

Impact of fungicide application timing on *Cercospora beticola* latent infection, symptom development, and fungicide resistance profiles

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Introduction

Cercospora leaf spot (CLS, Figure 1), caused by the fungus, *Cercospora beticola*, continues to limit sugarbeet yields and economic returns for growers and cooperatives in North Dakota and Minnesota.

Multiple factors contribute to the severity of CLS in sugarbeet each year, including selection of tolerant varieties, timely use of preventative fungicides, and temperature and moisture conditions. Given the inherent variability in the success of cultural practices, such as crop rotation and residue management, and weather conditions in and around the sugarbeet canopy, fungicide applications play a key role in management of CLS.

Two to six fungicide applications to control CLS may be made in a typical season, depending on the date of onset of disease symptoms and how conducive the environment is to spore germination and infection.

Objective

Assess different fungicide program start dates and spray intervals to improve control of CLS and improve recoverable sugar per acre (RSA)



Figure 1. Tan-colored CLS lesions on a sugarbeet leaf

Materials and Methods

Replicated small-plot field trials were conducted at near Foxhome in Wilkin County, MN. Both a CR+ (2-year CLS rating = 2.03) and non-CR+ (2 year CLS rating = 4.9) sugarbeet variety (Brantner et al. 2024) were evaluated in separate, adjacent trials. Planting occurred on April 23, 2024. Fungicide programs began at various times (Table 1) but used the same active ingredients (Table 2).

- Trials were inoculated on July 10th with 18 grams per plot of ground-leaf CLS inoculum (mixed 2:1 with talc)
- Six leaves per plot were rated for CLS severity on July 26, August 9, September 5, and September 20.
- Harvest and final data collection (final stand count, yield, percent sugar) occurred on September 25.
- Latent CLS detections via digital droplet PCR in collaboration with Wyatt lab at USDA-ARS in Fargo, ND.

Table 1. Fungicide programs to control *Cercospora* leaf spot evaluated in small-plot replicated field trials in 2024. Treatments that differed by fungicide application timing (both program start date and application interval). Final applications of each treatment was made on September 10.

Treatment	Program start date	Interval	Number of applications
1	Mid June (6/14)	10-14 days ¹	6
2	Late June (6/28)	10-14 days	5
3	Late June (6/28)	based on DIV ²	4
4	Late June (6/28)	10-14, then 21-28 days ³	4
5	Early July (7/12)	10-14 days	4
6	Early July (7/12)	10-14, then 21-28 days	3
7	Early July (7/12)	Based on DIV	3
8	Disease onset (7/29)	10-14 days	3
9	3-5% CLS severity (8/12)	10-14 days	2
10	Nontreated check	-	0

¹“Standard interval”

²DIV = Daily Infection Value

³“Extended interval”

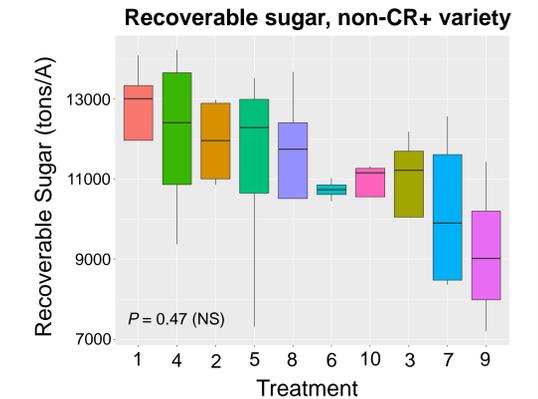
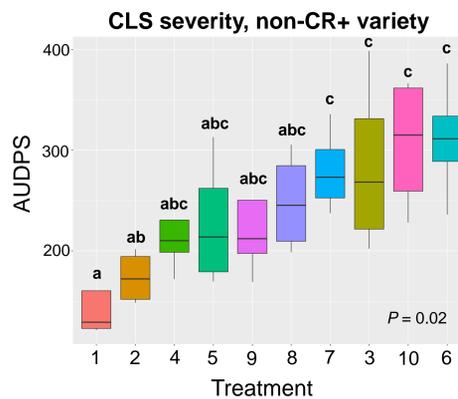
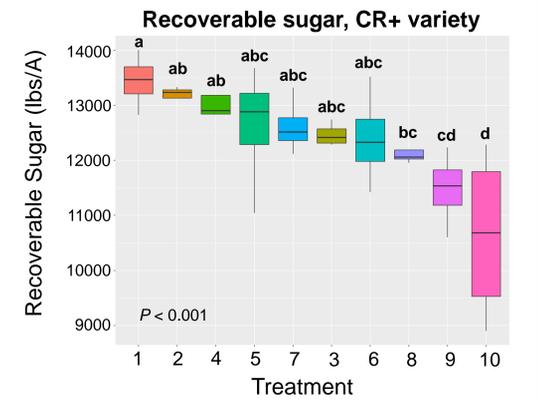
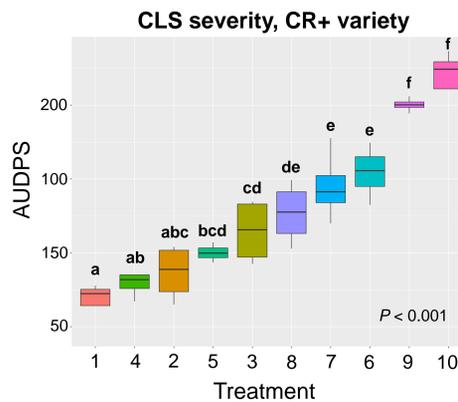
Table 2. The same fungicide modes of action and tank mix partners were used for all treatments in this trial. Treatments with later fungicide program start dates did not use all six applications.

Application	Mode(s) of action	Product (Rate/Acre)
1 st	EBDC	Koverall (2 lbs)
2 nd	DMI (tetraconazole) + EBDC	Minerva (13 fl oz) + Koverall (2 lbs)
3 rd	Tin + EBDC	Super Tin (8 fl oz) + Koverall (2 lbs)
4 th	DMI (difenoconazole, Propiconazole) + EBDC	Inspire XT (7 fl oz) + Koverall @ 2 lbs
5 th	Tin + EBDC	Super Tin (8 fl oz) + Koverall (2 lbs)
6 th	Copper + EBDC	Badge SC (2 pt) + Koverall (2 lbs)

References

Brantner et al. 2024. *Sugarbeet Research and Extension Reports* 54:208-239. <https://www.sbreb.org/wp-content/uploads/2024/08/2024-08-20-Brantner-et-al.-Sugarbeet-Research-and-Extension-Reports-54-208-239.pdf>
Windels et al. 1998. *Plant Dis.* 82:716-726. DOI: 10.1094/PDIS.1998.82.7.716.

Effect of Program Timing on CLS Severity and Recoverable Sugar per Acre



Program Start / Application Interval¹

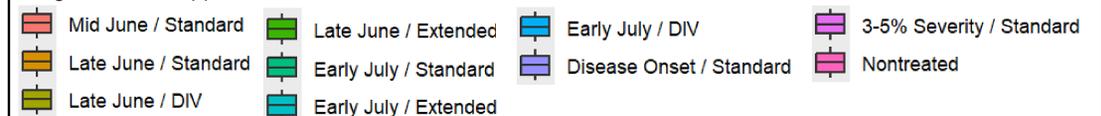


Figure 2. Field trials near Foxhome in Wilkin County, MN were conducted to evaluate the effect of fungicide program start date and application interval on *Cercospora* leaf spot control in sugarbeet. Recoverable sugar from the trials is also shown. All treatments were applied to one CR+ and one non-CR+ sugarbeet variety in separate trials.

¹ Standard = 10-14 day interval between applications, Extended = 10-14 day interval, then 21-28 days, DIV = applications made when indicated by Daily Infection Value.

Conclusions and Future Work

Starting fungicide programs in mid June or Late June resulted in improved control of CLS and increased recoverable sugar compared to the nontreated control plots (Figure 2).

- Both mid June and late June dates were prior to row closure
- Results indicate that beginning fungicide applications **prior to row closure** and keeping **10-14 day spray intervals** is optimal for both CR+ and non-CR+ sugarbeet.

Latent detection dates varied (Table 3).

Analysis of fungicide resistance DNA markers is ongoing.

Table 3. Date of first detection of *Cercospora beticola* DNA within leaf tissue. Six leaves were sampled per plot prior to each fungicide application replicates.

Treatment	Date of first latent <i>C. beticola</i> detection	
	CR+	non-CR+
1	June 25	June 14
2	June 25	July 12
3	June 14	July 12
4	June 25	July 12
5	June 25	July 12
6	July 26	June 14
7	June 25	July 12
8	July 26	July 12
9	July 12	July 12
10	July 12	July 12

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