

EFFICACY OF TOPGUARD IN MIXTURES FOR CONTROLLING CERCOSPORA LEAF SPOT IN 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 increases impurity concentrations resulting in reduced extractable sucrose and higher processing losses (Smith and Ruppel, 1973; Khan and Smith, 2005). Roots of diseased plants do not store well in storage piles that are processed in a 7 to 9 month period in North Dakota and Minnesota (Smith and Ruppel, 1973). *Cercospora* leaf spot is managed by integrating the use of tolerant varieties, reducing inoculum by crop rotation and tillage, and fungicide applications (Khan et al; 2007). It is difficult to combine high levels of *Cercospora* leaf spot resistance with high recoverable sucrose in sugarbeet (Smith and Campbell, 1996). Consequently, commercial varieties generally have only moderate levels of resistance and require fungicide applications to obtain acceptable levels of protection against *Cercospora* leaf spot under moderate and high disease severity.

The objective of this research was to evaluate the efficacy of Topguard (flutriafol) mixed with other fungicides to control *Cercospora* leaf spot on sugarbeet.

MATERIALS AND METHODS

A field trial was conducted at Foxhome, MN in 2012. 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 10 May with Beta 89RR10. Seeds were treated with Tachigaren (45 g/kg seed) and Poncho beta. Seed spacing within the row was 4.7 inches. Weeds were controlled with two applications (24 May and 21 June) of glyphosate. Quadris fungicide was applied to all plots on 22 May to control *Rhizoctonia solani*. Plots were inoculated on 3 July with grounded *C. beticola* inoculum not previously exposed to fungicides (Betaseed, Shakopee, MN).

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. Fungicide treatments were initiated on 17 July when disease incidence was relatively uniform at the research site. Most treatments were three fungicide applications on 17 July, 2 and 17 August. 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 (Jones and Windels, 1991). 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 27 September. 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 favorable for good plant growth which led to row closure early as well as rapid development of *C. beticola* with first symptoms observed on 13 July. Fungicide treatments were initiated four days later. *Cercospora* leaf spot progressed very rapidly in the non-treated check and reached economic injury level by early-August. By mid-August, the non-treated check had severe disease and a *Cercospora* leaf spot rating of 10

which was significantly greater than the fungicide treatments (Table 1). Fungicide treatments, all mixtures, provided effective leaf spot control with none of the treatments reaching economic injury level. All treatments resulted in significantly higher tonnage, sucrose concentration and recoverable sucrose compared to the non-treated check. Both SuperTin (triphenyltin hydroxide, TPTH) and Koverall (mancozeb) mixed with Topguard (flutriafol) and used multiple times provided effective early season control of *C. beticola*. However, back-to-back uses of the same fungicides or the same fungicide mixtures are not recommended for *Cercospora* leaf spot control. Rotation of fungicides with different modes of action will provide effective disease control and delay the development of resistance in fungal pathogens to fungicides.

This research indicated that Topguard could be mixed with other effective fungicides and be used in a rotation system to effectively control *C. beticola* once fungicide applications are initiated at first symptoms and subsequent application are made in a timely manner. The use of a triazole (Topguard) with other chemistries (mancozeb – EBDC, and TPTH – organotin) will also help in retarding fungicide resistance.

Table 1. Effect of multiple applications of Topguard in mixtures on *Cercospora* leaf spot control, and sugarbeet yield and quality at Foxhome, MN in 2012

Treatment and rate/A	App. Interval (days)	CLS*	Stand Count Sept 27	Root yield (t/A)	Sucrose Concentration (%)	SLM (%)	Recoverable sucrose	
							(lb/t)	(lb/A)
Topguard 14 fl oz/a + Super Tin 8 fl oz/a/								
Topguard 14 fl oz/a + Super Tin 8 fl oz/a/								
Topguard 14 fl oz/a + Super Tin 8 fl oz/a/								
Topguard 14 fl oz/a + Super Tin 8 fl oz/a	14	3.0	204	26.1	19.9	1.84	361	9,414
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v/								
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v/								
Headline 9.6 fl oz/a + Super Tin 6 fl oz/a/								
Headline 9.6 fl oz/a + Super Tin 6 fl oz/a	14	4.0	211	24.2	19.3	1.92	349	8,482
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v/								
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v/								
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v/								
Topguard 14 fl oz/a + Koverall 2 lb/a + NIS 0.25% v/v	14	4.0	194	23.3	19.4	2.03	347	8,101
Nontreated Check	-	10.0	197	18.2	16.6	2.21	288	5,251
LSD (P=0.05)	-	0.7	NS	1.89	0.48	NS	12.9	725

**Cercospora* leaf spot measured on 1-10 scale (1 = 1-5 spots/leaf or 0.1% severity and 10 = 50% severity) on August 14.