

# Bacterial canker infection and control



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**Two “sacrificial”  
orchards planted 2006:**

**Sunset Bing/G6  
Golden Heart/Mazzard**

**Eight “injuries”:**

**Heading cut**

**Strip lower buds**

**Leaf scars**

**Early winter freeze**

**Mid winter freeze**

**Dormant pruning**

**Summer pruning**

**Scoring notches**

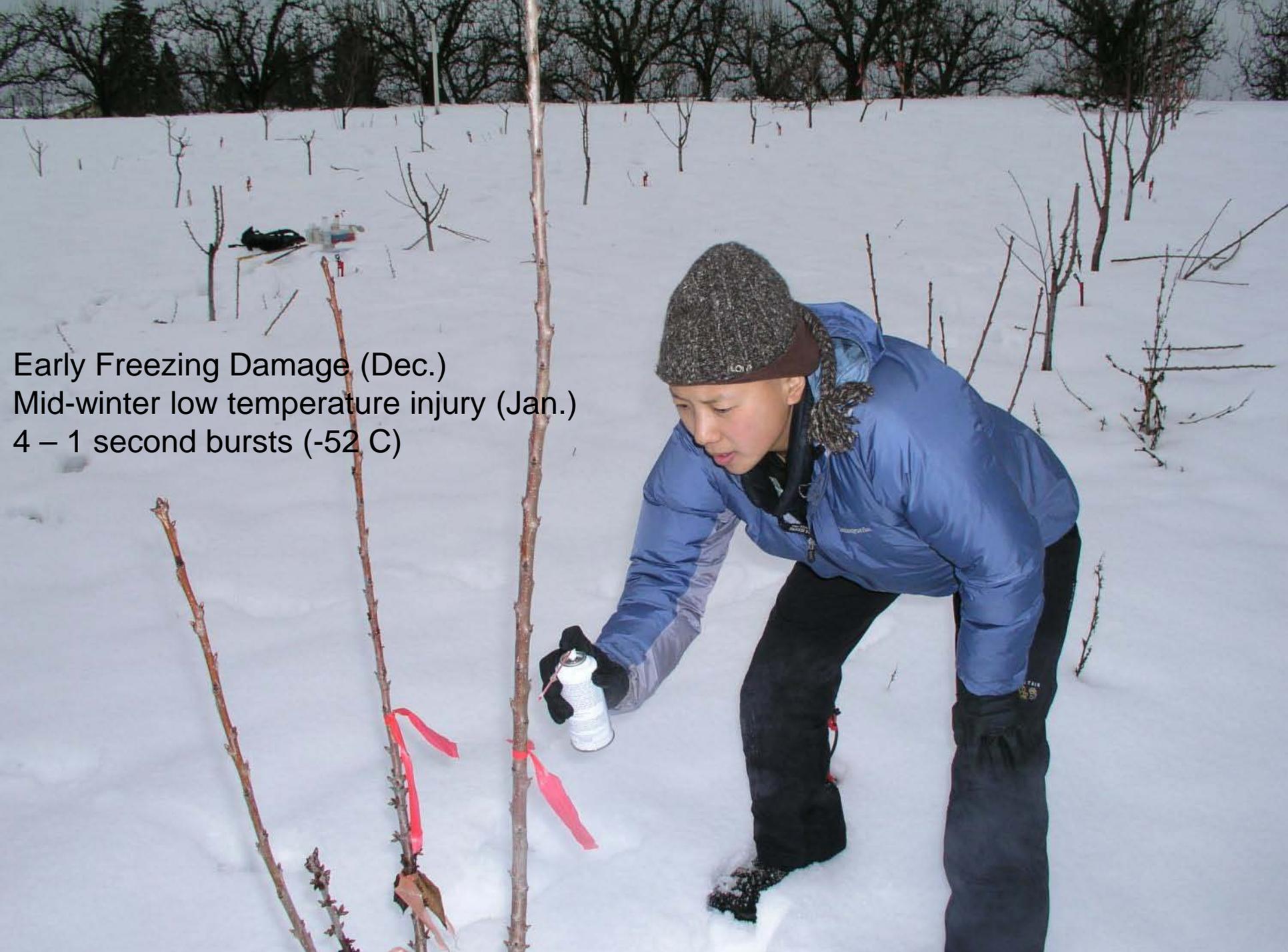
Heading cut inoculated





**One  
month  
later**

Early Freezing Damage (Dec.)  
Mid-winter low temperature injury (Jan.)  
4 – 1 second bursts (-52 C)





# When and where does infection occur?

<b>Sunset Bing Injury</b>	<b>Percent infected</b>	<b>Canker length (in.)</b>	<b>Dead trees (%)</b>
<b>Low Temp (Jan.)</b>	<b>94b</b>	<b>9.8b</b>	<b>64c</b>
<b>Dormant prune</b>	<b>94b</b>	<b>3.8a</b>	<b>29b</b>
<b>Heading cut (at planting)</b>	<b>100c</b>	<b>6.2ab</b>	<b>86d</b>
<b>Scoring</b>	<b>100c</b>	<b>5.5ab</b>	<b>21ab</b>
<b>Summer prune</b>	<b>69a</b>	<b>8.9ab</b>	<b>64c</b>
<b>Leaf Scars</b>	<b>95b</b>	<b>10.7b</b>	<b>71c</b>
<b>Early freezing (Dec)</b>	<b>63a</b>	<b>1.2a</b>	<b>14a</b>

# General Impressions of Injury Susceptibility

- Lower susceptibility levels during December and dormant pruning period
- Making heading cuts in the spring can be problematic (inoculum levels at bloom increase 10 – 100 fold)
- Inoculum levels and susceptibility decrease in Summer
- Inoculum levels and susceptibility increase in Fall

# Summer pruning (June and August)



**Wound healing**



**Winter pruning  
(January)**

# Time for wounds on Sweetheart to heal

## Canker length (mm)

Time (wks)

Summer

Winter

0

18b

10b

1



7ab

7b

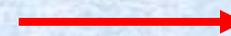
2

5a

6b

3

5a



2a

Control

4a

1.3a

Canker length no different than control after 1 week or 3 weeks. Wounds susceptible for < 1 wk or > 2 but < 3 wks.

# Discussion on Wound Healing

- Summer
  - If no water present in summer than no infection
  - If chance of sprinklers contacting trees wait at least one week after pruning to irrigate or change sprinkler design
- Winter
  - Wait for dry weather
  - Colder weather is better than warm

# Pruning Through an Active Canker



# Attempt to spread bacterial canker with contaminated loppers

## Canker length (mm)

Cut made through	Aug 2007	Jan 2008	Aug 2008
<b>Canker</b>	<b>2.7a</b>	<b>4.7a</b>	<b>5.9a</b>
<b>Healthy wood</b>	<b>4.3a</b>	<b>8.0a</b>	<b>6.3a</b>

At end of study 17% of trees cut with contaminated pruners and 17% of wounded control trees were dead

# Discussion About Transmission with Pruning Tools

- If possible, cut several inches below canker to remove disease
- Don't worry about sterilizing tools between cuts



# **Rootstock/cultivar resistance trial**

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- **Planted April, 2007**
- **Rootstocks: Gisela 6; Mazzard; Maxma 14;  
Colt; Krymsk 5**
- **Cultivars: Bing; Sylvia; Sweetheart; Regina; Rainier**
- **Headed and inoculated: May 2007**
- **Scored, tipped, and inoculated: April 2008**



**Sweetheart on Gisela 6**



**Sweetheart on MM14**

# Evaluation of rootstock/scion combinations for canker resistance

Cultivar*	Head Cut 07	Score Cut 08	Dead 09 (%)
Bing	18b	14bc	70b
Sweetheart	13a	14bc	43a
Sylvia	12a	8a	60ab
Regina	11a	11ab	50a
Rainier	9a	16c	47a

\*Data from G6, Mazzard and MxM14 combined for each cultivar

“Bing and Sweetheart were overall the most susceptible cultivars while Regina and Rainier appeared to be more resistant.”

# Discussion on Varietal Susceptibility

- In sensitive locations Regina is better choice than Sweetheart for late season variety
- All varieties are sensitive

# Evaluation of rootstock/scion combinations for canker resistance

Rootstock*	Head Cut 07	Score Cut 08	Dead 09 (%)
Gisela 6	15c	9a	77b
Mazzard	12b	17c	30a
Maxma 14	9a	11b	45a

\*All cultivars combined for each rootstock

## Discussion

- Mazzard better choice than G6 in sensitive locations

# Bacterial canker severity of Bing on four rootstocks

Rootstock	Head Cut 07	Score Cut 08	Shoot Cut 08	Dead (%) 09
Gisela 6	19b	8a	4a	90c
Mazzard	17b	19b	6a	50b
Colt	7a	17b	8b	0a
Krymsk 5	5a	13b	4a	43b

# Bing/Rootstock Discussion

- Colt shows greatest resistance of all rootstocks but not precocious
- K5 provides precocity and a low rate of heading cut susceptibility and moderate mortality similar to Mazzard

**Bactericide Test for Control of *Pseudomonas* Using Detached Leaves**



**Water**

**Famoxate+Kocide**

**Agri-mycin**

	Percent leaves infected
Bactericide	3 year average
<b>Kasumin 2L</b>	<b>0.0a</b>
<b>Agri-Mycin 17</b>	<b>6.7ab</b>
<b>Gentamycin</b>	<b>8.3abc</b>
<b>Mycoshield</b>	<b>8.3abc</b>
<b>Fosphite</b>	<b>12.5abc</b>
<b>Cuprofix Ultra</b>	<b>31.7bcd</b>
<b>Serenade ASO</b>	<b>33.3cde</b>
<b>Chloramphenicol</b>	<b>43.0def</b>
<b>Actigard</b>	<b>55.0defg</b>
<b>Famoxate</b>	<b>55.0defg</b>
<b>ManKocide</b>	<b>58.3efg</b>
<b>Silmatrix</b>	<b>65.5fgh</b>
<b>Tanos</b>	<b>67.1fgh</b>
<b>Water control</b>	<b>68.9fgh</b>
<b>Famoxate + Kocide</b>	<b>71.7gh</b>
<b>Kocide 2000</b>	<b>86.7h</b>

# Bacterial canker control in a commercial orchard A

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	Head cuts	Score cuts	Other cuts
Treatment	% infected	% infected	Number/tree
Famoxate	41ab	9ab	0.9cd
Tanos	62bc	11ab	0.4abc
Tanos+Kocide	80c	27cd	0.5abcd
Kocide	81c	16abc	0.7bcd
Cuprofix UD	56b	35d	0.3ab
Kasumin	30a	18bc	0.1a
Unsprayed	51b	5a	1.0d

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# Discussion of Bactericides

- No effective product currently registered for control of BC
- Copper products can actually increase BC levels

# **12 Steps to Manage Bacterial Canker of Sweet Cherry**

- 1. Do not interplant new trees with old trees**
- 2. Keep irrigation water off the trees as much as possible for the first 2 or 3 years after planting.**
- 3. Avoid injury – mechanical, insect, frost. Paint trunks white with latex paint to prevent winter injury.**
- 4. Less disease occurs when summer pruning is used. Prune only during dry weather.**

- 5. Remove and destroy branches and trees killed by *P. syringae* from the orchard.**
- 6. For non-precocious rootstocks use Colt.  
For precocious rootstocks consider K5.**
- 7. Locate the orchard in an area less likely to be affected by frost and slow drying conditions.**
- 8. Provide optimal soil conditions for growth of trees, including attention to pH and nutrition.  
Avoid excess nitrogen.**

- 9. Control weeds as *P. syringae* colonizes surfaces of many plants. Try clean cultivation or clover.**
- 10. No good spray program available yet. Avoid the use of copper.**
- 11. Test for nematodes before planting. High populations of ring nematode are associated with more bacterial canker.**
- 12. In the Parkdale area, plant trees later in spring. *P. syringae* populations increase 10-100 fold during bloom in mid-April.**