

MANAGEMENT OF BACTERIAL DISEASES ON STONE FRUIT



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Overview

Bacterial spot

Xanthomonas arboricola pv. *pruni*
(*Xap*)



- Predisposing factors
- Symptoms
- Disease Cycle
- Management

Bacterial canker

Pseudomonas syringae pv. *syringae*
Pseudomonas syringae pv.
morsprunorum



Bacterial Spot

- Predisposing factors favoring the occurrence of bacterial spot
 - Cultivar susceptibility
 - Early bud break and early fruit ripening
 - Sandy and very clay soils
 - ~ 86 °F temperature
 - Relative humidity of 100% over a period of 3 days = appearance of disease



Bacterial Spot Symptoms - Fruit

- **Early Season Lesions**

- 3 weeks after petal fall
- Irregularly shaped
- Extend deep into fruit

- **Late Season Lesions**

- Shallow
- Skin Cracking
- Secondary infection: brown rot



Bacterial Spot Symptoms - Fruit

- **Peach Scab**
 - Circular lesions
 - Dark olive-brown, fuzzy lesions
 - Lesions form pattern
 - No fruit surface pitting
 - No foliar symptoms



Bacterial Spot Symptoms - Leaves

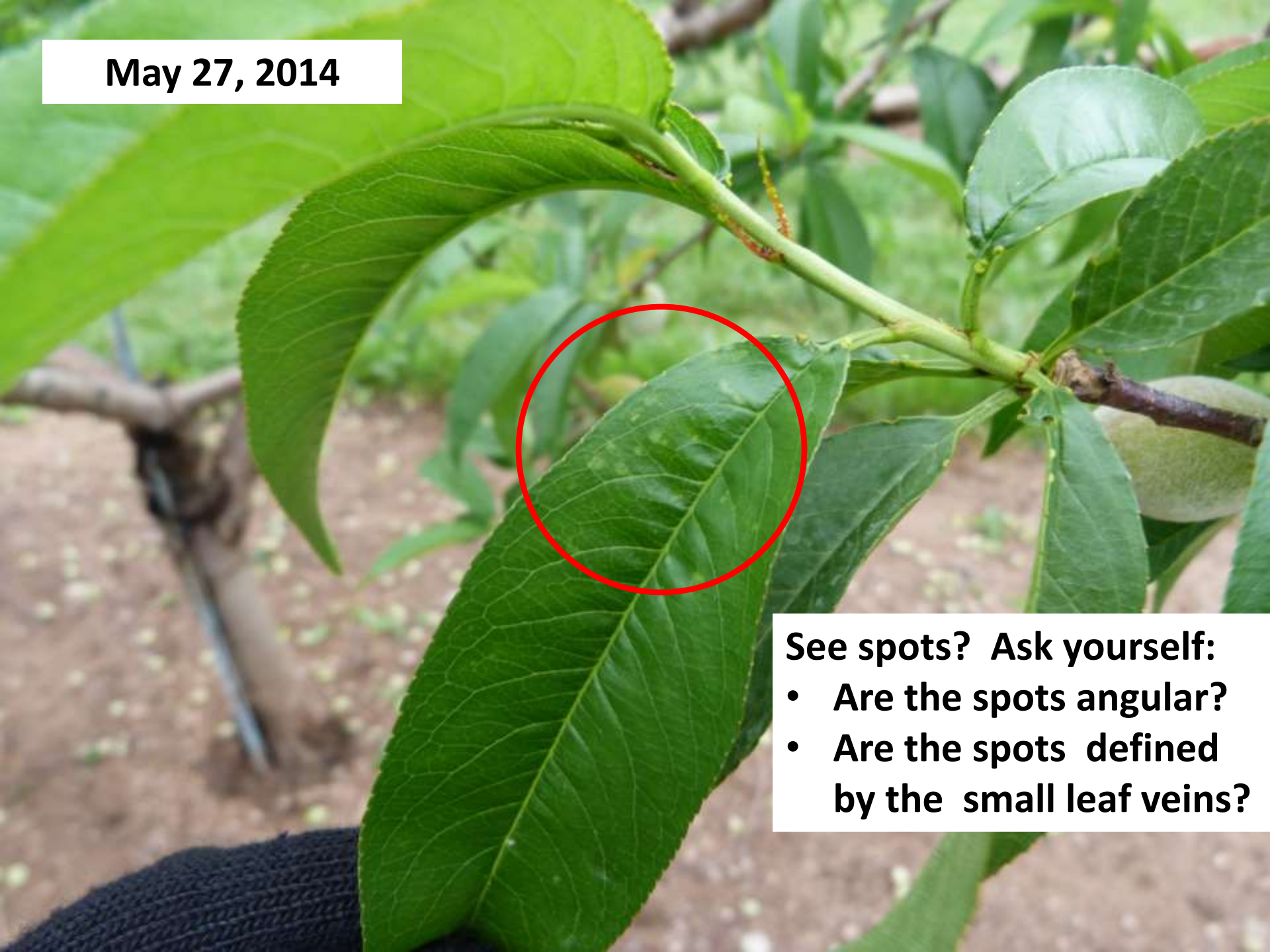
- Most susceptible before full expansion
- Angular lesions
- “Shot-hole” appearance
- Yellowing
- Premature defoliation
- Copper & Captan injury



Chemical injury



May 27, 2014



See spots? Ask yourself:

- **Are the spots angular?**
- **Are the spots defined by the small leaf veins?**

Late May – early June 2014



See spots? Ask yourself:

- **Are the spots angular?**
- **Are the spots defined by the small leaf veins?**

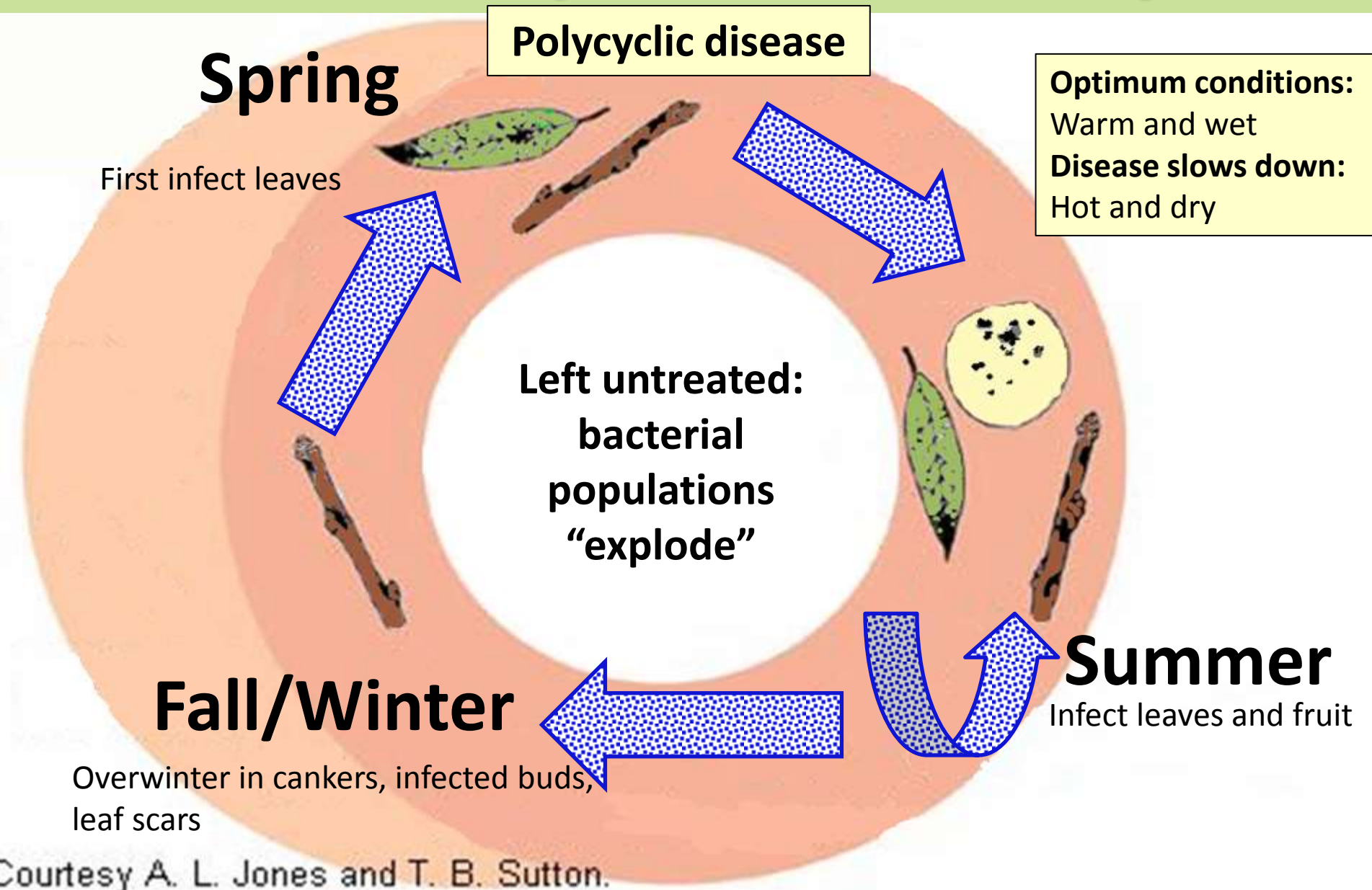
Bacterial Spot Symptoms - Twigs

- Cankers
- Lack of vegetative growth
- Bark cracking
- Overwintering site for bacteria
- Black Tip



Ritchie, D.

Bacterial Spot Disease Cycle



Bacterial Spot Management

- **Two Main Strategies**
 - **Resistant Cultivars**
 - Not immune = Still need control measures
 - **Chemical Products**
- **Copper**
 - Dormant spray
 - Phytotoxic
 - Risk of resistance
- **Oxytetracycline (Mycoshield, FireLine)**
 - Suppresses bacteria
 - Up to 10 applications per season (**disease conditions)
 - Risk of antibiotic resistance
 - Short life span
 - Persistent yield loss
 - Label limitations

Bacterial Spot Management

Other considerations...

- Start applications late petal fall to early shuck split
- Spray 7 – 14 days according to conditions
- Rotating other chemicals with oxytetracycline
- Serenade Optimum (14 oz/A)
 - Works well in rotation
 - Can be tank mixed with oxytet
- For apricots, plums, etc: Cueva, Badge, Kocide, etc; Serenade Optimum, Double Nickel
 - ** Always double check the label**

Bacterial Spot Management:

Copper recommendations (N. Lalancette, Rutgers)

Copper Bactericides for Peach Bacterial Spot Control						
Product Name	Formulation (metallic Cu)	Active Ingredient	REI	PHI	Post-bloom Application Rate/A	
					Label	Recommended
0 Day PHI						
Kocide 3000	30DF	Copper hydroxide	48 hr	0 days	4.0 – 8.0 oz	1.7 oz
Cueva	0.16F	Copper octanoate	4 hr	0 days	0.5 – 2.0 gal	25 fl oz
21 Day PHI						
Nordox	75WG	Cuprous oxide	12 hr	2nd cover	10.7 oz	0.7 oz
Nu-Cop	50DF	Copper hydroxide	48 hr	21 days	1.0 – 3.0 lb	1.0 oz
Mastercop	0.54SC	Copper sulfate pentahydrate	48 hr	21 days	4.0 – 8.0 fl oz	7.4 fl oz
Champ Formula 2 Flowable	2.93F	Copper hydroxide	48 hr	21 days	none provided	1.4 fl oz
COC DF	50DF	Copper oxychloride	24 hr	21 days	1.0 lb	1.0 oz
Copper-Count-N	0.77F	Copper diammonia diacetate complex	48 hr	21 days	1.0 qt	5.3 fl oz
Badge X2	28DF	Copper oxychloride + copper hydroxide	48 hr	21 days	8.0 oz	1.8 oz

Recommended rate based on the metallic copper concentration of 0.5% = 1X

Can increase concentration to 2X (1% → multiply current recommended rate times 2)

****Be sure to monitor shoot s for increase in defoliation when using 2X rate****

Bacterial Spot Management

If your crop was frozen out: you still need to control for bacterial spot!

- **If you don't control the disease in no-crop years:**
 - **Build up of inoculum—issues for subsequent years**
 - **Stress – defoliation; weakens tree making it more susceptible to bacterial spot in coming years**
 - **Also holds true for CHERRY LEAF SPOT!**

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Bacterial canker

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Bacterial Canker

- Predisposing factors favoring the occurrence of bacterial canker

➤ Training systems

Ranked in order of increasing vulnerability to canker infections

Least susceptible

Perpendicular V

Vertical Axis

Marchant

Vogel Slender

Spindle

Modified Central Leader

Most susceptible

Spanish Bush

Bacterial Canker

- Predisposing factors favoring the occurrence of bacterial canker

- Cultivar susceptibility

Least susceptible

Sweetheart

Lapins

Tehranivee

Hedelfingen

Most susceptible

Regina

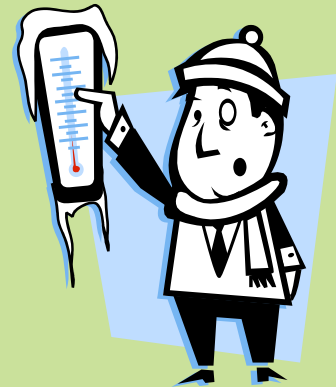


- Rootstock susceptibility

Gisela rootstocks highly susceptible

Bacterial Canker

- Predisposing factors favoring the occurrence of bacterial canker
 - Sandy and clay soils
 - Nutrient deficiency
 - High ring nematode populations
 - Winter pruning
 - **Spring freezes** (*May 2013 freeze; 2014 spring freeze)
 - Bacteria: Ice nucleation proteins & frost injury
- Proteins allow water to freeze at higher temperatures resulting injury to the plant
- Bacteria “feed” on the nutrients released by the injured plant tissue



Bacterial Canker Symptoms

Fruit

- Sporadic
- Water – soaked lesions
- Chocolate – brown lesions



Leaves

- Sporadic
- Necrotic lesions, chlorotic rings
- “Shot hole” appearance
- Lesions occur along leaf margin - curling effect



Bacterial Canker Symptoms

Branches and Trunk

- Facilitated by stress
 - Spring frost
 - Severe winter freezes
 - Water – soaking
 - Blossom infection
 - Pruning wounds
 - Insect injuries
- Sunken bark
- Amber gummosis
- Girdled branches and trunks
- Limb and tree death
- Cytospora Canker



Bacterial Canker

Favorable conditions - susceptibility

****Wind and rainstorms move the bacteria**

- **Mid-April (cool, wet, frost injury):**
 - Bacteria overwintering in buds, cankers
 - *P. syringae* populations increase 10 – to 100 – fold during bloom (**blossom infection – blossom blast**)
- **Summer:**
 - Humid, wet weather: symptoms on leaves and fruit
 - **Hot and dry conditions: *P. syringae* populations low**
- **Autumn rains and cooler temperatures:**
 - *P. syringae* detected at high levels prior to and during leaf fall
 - ***** Infection at leaf scars can be high**
- **Early to mid-winter**
 - Bacteria overwinter in cankers, dead buds, healthy buds
 - Exposed to severe temperatures increases chance of infection

Bacterial Canker Management

- Goal: reduce number of bacteria before trees enter susceptible period
- Using Copper*
 - Copper alone: evidence shows limited ability to control
 - Bordeaux mixture PLUS vegetable oil
 - 2.8 qts veg. oil/100 gal
 - (described: <http://jerseyfruitagupdates.blogspot.com/2012/09/spray-cherries-for-bacterial-canker.html>)
 - Sept, Oct, Nov, and in spring
- Pruning*
 - Avoid large dormant cuts
 - Minimize impact of disease with summer pruning
 - 12 inch rule: distances infection from the main trunk
 - “Ugly stub”



Bacterial Canker Management

- **Remove/Prevent tree stressors**
 - Plant in well drained soils
 - Maintain adequate nutrients
 - Weed control: weeds support populations of bacteria
 - Remove wild *Prunus*
 - Do not interplant new trees with old trees
 - Old trees source of bacteria



Take home messages:

Maintain healthy trees!



Bacterial spot

Resistant cultivars

Warm, humid temps favor high bacterial populations

Dormant copper sprays; reduced rates during the season

Oxytetracycline – favorable conditions throughout the season

Still need to control with or without crop

Bacterial canker

Susceptibility of rootstocks and cultivars

Spring freezes, cool fall weather promote disease

Mindful pruning – summer (low bacteria numbers)

Limited control options

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QUESTIONS?

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