

## **Early detection of *Cercospora beticola* asymptomatic infection in commercial sugarbeet fields in 2025**

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*Cercospora* leaf spot (CLS) on sugarbeet, caused by the fungus *Cercospora beticola*, is a devastating leaf spot disease of sugar beet that is endemic in the Red River Valley (RRV) of Minnesota and North Dakota. CLS severity varies with environmental conditions and causes serious economic losses if not managed. Management of CLS relies on a combination of crop rotation, cultural practices, resistant cultivars, and timely fungicide applications. In the RRV, *C. beticola* has developed decreased sensitivity at varying levels to all fungicides used with the sole exception being the ethylene bisdithiocarbamate (EBDC) fungicides.

Timing of fungicide applications, especially the first application is highly variable and subsequent fungicide applications are often based on daily infection values (DIVs) calculated from relative humidity and temperature in the region. As DIVs increase, disease favorability increases, and fungicide applications are recommended when a threshold is reached. Results from field surveys of asymptomatic leaf samples from commercial sugarbeet fields show that CLS infection is occurring earlier and at wider prevalence than previously thought. Since 2021, annual surveys of CLS infection detection have been facilitated via molecular assays that detect the presence of *C. beticola* growing asymptotically in sugarbeet fields. Here we present the results of this survey in 2025.

### **OBJECTIVES**

- 1) Detect the onset of CLS asymptomatic infection across the entire RRV growing region.

### **METHODS AND MATERIALS**

From 2021 - 2025, with financial support of the Sugarbeet Research and Extension Board of MN and ND, we tested samples collected for 5-6 weeks from 280 commercial sugarbeet fields in MN and ND. Agriculturalist staff from the region were asked to collect five leaf samples from seven fields weekly to be mailed or dropped off to the USDA-ARS Sugarbeet and Potato Research Unit located in Fargo, ND. Upon sample arrival, leaves are hole punched for a total of 10 leaf disks from each of the five leaves submitted per field location. These leaf punches are batch processed as a single sample for DNA extraction using a KingFisher™ Flex Purification System (ThermoFisher: 5400630) with the sbeadex™ plant nucleic acid purification kit (LGC: NAP41620) after freeze drying samples. Sample DNA is then subjected to qPCR assays designed to detect the G143A mutation associated with Strobilurin fungicide resistance (Bolton et al. 2013), The E170 and L144F mutations associated with Triazole fungicide resistance (Spanner et al. 2021, Shrestha et al. 2022), and the E198A mutation associated with Benzimidazole fungicide resistance. A probe designed to detect the wild type at the G143A locus is also incorporated to ensure that *C. beticola* DNA is detected in either of the two forms this mutation is present as. Results from each weekly sample set and assay batches are compiled into weekly reports and distributed back to the regional sugar cooperatives.

### **RESULTS AND DISCUSSION**

Detection of latent CLS infection steadily rose as the sampling season progressed (Figure 1). In each of 2021 – 2025, the frequency of latent CLS detected in submitted samples approached 100% during the first week of July, approximately corresponding to row closure events. These results have been used to inform best practices for the start of CLS fungicide management. By looking at historical data on recoverable sucrose for fields with different fungicide management start dates, a clear trend of earlier applications correlating with higher recoverable sucrose presents itself (Figure 2). On average, fields that had fungicide applications the week prior to 100% asymptomatic CLS infection produced the most sugar and waiting just one additional week lead to a drop of 4% in recoverable sucrose per acre on average. This trend was more pronounced in years with higher CLS pressure as exemplified by data from the year 2020 (Figure 2).

## **SUMMARY**

Across five sampling years, a pattern of latent CLS progression has been observed, leading to near 100% prevalence of CLS detection just prior to or at sugarbeet row closure. These results have implications for the initial timing of fungicide applications for CLS management. Control of primary infection is paramount to mitigate the exponential increase in inoculum levels that can occur when CLS symptoms begin to arise. Data collected across multiple growing seasons has revealed that growers who apply fungicides prior to or at row closure have experienced the highest recoverable sucrose relative to those who wait until symptoms arise. This data adds to the robust evidence that management of the primary infection is paramount in CLS management.

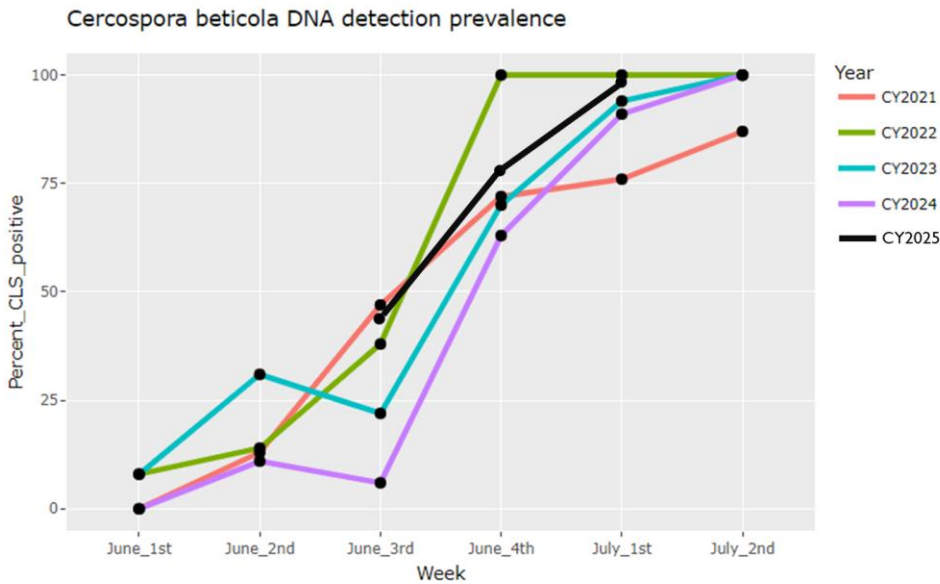
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**Figure 1:** Prevalence of latent CLS detection in years 2021, 2022, and 2023 across sampling weeks. Sampling week 5 (W5) corresponds to the first week in July.



**Figure 2:** Average recoverable sucrose per acre (RSA) in commercial sugarbeet fields. Fields were binned into weekly bins based on the week in which fungicide applications began. Each yearly dataset was normalized by setting the highest value to 100 and applying a relative score to the highest value. Each additional week is shown as the relative percent compared to the best. On average the best weekly bin was the fourth week of June. The colored lines show the annual results for each year 2020 – 2024. Each bar has a numerical designation in white which represents the average performance of each weekly bin across the years examined.

