Investigations into which pathogens are responsible for, and management of vine decline in Ontario processing tomatoes, 2011

Research report to Ontario Tomato Research Institute

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EXECUTIVE SUMMARY

Vine decline symptoms on processing tomato, including early dieback of above-ground plant parts, increased incidence of bacterial disease, banded root lesions, and root decay were reported in a number of processing tomato fields in Essex and Kent counties in 2009 and 2010. The disease complex associated with vine decline symptoms includes the plant pathogens *Pyrenochaeta terrestris*, *Pyrenochaeta lycopersici*, *Rhizopycnis vagum*, *Colletotrichum coccodes*, and *Fusarium* spp. We completed several trials evaluating potential products for management of vine decline under controlled greenhouse conditions, controlled outdoor conditions, and in a commercial field in 2011. In addition, in order to obtain a better understanding of symptoms associated with individual pathogens in the complex, we initiated growth chamber trials to evaluate symptoms development in tomatoes inoculated with vine decline pathogens. This work was a continuation of research that was initiated in 2010.

Greenhouse trials were conducted at Ridgetown Campus in 2010 and 2011 to identify potential products for management of vine decline symptoms. Tomatoes were grown in soil obtained from one field in 2010 and three fields in 2011 that had a history of vine decline. Root lesions were observed but no foliar symptoms developed. Vapam, rye, oilseed radish, and Actigard showed potential as management tools to reduce lesions on tomato roots in 2010 but not in 2011. Serenade Max also resulted in fewer banded lesions on roots as compared to the nontreated control in 2010 but not in 2011.

To evaluate Vapam and Actigard further, a trial was established at AAFC-London in a micro-plot research area in 2010 and 2011. Soil for the trial was obtained from the same location as the field fumigant trial (see below) in both years, and in 2011 an additional soil from the location of the fumigant strip trial was also included. Yield in the treatment using the high rate of Vapam was almost 2 times higher than the nontreated control in 2010, but Vapam did not increase tomato yield in any of the soils in 2011, including the soil that was treated in 2010. The increase in yield with the high Vapam rate in 2010 occurred with no decrease in vine decline symptoms or number of root lesions. Thus, since Vapam and Actigard do not give consistent yield increases under these controlled micro-plot conditions, Vapam and Actigard do not appear to be potential

treatments for vine decline. Neither Vapam nor Actigard reduced the amount of corky root rot symptoms.

Field trials were established at a grower site in Kent County in 2010 and 2011, where symptoms of vine decline were reported in 2009, in order to evaluate the potential for Vapam to reduce vine decline symptoms under grower conditions. Treatments included a high rate of Vapam, low rate of Vapam, and a nontreated control. There were no differences among treatments for tomato yield in either year. *Pyrenochaeta terrestris*, *Rhizopycnis vagum*, *Colletotrichum coccodes*, and *Fusarium* spp. were isolated from root lesions from all treatments at this site. In addition, we collaborated with personnel in the tomato industry to establish a second field trial location in 2011. This trial was a strip trial in a commercial field located in western Kent County. Applications of Vapam did not result in a statistically significant increase in tomato yield at this location.

In evaluating the role of the fungi associated with corky root rot, it was found that autoclaving soil or autoclaving plus fumigation with Vapam cannot be used to create a disease-free soil to be used as a control for experiments involving inoculation with individual fungi. This indicates that fungi like *P. terrestris* are very hardy. Use of an artificial soil medium may be successful to conduct these types of experiments but it is too early to tell. The corky root rot pathogens appear to be widespread as they were found in a soil from a commercial potato field near Delhi, Ontario that had never had tomatoes in it.

We have been developing molecular methods to detect the fungi associated with corky root rot in roots. Thus far, specific primers and probes have been designed for *P. lycopersici*, *R. vagum*, and *C. coccodes* and *P. terrestris* together that will allow detection by quantitative real-time PCR of these fungi in roots. Work continues to try to get *C. coccodes* and *P. terrestris* alone, but even together, there are ways to make the method it useful. Work continues with the *Fusarium* spp. One of the next steps is to prepare standard DNA curves so that these primers and probes can be used for qPCR. Without the standard curves, we can detect the presence of these fungi, but not the relative amounts.