

Cercospora Leaf Spot Program Trials

David Mettler¹ and Mark Bloomquist²

¹Research Agronomist, ²Research Director, SMBSC, Renville, MN

Cercospora leaf spot (CLS) is the most destructive foliar disease to impact sugar beet production in the SMBSC growing area. Without effective new fungicides, controlling the disease has become more difficult. Despite some advancements in variety tolerance to CLS, the key to control is still utilizing best management practices that include an appropriately timed fungicide program that incorporates multiple modes of action, along with planting sugar beet varieties with higher levels of genetic tolerance to CLS.

Research Objective

- High levels of cercospora inoculum and a favorable environment for the development of CLS have been major contributors in causing losses to profitability of sugar beet production in the past. Trials need to be conducted to evaluate the efficacy of individual fungicides and season long fungicide programs.

Methodology

In 2025 the CLS Program Trials were conducted as randomized complete block with four replications located near Renville and Bird Island. These trials evaluated fungicides in a program setting. The Bird Island site was planted on April 23rd and the Renville site was planted on April 26th using Crystal M977 for the traditional (non-CR+) variety and Beta 9131 for the CR+ variety. Standard practices were used to keep the sites weed free. The sites were inoculated with pulverized leaves from the previous year that were infected with CLS. The inoculum was spread evenly across the sites with a Gandy Orbit-Air applicator shortly before canopy closure. Six fungicide applications were made in the Renville Program Trial beginning July 9th and the Bird Island Program Trial beginning on July 14th. The treatment list containing the fungicides used, rates, and timing of application can be found in Tables 5 and 6.

Applications were made using a custom-made tractor mounted sprayer traveling 3.3mph with a spray volume of 20gpa and 40psi, utilizing XR110025 spray nozzles (Photo 1). Each plot consisted of six rows that were 35ft in length. The sprayer used CO² as a propellant and was designed to apply the treatment to the center four rows, leaving rows one and six untreated. Plots were rated for foliar disease using a 1-9 scale with one being disease free and nine being completely necrotic. Plots were rated multiple times throughout the season by several members of the research staff. The center two rows of each six-row plot were harvested on September 16th for the Renville site and September 12th for the Bird Island site using a six-row defoliator and a two-row research harvester. The beets harvested from the center two rows were weighed on the harvester and a sample of those beets were used for a quality analysis at the SMBSC tare lab. The data was analyzed for significance using SAS GLM version 9.4.



Photo 1. Tractor mounted sprayer applying a fungicide treatment.

Results

At the Renville site there were significant yield differences with the untreated check for both CR+ and traditional varieties having lower extractable sugar per acre (Table 1). The late start three spray program also had lower ESA than many other treatments for the traditional variety. The foliar disease ratings in the Renville Program Trial were highest for the unsprayed checks followed by the programs with reduced applications or a late start (treatments 5-12) (Table 2). Differences in foliar disease ratings between all other treatments were minimal.

At the Bird Island site there were again significant yield differences with the untreated check for both CR+ and traditional varieties having lower extractable sugar per acre (Table 3). The rest of the treatments had similar yields. The foliar disease ratings in the Bird Island Program Trial were also highest for the unsprayed checks followed by treatments 11 and 12 which were a reduced spray program. The rest of the treatments had mostly similar disease ratings.

Table 1. Yield parameter results for the Renville CLS Program Trial. Values with different letters are significantly different. Table 5 contains a full description of each treatment.

Program	Variety	Trt	Percent Sugar	Tons Per Acre	Percent Extractable Sugar	Extractable Sugar per Ton (lbs.)	Extractable Sugar per Acre (lbs.)	Percent Purity
Check	CR+	1	13.4 i	17.4 f	11.2 j	223.6 j	3881.5 i	90.9 f
	Trad	2	13.3 i	17.9 f	11.0 j	220.6 j	3949.6 i	90.6 ef
Standard	CR+	3	15.7 bcde	22.9 abcd	13.5 abc	269.8 abc	6204.7 abcdef	92.1 a
	Trad	4	15.3 defg	22.4 bcde	13.1 cdefgh	261.2 cdefgh	5991.8 cdefg	91.7 abcd
4 Spray	CR+	5	15.0 gh	22.8 abcd	12.8 ghi	254.9 ghi	5798.1 efg	91.7 abcd
	Trad	6	15.1 gh	22.0 bcde	12.7 ghi	254.4 hi	5614.1 fg	91.2 cdef
3 Spray	CR+	7	15.2 fg	23.6 abcd	12.9 fghi	257.6 fghi	6075.7 bcdefg	91.4 abede
	Trad	8	15.0 gh	21.4 de	12.7 ghi	254.3 hi	5435.2 gh	91.6 abede
Late Start	CR+	9	15.4 cdefg	22.5 bcde	13.1 bcdefg	262.2 cdefgh	5874.2 defg	91.8 abcd
	Trad	10	15.0 gh	22.1 bcde	12.7 hi	254.0 hi	5602.0 fg	91.4 abcde
Late Start	CR+	11	15.2 fg	22.2 bcde	13.0 defgh	260.0 defgh	5719.9 efg	92.0 abc
3 Spray	Trad	12	14.7 h	19.5 ef	12.4 i	248.8 i	4822.6 h	91.3 abcdef
Standard	CR+	13	16.3 a	24.5 abc	13.9 a	278.7 a	6813.5 ab	91.9 abc
	Trad	14	15.8 bcd	23.5 abcd	13.4 bcde	267.8 bcde	6322.0 abcdef	91.4 abcde
Standard	CR+	15	16.0 ab	22.7 bcd	13.7 ab	273.6 ab	6162.7 abcdefg	92.0 ab
	Trad	16	15.9 ab	23.8 abcd	13.4 bcd	268.5 bcd	6389.2 abcde	91.3 bcdef
Standard	CR+	17	15.8 abc	24.4 abcd	13.5 abc	269.8 abc	6569.6 abcd	91.7 abcd
Fr. Copilot	Trad	18	15.3 efg	21.7 cde	12.9 efg	258.6 efg	5603.1 fg	91.1 def
Standard	CR+	19	15.6 bcdef	25.8 a	13.3 bcdef	265.4 bcdef	6831.5 a	91.6 abed
no adjuvant	Trad	20	15.6 bcdef	25.0 ab	13.2 bcdefg	264.2 bcdefg	6678.4 abc	91.5 abcde
		Mean	15.2	22.3	12.9	258.4	5762.4	91.5
		CV%	2.1	9.6	2.7	2.7	9.0	0.6
		Pr>F	<.0001	0.0002	<.0001	<.0001	<.0001	0.0251
		lsd (0.05)	0.4501	3.06	0.4983	9.8182	743.35	0.7708

Table 2. Foliar ratings for the Renville Program Trial using the KWS (1-9) rating system with 1 being disease free and 9 being completely necrotic. Ratings with different letters are significantly different. Table 5 contains a full description of each entry.

Program	Variety	Trt	Aug 14th	Aug 20th	Aug 28th	Sep. 8th
Check	CR+	1	6.3 a	8.0 a	8.8 a	9.0 a
	Trad	2	6.5 a	8.1 a	8.9 a	9.0 a
Standard	CR+	3	3.1 de	3.2 hij	4.2 de	4.6 d
	Trad	4	2.3 e	3.0 hij	3.8 e	4.3 d
4 Spray	CR+	5	4.1 c	4.3 cdef	5.3 bc	6.6 b
	Trad	6	3.2 d	4.0 efg	4.8 cd	6.1 bc
3 Spray	CR+	7	5.0 b	5.0 b	5.6 b	6.5 b
	Trad	8	4.2 bc	4.2 def	5.0 bc	5.9 bc
Late Start	CR+	9	4.2 bc	4.6 bcde	5.0 bc	5.6 c
	Trad	10	4.5 bc	4.8 bcde	5.3 bc	5.7 c
Late Start	CR+	11	4.4 bc	4.9 bc	5.5 bc	6.1 bc
3 Spray	Trad	12	4.2 bc	4.5 bcde	5.4 bc	5.9 bc
Standard	CR+	13	2.8 de	3.4 ghi	4.1 e	4.2 d
	Trad	14	2.8 de	3.1 hij	3.8 e	4.3 d
Standard	CR+	15	2.5 de	2.8 ji	3.8 e	4.1 d
	Trad	16	3.0 de	3.3 ghij	4.1 e	4.5 d
Standard	CR+	17	3.1 de	3.3 hij	4.1 e	4.5 d
Fr. Copilot	Trad	18	2.5 de	2.7 j	3.6 e	4.0 d
Standard	CR+	19	3.2 d	3.7 fgh	4.0 e	4.0 d
no adjuvant	Trad	20	2.5 de	2.9 ji	3.6 e	4.0 d
		Mean	3.7	4.2	4.94	5.439
		CV%	15.7	11.3	9.84	9.44
		Pr>F	<.0001	<.0001	<.0001	<.0001
		lsd (0.05)	0.82	0.67	0.69	0.73

Table 3. Yield parameter results for the Bird Island CLS Program Trial. Values with different letters are significantly different. Table 6 contains a full description of each treatment.

Fungicide Program	Variety	Trt	Percent Sugar	Tons Per Acre	Percent Extractable Sugar	Extractable Sugar per Ton (lbs.)	Extractable Sugar per Acre (lbs.)	Percent Purity
Check	CR+	1	13.4 f	18.0	11.2 e	224.4 e	4036.3 c	91.0
	Non-CR+	2	13.3 f	17.8	11.0 e	220.0 e	3906.3 c	90.6
Standard 6 spray Program	CR+	3	14.8 abc	22.0	12.5 ab	248.8 ab	5491.0 ab	90.9
	Non-CR+	4	14.4 cde	22.5	12.2 bcd	242.9 bcd	5448.8 ab	91.2
6 spray	CR+	5	14.7 abcd	21.8	12.3 abcd	246.4 abcd	5373.0 ab	90.9
Veltyma not Inspire XT	Non-CR+	6	14.6 abcd	22.3	12.4 abc	247.1 abc	5507.8 a	91.4
6 spray	CR+	7	14.5 bcde	22.7	12.2 bcd	244.5 bcd	5538.6 a	91.1
No QoI or Topsin	Non-CR+	8	14.3 de	22.5	12.0 cd	240.7 cd	5424.7 ab	91.2
6 spray	CR+	9	14.4 bcde	21.4	12.0 d	239.2 d	5134.1 ab	90.0
Copper + Manzate	Non-CR+	10	14.2 e	20.8	12.0 d	239.3 d	4971.2 ab	91.2
4 spray	CR+	11	14.4 de	20.7	12.0 cd	240.0 cd	4954.2 ab	90.8
extended intervals	Non-CR+	12	14.4 de	22.2	12.1 cd	241.9 bcd	5364.7 ab	91.2
6 spray	CR+	15	14.4 de	22.6	12.1 cd	241.9 bcd	5469.4 ab	91.1
Provysol not Inspire XT	Non-CR+	16	14.5 bcde	23.3	12.2 bcd	245.1 bcd	5696.7 a	91.4
6 spray	CR+	19	15.0 a	22.5	12.7 a	254.0 a	5725.7 a	91.4
Lucento not Proline	Non-CR+	20	14.4 de	21.3	12.1 cd	241.7 bcd	5139.6 ab	91.2
6 spray	CR+	21	14.8 ab	21.1	12.5 ab	249.2 ab	5262.6 ab	91.1
Minerva not Proline	Non-CR+	22	14.6 bcde	18.8	12.3 bcd	245.7 bcd	4601.0 bc	91.3
		Mean	14.4	21.6	12.1	242.5	5252.9	91.1
		CV%	1.9	11.5	2.2	2.2	12.1	0.6
		Pr>F	<.0001	0.0522	<.0001	<.0001	0.0025	0.2533
		lsd (0.05)	0.38	ns	0.37	7.6	900.5	ns

Table 4. Foliar ratings for the Bird Island Program Trial using the KWS (1-9) rating system with 1 being disease free and 9 being completely necrotic. Ratings with different letters are significantly different. Table 6 contains a full description of each entry.

Fungicide Program	Variety	Trt	31-Jul	11-Aug	20-Aug	8-Sep
Check	CR+	1	3.8 a	7.7 a	8.9 a	9.0 a
	Trad	2	3.5 a	7.1 a	8.8 a	9.0 b
Standard 6 spray Program	CR+	3	1.8 cde	3.3 def	4.5 bcdefg	6.0 defg
	Trad	4	1.9 bcde	3.3 def	4.3 defg	5.1 ij
6 spray	CR+	5	2.2 bcd	3.9 bcd	4.8 bcde	6.0 defg
Veltyma not Inspire XT	Trad	6	1.8 cde	3.3 def	4.1 efg	5.2 ij
6 spray	CR+	7	1.9 bcde	2.8 ef	4.0 fg	5.2 ij
No QoI or Topsin	Trad	8	1.6 e	2.6 f	3.8 g	4.7 j
6 spray	CR+	9	2.3 b	3.8 bcd	4.7 bcdef	6.5 cd
Copper + Manzate	Trad	10	2.3 bc	3.9 bcd	4.4 cdefg	5.9 defgh
4 spray extended intervals	CR+	11	1.7 de	3.8 bcd	4.8 bcde	7.3 b
6 spray	CR+	15	1.7 e	3.8 bcd	4.9 bcd	6.1 def
Provysol not Inspire XT	Trad	16	1.8 cde	3.3 cde	4.4 cdefg	5.3 ghij
6 spray	CR+	19	1.8 cde	3.9 bcd	4.8 bcde	6.3 de
Lucento not Proline	Trad	20	2.0 bcde	3.8 bcd	4.8 bcde	5.5 fghi
6 spray	CR+	21	2.0 bcde	4.3 b	5.0 bc	6.2 de
Minerva not Proline	Trad	22	1.8 cde	3.5 cde	4.4 cdefg	5.2 ij
Mean						
CV%						
Pr>F						
lsd (0.05)						
2.0						
17.4						
<.0001						
0.50						
4.0						
12.8						
<.0001						
0.71						
5.0						
<.0001						
0.74						
6.1						
7.7						
0.67						

Conclusions

The overall conditions for disease development were extremely high in 2025. Frequent rain events led to a delayed start in the fungicide programs and spray intervals that were not always in the targeted range of 10-12 days. The untreated checks at both locations reached a 9.0 rating in early September and programs with either a late start or reduced number of sprays had higher ratings than the six spray programs. These results were not surprising given the environment. It is worth noting that the Cuprofix Ultra tank mixed with Manzate Prostick for all six applications had similar ratings to the other more traditional programs at the Bird Island site. None of these programs provided acceptable control for the 2025 season as even the best treatments were at a 4.0 rating in early September and would have reached economic damage before the beginning of main harvest in October.

Table 5. Renville Program Trial treatment list. The application code indicates when the product was applied in the program.

2025 Renville CLS Program		Rate/A	Appl. Code		Rate/A	Appl. Code	
1	CR+ Check	n/a	abcdef	13 (CR+)	Manzate Prostick	2 lbs	abcdef
2	Traditional Check	n/a	abcdef		Masterlock	6.4 oz	abcdef
3 (CR+)	Manzate Prostick	2 lbs	abcdef		Proline	5.7 fl oz	a
	Masterlock	6.4 oz	abcdef		Super Tin	8 fl oz	bdf
	Proline	5.7 fl oz	a		Topsin	10 fl oz	b
	Super Tin	8 fl oz	bdf		Headline	9 fl oz	c
	Topsin	10 fl oz	b		Inspire XT	7 fl oz	e
	Headline	9 fl oz	c		Sprout Stop	2 lbs ai	e
	Inspire XT	7 fl oz	e	14 (Trad)	Manzate Prostick	2 lbs	abcdef
4 (Trad)	Manzate Prostick	2 lbs	abcdef		Masterlock	6.4 oz	abcdef
	Masterlock	6.4 oz	abcdef		Proline	5.7 fl oz	a
	Proline	5.7 fl oz	a		Super Tin	8 fl oz	bdf
	Super Tin	8 fl oz	bdf		Topsin	10 fl oz	b
	Topsin	10 fl oz	b		Headline	9 fl oz	c
	Headline	9 fl oz	c		Inspire XT	7 fl oz	e
	Inspire XT	7 fl oz	e		Sprout Stop	2 lbs ai	e
5 (CR+)	Manzate Prostick	2 lbs	adf	15 (CR+)	Manzate Prostick	2 lbs	abcdef
	Masterlock	6.4 oz	abdf		Masterlock	6.4 oz	abcdef
	Proline	5.7 fl oz	a		Proline	5.7 fl oz	a
	Super Tin	8 fl oz	bf		Super Tin	8 fl oz	bdf
	Topsin	10 fl oz	b		Topsin	10 fl oz	b
	Headline	9 fl oz	d		Headline	9 fl oz	c
6 (Trad)	Manzate Prostick	2 lbs	adf		Inspire XT	7 fl oz	e
	Masterlock	6.4 oz	abdf		Sprout Stop	2 lbs ai	f
	Proline	5.7 fl oz	a	16 (Trad)	Manzate Prostick	2 lbs	abcdef
	Super Tin	8 fl oz	bf		Masterlock	6.4 oz	abcdef
	Topsin	10 fl oz	b		Proline	5.7 fl oz	a
	Headline	9 fl oz	d		Super Tin	8 fl oz	bdf
7 (CR+)	Manzate Prostick	2 lbs	ae		Topsin	10 fl oz	b
	Masterlock	6.4 oz	ace		Headline	9 fl oz	c
	Proline	5.7 fl oz	a		Inspire XT	7 fl oz	e
	Super Tin	8 fl oz	c		Sprout Stop	2 lbs ai	f
	Topsin	10 fl oz	c	17 (CR+)	Manzate Prostick	2 lbs	abcdef
	Headline	9 fl oz	e		Franchise Copilot	0.25 % v/v	abcdef
8 (Trad)	Manzate Prostick	2 lbs	ae		Proline	5.7 fl oz	a
	Masterlock	6.4 oz	ace		Super Tin	8 fl oz	bdf
	Proline	5.7 fl oz	a		Topsin	10 fl oz	b
	Super Tin	8 fl oz	c		Headline	9 fl oz	c
	Topsin	10 fl oz	c		Inspire XT	7 fl oz	e
	Headline	9 fl oz	e	18 (Trad)	Manzate Prostick	2 lbs	abcdef
9 (CR+)	Manzate Prostick	2 lbs	bdef		Franchise Copilot	0.25 % v/v	abcdef
	Masterlock	6.4 oz	bcdef		Proline	5.7 fl oz	a
	Proline	5.7 fl oz	b		Super Tin	8 fl oz	bdf
	Super Tin	8 fl oz	ce		Topsin	10 fl oz	b
	Topsin	10 fl oz	c		Headline	9 fl oz	c
	Headline	9 fl oz	d		Inspire XT	7 fl oz	e
	Inspire XT	7 fl oz	f	19 (CR+)	Manzate Prostick	2 lbs	abcdef
10 (Trad)	Manzate Prostick	2 lbs	bdef		Proline	5.7 fl oz	a
	Masterlock	6.4 oz	bcdef		Super Tin	8 fl oz	bdf
	Proline	5.7 fl oz	b		Topsin	10 fl oz	b
	Super Tin	8 fl oz	ce		Headline	9 fl oz	c
	Topsin	10 fl oz	c		Inspire XT	7 fl oz	e
	Headline	9 fl oz	d	20 (Trad)	Manzate Prostick	2 lbs	abcdef
	Inspire XT	7 fl oz	f		Proline	5.7 fl oz	a
11 (CR+)	Manzate Prostick	2 lbs	bf		Super Tin	8 fl oz	bdf
	Masterlock	6.4 oz	bdf		Topsin	10 fl oz	b
	Proline	5.7 fl oz	b		Headline	9 fl oz	c
	Super Tin	8 fl oz	d		Inspire XT	7 fl oz	e
	Topsin	10 fl oz	d				
	Headline	9 fl oz	f				
12 (Trad)	Manzate Prostick	2 lbs	bf				
	Masterlock	6.4 oz	bdf				
	Proline	5.7 fl oz	b				
	Super Tin	8 fl oz	d				
	Topsin	10 fl oz	d				
	Headline	9 fl oz	f				

Table 6. Bird Island Program Trial treatment list. The application code indicates when the product was applied in the program. All treatments contained 6.4oz of Masterlock with every application.

2025 BI CLS Program		Rate/A	Appl. Code	Rate/A	Appl. Code
1	CR+ Check	n/a	abcdef	12 (Trad)	Manzate Prostick 2 lbs adf
2	Traditional Check	n/a	abcdef		Proline 5.7 fl oz a
3 (CR+)	Manzate Prostick	2 lbs	acdef		Super Tin 8 fl oz bf
	Proline	5.7 fl oz	a		Topsin 10 fl oz b
	Super Tin	8 fl oz	bdf		Inspire XT 7 fl oz d
	Topsin	10 fl oz	b	15 (CR+)	Manzate Prostick 2 lbs acdef
	Headline	9 fl oz	c		Proline 5.7 fl oz a
	Inspire XT	7 fl oz	e		Super Tin 8 fl oz bdf
4 (Trad)	Manzate Prostick	2 lbs	acdef		Topsin 10 fl oz b
	Proline	5.7 fl oz	a		Headline 9 fl oz c
	Super Tin	8 fl oz	bdf		Provysol 5 fl oz e
	Topsin	10 fl oz	b	16 (Trad)	Manzate Prostick 2 lbs acdef
	Headline	9 fl oz	c		Proline 5.7 fl oz a
	Inspire XT	7 fl oz	e		Super Tin 8 fl oz bdf
5 (CR+)	Manzate Prostick	2 lbs	acdef		Topsin 10 fl oz b
	Proline	5.7 fl oz	a		Headline 9 fl oz c
	Super Tin	8 fl oz	bdf		Provysol 5 fl oz e
	Topsin	10 fl oz	b	19 (CR+)	Manzate Prostick 2 lbs acdef
	Headline	9 fl oz	c		Lucento 5.5 fl oz a
	Veltyma	10 fl oz	e		Super Tin 8 fl oz bdf
6 (Trad)	Manzate Prostick	2 lbs	acdef		Topsin 10 fl oz b
	Proline	5.7 fl oz	a		Headline 9 fl oz c
	Super Tin	8 fl oz	bdf		Inspire XT 7 fl oz e
	Topsin	10 fl oz	b	20 (Trad)	Manzate Prostick 2 lbs acdef
	Headline	9 fl oz	c		Lucento 5.5 fl oz a
	Veltyma	10 fl oz	e		Super Tin 8 fl oz bdf
7 (CR+)	Manzate Prostick	2 lbs	abcdef		Topsin 10 fl oz b
	Proline	5.7 fl oz	a		Headline 9 fl oz c
	Super Tin	8 fl oz	bdf		Inspire XT 7 fl oz e
	Inspire XT	7 fl oz	c	21 (CR+)	Manzate Prostick 2 lbs acdef
	Lucento	5.5 fl oz	e		Minerva 13 fl oz a
8 (Trad)	Manzate Prostick	2 lbs	abcdef		Super Tin 8 fl oz bdf
	Proline	5.7 fl oz	a		Topsin 10 fl oz b
	Super Tin	8 fl oz	bdf		Headline 9 fl oz c
	Inspire XT	7 fl oz	c		Inspire XT 7 fl oz e
	Lucento	5.5 fl oz	e	22 (Trad)	Manzate Prostick 2 lbs acdef
9 (CR+)	Manzate Prostick	2 lbs	abcdef		Minerva 13 fl oz a
	Cuprofix Ultra	2 lbs	abcdef		Super Tin 8 fl oz bdf
10 (Trad)	Manzate Prostick	2 lbs	abcdef		Topsin 10 fl oz b
	Cuprofix Ultra	2 lbs	abcdef		Headline 9 fl oz c
11 (CR+)	Manzate Prostick	2 lbs	adf		Inspire XT 7 fl oz e
	Proline	5.7 fl oz	a		
	Super Tin	8 fl oz	bf		
	Topsin	10 fl oz	b		
	Inspire XT	7 fl oz	d		