

Effect of spring-pruning method, copper sprays and training systems on bacterial canker of sweet cherry

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## Outputs

### Activities:

Pruning techniques and bactericides were evaluated for managing bacterial canker in sweet cherry. The impact of pruning date on infection was investigated in replicate orchard blocks, three at the NYS Agricultural Experiment Station, Geneva NY and two at the Hudson Valley Laboratory, Highland, NY. Trees were pruned March 25 and 15, April 24 and 15, May 22 and 14, and July 28 and 31, in Geneva and Highland, respectively. In Highland no bactericides were applied to the trees. In Geneva, the replicate blocks were treated with either no bactericide, copper (COCS or Cuprofix Ultra at 4 lb/100 gal), or phosphorous acid (Agri-Fos at 2.5 qt/100gal) on March 26, April 24 and April 25. In Geneva, an additional 21 trees in each block were pruned on April 24 to more thoroughly investigate the effect of the bactericide treatments before and after the April 24 pruning. Pruned branches averaged 3.5 cm in diameter and all cuts were made to leave a stub approximately 20-cm-long. Pruned cut surfaces were inoculated with copper-sensitive *Pseudomonas syringae* pv. *syringae* (Pss) (10 to the 8th cfu/ml) immediately after pruning. Bacterial canker symptom development was assessed on stubs five times during the growing season, once in June prior to the July pruning date and subsequently at two week intervals from August to October.

During the late dormant season, the relative susceptibility of six sweet cherry orchard planting systems and five cultivars to the canker phase of the disease was visually assessed in Geneva.

Detached green cherry fruit assays were conducted to determine pre-infection and post-infection activity of labeled rates of Kocide 2000 (standard), Regalia, Flameout, Oxidate, Serenade, BCYP, Kasumin, Kasumin + Captan, Prophyt, Pentra Bark, Prophyt + Pentra Bark, Urea, Kasumin + Pentra Bark, and Flameout + Pentra Bark.

*P. syringae* isolates recovered in 2006 and 2008 from inoculated sweet cherry trees in the Geneva orchard were subjected to PCR analysis to identify them as either pv *syringae* or pv *morsprunorum*. The isolate of Pss used for inoculum in the field experiments (Ps34 collected by Burr from sweet cherry, Wayne County, NY) was submitted for genome sequencing. Three streptomycin resistant isolates of Pss were recovered from apple buds in Geneva.

### Services:

A Sweet Cherry Field Meeting on July 14, 2009 at the Geneva, NY featured the bacterial canker work, information on planting systems, high tunnels and rain shields, postharvest cooling and

handling and a sweet cherry variety showcase. Forty growers, nurserymen, and consultants attended.

#### Products:

We have new knowledge that copper and phosphite are essentially ineffective against bacterial infections of pruning cuts, pruning stubs may effectively contain bacterial canker infections, cankers progress further in stubs pruned in March, April and May compared to those in late July, and Flamout and Kasumin show potential activity against Pss infection in sweet cherry. We have an initial genome sequence collection of contigs for Pss isolate Ps34. We recovered three naturally-occurring streptomycin resistant Pss isolates.

#### **Outcomes / Impacts**

Canker progressed furthest in stubs pruned in March (11.2 and 14.5 cm), April (9.8 and 10.5 cm) and May (7.2 and 14.8 cm), as compared to the July pruning date (2.1 and 4.0 cm) in Geneva and Highland, respectively. There was little to no effect of the whole block bactericide treatments on canker progression in the two Geneva field experiments: the four pruning dates (no bactericide 7.7 cm, copper 7.6 cm, and phosphite 7.5 cm) and the April pruning plus treatment (no bactericide 8.1 cm, copper 8.8 cm, and phosphite 9.0 cm). Inoculated pruning stub infections did not progress into scaffold limbs or trunks in any of the trees.

We rated, in order of higher to lower canker incidence, the training systems Modified Central Leader more susceptible, Spanish Bush, Vogel Slender Spindle, Vertical Axis, Marchant, and Perpendicular V least susceptible, and the cultivars Tehranivee more susceptible, Hedelfingen, Regina, Lapins, and Sweetheart least susceptible, though no statistical separation in the ratings was found.

Results from the green cherry eradicator and protectant tests suggest that Flameout (54 and 44% control, respectively) may have promise as a material to replace or augment the use of copper (32 and 30% control, respectively) for managing bacterial canker. Kasumin had eradicator activity (25% control), but not protectant activity (7% control).

The collection of 420 *P. syringae* isolates recovered during 2006 and 2008 from the Geneva orchard were confirmed to contain only pv *syringae* and no pv *morsprunorum* isolates were found. We have an initial genome sequence collection of contigs for the Pss isolate Ps34 collected by Burr from sweet cherry, Wayne County, NY. We recovered three naturally-occurring streptomycin resistant Pss isolates from apple buds.

Future field experiments are being designed to explore the seasonal dispersal of Pss in sweet cherry orchards.

#### **Publications**

Carroll, J.E., Robinson, T.L., Burr, T.J., Hoying, S., and Bucien, T. 2008. Effect of spring-pruning method, copper sprays and training systems on bacterial canker of sweet cherry. 2007-2008 NYS IPM Project Reports, Cornell. NYS IPM Publication #509:83-85.

## **Participants**

Juliet Carroll, Senior Extension Associate, New York State IPM Program. Her role is principal investigator. She lead research efforts in two field experiments, two laboratory experiments, the collection and identification of Pss isolates and provided overall coordination of the project.

Terence Robinson, Professor, Horticultural Sciences. His role is co-principal investigator. He provided and maintained experimental orchards, pruning and spraying of two field experiments, and input on direction of research.

Thomas Burr, Professor, Plant Pathology and Plant-Microbe Biology. His role is co-principal investigator. He provided research laboratory facilities and equipment, guidance on bacterial laboratory work and input on direction of research.

Stephen Hoying, Senior Extension Associate, Horticultural Sciences. His role is co-principal investigator. He lead the research efforts in Highland, NY. He provided input on direction of research.

Theodora Bucien, Research Aide. She worked under the direction of Carroll providing technical support for field and laboratory experiments, maintained and identified cultures of bacterial isolates from the field, and assisted with data collection.

### **Collaborators:**

Kerik Cox, Assistant Professor, Plant Pathology and Plant-Microbe Biology. His role is collaboration on testing materials to substitute for copper in the management of bacterial canker and on the molecular genetics and identification of Pss isolates.

David Rosenberger, Professor, Plant Pathology and Plant-Microbe Biology. His role is collaboration on identification and awareness of outbreaks of bacterial canker in orchards in the Hudson Valley and input on direction of research. His laboratory assisted with preparation of inoculum for the Highland, NY experiments.

### **Training:**

We have extended our knowledge of this disease through Sweet Cherry Field Meeting on July 14, 2009 to 40 sweet cherry growers.

## **Target Audiences**

Sweet and tart cherry growers are the target audiences, in New York, the USA, and worldwide where this disease threatens cherry production. New York ranks fourth in the nation in tart cherry production with 2000 acres producing 7.5 million pounds of fruit valued at 3.24 million dollars. New York farmers grew 700 acres of sweet cherries producing 800 tons of fruit valued at 1.27 million dollars in 2005. New York tree fruit growers ranked the need for research on bacterial canker biology and management in the top ten.