Apple anthracnose canker life cycle and disease cycle

Whitney Garton¹, Mark Mazzola², and Carol Miles¹

¹Department of Horticulture, Washington State University, Northwestern Washington Research and Extension Center, Mount Vernon, WA
²USDA-Agriculture Research Service, Wenatchee, WA

ABSTRACT

Apple anthracnose [Neofabraea malicorticis (H.S. Jacks) anamorph Cryptosporiopsis curvispora (Peck)] produces cankers on trees and ‘Bull’s-eye rot’ on fruit. Growers in western Washington have reported removing 2-5% of trees and in some cases entire orchard blocks due to apple anthracnose canker. A controlled inoculation study was conducted in a screen house at WSU Mount Vernon NWREC, WA to better understand canker development and to create an effective management plan. The five treatments were designed to elucidate the necessity of wounding for infection and if Bordeaux mix [copper sulfate (CuSO₄) and calcium hydroxide (Ca(OH)₂)] can prevent infection with or without wounding. Inoculations was on 25 Nov. 2015 and a canker was first observed 9 weeks later on 27 Jan. 2016, in treatments 1 and 2; and 13 weeks after inoculation a canker appeared in all treatments excluding the control. Canker area size ranged from 0.02 to 0.24 cm² and infection occurred regardless of wounding and Bordeaux mix application. Small streaks of diseased tissue expanding from the wounded/inoculated area were observed only in treatment 3, suggesting that Bordeaux mix may prevent disease progression when wounding occurs.

INTRODUCTION

In the maritime Pacific Northwest, apple production is limited by apple anthracnose canker caused by Neofabraea malicorticis (H.S. Jacks), anamorph Cryptosporiopsis curvispora (Peck). Although apple anthracnose is present in many regions of the world, in this region cankers cause severe damage to trees, can kill newly planted trees, and is the primary limiting factor for long-term orchard productivity.

Research on apple anthracnose is limited because it is not a severe problem in other regions, and current apple anthracnose management recommendations are for Bull’s-eye rot on the fruit, not for the canker stage of the disease on trees. To better understand canker development (Fig. 1) and the elements of an effective management plan, a controlled inoculation study was conducted in a screen house at WSU Mount Vernon NWREC, WA.

METHODS

- Trees placed in a screen house with 0 – 15°C and RH 50 – 98% (similar to outdoor conditions)
- Trees inoculated with N. malicorticis (Fig. 2) and bandage kept in place for 21 days
- Applied Bordeaux mix with a hand sprayer prior to inoculation
- Each treatment (Table 1) applied to 1 tree and replicated 7 times

Table 1. Five treatments applied Nov. 2015 to 2 year-old ‘Tomkins King’ apple trees.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>No. of cankers</th>
<th>Size (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bordeaux mix + wounding + inoculation</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>2 Bordeaux mix + no wound + inoculation</td>
<td>1</td>
<td>0.19</td>
</tr>
<tr>
<td>3 Wounding + inoculation</td>
<td>1</td>
<td>0.24</td>
</tr>
<tr>
<td>4 Inoculation only</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>5 Control (no treatment)</td>
<td>1</td>
<td>0.05</td>
</tr>
</tbody>
</table>

RESULTS

- A canker first appeared 9 wks after inoculation in:
  - Trt. 1 (Bordeaux mix + wounding + inoculation)
  - Trt. 2 (Bordeaux mix + no wound + inoculation)
- A canker appeared in all treatments 13 wks after inoculation (excluding control)
- Canker area size ranged from 0.02 – 0.24 cm²
- Small streaks of diseased tissue expanded from the inoculated/wounded area only in:
  - Trt. 3 (Wounding + inoculation)

DISCUSSION

- Canker lesions first appeared as small, oval, reddish lesions above and below inoculated area
- Infection occurred regardless of wounding and Bordeaux mix application
- Wounding appears to enhance disease severity
- Bordeaux mix may prevent disease progression when wounding occurs
- Study to be repeated in September 2016

ACKNOWLEDGEMENTS

Committee: Dr. Carol Miles (Chair), Dr. Mark Mazzola, and Dr. Lisa DeVetter
Colleagues: Ed Scheenstra, Rebekah Timothy, Jacky King, and Veg. Hort staff
Funding: Washington State University Extension
Washington State Commission on Pesticide Registration
Northwest Cider Association