STEWART, JAMES F.[1]*, LEE A. HUBBELL[1], BRIAN J. GROULX[1], GREGORY M. CLARK[2] and STEVEN S. POINDEXTER[3]. [1]Michigan Sugar Company, Agricultural Research Center, 1459 S. Valley Center Dr., Bay City, MI 48706, [2]Michigan Sugar Company, 2600 South Euclid Avenue, Bay City, MI 48706 and [3]Michigan State University Extension, 1 Tuscola Street, Suite 100, Saginaw, MI 48607. **Managing *Rhizoctonia solani* root and crown rot in sugarbeets with tolerant varieties and fungicide applications.**

EXPANDED ABSTRACT

Michigan **s**ugarbeet growers lose an estimated 1 to 4 tons per acre to Rhizoctonia root rot infestations depending upon the region they farm in. Yield losses can be much higher when weather conditions prevent timely fungicide applications, when sprayer malfunctions occur or when the wrong variety is planted. Michigan Sugar Company has three distinct Rhizoctonia risk zones. The western region has a high risk of Rhizoctonia root rot and tolerant varieties in addition to Quadris applications are required to grow a successful crop. The central region has a moderate risk and the eastern growing region has a low to moderate risk of Rhizoctonia.

Rhizoctonia root and crown rot is caused by the fungus *Rhizoctonia solani*. This fungus is divided into several anastomosis groups (AGs). *R. solani* AG 2-2 IV and IIIB are the AGs that cause root and crown rot in sugarbeets. Surveys conducted by Dr. Linda Hanson, USDA-ARS, East Lansing Michigan, show that the IIIB strain is more prevalent than the IV strain (55% to 45%). Dr. Hanson also believes that the AG IV and III groups will be reclassified into three groups in the near future. Research conducted in Minnesota by Dr. Carol Windels, University of Minnesota, shows that *R. solani* AG 2-2 IIIB is a more aggressive Rhizoctonia strain compared to *R. solani* AG 2-2 IV. The IIIB strain grows at higher temperatures and also infects corn while the IV strain does not infect corn.

Rhizoctonia can invade the sugarbeet on the root or at the crown level. In Michigan the root has become the predominant entry point for the disease. The decreased utilization of cultivation for weed control due to the Roundup Ready system has likely decreased the incident of crown rot. Quadris is used on almost all of Michigan sugarbeets fields and is applied to the sugarbeet crown or soil surface. Quadris does not move far in the soil so it is likely that Quadris applications control crown rot but not infections that begin further down on the roots.

Early symptoms of crown rot include yellowing of the leaves followed by a sudden and permanent canopy collapse. This occurs when the vascular system becomes damaged and the leaves cannot obtain enough water from the roots. As the infection worsens lesions and scabs form on the crown and root, cracks form and eventually the entire root rots.

Symptoms of tip rot or root rot often remain undetected until significant damage has occurred underground. Superficial lesions begin forming on the lower part of the root and progress upward toward the crown. Lesions darken and coalesce as the disease advances. The root can be more than 50 percent covered by lesions before the fungus begins penetrating deep into the root interior. Before the interior of the root rots, a clear distinction exists between healthy and diseased tissue. Canopy collapse occurs when the fungus invades the center of the root and damages the vascular tissue.

With crown rot and root rot, after the canopy collapses it turns dark and brittle and remains attached to the crown. The disease often moves from beet to beet down the sugarbeet row creating oval patterns of dead sugarbeet in grower's fields.

Almost all of the Michigan sugarbeet growers utilize Quadris in some manner. Approximately 50 percent of the growers apply Quadris in-furrow at planting followed by an 8 leaf foliar application directed at the sugarbeet crown. About 40 percent of the growers apply only a foliar Quadris application and about 10 percent apply only an in-furrow application. The in-furrow applications are applied in a 3 to 4 inch band over the open furrow after the seeds drop but before the furrow is closed. For in-furrow applications, growers typically use banding nozzles such as 4002E tips with around 20 PSI and deliver between 4 to 6 GPA.

Over 100 Rhizoctonia research trials have been conducted by Michigan Sugar Company and Sugarbeet Advancement during the past 15 years. Michigan Sugar conducts small plot replicated trials and Sugarbeet Advancement conducts large plot replicated strip trials. Results from Quadris spray trials and varietal tolerance trials conducted between 2008 and 2014 have been summarized for this presentation. All Quadris rates discussed here are for 22 inch row spacing.

Quadris applied in-furrow (7 fl oz/A) at planting in a 3 to 4 inch t-band followed by a Quadris application at the 8 leaf stage (14 fl oz/A) in a 7 inch band has provided the best Rhizoctonia root rot control in Michigan. Quadris applied in-furrow at 7 to 10 fl oz/A provides better Rhizoctonia control than Quadris (14 fl oz/A) applied in a 7 inch band at the 4 to 8 leaf. The 7 fl oz in-furrow rate is recommended for most of the Michigan growing region and the 10 fl oz rate is recommended for our western "high risk" region. We have also tested higher and lower Quadris in-furrow rates. Quadris applied in-furrow at 5 fl oz/A has a high failure rate and is not recommended while Quadris at 14 fl oz/A and higher has caused significant levels of stand loss and is not recommended.

With foliar applications, the 6 to 8 leaf stage has generally provided the best results. Quadris applied at the 2 leaf stage and the 10 to 12 leaf stages have not given good Rhizoctonia control. Trials have also been conducted applying Quadris near row closure timing with little success.

Several other fungicides have been evaluated for Rhizoctonia control in Michigan. The most promising product we have tested is Moncut which has performed similarly to Quadris but it is not registered. Proline has provided fairly good Rhizoctonia control but has been less effective than Quadris. Headline, Topsin, Vertisan, Priaxor and several other products have been less effective than Proline in our trials.

Much of the Rhizoctonia research in Michigan has involved evaluating tolerant and moderately tolerant sugarbeet varieties. High yielding varieties that are susceptible to Rhizoctonia typically have twice as many dead beets in test plots as tolerant varieties. When used in combination with Quadris, tolerant or moderately tolerant varieties provide effective control of Rhizoctonia, even in high risk fields. Until recently varieties with tolerance to Rhizoctonia did not yield well and were only used in very heavily infested fields. High producing varieties with moderate tolerance to Rhizoctonia have recently become available in Michigan.

Approximately one third of the Michigan Sugar Company acreage is infested with sugarbeet cyst nematode, *Heterodera schachtii*, and nematode tolerant varieties are required to grow beets in these fields. Until recently all of the nematode tolerant varieties had poor tolerance to Rhizoctonia root rot, however, within the past two years nematode tolerant varieties with Rhizoctonia tolerance have been evaluated and approved by Michigan Sugar Company.