MANAGING CERCOSPORA LEAF SPOT ON SUGARBEET AT MILAN, SOUTHERN MINNESOTA BEET SUGAR COOPERATIVE

Mohamed F. R. Khan[1], Randy Nelson[2], Mark Bredehoeft[3]

[1]Extension Sugarbeet Specialist, North Dakota State University & University of Minnesota
[2]Research Technician, North Dakota State University
[3] Research Agronomist, Southern Minnesota Beet Sugar Cooperative

Cercospora leaf spot, caused by the fungus *Cercospora beticola* Sacc., is the most economically damaging foliar disease of sugarbeet in Minnesota and North Dakota. Severe disease reduces root and sucrose concentration, and generally increases the sugar lost to molasses resulting in significant reductions in recoverable sucrose (Shane and Teng, 1992; Khan and Smith, 2005). Cercospora leaf spot is managed by planting disease tolerant varieties, reducing inoculum by crop rotation and tillage, and fungicide applications (Miller et al., 1994; Khan et al; 2007). Khan et al. (2007) have demonstrated that fungicide application at initial symptoms and subsequent applications based on disease severity and favorable environmental conditions are effective and economical for growers in the northern and southern part of the Red River Valley (RRV) of North Dakota and Minnesota. In the RRV, growers typically apply the first fungicide at first symptoms and subsequent applications based on the presence of symptoms and favorable environmental conditions. In 2006, growers successfully controlled leaf spot using an average of 1.9 fungicide applications. In southern Minnesota, growers typically apply the first fungicide at or just after row closure followed by two and sometimes three applications at about 14 day intervals. In 2006, growers in southern Minnesota successfully controlled leaf spot using an average of 3.18 fungicide applications (Carlson et al., 2007).

The objective of this research was to determine the timing of fungicide application that would result in effective and economical control of Cercospora leaf spot on sugarbeet at Milan, MN.

MATERIALS AND METHODS

Field trial was conducted at Milan, MN in 2007 where the previous crop was soybean. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 30-feet long rows spaced 22 inches apart. Plots were planted on 27 April with Betaseed variety RZ02RR07, that was glyphosate tolerant and resistant to Rhizomania. Terbufos (Counter 15G) was applied modified in-furrow at 12 lbs/A during planting to control sugarbeet root maggot (*Tetanops myopaeformis* von Röder; Diptera: Ulidiidae). Plots were thinned manually at the 6-leaf stage to 41,580 plants per acre. Weeds were controlled with glyphosate (Roundup Original Max, 64 oz/A + a non-ionic surfactant [premier 90] at 0.25%v/v + AMS at 10 lb/100 gal) applied on 15 May and 11 June. Plots were inoculated naturally.

Fungicide spray treatments were applied with a hand-held 4-nozzle (8002) sprayer calibrated to deliver 20 gpa of solution at 40 p.s.i pressure to the middle four rows of plots. Treatments were as follows: untreated check; 1st fungicide application at row closure followed by three applications at 14 d interval; 1st fungicide application at row closure followed by four applications at 14 d interval; 1st fungicide application at row closure with subsequent applications based on disease severity and favorable environmental conditions; 1st fungicide application at first symptoms with subsequent applications based on disease severity and favorable environmental conditions. Rows were considered closed when leaves of adjacent plants were touching or overlapping. Row closure was around 6 July and first fungicide application was made on 10 July. Disease severity of one lesion per lower leaf early in the season (July), or 10 lesions per lower leaf in late August were not attained. Fungicides were applied on 10 and 24 July, 8 17, and 29 August. The fungicide alternation program for treatments was Eminent (9 fl oz/A), SuperTin (5 oz/A), Headline (9 fl oz/A), SuperTin (5 oz/A), Eminent (9 fl oz/A).

Cercospora leaf spot severity was rated on the KWS scale of 1 to 9. A rating of 1 indicated no disease, a rating of 3 indicated that all outer leaves displayed typical symptoms and was the early stages of economic loss level, and a rating of 9 indicated that the plants had only new leaf growth, all earlier leaves being dead. Except for a few plants with a few lesions in late August, plants were free of Cercospora leaf spot throughout the season.

The middle two rows of plots were hand harvested on 20 September and weighed for root yield. Twelve to 15 random 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 6.0 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 (P=0.05).

RESULTS AND DISCUSSIONS

In late August, a few lesions were observed on a few plants; the conservative threshold of 10 lesions per lower leaf was not attained. As such, plots were not treated where fungicides were to be applied at first symptoms, or in the presence of symptoms and favorable environmental conditions. At harvest, all plots had a KWS Cercospora leaf spot rating of one (Table 1). Conditions were favorable for disease development in late August when a few lesions were observed; however, there was no significant outbreak of CLS, probably because of low inoculum levels as a result of crop rotation and the use of fungicides to control any leaf spot in sugarbeet fields. It may also be possible that a windbreak of trees on one side and corn that surrounded the research site prevented wind blown *C. beticola* inoculum from entering the plots.

Treatments with one, four, or five fungicide applications resulted in similar recoverable sucrose, root yield, sucrose concentration, and sugar loss to molasses as treatments with no fungicide application. The data suggest that in the absence of disease, there was no advantage, in terms of sugarbeet yield or quality at harvest, in using fungicides.

This research indicates that fungicide application should commence at first symptoms. However, some scouting will be necessary to determine the presence and severity of disease. At Milan, fungicide application starting at canopy closure with subsequent applications on a calendar basis was unnecessary and increased production cost since the disease did not develop.

References

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Table 1. Number of fungicide applications and yield measures using different management programs at Milan, MN in 2007

Treatment and rate/A	Sprays	CLS[z]	Recoverable Sucrose (lb/A)	Recoverable Sucrose (lb/T)	Root yield (t/A)	Sucrose concen-tration (%)	LTM[y] (%)	Net Return[x] ($/A)
Untreated Check	0	1	6591	258	25.9	14.48	1.55	857
Eminent 125SL 9 fl oz / SuperTin 80WP 5 oz/ Headline 2.09 EC 9 fl oz / SuperTin 80WP 5 oz[w]	4	1	6072	253	24.1	14.30	1.65	719
Eminent 125SL 9 fl oz / SuperTin 80WP 5 oz/ Headline 2.09 EC 9 fl oz / SuperTin 80WP 5 oz / Eminent 125SL 9 fl oz[v]	5	1	6737	261	26.1	14.63	1.60	784
Eminent 125SL 9 fl oz[u]	1	1	5967	252	24.0	14.22	1.63	754
1st Symptoms[t]	0	1	6374	263	24.5	14.73	1.60	829
LSD (P= 0.05)		NS	NS	NS	NS	NS	NS	NS

[z]Cercospora leaf spot measured on KWS scale 1-9 (1 = no leaf spot; 9 = dead outer leaves, inner leaves severely damaged, regrowth of new leaves).
[y]LTM: Sugar loss to molasses.
[x]Net Return was calculated as follows: [Recoverable sucrose/A x 13 cents/lb recoverable sucrose] – [Fungicide cost + application cost]. Fungicide cost/A were as follows: Eminent - $16.50/A; SuperTin - $9.42/A; Headline - $15.00/A; and fungicide application cost - $5.00/A .
[w]1st fungicide application at row closure followed by three applications at 14 d interval.
[v]1st fungicide application at row closure followed by four applications at 14 d interval.
[u]1st fungicide application at row closure with subsequent applications based on disease severity and favorable environmental conditions.
[t]1st fungicide application at first symptoms with subsequent applications based on disease severity and favorable environmental conditions.