

EFFICACY OF MIXTURES OF GLYPHOSATE AND FUNGICIDES FOR CONTROLLING CERCOSPORA LEAF SPOT ON SUGARBEET

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In 2008, glyphosate-tolerant sugarbeet seeds became commercially available for widespread use in all sugar producing states except California, in the United States. Growers have rapidly adopted this technology which was used on over 85% of the sugarbeet acreage in 2009. Growers wanted to know whether it is possible to mix glyphosate with fungicides and maintain effective pest control without causing phytotoxicity.

The objective of this research was to evaluate mixtures of glyphosate and fungicides for efficacy at controlling weeds and *Cercospora* leaf spot, and for phytotoxicity on sugarbeet.

MATERIALS AND METHODS

A field trial was conducted at Foxhome, MN in 2009. 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 19 May with Beta 86RR66 which is resistant to Rhizomania and has a *Cercospora* leaf spot KWS rating of 5.0. Seeds were treated with Tachigaren at 20g per 100,000 seeds and Poncho beta to provide protection against *Aphanomyces cochlioides* and insect pests, respectively. The site was seeded with barley as a cover crop at planting. Plots were thinned manually on 1 July to 41,580 plants per acre. Weeds were controlled with a treatment application on 16 June and a maintenance application of Roundup Powermax at 22 fl oz/A, Interlock at 4 fl oz/A, and Class Act NG at 1% v/v on 13 July. Plots were inoculated with *C. beticola* inoculum provided by Margaret Rekoske (Betaseed, Shakopee, MN) on 14 July.

Treatments comprised of fungicides that are typically used for *C. beticola* control with glyphosate plus AMS, and glyphosate plus AMS with no fungicides. 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. Treatments were applied on 16 June and 3, 18 August. Treatments and application rates are found 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% severity and a rating of 10 indicated 50% or higher disease severity. *Cercospora* leaf spot rating done 2 September is reported.

Plots were defoliated mechanically and harvested using a mechanical harvester on 14 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, Moorhead, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 7.5 software package (Gylling Data Management Inc., Brookings, South Dakota, 1999). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

Glyphosate provided excellent control of all weeds and the cover crop regardless of whether it was applied alone or with a fungicide. After inoculation, *Cercospora* leaf spot progressed very slowly in the control plots treated with glyphosate but no fungicide. After favorable weather conditions in mid-August, disease severity started to increase and reached economic levels by early September. All fungicide and glyphosate mixtures resulted in significantly better CLS control and significantly greater root yield and recoverable sucrose compared to glyphosate alone. No phytotoxicity was observed from any of the treatments. The data suggest that mixtures of glyphosate and certain fungicides can be safely used for effective weed and CLS control in glyphosate-tolerant sugarbeet.

Table 1. Effect of mixtures of glyphosate and fungicides on Cercospora leaf spot control, and sugarbeet yield and quality at Foxhome, MN in 2009.

Treatment and rate/A*	CLS**	Root yield	Sucrose concentration	Recoverable sucrose
	1-10	ton/A	%	lb/A
Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	7	24.3	14.1	6187
Eminent 125 SL 13 fl oz Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	2	30.6	14.9	8325
Headline 2.09 EC 9 fl oz Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	3	32.1	15.7	9324
Inspire XT 7 fl oz Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	2	30.9	15.1	8507
Super Tin 4L 8 fl oz Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	5	31.4	15.5	8994
Proline 5.7 fl oz + Premier 90 NIS 0.125%v/v Weathermax 28 fl oz Amstik 2.5 lb ai/100 gal	2	31.2	15.5	8909
LSD (P=0.05)	1.4	3.28	0.59	1041

*Treatments were applied on 16 June, 3 and 18 August.

**Cercospora leaf spot evaluated 22 September. 1 = 1- 5 spots/leaf or 0.1% severity and 10≥50% severity.