

A *Cercospora* leaf spot management program for American Crystal Sugar Company growers in 1999-2000

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Introduction

Cercospora leaf spot caused an estimated \$40,000,000 loss in revenue to American Crystal Sugar Company shareholders during the 1998 crop year. Both yield and quality declined and storage losses of sucrose increased. A majority of all fields had disease severity well above economic loss levels. That significant amount of loss was suffered after those shareholders spent \$20,000,000 for *Cercospora* control in 1998.

The money spent for control was in the face of moderate to high levels of disease resistance and tolerance to the available fungicides. Triphenyltin hydroxide (TPTH) and benzimidazole fungicides have been used in North Dakota and Minnesota for *Cercospora* control for nearly twenty years. However, the *Cercospora* fungus developed resistance to Topsin and Benlate (benzimidazole fungicides) in North Dakota and Minnesota in the early 1980's, and the USDA lab in Fargo found tolerance to TPTH in the Southern Minnesota beet growing area in 1994. The evidence of tolerance to TPTH prompted the Sugarbeet Research and Education Board of Minnesota and North Dakota to fund projects to determine the extent and severity of resistance and tolerance to fungicides starting in 1995 and continuing each year since 1995.

The objective of the *Cercospora* management program implemented in 1999 was to cost effectively reduce *Cercospora* severity below economic loss levels in all fields in spite of the moderate to high levels of disease resistance and tolerance to the available fungicides.

Procedures

In the late summer of 1998 American Crystal Sugar Company agronomists collected infected leaf samples from over 700 fields throughout the Red River Valley. The samples were taken to the USDA-ARS Fargo Laboratory and tested for levels of resistance to thiophanate methyl (TM; a benzimidazole), and tolerance to TPTH and Mancozeb. Spores obtained from the samples were transferred to each of seven petri plates containing unamended potatoe dextrose agar (PDA), PDA + 0.2 ppm TPTH, PDA + 1.0 ppm TPTH, PDA + 5 ppm Mancozeb, PDA + 10 ppm Mancozeb, and PDA + 5 ppm benomyl. The cultures were incubated at 22°C and evaluated for growth at 5 to 7 days after plating.

The results from the tests were presented as the percent of leaf spots that exhibited tolerance to TPTH and Mancozeb and resistance to TM at the various levels. Site specific management maps were created from the test results, pin pointing the severity of resistance and tolerance to fungicides by section (1 square mile) or township (36 square miles). The maps were created in the geographic information system (GIS), ArcView™.