CERCOSPORA LEAF SPOT CONTROL IN EASTERN NORTH DAKOTA AND MINNESOTA IN 2000

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Cercospora leaf spot, caused by the fungus *Cercospora beticola* Sacc. is the most serious leaf disease of sugarbeet (*Beta vulgaris* L.) in the production areas of North Dakota and Minnesota. This disease may cause reductions in tonnage and sucrose, and increase impurities. Losses as high as 30 percent in recoverable sucrose are fairly common under moderate disease conditions. Roots of diseased plants do not store in piles as well as roots of healthy plants. Limited tolerance to the triphenyl tin hydroxide (TPTH) fungicides was identified in the southern Red River Valley and southern Minnesota in 1994. This tolerance has increased in incidence and severity in the Red River Valley and southern Minnesota. Benzimidazole resistance is present in all production areas of North Dakota and Minnesota.

OBJECTIVES:

The research objectives of these trials were to evaluate the efficacy of labeled and experimental fungicides at controlling Cercospora leaf spot. These fungicides were applied alone, in tank mixes, or alternated at various application intervals to evaluate Cercospora leaf spot control. All 2000 test sites had known TPTH tolerance and benzimidazole resistance.

PROCEDURES:

Research was conducted at Crookston, Breckenridge, Maynard, and Renville, Minnesota. The cultural practices and application dates for each location are in **Table 1**. At all locations, plots were 11 feet wide (6-22 inches rows) and 35 feet long. The middle four rows received the fungicide applications. The middle two rows of each plot were harvested for yield and quality determinations. The Breckenridge and Crookston analysis were completed at the American Crystal Sugar Company Quality Tare Laboratory, East Grand Forks, MN. Southern Minnesota samples were analyzed at the Southern Minnesota Beet Sugar Cooperative Laboratory, Renville, MN. The experiments were all arranged in a randomized complete block design with four replications. At Crookston, three replications were analyzed. Cercospora leaf spot severity was rated on the KWS scale of 1 to 9. One indicates there is no disease, a rating of 3 indicates the early stages of economic loss level, and a rating of 9 indicates that the plants assessed have only new leaf growth, all earlier leaves being dead, and severe economic loss.

All sites were planted in April. All sites were affected by Cercospora leaf spot, with initial symptoms occurring around mid July. The fungicides tested in 2000 are listed in **Table 2**. The application interval for each treatment at each site is indicated in the tables for the respective sites.

RESULTS AND DISCUSSION:

(Note – The data in this trial represents one year of research and the fungicide treatments applied are for experimental purposes only, and do not always follow resistance management strategies necessary to protect the continued effectiveness of our current registered and experimental fungicides).
The effect of the treatments for Cercospora leaf spot control for the test sites are shown in Tables 3, 4, 5 and 6. **Please note** some treatments with TPTH exceeded the labeled amount to be applied for a growing season. Only 15 oz/A of TPTH is allowed per season. A Section 18 label was granted for Eminent 125 SL on sugarbeet for the 2000 cropping season. **Another Section 18 label for Eminent 125 SL on sugarbeet in North Dakota and Minnesota was requested for the 2001 cropping season**. Registration status of all other experimental fungicides for the 2001 cropping season is not known at this time.

Crookston:

Cercospora leaf spot progressed slowly after first detection on June 20 until August 28 when a rapid increase occurred and continued until harvest even though climatic conditions for this increase appeared unfavorable. All the fungicide treatments increased recoverable sucrose per acre and reduced the level of Cercospora leaf spot when compared to the untreated check (**Table 3**). Of the labeled fungicides, the Topsin + Penncozeb mixture followed by Eminent alternating with TPTH treatment provided fair control of Cercospora leaf spot with high recoverable sucrose per acre. Eminent (with a Section 18 label) gave consistent control and high recoverable sucrose per acre. The experimental compound, BAS 500, also gave good control if applied at the 0.15 lb a.i per acre rate. It should be noted the BAS 500 applied with Agridex at 1% v/v caused leaf necrosis at the first application on July 26 and the addition of Agridex was discontinued on subsequent applications. The amount of leaf necrosis increased with increasing rates of BAS 500.

Breckenridge:

Cercospora leaf spot progressed slowly after it was first detected on July 14. Disease pressure was fairly high during the season with the untreated check plots having a KWS Cercospora leaf spot rating of 7.9 at harvest (**Table 4**).

All treatments, except Quadris, Caramba, TPTH, and AgriTin applied in alternation with Eminent, resulted in significantly higher recoverable sucrose per acre than the untreated check. Of the labeled fungicides, the Topsin + Penncozeb mixture followed by Eminent alternating with TPTH treatment provided reasonable control of Cercospora leaf spot with high recoverable sucrose per acre. The most effective treatments were Eminent, Flint alternating with TPTH, and BAS 500 alternating with Eminent. There was some phytotoxicity when BAS 500 was applied

with Agridex COC in the first and second applications, resulting in Agridex COC not being used with BAS 500 in later applications. There was also some phytotoxicity with TPTH and Eminent applied on September 7.

Southern Minnesota:

Maynard and Renville:

Cercospora leaf spot damage was moderate to high resulting in untreated check plots having a 7.0 and 7.5 Cercospora leaf spot rating on the KWS scale when rated on September 22 at Maynard and Renville, respectively (**Table 5**). All treatments resulted in significantly higher recoverable sucrose per acre than the untreated check, and the treatment comprising of only 40 lbs of additional nitrogen. Of the labeled fungicides, the best treatments involved Eminent alternating with TPTH. No phytotoxicity was observed.

SUMMARY AND CONCLUSIONS

A. Registered Fungicides

1. The 5.0 oz/A TPTH rate should be used to manage TPTH tolerance with an application interval of 10-14 days at southern Minnesota and 14 days in the Red River Valley.

2. Using a single application of a mixture of benzimidazole (Topsin M) and a protectant (Penncozeb), followed by Eminent alternating with TPTH provided the best Cercospora leaf spot using labeled compounds at both Crookston and Breckenridge. However, this treatment was not as effective at Maynard and Renville, probably because of resistance of the pathogen to benzimidazole. Only one application of a benzimidazole fungicide in combination with a protectant fungicide should be used in the Red River Valley of North Dakota and Minnesota.

B. Experimental Fungicides

1. Some experimental fungicides consistently provided better Cercospora leaf spot control than the currently registered fungicides. The experimental fungicides that were most effective, alone or in combinations with other experimental or registered fungicides, include BAS 500 (with the addition of Agridex at Maynard and Renville), and Eminent.

C. Fungicide with Section 18 Label

1. The availability of Eminent (a Section 18 was granted for 2000 and a request was submitted to the EPA for another Section 18 label for the 2001 growing season) will enhance the ability of growers to control Cercospora leaf spot and better manage fungicide resistance. Alternating Eminent with other classes of fungicides is economical, provides better disease control, and delays the development of fungicide resistance.

D. Other Comments

1. The addition of an extra 40 lb/A of N_2 above the recommended level at cultivation in southern Minnesota did not improve Cercospora leaf spot control.

2. The first fungicide application should be made when conditions first favor the disease or at disease onset. If the first application is late, control will be difficult all season.

3. Use the recommended rates of fungicides to control Cercospora leaf spot.

4. Never use the same fungicide 'back-to-back'.

5. Alternate, alternate, alternate! Alternate different chemistry fungicides.

The following shows the fungicides used and their class of chemistry:

Strobilurin	**Sterol Inhibitor**	**Ethylenebisdithiocarbamates (EBDC)**
Quadris	Eminent	Maneb
Flint	RH-7592	Mancozeb
BAS 500	Caramba	Manzate
Stratego (Tilt + Flint)	Stratego (Tilt + Flint)	Penncozeb

Benzimidazole	**Triphenyltin Hydroxide (TPTH)**
Benlate	SuperTin
Topsin M	AgriTin

ACKNOWLEDGEMENTS:

Special thanks to the Sugarbeet Research and Education Board of Minnesota and North Dakota for funding of this research. The assistance of Charles Hotvedt at the American Crystal Quality Tare Laboratory at East Grand Forks is greatly appreciated. We are grateful to Mr. Doug Tischer at Breckenridge and our other cooperators at Maynard and Renville for allowing us to conduct research on their farms. Special thanks to Norman Cattanach, Jeff Nielsen and Todd Cymbaluk for their assistance in managing the research sites. Financial support from Elf Atochem, Novartis, BASF, Griffin, Zeneca, Sipcam, Du Pont, Agtrol, and Rohm and Haas is appreciated.

Table 1. Cultural Practices And Application Date Information For Cercospora Leaf Spot Trials In 2000

	Crookston	**Breckenridge**	**Maynard**	**Renville**
Planting Date	April 24	April 27	April 26	April 26
Previous Crop	Wheat	Wheat	Corn	Corn
Variety	HM Valley	HM Valley	Beta 4705	Beta 4705
Weed Control	Betamix –micro-rate	Betamix –micro-rate	Betamix –micro-rate	Betamix –micro-rate
	Betanex – m/rate	Betanex – m/rate	Betanex – m/rate	Betanex – m/rate
	Upbeet – m/rate	Upbeet – m/rate	Upbeet – m/rate	Upbeet – m/rate
	Stinger – m/rate	Stinger – m/rate	Stinger – m/rate	Stinger – m/rate
	Poast – m/rate	Poast – m/rate	Poast – m/rate	Poast – m/rate
	Oil – micro-rate	Oil – micro-rate	Oil – micro-rate	Oil – micro-rate
			Ammonia	Ammonia
	Hand labor	Hand labor	Hand labor	Hand labor
	Cultivation	Cultivation	Cultivation	Cultivation
Insecticide	Counter	Counter	None	None
Plant Population at Thinning	35,000 plant/A	35,000 plant/A	35,000 plant/A	35,000 plant/A
Spray Application	**Crookston**	**Breckenridge**	**Maynard**	**Renville**
1st	July 26	July 25	July 12	July 12
2nd	August 9	August 8	July 19	July 19
3rd	August 16	August 15	August 2	August 2
4th	August 22	August 22	August 5	August 5
5th	August 30	August 29	August 9	August 9
6th	September 7	September 7	August 16	August 16
7th			August 19	August 19
8th			August 23	August 23
9th			August 29	August 29
Spray Volume (gpa)	20.0	20.5	20	20
Spray Pressure (psi)	100	110	120	120
Rain and/or wet conditions may have occasionally kept application intervals from being exactly correct.				
Harvest Date	September 29	September 26	October 9	October 11

Table 2. Fungicides tested in 2000.

Fungicides	Status
Manzate	Registered
Benlate	Registered
Penncozeb	Registered
Topsin M	Registered
Super Tin, Agritin, Triphenyltin hydroxide (TPTH)	Registered
Quadris	Registered
Flint	Registered but not currently available
Eminent	Section 18 granted for 2000; request was submitted to EPA for 2001
Caramba	Experimental
Stratego	Experimental
Bas 500	Experimental
RH-7592	Experimental
YF 11393	Experimental

Table 3. Cercospora leaf spot control at Crookston in 2000 with registered and experimental fungicides.

Treatment and rate/A	App. Interval	CLS*	Recoverable Sucrose		Root Yield	Sucrose Content	LTM**
	(d)	22-Sep	(lb/A)	(lb/T)	(T/A)	(%)	(%)
BAS 500 2.09 EC 0.15 lb a.i / Eminent 125 SL 13 fl oz……..	14	1.8	9929	347	28.6	18.4	1.1
BAS 500 2.09 EC 0.15 lb a.i / SuperTin 80 WP 5 oz……	14	2.2	9791	352	27.8	18.7	1.1
Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 1) / Eminent 125 SL 13 fl oz (App 2, 4) / TPTH 80 WP 5 oz (App 3)….	14	3.0	9473	345	27.5	18.4	1.1
BAS 500 2.09 EC 0.15 lb a.i……..	14	1.8	9453	343	27.6	18.3	1.1
Eminent 125 SL 13 fl oz / BAS 500 2.09 EC 0.15 lb a.i……...	14	2.2	9308	336	27.7	17.9	1.1
BAS 500 2.09 EC 0.15 lb a.i…….	21	3.0	9257	331	28.0	17.7	1.1
Eminent 125 SL 13 fl oz (App 1) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……	14	2.5	9150	340	27.0	18.1	1.1
BAS 500 2.09 EC 0.20 lb a.i……..	14	2.2	9069	333	27.3	17.8	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)..…….	14	2.8	9057	333	27.0	17.8	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……	14	1.8	8978	333	27.0	17.8	1.1
Stratego 2.1 EC 10 fl oz / TPTH 80 WP 5 oz…….	14	2.0	8976	341	26.3	17.2	1.1
RH-7592 2F 8 oz + COC 1 pt ……	14	3.0	8903	339	26.3	18.1	1.2
Eminent 125 SL 13 fl oz (App 1, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…..……	14	3.5	8873	332	26.7	17.7	1.1
BAS 500 2.09 EC 0.40 lb a.i……..	14	1.7	8864	331	26.8	17.8	1.2
Eminent 125 SL 13 fl oz (App 1,4) / YF11393 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	3.3	8336	338	26.2	18.1	1.2
SuperTin 80 WP 5 oz / BAS 500 2.09 EC 0.15 lb a.i……	14	3.3	8698	335	26.0	18.0	1.2
Flint 50 WG 3 oz / TPTH 80 WP 5 oz……...	14	3.2	8686	337	25.8	18.1	1.2
Eminent 125 SL 13 fl oz (App 1,4) / Quadris 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…...……..	14	3.3	8614	333	25.9	17.8	1.1
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	21/14	3.7	8589	340	25.2	18.1	1.1
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14	2.8	8552	337	25.5	18.0	1.1
Caramba 90 SL 0.1 lb a.i……	14	4.7	8497	326	26.1	17.5	1.2
YF 11393 2.08 EC 0.15 a.i…….	14	4.0	8463	329	25.8	17.6	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Benlate 50 WP 0.5 lb + Manzate 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	3.0	8347	326	25.6	17.5	1.2
Agri-Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……	14	3.7	8269	330	25.1	17.7	1.2
Super Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……..	14	3.2	8084	325	24.9	17.5	1.2
Check……..		7.5	5974	310	19.4	16.7	1.2
LSD (P=0.05)		0.82	623	15.8	1.4	0.78	NS
CV%		16.32	4.32	2.88	3.35	2.67	9.9

*Cercospora leaf spot measured on KWS scale 1-9 (no leaf spot – dead outer leaves, inner leaves severely damaged, regrowth of new leaves)
**LTM: Sugar loss to molasses

Table 4. Cercospora leaf spot control at Breckenridge in 2000 with registered and experimental fungicides.

Treatment and rate/A	App. Interval	CLS*	Recoverable Sucrose		Root Yield	Sucrose Content	LTM**
	(d)	22-Sep	(lb/A)	(lb/T)	(T/A)	(%)	(%)
Flint 50 WG 3 oz / TPTH 80 WP 5 oz……..	14	2.4	10086	350	29.4	18.9	1.4
BAS 500 2.09 EC 0.15 lb a.i / Eminent 125 SL 13 fl oz……..	14	1.6	10073	338	29.0	19.0	1.3
Eminent 125 SL 13 fl oz (App 1, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)….	14	1.8	10002	353	28.2	19.3	1.4
BAS 500 2.09 EC 0.15 lb a.i……..	14	2.3	9994	346	29.5	18.7	1.3
BAS 500 2.09 EC 0.15 lb a.i…….	21	2.6	9922	354	28.6	19.0	1.3
SuperTin 80 WP 5 oz / BAS 500 2.09 EC 0.15 lb a.i……	14	3.9	9836	344	28.4	18.6	1.4
Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 1) / Eminent 125 SL 13 fl oz (App 2, 4) / TPTH 80 WP 5 oz (App 3)….	14	2.9	9800	341	29.4	18.4	1.4
Eminent 125 SL 13 fl oz (App 1,4) / YF11393 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	2.9	9775	353	25.2	19.0	1.3
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)..……	14	1.8	9730	351	28.2	19.0	1.3
Eminent 125 SL 13 fl oz (App 1,4) / Quadris 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…..……..	14	2.5	9727	335	29.8	18.3	1.5
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……	14	2.8	9704	328	28.7	18.7	1.4
Eminent 125 SL 13 fl oz (App 1,4) / Benlate 50 WP 0.5 lb + Manzate 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	2.4	9690	359	27.5	19.2	1.2
YF 11393 2.08 EC 0.15 a.i…….	14	3.5	9687	338	29.3	18.4	1.5
Super Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……..	14	2.9	9681	352	28.0	19.0	1.4
Stratego 2.1 EC 10 fl oz / TPTH 80 WP 5 oz…….	14	2.7	9654	356	27.6	19.1	1.3
Eminent 125 SL 13 fl oz (App 1) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)…….	14	2.3	9651	337	29.3	18.3	1.5
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	21/14	3.0	9632	349	28.1	18.8	1.3
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14	3.4	9565	335	29.2	18.2	1.4
Eminent 125 SL 13 fl oz / BAS 500 2.09 EC 0.15 lb a.i……...	14	2.4	9534	338	28.8	18.3	1.4
BAS 500 2.09 EC 0.15 lb a.i / SuperTin 80 WP 5 oz……	14	2.3	9468	340	28.4	18.4	1.5
BAS 500 2.09 EC 0.20 lb a.i……..	14	1.8	9299	322	30.0	17.6	1.5
BAS 500 2.09 EC 0.40 lb a.i……..	14	1.7	9286	314	30.3	17.3	1.7
RH-7592 2F 8 oz + COC 1 pt ……	14	3.3	9272	334	28.5	18.1	1.4
Agri-Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……	14	5.1	9008	341	27.1	18.6	1.5
Caramba 90 SL 0.1 lb a.i……	14	4.5	8963	329	27.9	17.9	1.4
Check……..		7.9	8288	325	26.1	17.9	1.7
LSD (P=0.05)		1.3	956.2	34.7	2.4	1.5	0.3
CV%		30.8	7.06	7.23	5.8	5.6	15.4

*Cercospora leaf spot measured on KWS scale 1-9 (no leaf spot – dead outer leaves, inner leaves severely damaged, regrowth of new leaves)
**LTM: Sugar loss to molasses

Table 5. Cercospora leaf spot control at Maynard in 2000 with registered and experimental fungicides.

Treatment and rate/A	App. Interval	CLS[1]	Recoverable Sucrose		Root Yield	Sucrose Content	LTM[2]
	(d)	22-Sep	(lb/A)	(lb/T)	(T/A)	(%)	(%)
Eminent 125 SL 13 fl oz + 10 lb N_2 (28%) / TPTH 80 WP 5 oz + 10 lb N_2 (28%)…….....…….	14/10	3.8	10007	345	29.0	18.3	1.1
Eminent 125 SL 13 fl oz (App 1, 5) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……..	14/10/14	3.5	9486	339	28.0	18.1	1.1
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14/10	3.0	9441	342	27.6	18.2	1.1
Eminent 125 SL 13 fl oz / BAS 500 2.09 EC 0.15 lb a.i.……...	14	2.7	9387	344	27.3	18.3	1.1
YF 11393 2.08 EC 0.15 a.i.……	14	3.5	9384	337	27.9	18.0	1.1
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14	2.8	9369	345	27.2	18.3	1.1
BAS 500 2.09 EC 0.15 lb a.i / Eminent 125 SL 13 fl oz……..	14	2.5	9280	346	26.8	18.4	1.1
Super Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……..	14	3.3	9263	335	27.7	17.9	1.2
BAS 500 2.09 EC 0.40 lb a.i……..	14	2.8	9230	341	27.0	18.2	1.2
Eminent 125 SL 13 fl oz (App 1, 4) / YF 11393 2.08 EC 0.15 a.i (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	3.2	9131	344	26.5	18.3	1.1
Eminent 125 SL 13 fl oz (App 1) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……..	14	2.7	9121	346	26.4	18.3	1.1
BAS 500 2.09 EC 0.15 lb a.i……..	14	3.0	9114	344	26.5	18.3	1.1
BAS 500 2.09 EC 0.15 lb a.i…….	21	3.7	9097	338	26.9	18.0	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)..…….	14	3.8	8980	336	26.7	17.9	1.1
BAS 500 2.09 EC 0.20 lb a.i……..	14	3.0	8951	342	26.1	18.2	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……	14	3.3	8921	345	25.9	18.4	1.1
Flint 50 WG 3 oz / TPTH 80 WP 5 oz……..	14	3.5	8864	338	26.2	18.0	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Benlate 50 WP 0.5 lb + Manzate 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	4.7	8863	332	26.7	17.7	1.1
Eminent 125 SL 13 fl oz (App 1, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)….……	14	3.0	8783	345	25.5	18.3	1.1
SuperTin 80 WP 5 oz / BAS 500 2.09 EC 0.15 lb a.i.……	14	3.0	8747	346	25.3	18.3	1.1
Eminent 125 SL 13 fl oz (App 1,4) / Quadris 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…...……..	14	3.0	8699	343	25.4	18.2	1.1
Stratego 2.1 EC 10 fl oz / TPTH 80 WP 5 oz……	14	4.5	8634	335	25.7	17.8	1.1
BAS 500 2.09 EC 0.15 lb a.i / SuperTin 80 WP 5 oz……	14	3.0	8547	345	24.8	18.3	1.1
Caramba 90 SL 0.1 lb a.i.……	14	4.0	8462	336	25.2	17.9	1.1
Agri-Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……	14	2.5	8432	346	24.4	18.5	1.2
Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 1) / Eminent 125 SL 13 fl oz (App 2, 4) / TPTH 80 WP 5 oz (App 3)….	14	4.5	8412	335	25.1	17.8	1.1
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	21/14	4.7	8135	328	24.8	17.5	1.1
(+ 40 lb N_2)[3] Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14/10	3.3	8118	340	23.9	18.1	1.1
RH-7592 2F 8 oz + COC 1 pt ……	14	4.3	7986	331	24.1	17.7	1.1
+ 40 lb N_2[3]……		6.8	6743	271	24.9	14.7	1.2
Untreated Check……..		7.0	6109	265	23.2	14.5	1.2
LSD (P=0.05)		0.8	915	11	2.6	NS	0.1
CV%		16.7	9.2	2.9	8.7	2.6	7.94

[1]Cercospora leaf spot measured on KWS scale 1-9 (no leaf spot – dead outer leaves, inner leaves severely damaged, regrowth of new leaves)
[2]LTM: Sugar loss to molasses
[3]Applied on 19 July

Table 6. Cercospora leaf spot control at Renville in 2000 with registered and experimental fungicides.

Treatment and rate/A	App. Interval	CLS[1]	Recoverable Sucrose		Root Yield	Sucrose Content	LTM[2]
	(d)	22-Sep	(lb/A)	(lb/T)	(T/A)	(%)	(%)
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14	4.2	9000	356	25.3	18.8	0.99
BAS 500 2.09 EC 0.15 lb a.i……..	14	4.3	8947	366	24.4	19.3	0.98
Eminent 125 SL 13 fl oz / BAS 500 2.09 EC 0.15 lb a.i……...	14	3.8	8865	355	25.0	18.7	0.99
Agri-Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……	14	3.5	8852	356	24.8	18.8	0.99
BAS 500 2.09 EC 0.15 lb a.i / Eminent 125 SL 13 fl oz……..	14	4.2	8561	351	24.4	18.6	0.99
Stratego 2.1 EC 10 fl oz / TPTH 80 WP 5 oz……	14	4.0	8480	353	24.0	18.7	0.99
Super Tin 80 WP 5 oz / Eminent 125 SL 13 fl oz……..	14	4.8	8473	351	24.2	18.5	1.0
Eminent 125 SL 13 fl oz (App 1, 5) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……...	14/10/14	4.7	8457	347	24.4	18.4	1.0
Eminent 125 SL 13 fl oz (App 1, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)….	14	4.2	8335	350	23.8	18.5	1.0
(+ 40 lb N_2)[3] Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14/10	4.2	8334	346	24.1	18.3	1.0
Flint 50 WG 3 oz / TPTH 80 WP 5 oz……...	14	4.2	8313	352	23.6	18.6	1.0
BAS 500 2.09 EC 0.15 lb a.i / SuperTin 80 WP 5 oz……	14	4.5	8301	347	23.9	18.4	1.0
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	14/10	4.0	8287	356	23.3	18.8	1.0
Eminent 125 SL 13 fl oz + 10 lb N_2 (28%) / TPTH 80 WP 5 oz + 10 lb N_2 (28%)……...…….	14/10	4.7	8168	346	23.7	18.3	1.0
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……	14	4.0	8086	346	23.4	18.3	1.0
BAS 500 2.09 EC 0.15 lb a.i…….	21	4.7	8060	359	22.4	18.9	1.0
BAS 500 2.09 EC 0.40 lb a.i……..	14	3.7	8055	351	22.9	18.5	1.0
SuperTin 80 WP 5 oz / BAS 500 2.09 EC 0.15 lb a.i……	14	4.2	7987	346	23.1	18.3	1.0
BAS 500 2.09 EC 0.20 lb a.i……..	14	4.7	7963	360	22.1	19.0	1.0
Eminent 125 SL 13 fl oz / TPTH 80 WP 5 oz……	21/14	5.3	7952	349	22.9	18.4	1.0
RH-7592 2F 8 oz + COC 1 pt ……	14	4.7	7833	350	22.4	18.5	1.0
Eminent 125 SL 13 fl oz (App 1) / TPTH 80 WP 5 oz (App 2, 4) / BAS 500 2.09 EC 0.15 lb a.i (App 3)……...	14	4.0	7758	350	22.2	18.5	1.0
YF 11393 2.08 EC 0.15 a.i…….	14	4.7	7653	347	22.1	18.3	1.0
Caramba 90 SL 0.1 lb a.i……	14	4.5	7629	362	21.1	19.1	1.0
Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 1) / Eminent 125 SL 13 fl oz (App 2, 4) / TPTH 80 WP 5 oz (App 3)….	14	4.7	7585	345	22.0	18.2	1.0
Eminent 125 SL 13 fl oz (App 1,4) / Quadris 2.08 SC 0.15 lb a.i (App 2) / TPTH 80 WP 5 oz (App 3)…..……..	14	4.7	7392	340	21.8	18.0	1.0
Eminent 125 SL 13 fl oz (App 1,4) / Topsin M 70 WSB 0.5 lb + Penncozeb 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)..…….	14	4.8	7328	340	21.6	18.0	1.0
Eminent 125 SL 13 fl oz (App 1,4) / Benlate 50 WP 0.5 lb + Manzate 75DF 2.0 lb (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	5.5	7232	336	21.6	17.8	1.0
Eminent 125 SL 13 fl oz (App 1, 4) / YF 11393 2.08 EC 0.15 a.i (App 2) / TPTH 80 WP 5 oz (App 3)…….	14	5.2	6904	332	20.7	17.7	1.0
+ 40 lb N_2[3]……		7.0	5152	307	16.8	16.5	1.12
Untreated Check……..		7.5	4998	308	16.3	16.5	1.1
LSD (P=0.05)		0.9	872	13	2.3	0.6	0.02
CV%		16.4	9.7	3.3	8.9	3.0	2.08

[1]Cercospora leaf spot measured on KWS scale 1-9 (no leaf spot – dead outer leaves, inner leaves severely damaged, regrowth of new leaves)
[2]LTM: Sugar loss to molasses
[3]Applied on 19 July