DATE OF PLANTING EFFECTS ON CERCOSPORA LEAFSPOT DEVELOPMENT AND FUNGICIDE ECONOMICS ON VARIETIES DIFFERING IN CERCOSPORA TOLERANCE

Larry J. Smith, Head, Northwest Research and Outreach Center,
University of Minnesota, Crookston, MN

For the past few growing seasons, wet weather has had a major impact on the duration of the planting season for the sugarbeet crop. In some years, over 40% of the crop has been planted after May 20. In 2002, frost and wind conditions also resulted in a major replant situation. Observations on these later planted sugarbeets has raised questions as to whether they develop *Cercospora beticola* later than those early planted, and if fungicide treatments can be reduced or eliminated, especially if the variety has better Cercospora tolerance. In 2002 and 2003, trials at the Northwest Research and Outreach Center were initiated to determine the effect of planting date and varietal tolerance on Cercospora control as they affect sugarbeet yield, quality and profitability.

Procedure: Van der Have H66240, Beta 6447, Beta 6400 and Van der Have H46177 sugarbeet seed, which differ in the level of tolerance to Cercospora, were planted on April 25, May 13 and May 27, 2003. The three-year mean Cercospora rating as reported in the 2002 Coded Variety Trial, was 4.96, 4.89, 4.48 and 4.04 respectively for these varieties. Two fungicide regimes, Eminent/TPTH and TPTH/Eminent were compared to a control. The fungicide treatments were applied at a pressure of 100 psi and at a volume 20 gpa to the center four rows of a six-row plot when Cercospora developed within a given planting date. This was different than the 2002 trial where fungicide treatments were applied to all planting dates when Cercospora developed in the first planting. Eminent/TPTH/Eminent (13 oz/5oz/13oz) or TPTH/Eminent/TPTH (5oz/13oz/5oz) was applied to the April 25 planting on July 28, August 11 and August 25. Eminent/TPTH or TPTH/Eminent fungicide treatments were applied to the May 13 planting on August 11 and August 25. These same treatments were applied to the May 26 planting on August 18 and September 4. Final Cercospora rating using the KWS scale were made on September 30. The center two rows were harvested for yield on October 1, 2003 and the quality factors determined at the ACSC Quality Laboratory in East Grand Forks, MN. All other cultural and pesticide practices were as recommended.

Results: There were no statistical differences between the two fungicide regimes (Table1) and therefore they were combined into a single comparison treatment against the control. No differences in initial disease onset was noted between varieties at a given planting date even though they differed in KWS Cercospora ratings. Onset in the May 13 planting was approximately 15 days after the April 25 planting and 21 days for the May 27 planting. Row closure was equal between the April 25 and May 13 plantings and was 10 days later for the May 27 planting. At harvest, the May 27 planting had the greatest amount of canopy area and closure.

At harvest, under natural Cercospora infection (non-inoculated) there were significant differences in the degree of Cercospora infection between varieties, planting dates, and planting dates within a given variety if no fungicide treatments were applied (Table 2). Within all varieties the level of leaf spot significantly decreased with later plantings. Application of fungicide significantly reduced the severity of Cercospora leafspot (Table 3). The gain (loss) from fungicide application at each planting date, for each variety is shown in Table 4. Increases in yield and quality factors from fungicide application decreased as planting date was delayed except with H66240. GROSS dollar return from fungicide application with the different varieties and planting dates is shown in Table 5. If a conservative estimate of $15/A application cost (chemical + application) is calculated, then total application cost for this trial would be $45 or $30/A. All four varieties planted early (4/25) benefitted from three fungicide applications. H66240, which had the highest KWS rating (4.96), had the highest NET return to fungicide applications over all planting dates (Table 6). Beta 6400 and H46177 would have given no NET return to fungicide application on the May 27 planting, with Beta 6447 giving marginal returns. Beta 6447 had a NET return to fungicide application of $111 on the April 25 planting, but this dropped to $16 and $4 respectively for the two later plantings.

Discussion: The sugarbeet varieties used in this trial were selected only for differences in KWS Cercospora ratings. No other inferences should be drawn relative to yield or quality factors, as they vary considerably in these regards.

The KWS Cercospora ratings the producer looks at in making varietal selections many times are extremely small and are not well understood. The published ratings are from inoculated trials and represent a mean score of several Cercospora readings after inoculation. In this trial, the published KWS Cercospora rating for the varieties chosen ranged from a high

of 4.96 to a low of 4.04. Cercospora ratings for the April 25 planting in this trial ranged from 6.75 to 3.50. These ratings represent a real world situation, at harvest, under a non-inoculated condition. The differences and magnitude of the effects of Cercospora leaf spot are evident from the data.

A general guideline for leafspot damage is that a KWS rating of less than 4.0 will not result in an economic loss of yield or quality (in most cases). This guideline, however, does not take into consideration the amount of time a variety may have a given level of leafspot. Analysis of the data from this trial showed no economic loss from a KWS rating below 2.50.

Canopy closure has been associated by some to be the trigger feature for the onset of Cercospora. This trial would suggest age of the plant rather than canopy closure to be the more important factor, as canopy closure for the April 25 and May 13 plantings were identical and only 10 days later for the May 27 planting. Cercospora ratings for the various planting dates significantly decreased as the planting date became later. H46177 gave a net return to fungicide application only on the April 25 planting, whereas H66240 gave positive returns to all three planting dates. Small differences in published Cercospora ratings can have a significant effect on the severity of Cercospora on a given variety under natural infection as well as the cost of control.

Calendar application or application of fungicides when Cercospora is first reported in a factory district, regardless of date of planting or Cercospora tolerance of the planted variety can add unneeded cost to the producer's bottom line. "All things are not created equal" definitely applies to Cercospora leaf spot management and Net return on your fungicide investment.

Table 1. Main fungicide combination effects on yield, quality and Cercospora control

Fungicide Combination	Rate (product/A)	Recoverable Sucrose (lb/A	(lb/T)	Yield (T/A)	Sucrose (%)	LTM (%)	Cercospora Rating (KWS (1-9)[1]
Eminent/TPTH/	13 oz/5 oz	7018	328.0	21.4	17.7	1.30	1.66
TPTH/Eminent	5 oz/13 oz	6958	326.8	21.3	17.7	1.32	1.71
Stat. Sign		NS[2]	NS	NS	NS	NS	NS

1. Cercospora leafspot measured on KWS scale 1-9 (No leafspot - dead outer leaves, inner leaves severely damaged, regrowth of new leaves)
2. Statistically non significant

Table 2. Planting date effects on Cercospora KWS disease ratings within varieties with no disease control measures applied

Planting Date	Variety			
	VDH 66240 (4.96)[1]	Beta 6447 (4.89)	Beta 6400 (4.48)	VDH 46177 (4.04)
April 25	6.75	4.38	4.25	3.50
May 13	5.63	3.50	3.25	2.50
May 27	4.13	3.25	2.50	2.50

1. 3-year mean Cercospora KWS rating (2002 Coded Varietal Trials)

Table 3. Planting date effects on Cercospora KWS disease ratings within varieties with fungicide measures applied.

Planting Date	Variety			
	VDH 66240 (4.96)	Beta 6447 (4.89)	Beta 6400 (4.48)	VDH 46177 (4.04)
April 25[1]	2.38	1.81	1.63	1.50
May 13[2]	1.81	1.81	1.56	1.50
May 27[2]	1.50	1.63	1.56	1.50

1. Three fungicide applications
2. Two fungicide applications

Table 4. Gain (loss) in yield, quality and Cercospora rating from fungicide application at different planting dates

Variety	Planting Date	RSA[1] (lb/A)	RST[2] (lb/T)	Yield (lb/A)	Sucrose (%)	LTM (%)	Cer. Rating KWS (1-9)
VDH66240	4/25	1089	1.8	3.2	(0.04)	0.12	4.37
	5/13	881	2.3	2.6	0.05	0.07	3.82

	5/27	1006	6.0	2.9	0.25	0.05	2.63
Beta 6447	4/25	1333	(1.5)	3.9	0.15	0.08	2.57
	5/13	387	(2.0)	1.3	(0.09)	(0.01)	1.69
	5/27	305	(3.2)	1.2	(0.18)	0.02	1.62
Beta 6400	4/25	699	2.0	2.0	0.10	0.00	2.62
	5/13	64	10.3	0.2	0.36	0.15	1.69
	5/27	183	1.3	0.4	0.01	0.05	0.94
VDH 46177	4/25	346	7.4	0.5	0.21	0.15	2.00
	5/13	186	5.0	0.2	0.23	0.01	1.00
	5/27	(97)	3.3	(0.5)	0.13	0.04	1.00

1. Recoverable sucrose/acre
2. Recoverable sucrose/ton

Table 5.Gross return[1] on fungicide application at different planting dates and Cercospora tolerance levels

	Variety			
Planting Date	VDH 66240 (4.96)	Beta 6447 (4.89)	Beta 6400 (4.48)	VDH 46177 (4.04)
April 25	135	156	92	62
May 13	109	46	39	32
May 27	124	34	21	(5)

[1] Basis ACSC 2003 November 15 payment

Table 6. Net return on fungicide application at different planting dates and Cercospora tolerance levels.

	Variety			
Planting Date	VDH 66240 (4.96)	Beta 6447 (4.89)	Beta 6400 (4.48)	VDH 46177 (4.04)
April 25[1]	90	111	47	17
May 13[2]	79	16	9	2
May 27[2]	94	4	(9)	(35)

1. 4/25 planting received three fungicide applications
2. 5/13 & 5/27 plantings received two fungicide applications