

Tree Fruit Bacterial Disease Management 2.0:

Going Beyond Antibiotics



2018 Commercial Tree Fruit School



PennState Extension

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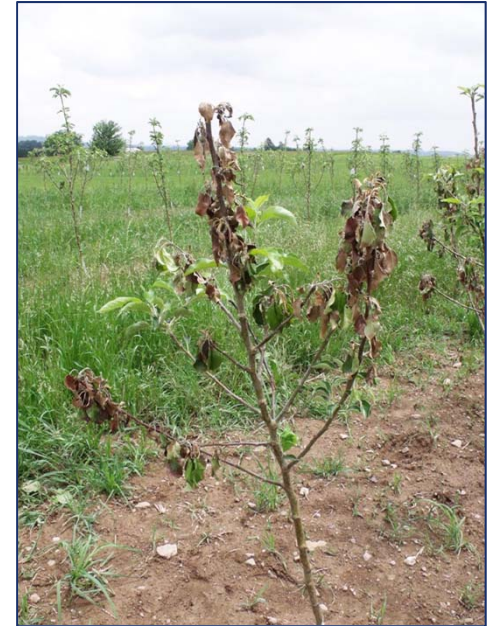


@drtreefruit

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FIRE BLIGHT

- **Blossom blight**
- **Shoot blight**

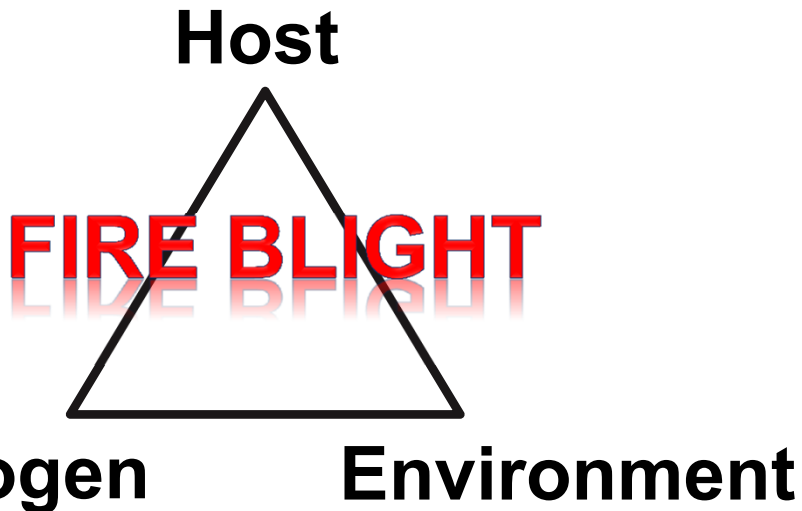


BACTERIAL SPOT on stone fruit



Fire blight susceptibility: The fundamentals

MANAGEMENT STRATEGIES



Disease Cycle

- Overwintering Sources of Bacteria
- Bacteria Dispersal and Colonization
- Five phases of infection
 - Blossom blight
 - Canker blight
 - Shoot blight
 - Trauma blight
 - Rootstock blight

Fire Blight Disease Cycle 101

Tight cluster – Pink:
Bacteria replicates
in cankers

Oozing bacteria: Attracts
insects – insects disperse
bacteria to flowers (wind and
rain also disperse bacteria)



Dormant
Canker:
Bacteria
overwinters
in bordering
living tissue

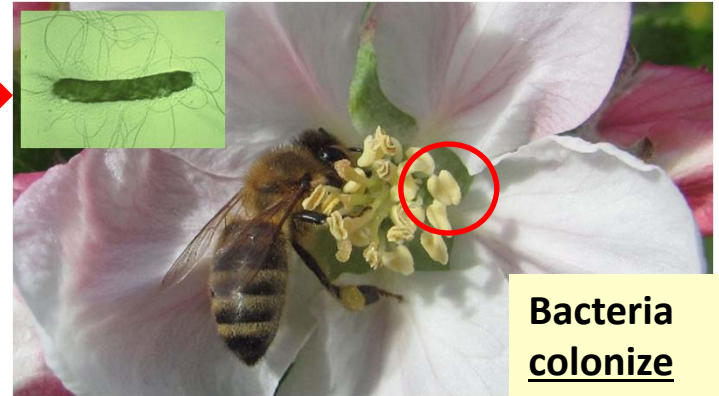


Active
canker

www.apsnet.org



Shoot Blight
Canker Blight
Trauma Blight
Rootstock Blight



Bacteria
colonize
stigmas
(favors warm
temps): does
not cause
disease (yet)

Wetting event
+ Ave. $\geq 60F$



5 – 30 days



Blossom Blight





E. Winzeler

Tools to manage blossom blight:

Biologicals

Serenade

Blossom Protect

Plant-based

Regalia

Vacciplant

Copper

Cueva

NuCop XLR

Previsto

Actigard



K. Peter

Blossom blight management

Option: Using less antibiotic sprays =
Using alternative early during bloom (~20%) (BEST)



2017 Treatments @ Bloom 20% -- 50% -- 100%	% Control	Russet?
Strep – Strep – Strep	99 a	No
Serenade Opti 20 oz/A – Strep – Strep	95 a	No
Serenade ASO 4 qt/A – Strep – Strep	96 a	No
Untreated	0 b	No

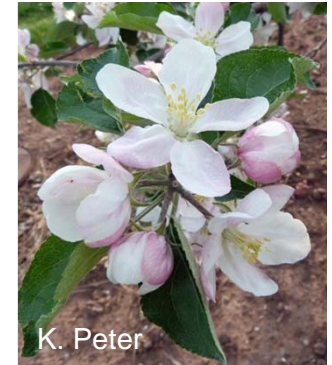
Mix with strep – later sprays: tank mix Actigard, Regalia, Vacciplant → some control post bloom

Using alternatives later in bloom = not as optimal

2016 Treatments @ Bloom: 50% -- 100% -- Late Bloom	% Control	Russet?
Strep – Strep – Strep	70 a	No
Strep – Strep – Serenade Opti 20 oz/A	52 ab	No
Strep – Serenade Opti 20 oz/A – Strep	45 b	No
Untreated	0 c	No

Blossom blight management

Alternatives: Blossom Protect (yeast) and copper options



2017 Fire blight trial results

Bloom sprays: 20% -- 50% -- 100% (Amt/A)	% Control	Russet?
Strep	99 a	No
Blossom Protect	40 c	Yes/No
Ceuva 2 qt	14 d	No
Previsto 3 qt	40 c	Yes (5%)
NuCop XLR 4 qt	80 b	Yes (12%)
Untreated	0 e	No

**** Do not use copper with strep (decreases efficacy of strep)**

→ Reducing the amount of copper = will russet lessen and still control disease?

→ IF fruit finish is not an issue = copper an excellent alternative to antibiotics

Downside of using Blossom Protect during very wet bloom time (and thereafter): Russet

Registered for sale in Arizona, California, Colorado, Idaho, Massachusetts, Michigan, New Jersey, Oregon, Pennsylvania, Virginia, Washington and Wisconsin



- ***Aureobasidium pullulans* can cause fruit russeting under certain environmental conditions**
- **Good scab weather = russet conditions (*Fungicides are limited when using BP during bloom)**



E. Winzeler

Tools to manage shoot blight in young and/or dwarf trees

Cover sprays

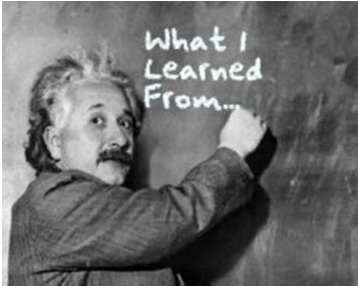
- **Copper**
 - Cueva ~ petal fall (2 qt/A)
 - Fire blight conditions post bloom: young and/or dwarf trees – petal fall through terminal bud set
 - Minimal russetting observed

Prohexadione calcium

- **Low dose = dwarf**
 - Space already filled = 2 oz/A
 - In a bloom spray (multiple apps necessary)
- **Susceptible semi-dwarf trees = ProCa a must and higher label rate!**

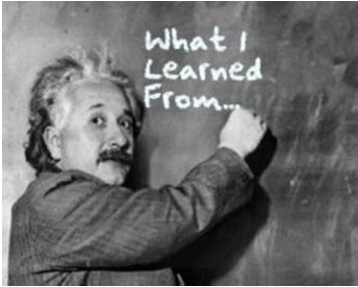
Plant immune system inducing products (young and/dwarf tree)

- **Actigard: Including in last bloom spray with streptomycin**
- **Consider Vacciplant or Regalia from petal fall and covers until terminal bud set**



Take home messages...

- Can limit the number of antibiotic bloom sprays early in the season
- Fruit finish not an issue = copper and yeast options @ bloom
- Low rates of ProCa in dwarf trees = if already filled tree space, 2 oz/A good option (start at petal fall)
- Semi-dwarf trees: ProCa encouraged (especially those with a history of fire blight...canker blight suppression)
- Copper sprays post bloom = limits shoots blight (dwarf trees, start ~ petal fall/1st cover)
- SAR in dwarf trees – start at petal fall
 - Smaller trees show better responses than larger (semi-dwarf) trees
 - Younger trees (greenhouse, potted) show better responses than older, established trees (more research needed)
- Timing is everything...!



Overall take home messages...

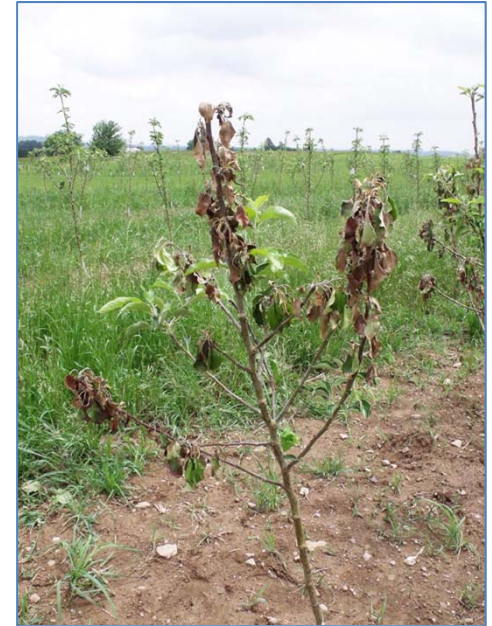
- **Fire blight management has to be an integrated approach**
 - **Sanitation: Canker removal**
 - **Blossom blight management (monitoring disease pressure: important)**
 - **Shoot blight management (may start during blossom blight management – disease pressure will be a factor for management decisions)**

Not only will you get control for the current season, but for future seasons



FIRE BLIGHT

- **Blossom blight**
- **Shoot blight**



BACTERIAL SPOT on stone fruit



Bacterial spot symptoms - Fruit

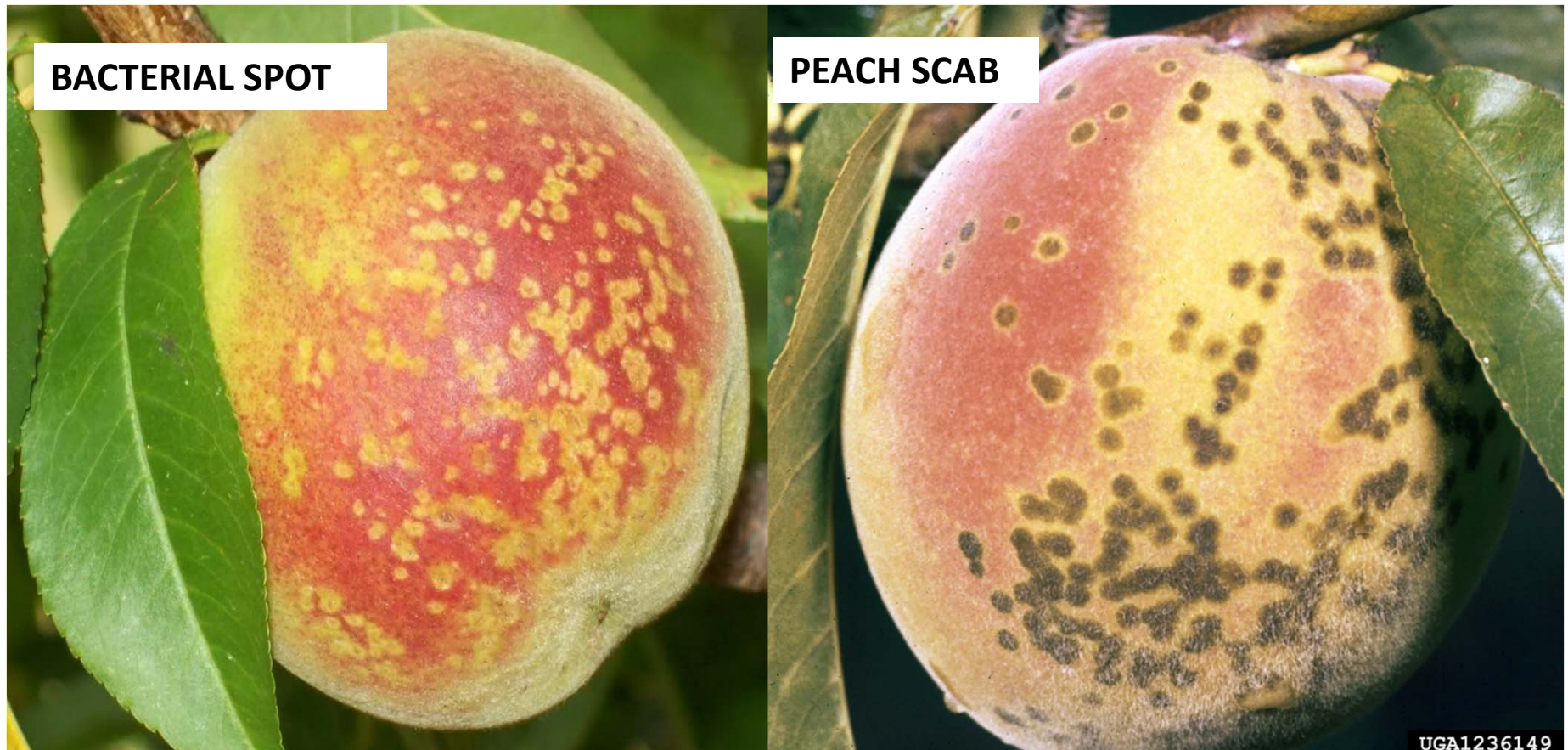
- **Early Season Lesions**
 - 3 weeks after petal fall
 - Irregularly shaped
 - Extend deep into fruit

- **Late Season Lesions**
 - Shallow
 - Skin Cracking
 - Secondary infection: brown rot



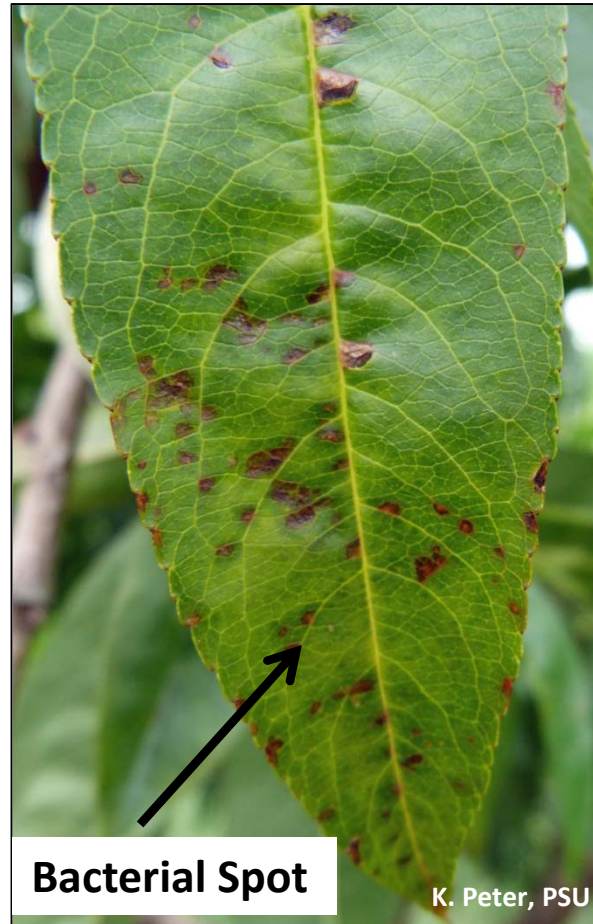
Bacterial spot symptoms - Fruit

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



Bacterial Spot vs. Copper Injury

- Angular
- Always bordered by the veins
- Few or many lesions
- Yellowing associated with lesions
- Defoliation— it does not take many lesions for this to occur



- Round (like a water droplet)
- Follows spray pattern
- “Swiss cheese”
- Yellowing not always associated with lesions
- Defoliation of older leaves
- Captan and sulfur injury: similar symptoms

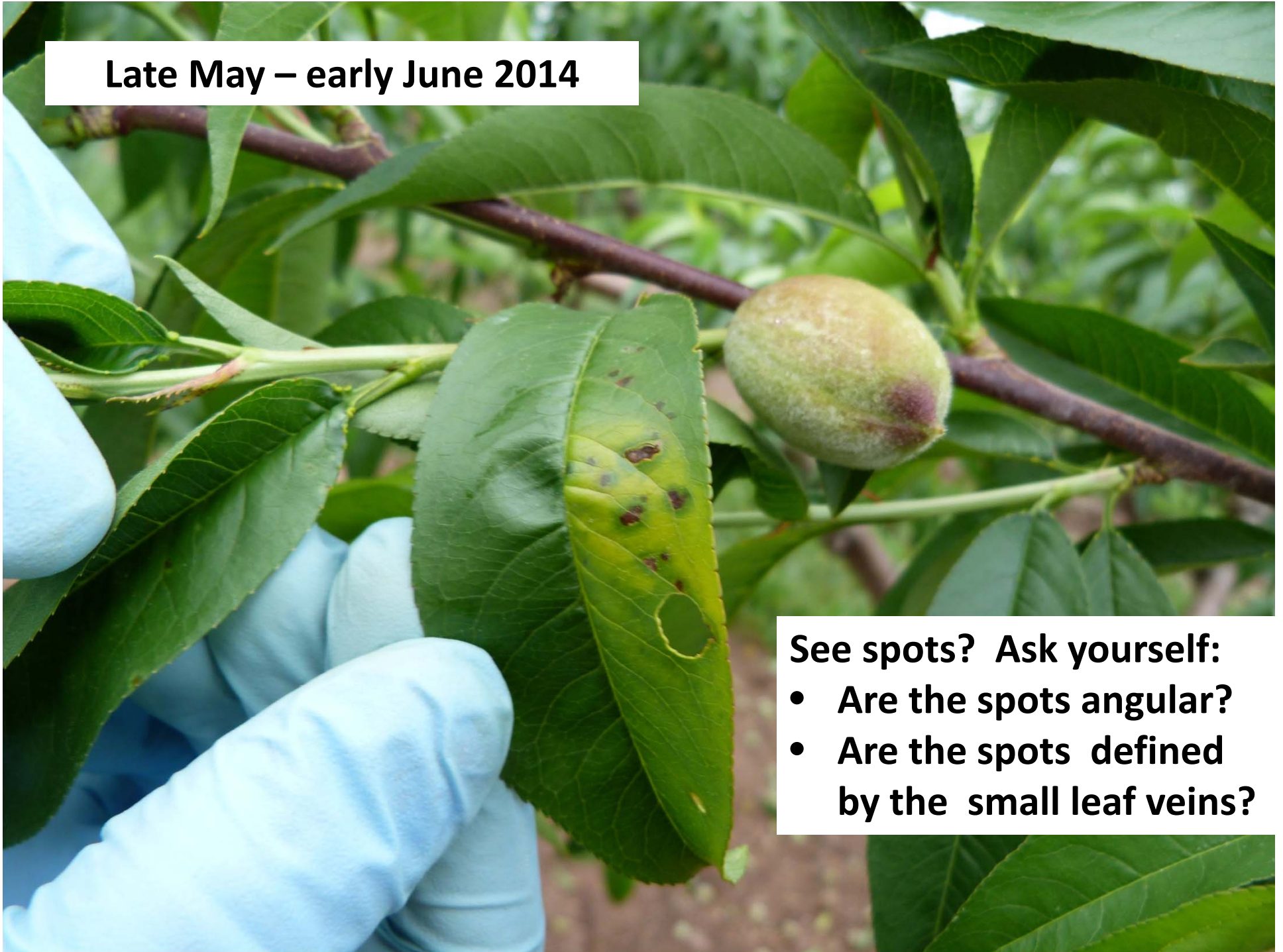
May 27, 2014



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 Disease Cycle

Polycyclic disease

Spring

First infect leaves

Optimum conditions:
Warm and wet
Disease slows down:
Hot and dry

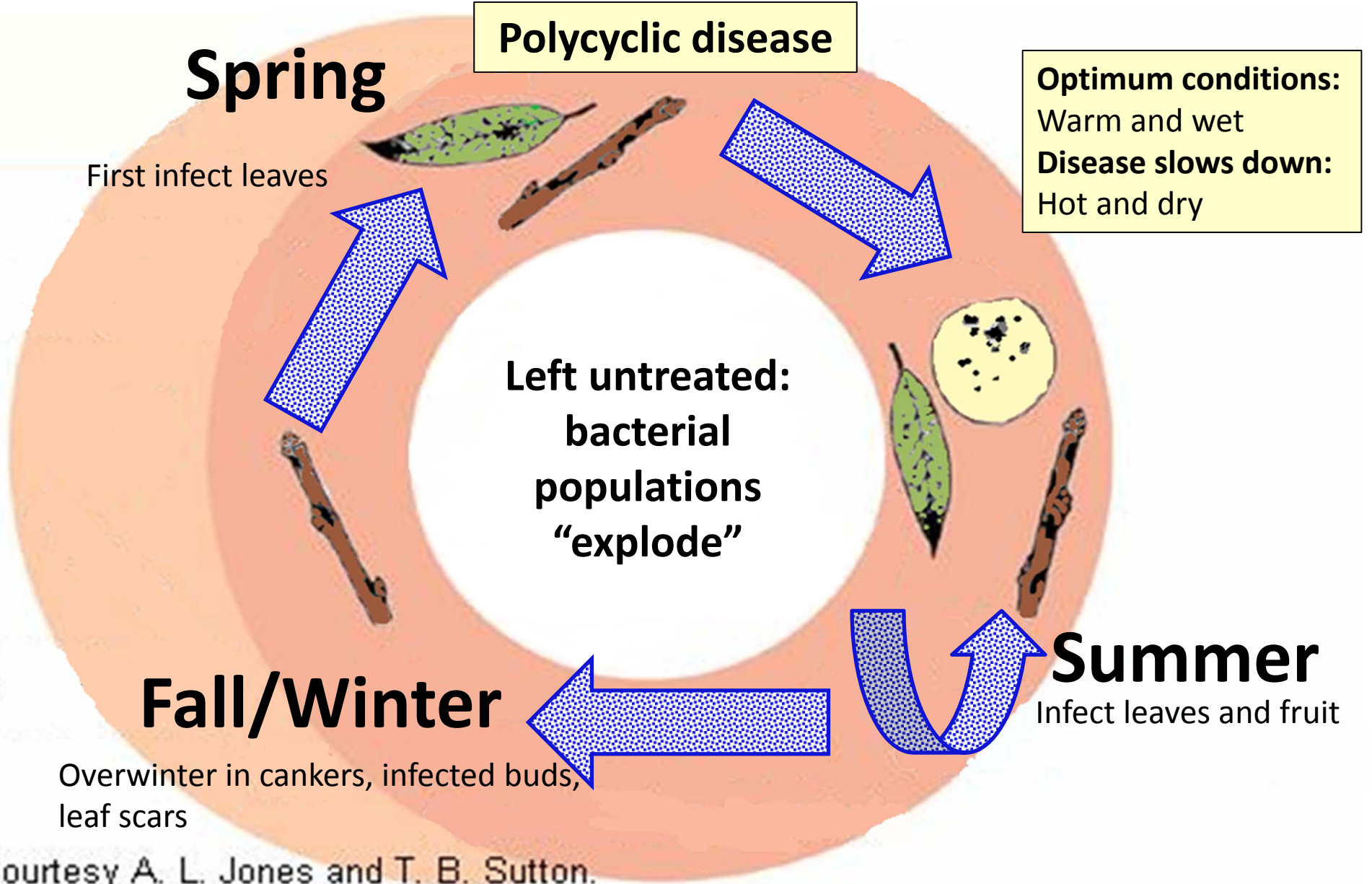
Left untreated:
bacterial
populations
"explode"

Fall/Winter

Overwinter in cankers, infected buds,
leaf scars

Summer
Infect leaves and fruit

Courtesy A. L. Jones and T. B. Sutton.



Bacterial spot management - options

- **Copper**
- **Bacterial based (Serenade, Double Nickel)**
- **Regalia**
- ***Oxytetracycline (use only during wet conditions)**



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 shoots for increase in defoliation when using 2X rate****

Bacterial spot management - options

- Several years in a row, we have observed success with a copper rotation program
- Start bac spot control program: Shuck split → 3 wk before harvest (then focus on brown rot)

Kocide 3.4 oz/A ROTATED with (rate/A):

Serenade ASO 4 qt

Serenade Opti 14 oz

Double Nickel 2 qt

Regalia 32 fl oz

MUST keep spray intervals tight (weekly, no more than 10 days) = especially when conditions favorable for disease

Option (if necessary): Use oxytetracycline (Mycoshield, FireLine) only in rotation during very wet conditions (frequent rain)

Phosphorous acid – based products (Rampart, ProPhyt) are not effective for controlling bac spot

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Questions?

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