Cercospora Leaf Spot Inoculum Reduction Trial

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Introduction: Cercospora Leaf Spot (CLS) is the most destructive foliar disease to impact sugar beet production in the SMBSC growing area. The increased presence of CLS in fields in recent years has led to a buildup of inoculum from one year to the next. The inoculum overwinters and generally persists in the soil for up to two years. Practicing a crop rotation of 3 to 4 years allows enough time for the inoculum to break down in the soil, but sugar beet fields planted along a common line to last years' sugar beet field could be exposed to high levels of inoculum early in the season.

Objective: A reduction in the amount of inoculum along common lines could slow disease development during the next growing season and decrease selection pressure on other methods of controlling the disease. Methods to reduce the amount of inoculum and slow the onset of disease development need to be explored.

Materials and Methods: A trial was conducted as a randomized complete block with four replications on a trial site near Renville that was planted to sugar beets in 2020. The beets were defoliated in the fall of 2020, but no tillage or harvest took place in the field. Since the site was previously sugar beets with a high infection of CLS, it was assumed there were ample levels of inoculum on the soil surface. Four methods for reducing CLS inoculum were tested in this trial using small plots 6 rows wide and 35 feet long (Table 1). Treatment 1 was the untreated check. Treatment 2 used Oxidate 2.0 (peroxyacetic acid) applied to the soil surface through a bike sprayer at 20gpa. The plots in Treatment 3 were tilled with a rotary tiller in the spring prior to planting to a depth of 4 inches to bury the residue. These tilled plots were raked by hand to create a firm seed bed for planting. Treatment 4 used Badge SC (copper product) at a low pH applied through a bike sprayer at 20gpa to the soil surface. Treatment 5 used propane to burn the residue and potentially destroy the overwintering spores. After treatments were applied to the trial area, Crystal M977 was planted at a high population (109,000 seeds/acre) without any additional seedbed preparation on May 12th. The trial was maintained weed free using normal best management practices. No fungicides were applied during the season to control CLS. Plots were rated for foliar damage using the KWS (Kleinwanzlebener Saatzucht) (1-9) scale with one being disease free and nine being completely necrotic. Foliar ratings began on July 12 and continued three times per week until the CLS infection overwhelmed the trial and the differences between treatments. Ratings were conducted by multiple raters and the average of those ratings are reported for each date (Table 2).

Trt #	Treatment Description
1	Untreated
2	Oxidate 2.0 (2.5% conc.)
3	Tilled (4” deep)
4	Badge SC (4pts.) + N-tense
5	Heat (propane burner)

Table 1: Treatments used to reduce the carry-over of CLS inoculum.

Results: The application of heat/burning of residue and the use of tillage to bury the inoculum significantly delayed the onset of CLS disease development in the 2021 trial (Table 2 and Figure 1). The Oxidate 2.0 and Badge SC treatments did not appear to impact the onset of disease in the 2021 trial and were not significantly different than the untreated check. These results are similar to the results from the 2019 and 2020 Inoculum Reduction Trials (Figures 2 and 3). The differences between the treatments were more pronounced in the 2021 season as the trial was conducted using a larger plot size. This larger plot size also maintained the treatment differences longer into the season. In smaller plots in 2019 and 2020 the treatment effects only lasted for a short period of time before adjacent treatments impacted the level of disease. After three years of testing with similar results we can conclude that the application of heat/burning of residue and burying the residue are both methods to reduce or delay the onset of disease. It may not be practical or economical to conduct these treatments across all acres, but it may be beneficial in areas where beets will be planted adjacent to the previous year's beets that had difficulty controlling the disease.

	Date of Rating								
Treatment	**12-Jul**	**14-Jul**	**16-Jul**	**19-Jul**	**21-Jul**	**23-Jul**	**26-Jul**	**30-Jul**	**2-Aug**
Untreated	4.6 a	5.4 a	5.9 a	6.9 a	7.4 a	7.5 a	8.1 a	8.8 a	9.0 a
Oxidate 2.0	4.2 a	5.2 a	5.8 a	6.5 a	7.0 a	7.3 a	8.0 a	8.8 a	9.0 a
Tilled	2.3 b	2.9 b	3.7 b	4.5 b	5.1 c	4.7 c	5.4 c	6.2 b	7.3 b
Badge SC	4.4 a	5.4 a	5.8 a	6.6 a	7.1 a	7.5 a	8.0 a	8.7 a	9.0 a
Heat	2.6 b	3.3 b	3.9 b	4.9 b	5.6 b	5.3 b	5.8 b	6.5 b	7.6 b
Mean	3.6	4.4	5.0	5.9	6.4	6.4	7.1	7.8	8.4
CV	8.367	6.5	5.7	5.7	4.7	3.9	2.3	2.6	3.2
Pr>F	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
lsd (0.05)	0.47	0.44	0.44	0.51	0.47	0.39	0.25	0.31	0.41

Table 2: Foliar ratings using KWS (1-9) scale. Ratings are an average of all raters for each date.

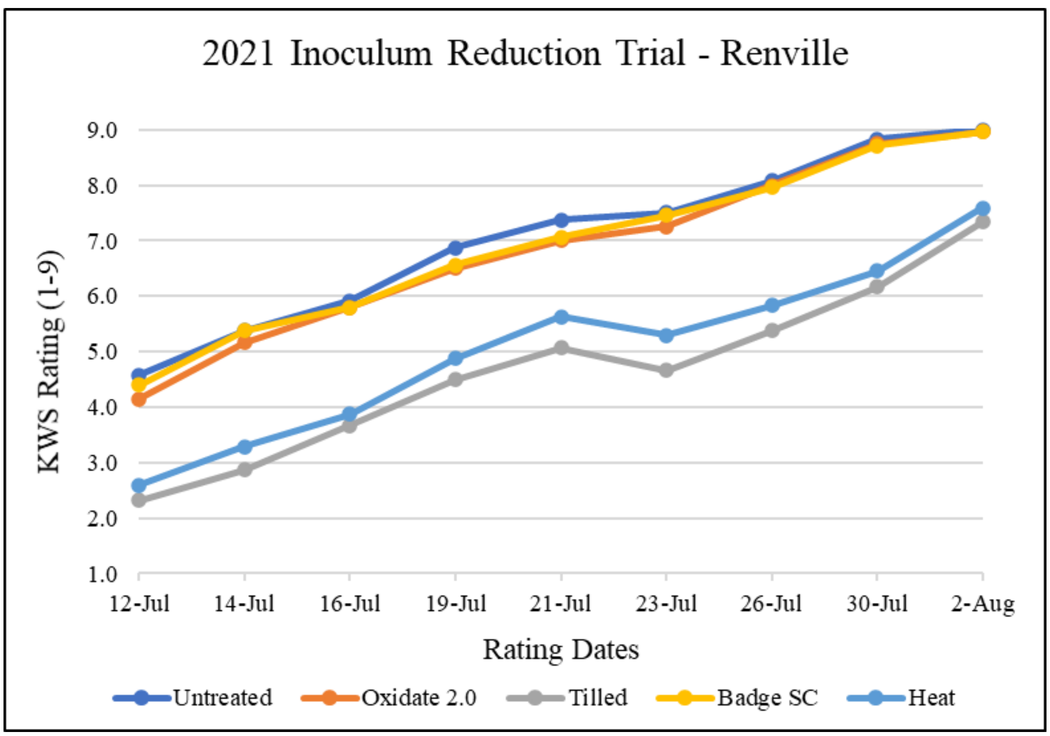

Figure 1: 2021 foliar ratings using KWS (1-9) scale. Ratings are an average of all raters for each date.

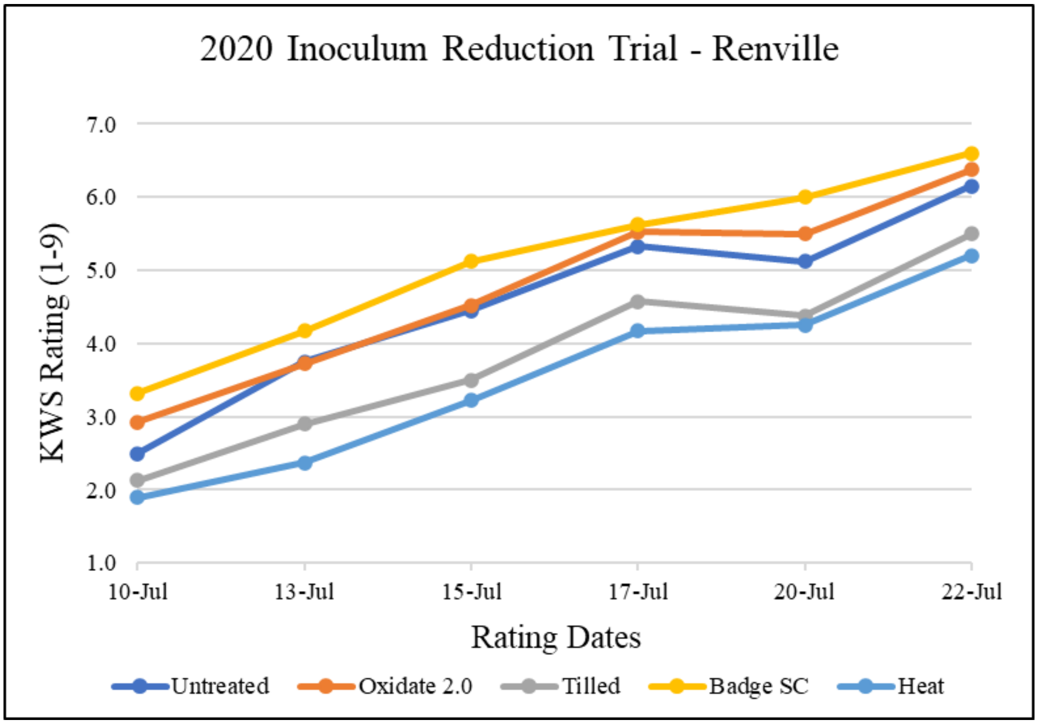

Figure 2: 2020 foliar ratings using KWS (1-9) scale. Ratings are an average of all raters for each date.

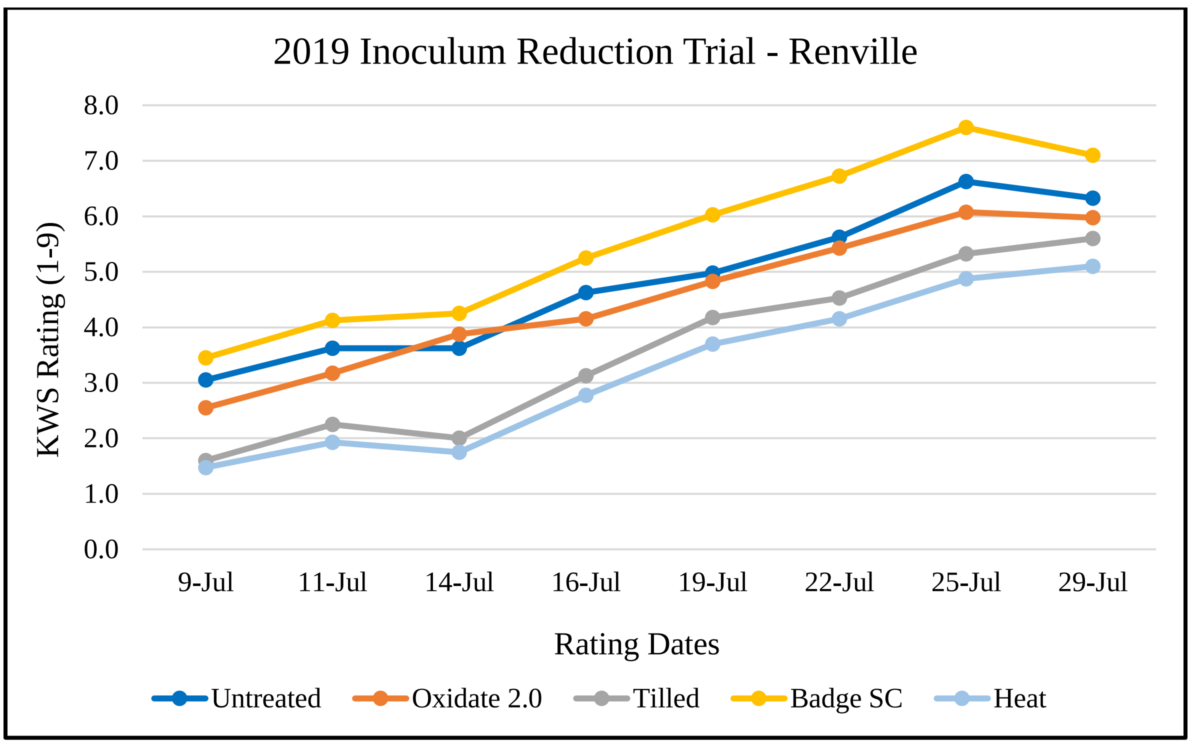

Figure 3: 2019 foliar ratings using KWS (1-9) scale. Ratings are an average of all raters for each date.