.001). Nontreated check is not included in the analysis.

Adjusting Nitrogen Management for Early and Conventional Sugarbeet Harvest

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See soil.msu.edu for more information

Location: Saginaw Valley Research & Extension Center	**Variety:** C-G049
Population: 52,000 (4-in. spacing)	**Tillage:** Conventional, 30-inch rows
Soil Type: Tappan-Londo-Loam	**Replications:** 4
Planting date: 27 April 2023 (Harvest 21 Aug 2023 - Early, 24 Oct 2023- Regular)	**Pre-plant soil**: 7.7 pH, 2.5% OM, 14 CEC, 14 ppm Olsen P, 141 ppm K

Summary: There are very few data indicating how early or how late N can be applied to sugarbeet and the resultant effects on sugar quality. Although the early harvest campaign is critical to ensure beet processing is complete by the end of March, early sugarbeet harvests compound the N application issue as a significant percentage of greater N rates are utilized by the plant later in the season. Weather variability continues to impact Michigan sugarbeet acres resulting in extremely dry or moderately wet time periods that not only affect N response but may also push early harvest beet acres to later harvest or regular harvest beet acres may get moved earlier based upon state yield and sugar estimates. When these changes occur, producers have little data available to help determine how much N or how early or late N can be applied and what impacts these changes have on sugar quality. Additional data on nutrient management adjustments in-season are critical to help producers adjust to uncertain weather and harvest logistics.

Treatments were arranged as a randomized complete block split-plot design with four replications. The whole plot factor consisted of harvest timing (early vs. conventional). Fertilizer strategy was the subplot factor and split into two rates of starter fertilizer (starter vs no starter at 60 lb. N/A applied 2x2) and two sidedress N rates of low (60 lb N/A) vs high (100 lb. N/A) applied in either early June, July, or August.

Preliminary Results

Early 2023 growing season (April-June) precipitation was down -48% from the 30-year average with April cumulative precipitation down 15% below average. Row fill (%) was slowed in treatments receiving starter fertilizer due to some saltation during extremely dry soil conditions. May and June rainfall remained -72% and -56% below the 30-year average resulting in slower row closure with starter fertilizer treatments. Once precipitation resumed mid-season (July-

August), row closure recovered with few differences between the starter/no starter application. Overall growing season precipitation (April-October) was below the 30-year average by -13%.

Harvest Timing: Regarding harvest date, conventional harvest timing obtained significant increases of +17.9 T/A, +81.4 RWST, and +4.3% sucrose as compared to early harvest timing (Table 3). In this current study year, the conventional harvest timing had an additional 64 days of growing season. Profitability was also significantly affected with mean profit from early harvest at $981/A as compared to $1999/A conventional harvest (Table 6). Treatment costs and individual treatment profitability can be found in tables 4 and 5.

Early Harvest: No significant differences occurred from starter fertilizer or sidedress application timing or rate on root yield, purity, or RWSA (Table 2). Compared to a zero N plot, 60 lb N/A as starter without any sidedress N treatment reduced sugar % by 0.6%, increased tonnage 0.6 T/A, and reduced RWST by 11 lbs. Among early harvest treatments not receiving starter fertilizer, no % sugar or RWST differences occurred between June or July sidedress timings but the August sidedress timing, as expected, did begin to reduce both % sugar and RWST as the August sidedress application timing was only ~3 weeks prior to the early harvest Among early harvest treatments receiving starter fertilizer, few % sugar or RWST differences occurred between the June, July, or August sidedress timings or rates with the exception for starter plus low rate of July sidedress significantly improved both % sugar and RWST. Despite potential profitability ranging between $835/A to $1103/A, no statistical differences due to starter application, sidedress timing, or sidedress rate were observed (Table 5).

Conventional Harvest: No significant differences occurred from starter fertilizer or sidedress application timing or rate on root yield, % sugar, purity, RWSA, or RWST (Table 2). Tonnage for this harvest timing ranged from 22.9 to 37.0 T/A. Starter fertilizer applied as 60 lb N/A 2x2 at-planting did result in about a 4 T/A difference as compared to no starter application. Despite potential profitability ranging between $1430/A to $2296/A, no statistical differences due to starter application, sidedress timing, or sidedress rate were observed (Table 5).

Preliminary Conclusions

Projects such as this are not intended to highlight the pitfalls or benefits from any single nutrient management practice within an individual growing season but rather to gather more data that will allow the grower to remain fluid with their N management practices. Scenarios will arise (e.g., extreme weather conditions) where growers may have to pivot from early to conventional harvest or vice versa. The extremely dry start to the 2023 growing season undoubtedly influenced both sugarbeet growth and development and N movement and availability within the rootzone. Field studies will continue in 2024 to gain additional information on how early or how late N applications can be made and the corresponding changes in sugar quality.

Table 1. Sugar beet treatment design and application timing, Richville, MI, 2023.

Treatment Name	Fertilizer applied	Fertilizer grade	Rate (N A^{-1})	Amount (A^{-1})	Placement	Timing†
No Starter + June SD (low)	Urea ammonium nitrate (UAN)	~	~	~	~	~
	UAN	28-0-0	60 lb.	20.2 gal	Side-dress	6-8 LF
No Starter + June SD (high)	UAN	~	~	~	~	~
		28-0-0	100 lb.	33.6 gal	Side-dress	6-8 LF
No Starter + July SD (low)	UAN	~	~	~	~	~
		28-0-0	60 lb.	20.2 gal	Side-dress	14-16 LF
No Starter + July SD (high)	UAN	~	~	~	~	~
		28-0-0	100 lb.	33.6 gal	Side-dress	14-16 LF
No Starter + August SD (low)	UAN	~	~	~	~	~
		28-0-0	60 lb.	20.2 gal	Side-dress	16-18 LF
No Starter + August SD (high)	UAN	~	~	~	~	~
		28-0-0	100 lb.	33.6 gal	Side-dress	16-18 LF
No Starter + No SD	~	~	~	~	~	~
Starter + June SD (low)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	60 lb.	20.2 gal	Side-dress	6-8 LF
Starter + June SD (high)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	100 lb.	33.6 gal	Side-dress	6-8 LF
Starter + July SD (low)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	60 lb.	20.2 gal	Side-dress	14-16 LF
Starter + July SD (high)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	100 lb.	33.6 gal	Side-dress	14-16 LF
Starter + August SD (low)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	60 lb.	20.2 gal	Side-dress	16-18 LF
Starter + August SD (high)	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		28-0-0	100 lb.	33.6 gal	Side-dress	16-18 LF
Starter + No SD	UAN	28-0-0	60 lb.	20.2 gal	2x2	Planting
		~	~	~	~	~

† **Application Dates**: Planting (Starter 2x2) – 27 April 2023; 6-8 leaf stage (side dress)– 01 June 2023; 14-16 leaf stage (side dress) – 01 July 2023; 16-18 leaf stage (side dress) – 01 August 2023

Table 2. Fertilizer effects on sugar beet root yield, recoverable sugar (RWST and RWSA), sucrose concentration, and purity, Richville, MI, 2023. †

Treatment	Root Yield	Sucrose	Purity	Recoverable Sugar	
Early Harvest	**-T A^{-1}-**	**————%————**		**-RWSA (lbs.)-**	**—RWST (lbs.)—**
NS* + June SD** (low)	13.9	14.0 bc	94.24	2767	199 bc
NS + June SD (high)	14.3	13.7 cde	93.53	2750	193 cdef
NS + July SD (low)	15.7	14.0 bcd	94.56	3049	197 bcd
NS + July SD (high)	15.3	13.7 cde	94.42	2959	193 cdef
NS + August (low)	12.8	13.3 f	93.4	2375	186 f
NS + August (high)	15.2	13.5 ef	94.19	2887	189 ef
NS + No SD	12.2	14.8 a	93.78	2636	214 a
S*** + June SD (low)	15.4	13.5 ef	93.68	2685	190 def
S + June SD (high)	16.4	13.7 cdef	93.81	3201	194 cde
S + July SD (low)	15.7	14.2 b	93.74	3179	203 b
S + July SD (high)	14.7	13.5 ef	93.64	2818	192 cdef
S + August SD (low)	12.4	13.6 def	93.31	2383	193 cdef
S + August SD (high)	15.3	13.7 cdef	93.64	2969	194 cde
S + No SD	12.8	14.2 b	94.13	2602	203 b
p-value	**NS**	**0.0593**	**NS**	**NS**	**0.0403**
Conventional Harvest	**-T A^{-1}-**	**————%————**		**-RWSA (lbs.)-**	**-RWST (lbs.)-**
NS + June SD (low)	33.1	18.3	95.86	9085	275
NS + June SD (high)	37.0	18.2	95.94	10062	272
NS + July SD (low)	29.9	18.3	96.07	8179	273
NS + July SD (high)	34.1	18.3	96.17	9340	273
NS + August (low)	28.7	18.3	95.71	7841	274
NS + August (high)	27.6	17.6	96.05	7457	269
NS + No SD	22.9	17.8	95.96	6088	264
S + June SD (low)	35.8	18.8	96.06	10075	282
S + June SD (high)	36.4	18.1	95.85	10125	273
S + July SD (low)	35.5	18.4	95.93	9783	276
S + July SD (high)	34.0	18.2	95.86	9317	273
S + August SD (low)	33.9	17.8	95.95	8998	266
S + August SD (high)	33.9	18.0	95.78	8873	262
S + No SD	29.8	18.1	96.05	8108	272
p-value	**NS**	**NS**	**NS**	**NS**	**NS**

*No Starter, **Side-dress, ***Starter

† Treatments were compared at 0.10 probability level, LSD. Values followed by the same lowercase letter are not significantly different.

Table 3. Harvest date effects on sugar beet root yield, recoverable sugar (RWST), and sucrose concentration, Richville, MI, 2023. †

Treatment	Root Yield	Recoverable Sugar	Sucrose
	T A^{-1}	RWST	%
Early Harvest	14.42 b	193.98 b	13.83 b
Conventional Harvest	32.32 a	275.41 a	18.14 a
p-value	**<0.0001**	**0.0002**	**0.0002**

† Treatments were compared at 0.10 probability level, LSD. Values followed by the same lowercase letter are not significantly different.

Table 4. Sugar beet fertilizer and application costs, Richville, MI, 2023. †

Treatment	Fertilizer Cost ††	Application Cost‡	Total Treatment Cost
		US$ A^{-1}	
NS + June SD (low)	36.36 d	11.3 b	47.66 d
NS + June SD (high)	60.54 c	11.3 b	71.84 c
NS + July SD (low)	36.26 d	11.3 b	47.66 d
NS + July SD (high)	60.54 c	11.3 b	71.84 c
NS + August (low)	36.36 d	11.3 b	47.66 d
NS + August (high)	60.54 c	11.3 b	71.84 c
NS + No SD	0 e	0 e	0 f
S + June SD (low)	72.73 b	14.28 a	87.01 b
S + June SD (high)	96.90 a	14.28 a	111.18 a
S + July SD (low)	72.73 b	14.28 a	87.01 b
S + July SD (high)	96.90 a	14.28 a	111.18 a
S + August SD (low)	72.73 b	14.28 a	87.01 b
S + August SD (high)	96.90 a	14.28 a	111.18 a
S + No SD	36.36 d	2.98 d	39.34 e
p-value	**<0.0001**	**<0.0001**	**<0.0001**

†† UAN \$340 T^{-1}

‡ 2023 Custom Machine and Work Rate Estimates.
https://www.canr.msu.edu/farm_management/uploads/files/2023%20MSU%20Custom%20Work%20Rates.pdf

Table 5. Sugar beet economic profitability, Richville, MI, 2023. †

Treatment	Gross Income¶*	Treatment Cost	Trucking Cost‡	Potential Profitability§
Early Harvest		**US$ A^{-1}**		
NS + June SD (low)	1101.73	47.66 d	69.51	984.54
NS + June SD (high)	1095.25	71.84 c	71.14	952.26
NS + July SD (low)	1228.45	47.66 d	78.13	1102.66
NS + July SD (high)	1178.22	71.84 c	76.38	1029.99
NS + August (low)	945.91	47.66 d	63.65	834.60
NS + August (high)	1149.56	71.84 c	76.00	1001.70
NS + No SD	1049.76	0 f	61.03	988.73
S + June SD (low)	1160.18	87.01 b	76.63	996.54
S + June SD (high)	1274.47	111.18 a	82.00	1081.28
S + July SD (low)	1266.03	87.01 b	78.25	1100.77
S + July SD (high)	1122.02	111.18 a	73.26	937.57
S + August SD (low)	949.17	87.01 b	61.65	800.51
S + August SD (high)	1182.19	111.18 a	76.50	994.50
S + No SD	1036.21	39.34 e	63.90	932.96
p-value	**NS**	**<0.0001**	**NS**	**NS**
Conv. Harvest		**US$ A^{-1}**		
NS + June SD (low)	2271.23	47.66 d	132.30	2091.27
NS + June SD (high)	2515.59	71.84 c	147.86	2295.88
NS + July SD (low)	2044.73	47.66 d	119.48	1877.59
NS + July SD (high)	2334.97	71.84 c	136.41	2126.72
NS + August (low)	1960.27	47.66 d	114.63	1797.97
NS + August (high)	1864.26	71.84 c	110.40	1682.01
NS + No SD	1522.1	0 f	91.73	1430.37
S + June SD (low)	2518.72	87.01 b	143.12	2288.59
S + June SD (high)	2488.24	111.18 a	145.62	2231.43
S + July SD (low)	2445.68	87.01 b	142.13	2216.54
S + July SD (high)	2329.21	111.18 a	136.15	2081.87
S + August SD (low)	2249.57	87.01 b	135.78	2026.78
S + August SD (high)	2218.17	111.18 a	135.65	1971.33
S + No SD	2026.95	39.34 e	119.10	1868.51
p-value	**NS**	**<0.0001**	**NS**	**NS**

† Treatments were compared at 0.10 probability level, LSD. Values followed by the same lowercase letter are not significantly different.
¶ Gross Income = root yield (ton A^{-1}) × RSWA × US$ 0.25 lb^{-1}
‡ Trucking cost = US$4 ton^{-1}
§ Potential Profitability = Gross Income – (Treatment Cost + Trucking Cost)
*Early Harvest Yield and RWST converted through 2023 Michigan Sugar Early Delivery Premiums (9/5/2023), yield factor = early harvest root yield x 1.2481, RWST factor = early harvest RWST x 1.2762

Table 6. Harvest date effects on sugar beet profitability, Richville, MI, 2023. †

Treatment	Potential Profitability
	US$ A^{-1}
Early Harvest	981.3 b
Conventional Harvest	1999.06 a
p-value	**0.0002**

† Treatments were compared at 0.10 probability level, LSD. Values followed by the same lowercase letter are not significantly different.

Herbicide Trial

Sylvester - Akron, MI - 2023

Trial Quality: Good
Variety: C-G932NT
Planted: April 24th
Harvested: September 25th
Plots: 6 rows X 38 ft, 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 3.1 **pH:** 7.6 **CEC:** 18.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2x2, 120 lbs. sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 18.35 in.
Beets/100 ft: 128

Application: JD 3520 tractor mounted plot sprayer, compressed air, 30 psi, 15.3 gpa
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	Spray Damage * 0-10	Weed Damage ** 0-10	Vigor***	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
				9-Jun	21-Jun	21-Aug						
38	Azterknot + Roundup Powermax + Ammonium Sulfate	24.3 fl oz + 24 fl oz + 17 lbs.	2 lf	**0.0**	1.8	7.8	**$3,301**	**10487**	**266**	**39.5**	**18.1**	94.8
39	Azterknot + Roundup Powemax + Ammonium Sulfate + Warrant	24.3 fl oz + 24 fl oz + 17 lbs. + 3 pt	2 lf	**0.0**	2.1	7.8	**$3,163**	**10104**	258	**39.2**	17.6	94.6
40	Azterknot + Roundup Powermax + Ammonium Sulfate + Warrant + Stinger + Mustang Maxx	24.3 fl oz + 24 fl oz + 17 lbs. + 3 pt + 2 fl oz + 2 fl oz	2 lf	**0.0**	2.3	**8.2**	$3,059	9802	**270**	36.2	**18.3**	95.0
37	Azterknot	24.3 fl oz	2 lf	**0.0**	6.1	7.8	**$3,260**	**10347**	**273**	**37.9**	**18.5**	94.9
25	Dual Magnum	8 fl oz	Pre	**0.1**	**0.3**	**8.3**	**$3,236**	**10278**	**265**	**38.8**	17.9	94.9
	Warrant + Roundup PowerMax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
27	Dual Magnum	8 fl oz	Pre	**0.1**	**0.3**	**8.0**	**$3,317**	**10588**	**272**	**39.0**	**18.2**	95.4
	Warrant + Roundup PowerMax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
3	Dual Magnum	8 fl oz	Pre	**0.1**	**0.3**	7.8	**$3,214**	**10219**	**272**	**37.6**	**18.3**	95.2
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	24 fl oz + 17 lbs. +2 fl oz + 4 fl oz + 2 fl oz	2 lf									
7	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.1**	**0.3**	7.7	**$3,197**	**10190**	**272**	**37.5**	**18.2**	95.5
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
19	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.1**	**0.4**	7.8	**$3,242**	**10373**	**268**	**38.7**	**18.3**	94.5
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
15	Dual Magnum	8 fl oz	Pre	**0.1**	**0.4**	**8.3**	**$3,134**	**10002**	**272**	36.8	**18.2**	95.4
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
23	Ethotron	3 pt	Pre	**0.1**	**0.3**	**8.1**	**$3,270**	**10507**	**268**	**39.3**	**18.4**	94.3
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 fl oz + 17 lbs + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									

Spray Damage* Ratings are on a scale of 0-10, 0 = no spray damage and 10 = total spray damage

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

Vigor*** 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment	Rate/A	Applic Timing	Spray Damage * 0-10	Weed Damage ** 0-10	Vigor***	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
				9-Jun	21-Jun	21-Aug						
31	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.1**	**0.7**	**8.8**	**$3,218**	**10309**	**276**	**37.3**	**18.6**	**95.2**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
35	Ethotron	3 pt	Pre	**0.2**	**0.3**	**8.8**	**$3,244**	**10437**	**270**	**38.6**	**18.3**	**95.0**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
5	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.2**	**0.4**	7.8	$2,993	9497	**266**	35.7	**18.1**	94.7
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
11	Ethotron	3 pt	Pre	**0.2**	**0.5**	**8.3**	**$3,226**	**10327**	**269**	**38.4**	**18.3**	94.6
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
21	Ethotron	3 pt	Pre	**0.3**	**0.4**	7.8	**$3,102**	9927	**270**	36.8	**18.3**	94.8
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang	1 pt + 24 fl oz + 17 lbs + 2 fl oz + 4 fl oz	2 lf									
33	Ethotron	3 pt	Pre	**0.4**	**0.4**	**8.3**	**$3,330**	**10652**	**263**	**40.4**	17.9	94.8
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
29	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.5**	**0.5**	**8.7**	**$3,209**	**10227**	**269**	**38.0**	**18.3**	94.8
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
1	Dual Magnum	8 fl oz	Pre	**0.5**	**0.9**	**8.0**	$2,952	9338	**269**	34.7	**18.2**	94.8
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	24 fl oz + 17 lbs + 2 fl oz + 4 fl oz	2 lf									
17	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	**0.6**	**0.4**	7.8	**$3,148**	**10025**	**265**	**37.8**	**18.0**	94.8
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
9	Ethotron	3 p t	Pre	**0.8**	**0.7**	**8.1**	**$3,422**	**10889**	**273**	**39.9**	**18.5**	**94.9**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
13	Dual Magnum	8 fl oz	Pre	**0.9**	**0.6**	7.8	**$3,236**	**10270**	**266**	**38.6**	**18.0**	**94.9**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
2	Dual Magnum	8 fl oz	Pre	4.4	**0.8**	7.5	**$3,164**	**10058**	**272**	36.9	**18.3**	**95.3**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									

Spray Damage* Ratings are on a scale of 0-10, 0 = no spray damage and 10 = total spray damage

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

Vigor* 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment	Rate/A	Applic Timing	Spray Damage * 0-10	Weed Damage ** 0-10	Vigor***	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
				9-Jun	21-Jun	21-Aug						
26	Dual Magnum	8 fl oz	Pre	4.7	**0.4**	7.8	$2,794	8950	262	34.2	17.7	**95.1**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
6	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	4.9	**0.3**	**8.3**	**$3,125**	**9968**	**273**	36.5	**18.4**	**95.2**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mutang Maxx	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
14	Dual Magnum	8 fl oz	Pre	5.3	**0.3**	7.6	**$3,307**	**10549**	**264**	**39.9**	17.9	**94.9**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
36	Ethotron	3 pt	Pre	5.3	**0.5**	**8.6**	**$3,191**	**10316**	**274**	**37.6**	**18.5**	**95.1**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
8	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	5.6	**0.3**	7.7	**$3,357**	**10751**	**265**	**40.7**	**18.1**	94.4
	Roundup Powermax + Ammonium Sulfate + Stinger + Mutang Maxx + Excalia	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
10	Ethotron	3 pt	Pre	5.6	**0.5**	**8.3**	**$3,191**	**10222**	**268**	**38.2**	**18.1**	**95.0**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
16	Dual Magnum	8 fl oz	Pre	5.6	**0.8**	7.6	$3,074	9872	**270**	36.5	**18.1**	**95.5**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									

Spray Damage* Ratings are on a scale of 0-10, 0 = no spray damage and 10 = total spray damage

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

Vigor*** 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment	Rate/A	Applic Timing	Spray Damage * 0-10	Weed Damage ** 0-10	Vigor***	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
				9-Jun	21-Jun	21-Aug						
4	Dual Magnum	8 fl oz	Pre	5.8	**1.2**	7.7	**$3,256**	**10403**	**268**	**38.9**	**18.1**	**95.2**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
28	Dual Magnum	8 fl oz	Pre	5.9	**0.6**	7.6	$2,947	9484	**267**	35.5	**18.0**	**95.2**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
18	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	5.9	**0.8**	7.9	$2,547	8198	**263**	31.2	**18.0**	94.5
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
20	Dual Magnum + Ethotron	8 fl oz + 16 fl oz		5.9	**0.3**	**8.3**	$2,984	9622	**268**	36.0	**18.2**	94.6
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 floz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
12	Ethotron	3 pt	Pre	6.1	**0.6**	**8.1**	**$3,422**	**11001**	**275**	**40.0**	**18.2**	**96.0**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
22	Ethotron	3 pt	Pre	6.2	**0.8**	7.9	**$3,256**	**10467**	**269**	**38.9**	**18.2**	**94.9**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
24	Ethotron	3 pt	Pre	6.5	**0.7**	7.9	**$3,109**	**10061**	**267**	**37.7**	**18.3**	94.5
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	1 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									

Spray Damage* Ratings are on a scale of 0-10, 0 = no spray damage and 10 = total spray damage

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

Vigor*** 0 to 10 ratings, 10 is the best

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment	Rate/A	Applic Timing	Spray Damage * 0-10	Weed Damage ** 0-10	Vigor***	Net $/A	RWSA	RWST	T/A	% SUC	% CJP
				9-Jun	21-Jun	21-Aug						
32	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	6.5	**0.8**	**8.9**	**$3,186**	**10265**	**274**	**37.5**	**18.4**	**95.1**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz + 2 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
34	Ethotron	3 pt	Pre	6.6	**0.2**	7.9	**$3,183**	**10249**	**274**	**37.4**	**18.4**	**95.3**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
30	Dual Magnum + Ethotron	8 fl oz + 16 fl oz	Pre	6.9	**0.4**	**8.4**	$2,907	9336	**267**	35.0	**18.0**	**95.1**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	3 pt + 24 fl oz + 17 lbs. + 2 fl oz + 4 fl oz	2 lf									
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	16 fl oz + 24 fl oz + 17 lbs.	6 lf									
Average				2.7	0.8	8.0	$3,162	10114	269	37.6	18.2	95.0
LSD 5%				0.9	1.1	0.9	337.1	1057.9	12.9	3.7	0.6	1.1
CV%				23.6	102.5	7.9	7.6	7.5	3.4	7.1	2.5	0.8

Spray Damage* Ratings are on a scale of 0-10, 0 = no spray damage and 10 = total spray damage

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

Vigor*** 0 to 10 ratings, 10 is the best

Comments: This study was designed to examine stand loss and injury potential from herbicides. Emergence was variable in the study. Neither Dual Maginum, Ethotron or the combination of both reduced stand. Treatments with Ultra Blazer resulted in significant crop injury.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

No.	Treatment	Applic Timing	Applic Date	Stand B/100 ft	Stand B/100 ft
				26-May	11-May
31	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**202**	**172**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
29	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**200**	**163**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
36	Ethotron	Pre-Emerge	27-Apr	**189**	**153**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
32	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**185**	**141**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
19	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**180**	**150**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
35	Ethotron	Pre-Emerge	27-Apr	**178**	**147**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
34	Ethotron	Pre-Emerge	27-Apr	**175**	**142**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
30	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**172**	**122**
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
17	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**171**	**143**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
7	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**167**	**134**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
20	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**167**	**143**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
6	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**164**	128
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
8	Dual Magnum + Ethotron	Pre-Emerge	27-Apr	**164**	122
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		

No.	Treatment	Applic Timing	Applic Date	Stand B/100 ft	Stand B/100 ft
				26-May	11-May
24	Ethotron	Pre- Emerge	27-Apr	**164**	**138**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
26	Dual Magnum	Pre- Emerge	27-Apr	**160**	120
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
10	Ethotron	Pre- Emerge	27-Apr	**160**	**131**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx +	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
33	Ethotron	Pre- Emerge	27-Apr	157	122
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
9	Ethotron	Pre- Emerge	27-Apr	156	127
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx +	2 lf	26-May		
5	Dual + Ethotron	Pre- Emerge	27-Apr	156	**131**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx +	2 lf	26-May		
25	Dual Magnum	Pre- Emerge	27-Apr	155	121
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
23	Ethotron	Pre- Emerge	27-Apr	155	**136**
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
1	Dual Magnum	Pre- Emerge	27-Apr	152	118
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
37	Azterknot	2 lf	26-May	152	**137**
18	Dual Magnum + Ethotron	Pre- Emerge	27-Apr	152	123
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
40	Azterknot + Roundup Powermax + Ammonium Sulfate + Warrant + Stinger + Mustang Maxx	2 lf	26-May	152	120
38	Azterknot + Roundup Powermax + Ammonium Sulfate	2 lf	26-May	151	125
15	Dual Magnum	Pre- Emerge	27-Apr	150	125
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
12	Ethotron	Pre- Emerge	27-Apr	150	122
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		

No.	Treatment	Applic Timing	Applic Date	Stand B/100 ft	Stand B/100 ft
				26-May	11-May
3	Dual Magnum	Pre-Emerge	27-Apr	150	113
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
27	Dual Magnum	Pre-Emerge	27-Apr	150	115
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
28	Dual Magnum	Pre-Emerge	27-Apr	149	114
	Warrant + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
11	Ethotron	Pre-Emerge	27-Apr	148	**132**
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
16	Dual Magnum	Pre-Emerge	27-Apr	144	115
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
2	Dual Magnum	Pre-Emerge	27-Apr	144	115
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
4	Dual Magnum	Pre-Emerge	27-Apr	144	127
	Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx + Excalia	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
22	Ethotron	Pre-Emerge	27-Apr	141	119
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
39	Azterknot + Roundup Powermax + Ammonium Sulfate + Warrant	B		139	115
14	Dual Magnum	Pre-Emerge	27-Apr	133	100
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
	Ultra Blazer + Roundup Powermax + Ammonium Sulfate	6 lf	5-Jun		
21	Ethotron	Pre-Emerge	27-Apr	133	111
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		
13	Dual Magnum	Pre-Emerge	27-Apr	130	97
	Outlook + Roundup Powermax + Ammonium Sulfate + Stinger + Mustang Maxx	2 lf	26-May		

Average	159	128
LSD	38.8	40.8
CV 5%	17.5	22.7

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

Pre-Emerge Trial

Sylvester Nematode - Akron, MI - 2023

Trial Quality: Good
Variety: C-G932NT
Planted: April 24th
Harvested: September 25th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 3.1 **pH:** 7.6 **CEC:** 18.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Wheat/Clover

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 18.35 in.
Beets/100 ft: 110

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	RWST	Weed* Damage 0-10	Vigor** 0-10	Net $/A	RWSA	T/A	% SUC	% CJP
					21-Jun	21-Aug					
4	Dual II Magnum Ethotron	8 oz 24 oz	Pre-Emerge	**280**	**3.3**	7.9	**$3,526**	**11127**	39.7	18.8	95.3
7	Metamitron Ethotron	64 oz 32 oz	Pre-Emerge	**272**	**5.2**	7.4	**$3,239**	**10254**	37.8	18.3	95.1
3	Dual II Magnum Ethotron	8 oz 16 oz	Pre-Emerge	**270**	**6.0**	7.8	**$3,231**	**10187**	37.7	18.2	95.3
2	Dual II Magnum Ethotron	8 oz 8 oz	Pre-Emerge	**270**	**5.1**	7.6	**$3,186**	**10027**	37.2	18.2	95.0
1	Dual II Magnum	8 oz	Pre-Emerge	**270**	6.5	7.8	**$3,225**	**10135**	37.5	18.3	94.9
5	Dual II Magnum Ethotron	8 oz 32 oz	Pre-Emerge	**267**	**3.4**	7.5	**$3,362**	**10628**	39.7	18.2	94.8
6	Metamitron	64 oz	Pre-Emerge	266	7.3	7.5	$2,980	9379	35.3	18.2	94.5
Average				271	5.3	7.6	$3,250	10248	37.8	18.3	95.0
LSD 5%				12.4	3.0	N.S.	445.3	1396.7	N.S.	N.S.	N.S.
CV%				3.1	37.9	4.9	9.2	9.2	8.8	2.2	0.6

Weed Damage** Weed Ratings are taken on a 0-10 scale, 0 = no weeds and 10 total weed coverage.

****Vigor** 0 to 10 ratings, 10 is the best

Comments: Study was designed to test stand loss with Pre-emergence herbicides that can help manage water hemp. Stand loss was observed with Metamitron. A slight trend was observed for stand loss with higher rates of Ethotron when combined with Dual II Magnum.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Pre Emerge Trial

Sylvester Nematode - Akron, MI - 2023

No.	Treatment	Rate/A	Applic Timing	Stand B/100 ft	Dead B/100 ft
2	Dual II Magnum	8 oz	At Plant	**120**	**145**
	Ethotron	8 oz	At Plant		
3	Dual II Magnum	8 oz	At Plant	**114**	**144**
	Ethotron	16 oz	At Plant		
5	Dual II Magnum	8 oz	At Plant	**113**	**131**
	Ethotron	32 oz	At Plant		
1	Dual II Magnum	8 oz	At Plant	**111**	**134**
4	Dual II Magnum	8 oz	At Plant	**108**	**131**
	Ethotron	24 oz	At Plant		
6	Metamitron	64 oz	At Plant	**105**	**122**
7	Metamitron	64 oz	At Plant	**101**	**123**
	Ethotron	32 oz	At Plant		

Valent Excalia

Answer Plot - Bach, MI - 2023

Trial Quality: Good
Variety: SX-2296N
Planted: May 15th
Harvested: October 24th
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.3 **pH:** 7.4 **CEC:** 12.3
P: Very High **K:** High
Mn: High **B:** High
Added N: 35 lbs. 2X2, 120 lbs. Sidedress
Previous Crop: Corn & Soybeans

Rhizoc Level: Low
Cerc Control: Good
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 22.57 in.
Beets/100 ft: 128

Application: JD 3520 tractor mounted plot sprayer, compressed air, 15.3 gpa
Monosem 6-row Agronomy Planter, compressed air, 30 psi, 9 gpa - IF, 3.5" band

No.	Treatment	Rate/A	Applic Timing	RWST	Vigor* 0-10 31-Aug	Vigor* 0-10 24-Jul	Net $/A	RWSA	T/A	% SUC	% CJP
4	Dual II Magnum	21.3 fl oz	6 lf	**269**	8.4	8.7	$2,544	10246	38.1	18.6	**94.1**
1	Untreated Check			**266**	8.9	9.0	$2,524	10094	37.9	18.4	**93.8**
5	Stinger	4 fl oz	6 lf	**265**	8.7	8.8	$2,525	10156	38.4	18.6	**93.1**
6	Excalia Roundup Powermax Dual II Magnum Nortron Asana XL	2 fl oz 32 fl oz 21.3 fl oz 4 fl oz 9.6 fl oz	6 lf	**264**	8.4	8.4	$2,496	10175	38.4	18.7	**92.7**
3	Excalia Roundup Powermax Stinger Asana XL Exponent Synergist	2 fl oz 32 fl oz 4 fl oz 9.6 fl oz 8 fl oz	6 lf	**250**	8.9	8.9	$2,453	10020	40.0	18.9	90.1
2	Excalia Roundup Powermax Dual II Magnum Asana XL Exponent Synergist	2 fl oz 32 fl oz 21.3 fl oz 9.6 fl oz 8 fl oz	6 lf	243	9.1	9.1	$2,260	9263	38.0	18.5	90.0
Average				260	8.7	8.8	$2,467	9992	38.5	18.6	92.3
LSD 5%				24.9	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3.3
CV%				6.4	6.4	6.5	10.6	10.5	7.4	3.3	2.3

***Vigor** 0 to 10 ratings, 10 is the best

Comments: Study was designed to test crop injury with products tank-mixed wih Excalia fungicide. No injury was observed in this trial.

$/A: Payment calculated using early delivery adjustment where necessary, and a per pound payment of $.25 minus fungicide and application cost.

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

Sugarbeet tolerance to Ultra Blazer alone and tank-mixed with Warrant

Christy Sprague and Brian Stiles II, Michigan State University

Location: Richville (SVREC)	**Application timings**: PRE (April 26), 2 lf beets (May 22), 6 lf beets (June 7), 12 lf beets (July 5)
Planting Date: April 26, 2023	**Herbicides:** see treatments
Soil Type: Sandy clay loam	**O.M.:** 2.1 **pH:** 8.0
Replicated: 4 times	**Variety:** Crystal G049RR

Table 1. Sugarbeet tolerance to POST applications of Ultra Blazer (acifluorfen) applied at various sugarbeet stages and with various mixtures, 7 d after the 6 lf, 14 d after the 12-lf application and in late-August.

Herbicide treatments[a]	Timing	Injury (June 14)	Injury (July 19)	Injury (August 21)	Yield	RWSA
		—%—	—%—	—%—	– ton/A –	– lb/A –
Roundup PowerMax 3 (30/20/20 fl oz)	2-, 6-, 12 lf	0	0	0	25.6	5902
Ultra Blazer (12/12 fl oz)	6-, 12 lf	21*	17*	7*	21.0	4713
Ultra Blazer (16 fl oz)	6 lf	23*	0	0	27.5	6319
Ultra Blazer (16 fl oz) + Warrant (3 pt)	6 lf	14*	2	0	27.2	6271
Ultra Blazer (16/16 fl oz)	6-, 12 lf	24*	17*	7*	23.0	5139
Ultra Blazer (16 fl oz) + Warrant (3 pt)	6-, 12 lf	14*	16*	9*	21.9	4992
Ultra Blazer (16 fl oz) + NIS (0.25%)	6 lf	19*	1	0	26.7	5983
Ultra Blazer (16 fl oz) + Warrant (3 pt) + NIS (0.25%)	6 lf	11*	2	1	26.1	6129
Ultra Blazer (16 fl oz)	12 lf	0	17*	7*	24.5	5542
Ultra Blazer (16 fl oz) + Warrant (3 pt)	12 lf	0	14*	8*	25.3	5860
$LSD_{0.05}$[c]		*3.2*	*2.7*	*3.5*	*4.89*	*1210*

[a] Roundup PowerMax 3 was included in all postemergence treatments at the rates listed in the first treatment. These treatments also included AMS at 17 lb/100 gal.

[b] Injury, yield and RWSA data with asterisks (*) are significantly different than the Roundup PowerMax 3 alone control.

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

Summary: Currently, options are extremely limited for POST control of glyphosate-resistant waterhemp in sugarbeet. Ultra Blazer (aciflurofen) is a Group 14 herbicide that has activity on pigweed species. Over the past several years we have conducted research evaluating sugarbeet safety to POST applications of Ultra Blazer. Ultra Blazer injury to sugarbeet consists of leaf speckling/bronzing. From our past trials it appeared tank-mixing Warrant with Ultra Blazer may reduce sugarbeet injury compared with Ultra Blazer alone. Initial sugarbeet injury was lower when Warrant was applied with Ultra Blazer at either the 6- or 12-lf sugarbeet stage. The addition of Ultra Blazer or Ultra Blazer + Warrant did not affect yield or RWSA compared with Roundup PowerMax 3 applied alone. However, when Ultra Bazer was applied twice, alone or with Warrant sugarbeet yield and RWSA tended to be lower compared with the highest yielding treatment. This research helps support Michigan's Section 18 registration for Ultra Blazer applications on sugarbeets at the 6-leaf stage or larger at a 16 fl oz/A rate and may provide evidence to allow for the inclusion Warrant to Ultra Blazer applications in the future.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Sugarbeet tolerance with Rinskor

Christy Sprague and Brian Stiles II, Michigan State University

Location: Richville (SVREC)	**Application timings**: (A) cotyledon-2 lf beets (May 22), (B) 4-6 lf beets (May 31)
Planting Date: April 26, 2023	**Herbicides:** see treatments
Soil Type: Sandy clay loam	**O.M.:** 2.1 **pH:** 8.0
Replicated: 4 times	**Variety:** Crystal G049RR

Table 1. Sugarbeet tolerance with Rinskor (florpyrauxifen) under weed-free conditions 7 d after the first application, and 15 and 48 d after the last application.

		Injury				
Herbicide treatments[a]	**Timing**	**7 DA-A**	**15 DA-B**	**48 DA-B**	**Yield**	**RWSA**
		— % —	— % —	— % —	— ton/A —	— lb/A —
Weed-free		0	0	0	25.6	5971
Rinskor (1.37/1.37 fl oz)	A, B	2	11*	9*	26.0	6206
Rinskor (1.37/1.37 fl oz) †	A, B	3	18*	13*	24.6	5650
Rinskor (2.06/1.37 fl oz) †	A, B	7*	20*	17*	22.4	5005
Rinskor (2.74/1.37 fl oz) †	A, B	7*	14*	12*	26.4	6087
Rinskor (5.5/2.74 fl oz) †	A, B	11*	25*	29*	21.1	4856
Rinskor (1.37/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz)‡	A, B	17*	18*	6*	27.0	6135
Rinskor (2.06/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	21*	19*	9*	21.6	4959
Rinskor (2.74/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	25*	15*	4	26.5	6356
Rinskor (5.5/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	23*	24*	23*	23.0	5357
Loyant (0.274/0.274 fl oz) †	A, B	8*	13*	7*	24.5	5685
$LSD_{0.05}$[c]		*3.6*	*6.5*	*5.1*	*4.96*	*1225*

[a] Etho = Ethofumesate, RUP 3 = Roundup PowerMax 3, Dual = Dual Magnum; † = Destiny HC at 1.5 pt; ‡ = Destiny HC at 1.5 pt + AMSOL at 2.5% v/v.

[b] Injury, yield and RWSA data with asterisks (*) are significantly different than the weed-free control.

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

Summary: Rinskor (florpyrauxifen) is a new arylpicolinate Group 4 herbicide. Currently, this active is sold as a different formulation (Loyant) in rice and has been used in sugarbeet in Europe. The goal of this research was to examine sugarbeet tolerance at various rates and tank-mixtures. Sugarbeet injury from Rinskor consisted of typical growth regulator injury, fused and elongated leaves. All rates of Rinskor resulted in significant sugarbeet injury. This year Rinskor applications did not reduce yield or recoverable white sugar per acre compared with the weed-free control. However, when compared to the highest yielding treatment, twice the high rate of Rinskor and the 2.74/1.37 fl oz/ rate of Rinskor applied with Dual + Ethofumesate + Roundup resulted in a slight reduction in sugarbeet yield and RWSA. We expect to continue to examine Rinskor and determine if there is a fit for weed control in Michigan sugarbeet production.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Waterhemp control with Rinskor in sugarbeet

Christy Sprague and Brian Stiles II, Michigan State University

Location: Shiawassee County	**Application timings**: (A) 2-lf beets (June 14), (B) 4-6 lf beets (June 21)
Planting Date: May 23, 2023	**Herbicides:** see treatments
Soil Type: Sandy clay loam	**O.M.:** 1.9 **pH:** 6.7
Replicated: 4 times	**Variety:** Crystal G049RR

Table 1. Sugarbeet tolerance and waterhemp control with Rinskor alone and in tank-mixture 6 d after the first application, and 16 and 28 d after the last application.

		6 DA-A		16 DA-B		28 DA-B	
Herbicide treatments[a]	**Timing**	**Injury**	**Control**	**Injury**	**Control**	**Injury**	**Control**
		—%—	—%—	—%—	—%—	—%—	—%—
Rinskor (1.37/1.37 fl oz) †	A, B	13	17	12	19	20	16
Rinskor (2.06/1.37 fl oz) †	A, B	17	22	15	15	21	21
Rinskor (2.74/1.37 fl oz) †	A, B	18	23	13	24	19	20
Rinskor (1.37/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz)‡	A, B	25	62*	12	92*	11	92*
Rinskor (2.06/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	25	63*	14	99*	16	96*
Rinskor (2.74/1.37 fl oz) + Etho (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	25	67*	17	97*	24	93*
Loyant (0.274/0.274 fl oz) †	A, B	7	17	15	22	13	22
Roundup PowerMax 3 (25/25 fl oz) §	A, B	0	13	0	0	0	0
Ethofumesate (6 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) ‡	A, B	20	67*	2	96*	5	95*
Stinger HL (1.2/2.4 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) §	A, B	23	68*	18	90*	21	84
Stinger HL (1.2 fl oz) + Dual (1 pt) + Rup 3 (25 fl oz) fb. Ultra Blazer (16 fl oz) + Rup 3 (25 fl oz) §	A fb. B	18	63*	23	98*	23	96*
$LSD_{0.05}$[c]		*5.7*	*12.8*	*6.3*	*11.8*	*6.6*	*11.1*

[a] Etho = Ethofumesate, RUP 3 = Roundup PowerMax 3, Dual = Dual Magnum; † = Destiny HC at 1.5 pt; ‡ = Destiny HC at 1.5 pt + AMSOL at 2.5% v/v; § = AMSOL at 2.5% v/v.

[b] Waterhemp data with asterisks (*) are not significantly different than the highest control within a column.

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

Summary: Rinskor (florpyrauxifen) is a new arylpicolinate Group 4 herbicide. Currently, this active is sold as a different formulation (Loyant) in rice and has been used in sugarbeet in Europe. The goal of this research was to examine waterhemp control from Rinskor and various tank-mixtures. Dry conditions early in the season resulted in erratic sugarbeet and waterhemp emergence. Significant precipitation did not occur until June 26 and continued throughout July and August improving the incorporation of the residual herbicide (Dual). All herbicide treatments with the exception of Roundup alone caused some sugarbeet injury. Rinskor alone had very little activity on waterhemp even after two applications at higher rates. The greatest waterhemp control included treatments that had overlapping Dual Magnum, Ethofumesate + Dual Magnum applied twice or a cleanup application of Ultra Blazer at 6-leaf sugarbeets following a Dual Magnum application. Currently, for waterhemp control the use of overlapping residual of a Group 15 herbicide (i.e., Dual, Warrant, or Outlook) will be important.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Waterhemp control with strategies using residual herbicides in sugarbeet

Christy Sprague and Brian Stiles II, Michigan State University

Location: Shiawassee County	**Application timings**: PRE (May 23), 2-lf beets (June 14), 6-8 lf beets (July 11)
Planting Date: May 23, 2023	**Herbicides:** see treatments
Soil Type: Sandy clay loam	**O.M.:** 1.9 **pH:** 6.7
Replicated: 4 times	**Variety:** Crystal G049RR

Table 1. Waterhemp control 27 d after the first herbicide application, and 7 and 30 days after the last application (6-8 leaf beets).

Herbicide treatments[a]		Waterhemp control[b]		
		July 11 (27 DA-2-lf)	July 18 (7 DA-6-lf)	Aug. 10 (30 DA-6-lf)
PREs	***POST apps. at 2- and 6-lf beets***	—%—	—%—	—%—
None	Roundup PowerMax 3 (30/20 fl oz)	0	0	0
Dual Magnum (0.5 pt)	Dual Magnum (1.3 pt) – 2 lf only	88*	89*	70
Dual Magnum (0.5 pt)	Warrant (3 pt) – 2 lf only	87*	86	68
Dual Magnum (0.5 pt)	Outlook (16 fl oz) – 2 lf only	92*	88*	71
Dual Magnum (0.5 pt)	Dual Magnum (1.3/1.3 pt)	90*	94*	88*
Dual Magnum (0.5 pt)	Warrant (3/3 pt)	85*	88*	79*
Dual Magnum (0.5 pt)	Outlook (12/12 fl oz)	88*	90*	82*
Dual Magnum (0.5 pt)	Etho (6 fl oz) + Dual Magnum (1pt)	83*	86	81*
None	Etho (6 fl oz) + Dual Magnum (1pt)	87*	91*	77*
None	Ultra Blazer (16 fl oz) – 6 lf only	0	91*	65
None	U. Blazer + Warrant (3 pt) – 6 lf only	0	86	62
None	Ethofumesate[a] (2/2 pt)	71	97*	75*
Dual Magnum (0.5 pt)	Ultra Blazer (16 fl oz) – 6 lf only	66	99*	82*
Dual Magnum (0.5 pt)	U. Blazer + Warrant (3 pt) – 6 lf only	65	96*	83*
Ethofumesate (3 pt)	Ultra Blazer (16 fl oz) – 6 lf only	60	93*	77*
Ethofumesate (3 pt)	Dual Magnum (1.3/1.3 pt)	88*	92*	82*
$LSD_{0.05}$[c]		*12.6*	*11.3*	*14*

[a] Roundup PowerMax 3 was included in all POST treatments at the rates listed in the first treatment. These treatments also included AMS at 17 lb/100 gal. All POST applications of ethofumesate (Etho) were applied with 1.5 pt/A of Destiny HC.
[b] Waterhemp control evaluations with asterisks (*) are similar to the best waterhemp control treatment.
[c] Means within a column greater than least significant difference (LSD) value are different from each other.

Summary: Residual herbicide programs may be the only way to effectively control glyphosate-resistant waterhemp in sugarbeet. A field trial was conducted evaluating several Group 15 herbicides (Dual Magnum, Outlook, and Warrant) and ethofumesate. Additionally, Ultra Blazer POST was examined for waterhemp control once sugarbeet was at the 6-leaf stage. Dry conditions early in the season resulted in erratic sugarbeet and waterhemp emergence and impacted waterhemp control. A PRE herbicide of Dual Magnum (0.5 pt) or Ethofumesate with an overlapping Group 15 herbicide applied at the 2-leaf stage was important for early season control within the first 50 days of planting. For later season waterhemp control an additional residual application was necessary. Applications of Ultra Blazer at the 6-8 lf stage also helped with control as long PRE was applied. Overall late-season waterhemp control was lower this year than in the past. The time between the 2- and 6-8 leaf (4 wks) application could have contributed to this. It is important to make sure the overlapping residuals are applied prior to any waterhemp emergence. We will continue to examine and refine waterhemp control strategies in sugarbeet.

UPL Storage Trial

Gruehn - Sebewaing - 2022

Trial Quality:
Variety: C-G932NT
Planted: May 10th 2022
Harvested: October 5th 2022
Plots: 6 rows X 38 ft., 4 reps
Row Spacing: 22 in.

Soil Info: Clay Loam
% OM: 2.4 **pH:** 7.6 **CEC:** 14.2
P: Very High **K:** Very High
Mn: Very High **B:** High
Added N: 125 lbs. PPI + 35 lbs. 2X2
Previous Crop: Oats

Rhizoc Level: Low
Problems: None
Seeding Rate: 4.1 in.
Rainfall: 8.68 in.
Beets/100 ft: 234
Taken out of Storage: 2/23/2023

Application: JD 3520 tractor mounted plot sprayer, compressed air, 100 psi, 25 gpa

No.	Treatment**	Rate/A	Applic Date	Storage Vs Harvest	Harvest RWST lb Suc/T	Storage RWST lb Suc/T	% Shrink	Internal Rot Rate	External Rot Rate
6	EBDC*	2 lb	A	-2.9	**318**	315	**13.9**	**0.3**	0.8
	EBDC* + Delaro + Proline + Vacciplant	2 lb + 11 fl oz + 1.6 fl oz + 16 fl oz	C						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	E						
	EBDC* + Provysol + Vacciplant	2 lb + 5 fl oz + 16 fl oz	F						
2	EBDC*	2 lb	A	12.6	**318**	**330**	9.8	**0.5**	**0.6**
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B						
	EBDC* + Super Tin + Topsin	2 lb + 8 fl oz + 20 fl oz	D						
	EBDC* + Provysol	2 lb + 5 fl oz	F						
1	Untreated Check			8.8	**315**	**324**	**17.0**	1.0	**0.6**
3	EBDC*	2 lb	A	22.2	**315**	**337**	**17.9**	**0.0**	**0.3**
	EBDC* + Delaro + Proline + Vacciplant	2 lb + 11 fl oz + 1.6 fl oz + 16 fl oz	B						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	D						
	EBDC* + Provysol + Vacciplant	2 lb + 5 fl oz + 16 fl oz	F						
7	EBDC*	2 lb	A	9.7	**314**	**324**	**12.7**	**0.5**	**0.6**
	EBDC* + Delaro + Proline + Vacciplant	2 lb + 11 fl oz + 1.6 fl oz + 16 fl oz	C						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	E						
8	EBDC*	2 lb	A	14.8	**314**	**329**	**13.7**	**0.3**	**0.6**
	EBDC* + Delaro + Proline + Vacciplant	2 lb + 11 fl oz + 1.6 fl oz + 16 fl oz	C						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	E						

***EBDC = Manzate Pro-Stick**

****All treatments included MasterLock @ 6.4 fl oz.**

******Application Dates: A = 6/30, B = 7/12, C = 8/5, D = 8/16, E = 9/1, F = 9/9**

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

UPL Storage Trial

Gruehn - Sebewaing - 2022

No.	Treatment**	Rate/A	Applic Date	Storage Vs Harvest	Harvest RWST lb Suc/T	Storage RWST lb Suc/T	% Shrink	Internal Rot Rate	External Rot Rate
4	EBDC*	2 lb	A	3.2	**310**	313	**14.6**	**0.5**	0.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	B						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	D						
	EBDC* + Provysol + Vacciplant	2 lb + 5 fl oz + 16 fl oz	F						
5	EBDC*	2 lb	A	16.5	303	320	**14.7**	0.8	0.8
	EBDC* + Delaro + Proline	2 lb + 11 fl oz + 1.6 fl oz	C						
	EBDC* + Super Tin + Topsin + Vacciplant	2 lb + 8 fl oz + 20 fl oz + 16 fl oz	E						
	EBDC* + Provysol + Vacciplant	2 lb + 5 fl oz + 16 fl oz	F						
Average				10.6	313	324	14.3	0.5	0.6
LSD 5%					12.5	15.5	5.6	0.7	0.4
CV%					2.7	3.3	26.7	100.5	43.6

***EBDC = Manzate Pro-Stick**

****All treatments included MasterLock @ 6.4 fl oz.**

******Application Dates: A = 6/30, B = 7/12, C = 8/5, D = 8/16, E = 9/1, F = 9/9**

Comments: This study was focused on storage results from in field applications. Storage results were collected in spring 2023.

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

Impacts of Cercospora leaf spot, mechanical damage, and variety on postharvest beet rot susceptibility, 2022-23

Carly Hendershot[1], Chris Bloomingdale[1], Holly Corder[1], Tom Goodwill[2], Sarah Ruth[1], Randy Beaudry[1], Linda E. Hanson[1,2], and Jaime F. Willbur[1]; [1]Michigan State University; [2]USDA-ARS

Objective 1: Evaluate the impact of Cercospora leaf spot (CLS) field infection on storage rot symptom development on bruised beets. Previous results indicate CLS levels in the field do not affect rot development in hand-harvested beet roots for three pathogens and multiple varieties tested (Hendershot et al. REACh 2021, 2022). Feedback from the industry indicated CLS may impact storability following commercial harvest.

Methods: CLS was rated on the KWS scale of 0 (disease-free) to 10 (>50% necrotic). Visually healthy beets were harvested by hand (field location details below), washed with water, and bruised on one side using a 1.5-kg weight dropped from a 1-meter height. Beets were stored at 7 °C in plastic bags with wood shavings to reduce free moisture. At each timepoint, roots were removed from storage and inoculated with a known storage rot pathogen or with a sterile clarified V8 (CV8) plug as a control. Based on common pathogen genera identified from Michigan Sugar pile samples, virulent isolates of *Penicillium vulpinum, Botrytis cinerea*, and *Fusarium graminearum* were chosen for storage trials. Inoculated beets were incubated with the agar plug at ambient temperature for 7 days before the plug was removed. Rot length, width and depth were measured after 50 and 90 days for timepoints 1 and 2, respectively.

Location: Saginaw (SVREC)	**Variety:** C-G932NT	**Harvest:** 9/22/22
Planting Date: 4/29/2022	**Inoculated:** July 12, 2022	**Replicates:** 4 plots/treatment in field
High CLS Average at harvest: 7.86	**Low CLS average at harvest:** 1.86	

Summary: There was no significant difference in rot development between CLS levels for any pathogen during either timepoint. Bruising led to significantly increased length, width, and depth of rot for beets infected with *Botrytis cinerea* and *Penicillium vulpinum* 50 days postharvest ($P < 0.05$, Figure 1). Bruising impacted rot length at 90 days postharvest in beets inoculated with *P. vulpinum*, but no other pathogen or measurement was significant at that timepoint.

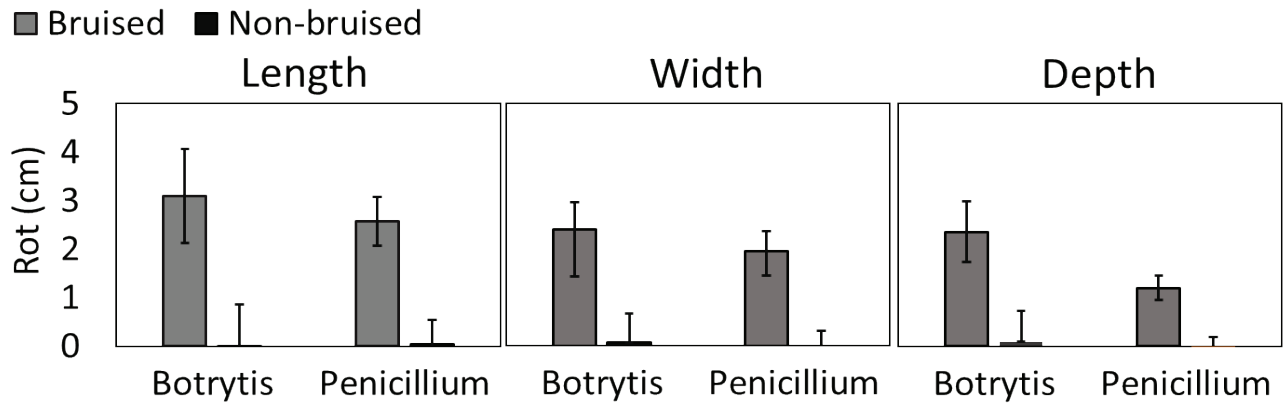

Figure 1: Mean measurements of necrotic tissue on beets after 50 days of incubation on bruised and non-bruised tissue. There was no significant difference in rot development between CLS levels for any pathogen at either 50- or 90-days postharvest timepoints ($P > 0.05$); thus, results are shown across low and high in-field CLS levels. Bars represent four replicate roots inoculated at the crown and mid-root.

Objective 2: Determine effect of CLS infection and pathogen colonization on respiration rate in storage. In 2021, there was no difference in rate of respiration per kilogram of beet weight between beets classified as having high and low CLS in the field ($P > 0.05$) across three storage pathogens and the tested variety (Hendershot et al. REACh 2022). Beets inoculated with *Botrytis cinerea* had a significantly increased respiration rate compared to other storage pathogens by the end of the storage period ($P < 0.05$); this observation was not related to in-season CLS levels ($P > 0.05$).

Summary: In 2022, storage rot development was poor in the inoculated respiration trial due to technical failure resulting in unfavorably cold conditions for infection. Our limited results indicate there was no significant difference in respiration rate between the beets inoculated with pathogens and those inoculated with the control ($P > 0.05$). For these reasons, we are currently repeating this trial during the 2023-24 storage period.

Objective 3: Determine susceptibility of varieties to post-harvest rot pathogens. Twelve commercial varieties grown in a Michigan Sugarbeet Advancement trial (details below) were tested for storage rot susceptibility. Beets were harvested by hand and stored at 7 °C in plastic bags with wood shavings. At each timepoint, visually healthy beets of each variety were removed from storage, washed, and cut into approximately 3-cm thick sections. Root sections were inoculated with a known storage rot pathogen or with a CV8 plug as a control. There were four replications of each variety x pathogen combination. Inoculated beets were incubated for 24 hours before removal of agar plugs. After one week at ambient temperature, the length and depth of rot were measured.

Location: Sandusky, Sanilac County	**Varieties:** BTS-1065, BTS-1606N, BTS-1703, C-G021, C-G049, C-G675, C-G932NT, HIL-2332NT, HIL-2361, HIL-9865, SX-2295, SX-2296N
Planting Date: May 8, 2022	
Harvest: October 27, 2022	

Summary: Significant variability in responses was observed among the twelve tested varieties, although no varieties consistently performed better or worse than others across the three tested pathogens (Figure 2). Interestingly, some varieties with the largest mean rot diameters for one pathogen may have exhibited the smallest diameters for another. These observations will inform future breeding efforts. This experiment is being repeated for the 2023-24 storage season.

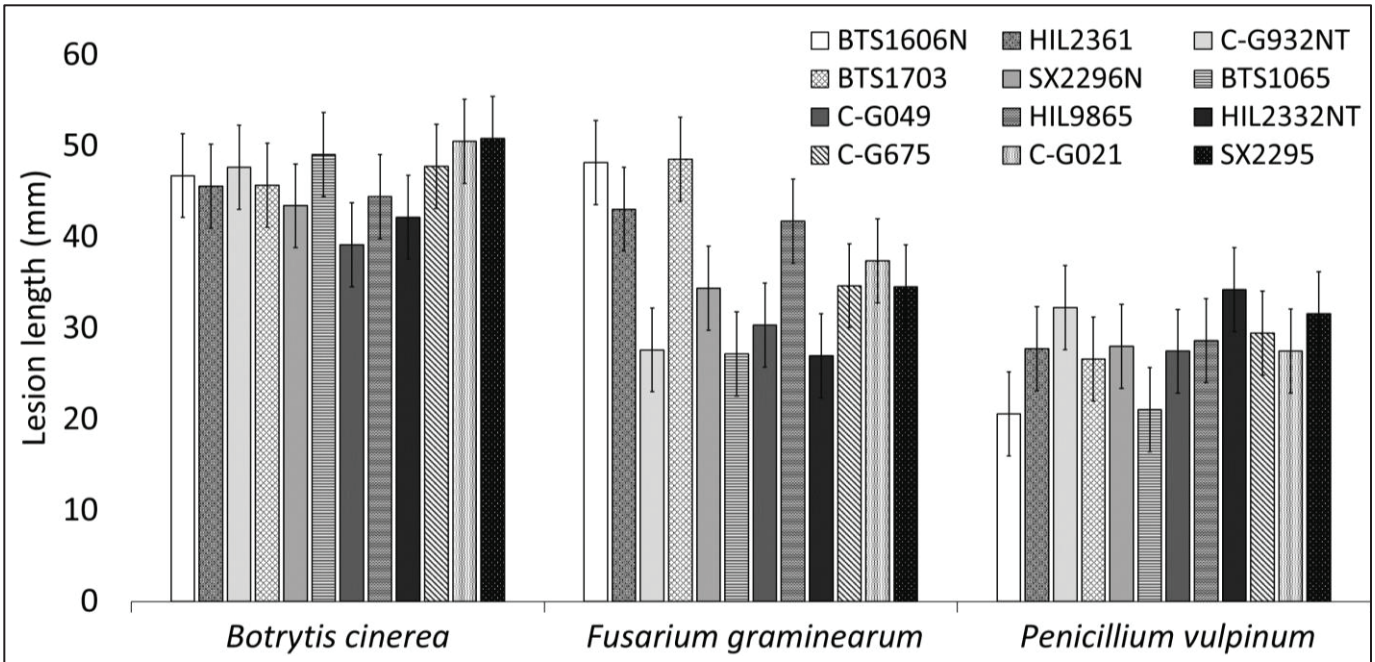

Figure 2: Mean lesion length following inoculation by three storage rot pathogens among twelve commercial beet varieties at 60-days post-harvest. Measurements collected after one week incubation. Significant differences were observed in variety responses to storage pathogens ($P < 0.05$). Bars represent four replicate sugar beet root slices.

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