

EFFICACY OF FUNGICIDES MIXED WITH GLYPHOSATE FOR CONTROLLING *CERCOSPORA* LEAF SPOT AND PHYTOTOXICITY ON SUGARBEET

Mohamed F. R. Khan¹ and Peter Hakk²

¹Extension Sugarbeet Specialist, North Dakota State University & University of Minnesota

²Research Technician, Plant Pathology Department, North Dakota State University

Cercospora leaf spot, caused by the fungus *Cercospora beticola* Sacc., is the most economically damaging foliar disease of sugarbeet in Minnesota and North Dakota. The disease reduces root yield and sucrose concentration and results in reduced extractable sucrose. Commercial sugarbeet production typically requires fungicide applications to obtain acceptable levels of protection against *Cercospora* leaf spot under moderate and high disease severity. Most growers produce Roundup Ready sugarbeet and typically use two glyphosate applications for effective weed control. In some one glyphosate application may become necessary in July around the same time growers need to control *Cercospora* leaf spot.

The objective of this research was to evaluate the efficacy of fungicides alone or in mixtures used in rotation mixed with glyphosate in the first application to control *Cercospora* leaf spot and safety on sugarbeet.

MATERIALS AND METHODS

A field trial was conducted at Foxhome, MN in 2013. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 30-foot long rows spaced 22 inches apart. Plots were planted on 14 May with Beta 89RR10. Seeds were treated with Tachigaren (45 g/kg seed) and Nipsit. Seed spacing within the row was 4.7 inches. Weeds were controlled with three applications (7 June, 1 July and 9 August) of glyphosate. Plots were inoculated on 19 July with grounded *C. beticola* inoculum.

Fungicide spray treatments were applied with a CO₂ pressurized 4-nozzle boom sprayer with 11002 TT TwinJet nozzles calibrated to deliver 17 gpa of solution at 60 p.s.i pressure to the middle four rows of plots. Quadris was applied to all plots on 7 June; other fungicide treatments were initiated on 25 July. Treatments were three fungicide applications on 25 July, 8 and 21 August. Glyphosate, when used was added to the fungicide on 25 July. Treatments were applied at rates indicated in Table 1.

Cercospora leaf spot severity was rated on the leaf spot assessment scale of 1 to 10. A rating of 1 indicated the presence of 1- 5 spots/leaf or 0.1% disease severity and a rating of 10 indicated 50% or higher disease severity. *Cercospora* leaf spot severity was assessed during the season. The rating done on 29 August is reported.

Plots were defoliated mechanically and harvested using a mechanical harvester on 9 October. The middle two rows of each plot were harvested and weighed for root yield. Twelve to 15 representative roots from each plot, not including roots on the ends of the plot, were analyzed for quality at the American Crystal Sugar Company Quality Tare Laboratory, East Grand Forks, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

Environmental conditions were not favorable for development of *C. beticola* until late July when first symptoms were observed. Fungicide treatments were initiated on 25 July. In the non-treated check, *Cercospora* leaf spot progressed slowly because of cold conditions in July and limited rainfall in August, reaching economic injury level until after the rains came in early September. Disease severity progressed rapidly in the non-treated check and by the end of September had a *Cercospora* leaf spot rating of 8 which was significantly greater than the fungicide treatments (Table 1). All fungicide treatments, including those with glyphosate in the first application, resulted in significantly greater tonnage and recoverable sucrose than the non-treated check. Treatments where TPTH was mixed with a triazole in the first application resulted in similar disease control on recoverable sucrose as treatments where TPTH was used with Topsin in the first application. Likewise, the use of glyphosate with fungicides did not

impact disease control, yield and quality compared to fungicide treatments where it was not used. There were no phytotoxicity symptoms on any of the treatments which indicated it was safe to use glyphosate with fungicides tested. These results suggests that growers may be able to reduce production cost by combining glyphosate for weed control that may be necessary later in the season with fungicides and thus avoid an extra trip across the field.

Table 1. Effect of fungicides with and without glyphosate on Cercospora leaf spot control, and sugarbeet yield and quality at Foxhome, MN in 2013

| Treatment and rate/A | App. Interval (days) | C I S* | Root yield (t/A) | Sucrose concentration(%) | Recoverable sucrose | |
|--|-------------------------|--------|---------------------|-----------------------------|---------------------|--------|
| | | | | | (lb/t) | (lb/A) |
| Inspire XT 5.6 fl oz + Agri Tin 6 fl oz + Roundup 22 fl oz + Npak 2.5% v/v/ Agri Tin 6 fl oz + Topsin 7.6 fl oz/ Headline 9 fl oz | 14 | 4.0 | 26.3 | 17.7 | 331 | 8,694 |
| Agri Tin 6 fl oz + Topsin 7.6 fl oz/ Headline 9 fl oz/ Agri Tin 8 fl oz | 14 | 3.0 | 25.7 | 17.7 | 331 | 8,501 |
| Proline 5 fl oz + NIS 0.125% v/v + Agri Tin 6 fl oz/ Agri Tin 6 fl oz + Topsin 7.6 fl oz/ Headline 9 fl oz | 14 | 3.0 | 25.5 | 17.9 | 334 | 8,508 |
| Inspire XT 5.6 fl oz + Agri Tin 6 fl oz/ Agri Tin 6 fl oz + Topsin 7.6 fl oz/ Headline 9 fl oz | 14 | 3.0 | 25.0 | 17.9 | 334 | 8,369 |
| Agri Tin 6 fl oz + Topsin 7.6 fl oz + Roundup 22 fl oz + Npak 2.5% v/v/ Inspire XT 5.6 fl oz + Agri Tin 6 fl oz/ Headline 9 fl oz | 14 | 4.0 | 25.8 | 17.7 | 331 | 8,521 |
| Nontreated check | - | 8.3 | 21.3 | 17.0 | 314 | 6,680 |
| LSD (P=0.05) | - | - | - | - | - | - |

*Cercospora leaf spot measured on 1-10 scale (1 = 1-5 spots/leaf or 0.1% severity and 10 = 50% severity) on September 30.