CONTROL OF CERCOSPORA LEAFSPOT IN MICHIGAN WITH EXPERIMENTAL FUNGICIDES

JAMES F. STEWART[1] AND TERESA M. CROOK[2]

[1]*Michigan Sugar Company, 320 Sugar Street, Carrollton, MI 48724*

[2]*L. Walther & Sons, Inc. 3390 West Lake Road, Clio, MI 48420*

ABSTRACT

Cercospora leaf spot is the most damaging foliar disease of sugarbeets in Michigan. Yield losses of one to two tons per acre have been documented with low to moderate disease levels. The disease also reduces sucrose content and increases the level of impurities in the beet. Cercospora leaf spot is controlled with a combination of cultural practices and timely fungicide applications. The fungicides which have been used for controlling Cercospora leaf spot in sugarbeets are only moderately effective. Information from recent surveys indicates that Cercospora is developing resistant to the benzimidiazole and organic tin fungicides in Michigan. We have been evaluating several new fungicides for Cercorpora leaf spot control including azoxystrobin, trifloxystrobin, pyraclostrobin and tetraconazole. It appears that pyraclostrobin is the most effective of this group for controlling cercospora leaf spot followed by tetraconazole, trifloxystrobin and azoxystrobin. In three years of trials, pyraclostrobin treated plots outyielded the untreated check and a standard fungicide treatment by 24 and 9 percent, respectively.

INTRODUCTION

Cercospora leaf spot, caused by the fungus *Cercospora beticola*, is the most serious foliar disease in sugarbeets in Michigan. This disease reduces sugarbeet yield, percent sucrose and increases the impurities in the beet. Yield losses of one to two tons per acre and ½ percentage points of sugar are common in the Michigan sugarbeet growing area. (Poindexter, 2000-2002). Roots of diseased plants do not store in piles as well as roots of healthy plants. (Khan et al., 1999)

The fungus overwinters as pseudostromata on infected beet debris left in the sugarbeet fields after harvest. Cercospora can also overwinter on weed debris. When moisture is present, new spores are produced and are spread to sugarbeet leaves by rain splash and wind. The development of the disease on sugarbeets is dependent upon favorable temperatures and extended periods of leaf wetness (over 8 hours). In general, day temperatures between 80 and 90 F and night temperatures above 60 F favor disease development. (Hart, 1999). Cercospora spores germinate on the sugarbeet leaves, enter the leaf through the stomata and infect the leaf. The Cercospora infection produces small

circular spots about 1/8 inch in diameter with ash gray centers and dark brown or purplish borders. If not controlled, new spores will be produced and the disease will spread. Under heavy infestations the spots coalesce and create large necrotic spots on the leaf. If unchecked, the disease will progress until all the leaves on a sugarbeet plant are desiccated.

Cercospora is controlled by a combination of cultural methods, variety selection and with fungicides. A minimum of a 3-year rotation is important to prevent serious Cercospora infections. Plowing down the sugarbeet residue will help reduce future infections. Many growers select sugarbeet varieties that have partial tolerance to Cercospora, however, many of these varieties give up yield, sugar, emergence or other desirable traits. Fungicide applications are an integral part of the control measures used in Michigan. Cercospora beticola is developing resistance to several effective fungicides including Topsin M and Super Tin. Protectant fungicides such as EBDC's and Coppers are effective but have short residual control and are susceptible to being washed off by rain. Eminent (tetraconazol) is a very effective new fungicide but is not yet registered for use. Eminent has been granted Section 18 registrations in recent years. Quadris, Gem and Headline have recently been approved for use in Michigan. These fungicides are all members of a new fungicide group called strobilurins. In research trials Headline and Gem have provided excellent Cercospora control and Quadris has been somewhat less effective.

MATERIALS AND METHODS

Research was conducted at Sebewaing, MI in 2000, Breckenridge MI in 2001 and at the Bean and Beet Research Farm in Saginaw, MI in 2002. Sugarbeet seeds were planted 1 inch deep at a 2.25 inches spacing in 30 inch rows with a Heath vacuum planter The sugarbeet variety used was HM E17, a common variety which is relatively susceptible to Cercospora leaf spot. Sugarbeets were thinned to an 8 inch spacing at the 4 leaf stage. Plots were 6 rows wide and 30 feet long and were arranged in a randomized complete block design with 6 replications. The plots were inoculated with Cercospora in early July. The fungicide treatments were applied with a Cub tractor small plot sprayer at 100 psi and 22.5 gpa beginning at the first sign of infection. The fungicide treatments are listed in table 1. The center 4 rows of each plot were sprayed and data was taken from the center 2 rows. Cercospora leaf spot visual ratings were taken using a 0-9 visual rating scale with 0 = no spots and 9 = complete burn down. Yields were taken with a 2 row test plot harvester that has been modified for research. Samples of sugarbeets were taken from each plot and analyzed for percent sucrose, clear juice purity and RWST at the Michigan Agricultural Research Laboratory.

Table 1. Fungicide Treatments

1. Untreated Check
2. Triphenyltin hydroxide (Super Tin 80 WP) at 5 oz/A
3. Azoxystrobin (Quadris 2.08 FL) at 9 fl oz/A
4. Tetraconazole (Eminent 125 SL) at 13 fl oz/A

5. Trifloxystrobin (Gem 25 DF) at 6.25 oz/A

6. Pyraclostrobin (Headline 2.09 EC) at 9.2 fl oz/A

Each treatment was applied 2 times (A and C timings). Topsin M + Penncozeb at 8 oz + 2 lbs. per acre was applied at the B timing in 2000 and 2002. In 2001 the in between treatment of Topsin + Penncozeb was not applied. The timing between the applications was 2 ½ to 3 weeks.

RESULTS AND DISCUSSION

The Sebewaing location in 2000 had a heavy Cercospora infestation. All of the fungicide treatments provided good to excellent Cercospora leaf spot control at this site. Headline gave the best disease control followed by Gem, Eminent, Quadris and Super Tin. Headline also had the highest yield. All of the treatments had significantly better leafspot ratings, yield and % sugar compared to the untreated check. There were no significant differences with respect to clear juice purity. The reliability of the Sebewaing location was rated as good.

The leafspot infestation at the Breckenridge site in 2001 came in late and never did develop completely. As a result, the treatments were delayed by about one month. Eminent and Headline provided excellent control at this site and Gem was slightly less effective. Quadris and Super Tin also provided effective control. The validity of this trial was rated as fair due to the low disease level.

The 2002 trial was conducted at the Bean and Beet Farm in Saginaw. A medium to heavy Cercospora infestation developed in this trial. Gem and Eminent provided excellent disease control at this site. Headline also provided very good control in this trial while Quadris and Super Tin were somewhat less effective. The reliability of this trial was considered to be good.

When averaged over the three locations, the 0-9 ratings for Headline, Eminent and Gem were 1.42, 1.52 and 1.57, respectively, but the differences were not significant. The Cercospora ratings for Quadris and Super Tin were 1.86 and 2.07, respectively, and were significantly less effective than Headline, Eminent and Gem. All of the treatments had significantly better ratings than the untreated check which had a rating of 4.7. Headline, Gem and Eminent had significantly higher yields in RWSA compared to Quadris and Super Tin. Gem and Eminent had significantly higher yields in RWSA compared to Super Tin. All of the fungicide treatments provided a significant yield increase compared to the untreated check. The percent sucrose and RWST levels were similar for all of the fungicide treatments and were significantly higher than the untreated check. Yields in the untreated check were 3.9 tons and 0.9 percentage points of sugar less than the average yield of the fungicide treatments. There were no significant differences with respect to clear juice purity. For detailed information about the Cercospora ratings, sugarbeet yield and quality see table 2.

CONCLUSIONS

Headline, Eminent and Gem provided excellent control of Cercospora leaf spot in trials conducted during 2000, 2001 and 2002. Quadris and Super Tin also

provided good leafspot control in these trials. Headline had the highest yield in RWSA followed by Gem, Eminent, Quadris and Super Tin. There were no differences between the treatments with respect to sucrose content, however, all of the fungicide treatments had higher levels of sucrose than the untreated plots. Clear juice purity was not affected by the treatments.

REFERENCES

Hart P. (1999). Fungicide Management of Cercospora Leaf Spot of Sugar Beets. Michigan State University, East Lansing, MI 48824.

Khan M., Smith L., Bredehoeft M., Roehl S., & Fiescher J. (1999). Cercospora Leaf Spot Control in Eastern North Dakota and Minnesota in 1999. 1999 Sugarbeet Research and Extension Reports, Vol. 30, 2000.

Poindexter S. (2000-2002). On Farm Research and Demonstration, Sugarbeet Advancement. January 2000, January 2001, January 2002. Michigan State University Extension, Saginaw, MI.

Table 2. Cercospora Leaf Spot Control in Sugarbeets With Experimental Fungicides
Data is an average of 2000, 2001 and 2002 Trials

Treatment	App[1]	Rate/Acre	CLSrate[2]	RWSA	TON/A	RWST	%Suc	%CJP
Headline 2.09 EC	A	9.2 fl oz						
Topsin + Penncozeb	B	8 oz + 2 lb	1.42 d	6373 a	24.8 a	256.0 a	17.8 a	93.7 a
Headline 2.09 EC	C	9.2 fl oz						
Eminent 125 SL	A	13 fl oz						
Topsin + Penncozeb	B	8 oz + 2 lb	1.52 d	6167 ab	24.2 a	254.3 a	17.8 a	93.3 a
Eminent 125 SL	C	13 fl oz						
Gem 25 DF	A	6.4 oz						
Topsin + Penncozeb	B	8 oz + 2 lb	1.57 d	6206 ab	24.6 a	250.8 a	17.7 a	93.1 a
Gem 25 DF	C	6.4 oz						
Quadris 2.08 FL	A	9 fl oz						
Topsin + Penncozeb	B	8 oz + 2 lb	1.86 c	5996 bc	23.7 ab	252.2 a	17.7 a	93.4 a
Quadris 2.08 FL	C	9 fl oz						
Super Tin 80 WP	A	5 oz						
Topsin + Penncozeb	B	8 oz + 2 lb	2.07 b	5836 c	22.9 b	252.9 a	17.7 a	93.7 a
Super Tin 80 WP	C	5 oz						
Untreated			4.70 a	4841 d	20.0 c	238.0 b	16.8 b	93.4 a
LSD (5%)			0.17	280.5	1.10	6.5	0.30	ns
CV %			6.3	6.7	6.1	3.7	1.4	0.6
Mean			2.19	5903	23.40	250.7	17.60	93.1
Treatment Prob (F)			0.0001	0.0001	0.0001	0.0001	0.0001	0.6404

Means followed by the same letter do not significantly differ (P = 0.05, Duncan's New MRT)

[1]Application timings: A = 1st sign of disease, B = 14-21 days after A, C = 14-21 days after B

[2]Cercospora leaf spot visual rating scale: 0-9 scale with 0 = no damage and 9 = extreme damage
Means are an average of three rating dates each year = 9 ratings combined