PRACTICES TO PREVENT PATHOGEN TRANSMISSION DURING TOMATO GRAFTING OPERATIONS

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The advantages of vegetable grafting in preventing soilborne diseases are well documented. However, the grafting process also presents inherent risks, particularly in the transmission of mechanically transmissible plant pathogens. In tomato, these include *Clavibacter michiganensis* subsp. *michiganensis* (Cmm), Pepino mosaic virus (PepMV) and *Botrytis cinerea*. Using a transgenic bioluminescent strain of Cmm, we have shown that the pathogen moves at similar rates upward and downward from the graft union when cuts are made with contaminated blades, and that high populations of the pathogen accumulate in roots of infected plants (Xu et al. 2010, 2012). These roots can then become a significant source of inoculum for plants in hydroponic culture. Cmm is also readily transmissible from systemically infected plants through topping, pruning, de-leafing, harvesting and other crop work. *Botrytis* is a common pathogen of greenhouse-produced vegetables, releasing large numbers of airborne spores that infect plants primarily at wound sites, such as those remaining after pruning or de-leafing. *Botrytis* thrives in conditions of high relatives humidity, and can be devastating if introduced during the grafting process. PepMV has become an endemic disease problem for greenhouse tomato production in North America and Europe and is spreading to other parts of the world (Ling et al. 2008).

Resistant cultivars are not available for any of these diseases, and crop protectants (bactericides, fungicides) are either not available or not fully effective. Therefore preventative practices are paramount for disease management. We have focused on the development of sanitation practices implemented throughout the tomato production system, but particularly important during grafting. Although disinfectants have been identified and used in the tomato industry for many years, there is a need for a systematic approach to determine their efficacy against all of the major groups of mechanically transmitted pathogens – fungi, bacteria and viruses and viroids. Requirements for potentially useful products include (1) very short contact time, (2) broad efficacy against viruses, viroids, bacteria and fungi, (3) worker safety, 4) reduced corrosiveness to infrastructure or phytotoxicity to plants and (5) cost-effectiveness.

Nineteen sanitizers were evaluated for efficacy against Cmm, *B. cinerea*, and PepMV. KleenGrow, Green-Shield, BioSide, Des-O-Germ, Menno Florades, Menno-Terforte and Clorox killed Cmm and *Botrytis cinerea* at all exposure times in *in vitro* studies. Vortex and Lysol were only effective against *B. cinerea* after 1 min of exposure time, while they were effective against Cmm at all exposure times. StorOx was effective against both pathogens after 1 min of

exposure time. Octave was also effective against both pathogens at the tested rate after 30 sec. Seven sanitizers (Octave, Trisodium Phosphate, StorOx, Menno-Ter forte, Menno Florades, Non-Fat dry milk, and Virkon S) reduced the rate of PepMV infection on inoculated tomato plants. Additional experiments with Squash mosaic virus (SqMV) transmission in zucchini indicated that Virkon S, SaniDate, Green-Shield, Vortexx, Octave, BioSide, Lysol, Des-O-Germ, and Menno-Terforte reduced SqMV infection at all exposure times. Additional trials are underway to determine the effectiveness of these products in larger scale experiments.

Ling, K.-S., Wintermantel, W. M. and Bledsoe, M. 2008. Genetic composition of Pepino mosaic virus population in North American greenhouse tomatoes. Plant Dis. 92:1683-1688.

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Xu, X., Rajashekara, G., Paul, P. and Miller, S. A. 2012. Colonization of tomato seedlings by bioluminescent *Clavibacter michiganensis* subsp. *michiganensis* under different humidity regimes. Phytopathology 102 (in press).