Disease Management in Organic Tomatoes

Annette L. Wszelaki[1] and Sally A. Miller[2]
Departments of [1]Horticulture and Crop Science and [2]Plant Pathology
The Ohio State University - OARDC
1680 Madison Ave., Wooster OH 44691

Diseases are major constraints to profitable organic vegetable production in much of the United States. During transition to organic production, they can be especially problematic and result in serious losses in vegetable crop yield and quality. Soil quality improvement, disease resistance, sanitation, crop rotation, irrigation management and other cultural practices can reduce disease incidence and severity in many instances. However, additional tactics may be needed to successfully manage vegetable crop diseases. While the use of pesticides is greatly restricted in organic agriculture, various natural products are permitted for disease management under the standards of the National Organic Program (NOP). Copper-based fungicides are widely used in organic vegetable production, but pose concerns due to potential accumulation in soil, contamination of run-off water, and subsequent toxicity to non-target organisms. Other materials allowed under NOP standards include bicarbonate salts, essential oils, plant and soil extracts, and biological control organisms. Potassium bicarbonate has been shown to reduce postharvest decay development and foliar diseases in citrus. Essential oils, such as tea tree, garlic and neem, have been tested *in vitro*, in soil, and on fruit and vegetable crops, but with variable results. Foliar applications of humic acid and extracts of horsetail (*Equisetum*) and seaweed have been tested for plant growth enhancement and/or inducing plant disease resistance. Lastly, biological control agents have been successful in combating disease by inducing plant resistance, producing antibiotics, and out-competing pathogens.

Many products are advertised for disease control in organic production systems, most of which have not been adequately evaluated in independent, replicated trials. The objective of this study was to test the efficacy of 16 products or product combinations approved or likely to be approved for organic production to control fruit and foliar diseases of tomatoes. The experiment was conducted on transitional organic soil at the Ohio State University/Ohio Agricultural Research and Development Center in Wooster, OH in 2002 and 2003. Details of the experimental design, materials and methods can be found in Wszelaki and Miller (2005). The principle disease assessed were early blight (*Alternaria solani*), Septoria blight (*Septoria lycopsersici*) and fruit anthracnose (*Colletotrichum coccodes*).

Weather conditions during the two years of this study were very different, resulting in differences in disease pressure (low in 2002, moderate-high in 2003). In 2002, the average maximum temperatures tended to be 5-10 ºF warmer than in 2003. Also, 2002 was a dry year with only 6.9 inches of rain during the growing season, while 17.0 inches of rain fell during the 2003 growing season. Nonetheless, the results show that copper compounds were most effective for controlling Septoria leaf spot and early blight (Figure 1). Bordeaux mixture caused phytotoxicity in the form of leaf curling in year 1 on 'Peto 696', a processing tomato variety, although not in year 2 on 'Celebrity', a fresh market variety. This difference may be variety related or may be the result of hotter, drier

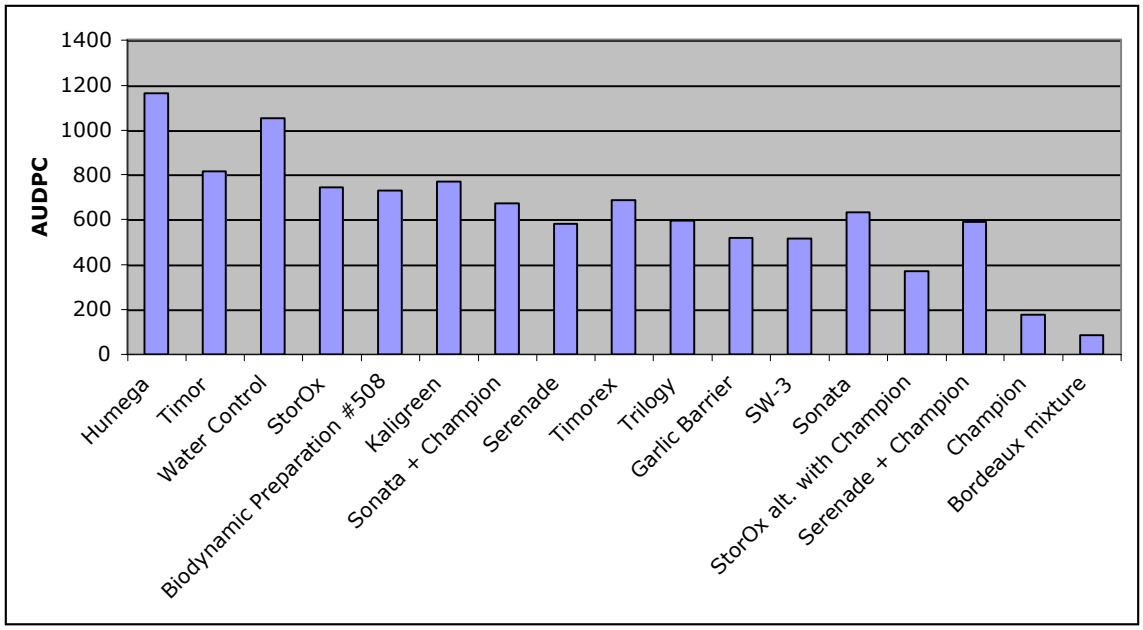

Figure 1. Area Under the Disease Progress Curve (AUDPC) for early blight and Septoria blight of tomatoes cv. 'Celebrity' treated with various OMRI-approved materials, Wooster, OH 2003.

conditions in 2002 than in 2003. Because copper-containing products are classified as 'restricted' on the OMRI (Organic Materials Review Institute, Eugene, OR) list, alternative disease control measures must be in place if the established limit is reached in any given crop cycle to prevent toxic buildup of copper in the soil. Therefore, it is essential for organic growers to adopt an integrated approach to disease management that does not rely on copper alone. Integrated control methods might include choosing disease-resistant varieties, disinfecting seeds with heat treatments, rotating crops, applying compost, managing weeds, and, when necessary, using other effective, approved products for disease management. Garlic and neem oils, *Bacillus subtilis* and seaweed extract significantly reduced foliar disease on tomato compared to the control in this study. While treatment with Sonata (*Bacillus pumilus*) did not significantly reduce disease severity, tomato plants treated with Sonata tended to yield better than control plants.

Publications Resulting From This Work

Wszelaki, A. L. and Miller, S. A. 2005. Determining the efficacy of disease management products in organically-produced tomatoes. Plant Health Progress doi:10.1094/PHP-2005-0713-01-RS.

Wszelaki, A., Butler, T., Steiner, C., Burnison, E., and Miller, S. A. 2004. Evaluation of approved materials for the control of foliar and fruit diseases of organic fresh-market tomatoes, 2003. Biological and Cultural Tests 19:PT013.

Wszelaki, A. L., Walker, S. D., Steiner, C. P., and Miller, S. A. 2003. Evaluation of alternatives for the control of foliar and fruit diseases of organic processing tomatoes, 2002. Biological and Cultural Tests 18:PT008.