



## Non-Antibiotic Control of Fire Blight: What Works As We Head Into a New Era

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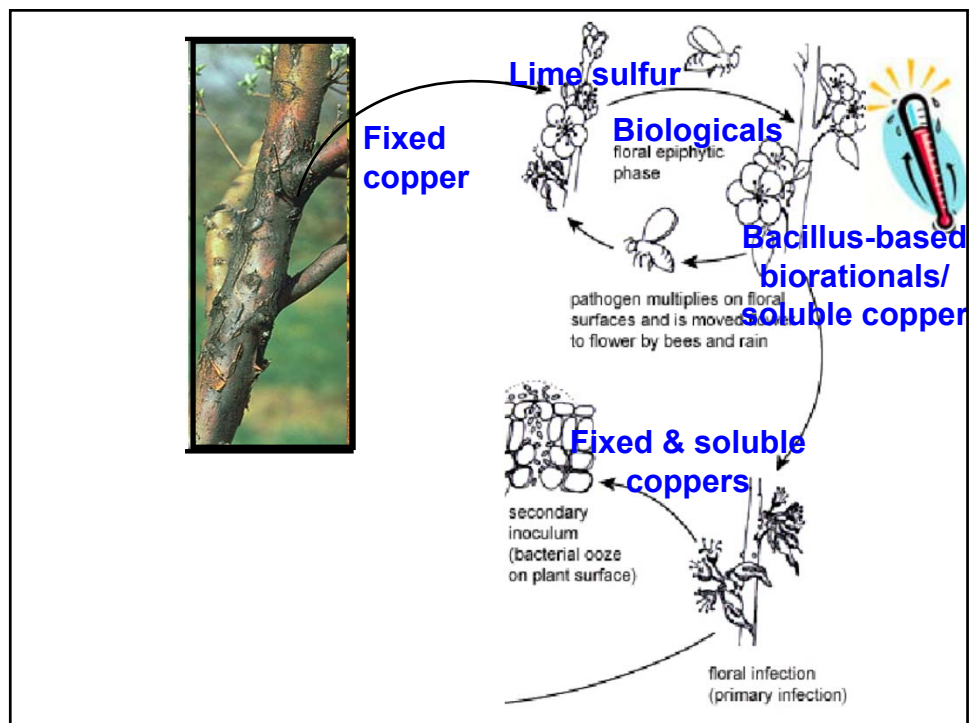
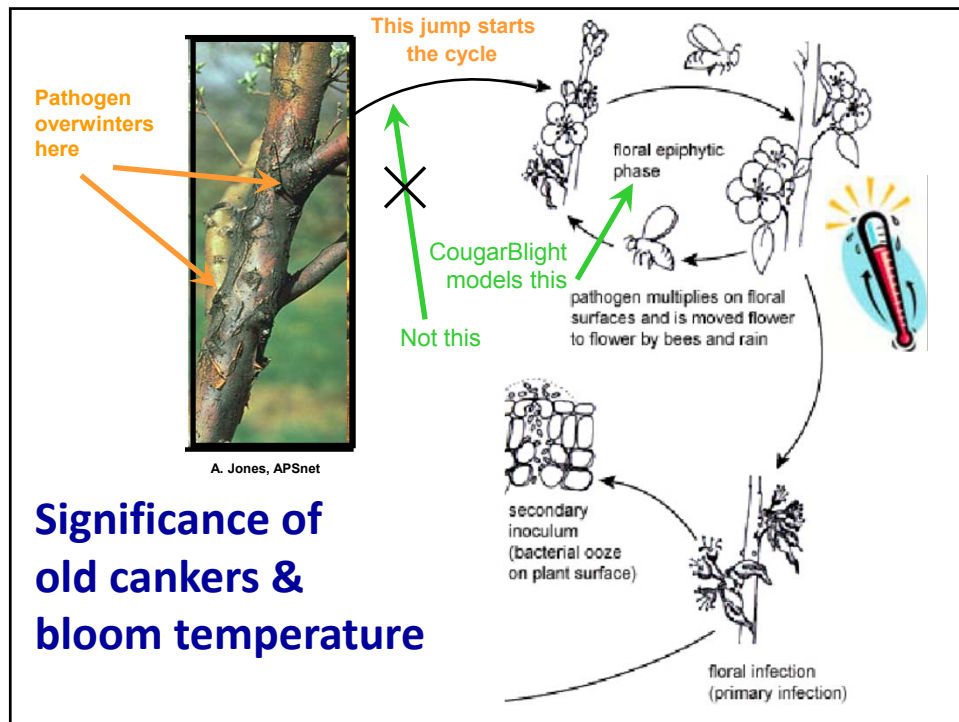
### Fire blight suppression without antibiotics:

Antibiotics:      Removed from NOP approved materials list:

Streptomycin	October, 2014
Oxytetracycline	October, 2014

Non-antibiotic methods must be used in certified organic in 2015

Our focus has been on controlling fire blight in susceptible cultivars



## Example PNW non-antibiotic program with considerations for fruit safety:

- 1) Prebloom (just prior to green tip):  
Fixed copper sanitation if fire blight was in orchard last year (5 to 6 lb/A)
- 2) Early bloom apple: (crop load thinning)  
Lime sulfur (plus oil) early bloom at 20 and 70% bloom  
 Reapply biological if LS goes on after biological
- 3) Early bloom pear and apple Blossom Protect:  
 One full, or two half apps, or two full apps if blight in orchard last year  
 In apple, Blossom Protect immediately after 2nd LS.  
 In smooth-skinned pears in wetter areas, russet risk might be unacceptably high  
 - Bloomtime Biological is an alternative, fruit-safe biological material
- 4) Full bloom to petal fall, depending on cultivar russet risk/CougarBlight model risk:  
Serenade Optimum every 2 to 5 days (most fruit safe)  
 Improved control: Mix Serenade Opt with Cueva (2 to 3 qts/A)  
Cueva every 3 to 6 days (3 to 4 qts/A) (least fruit safe)

## Q2: Does delayed dormant copper effect pathogen activity?

- Delayed dormant oil plus  
**CuOH+CuOCl** (6 lbs/A)  
 (just prior to green tip)

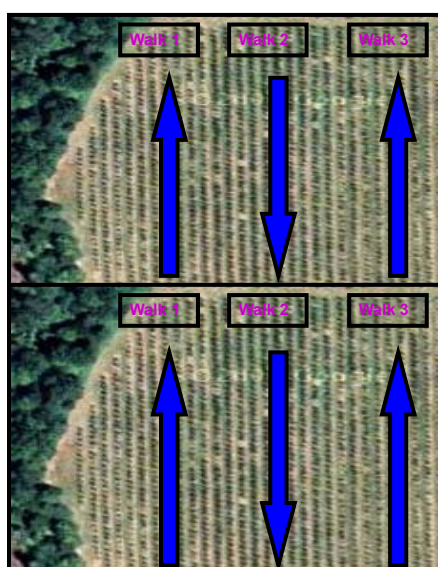
For four seasons, we split  
 ~fourteen 10-acre blocks

- Delayed dormant oil



Rachel Elkins  
 Pomology Farm Advisor  
 UC Lake County

### Flower sampling walks



Q1: When is the fire blight pathogen active in orchards?

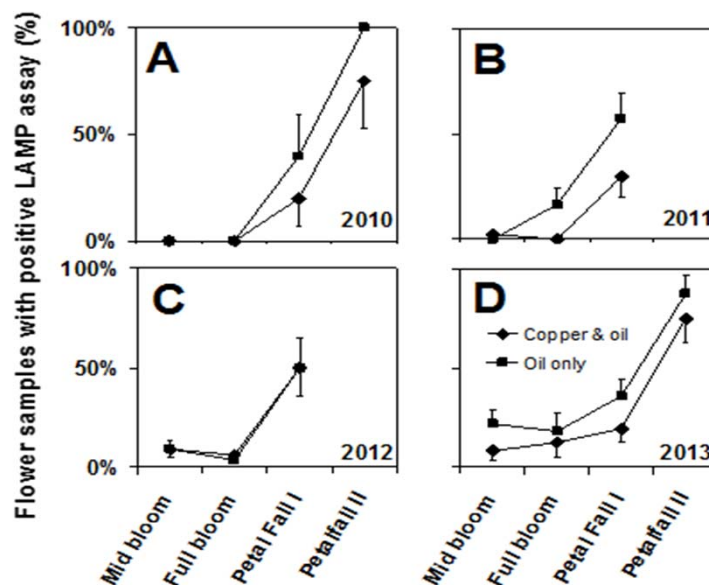
Is the fire blight pathogen  
in this bag of flowers?



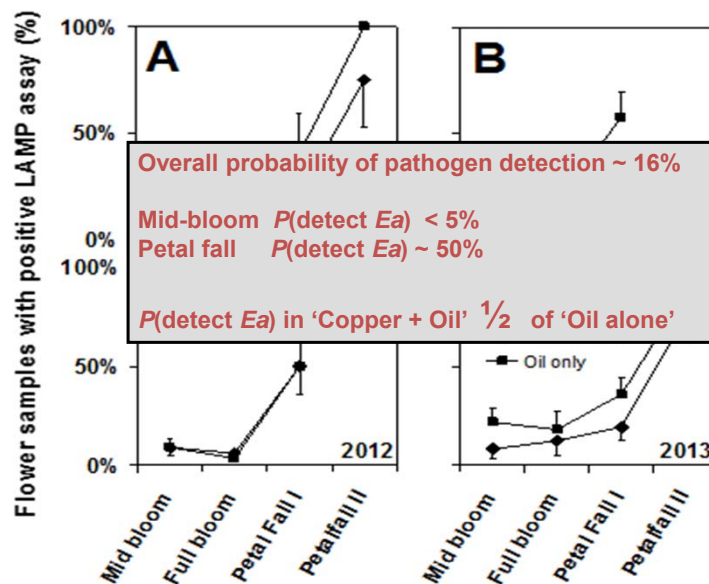
Answered by 'LAMP'  
assay that detects  
pathogen DNA:



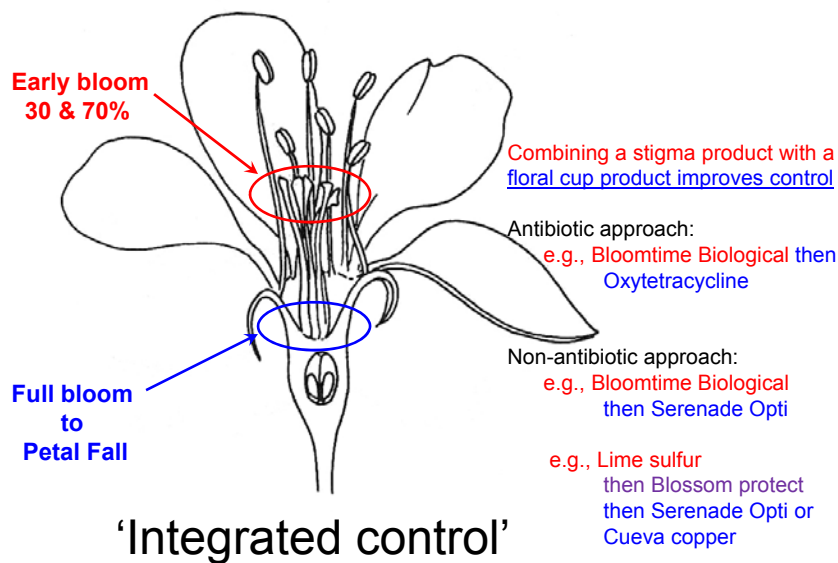
Does delayed dormant copper effect pathogen detectability?



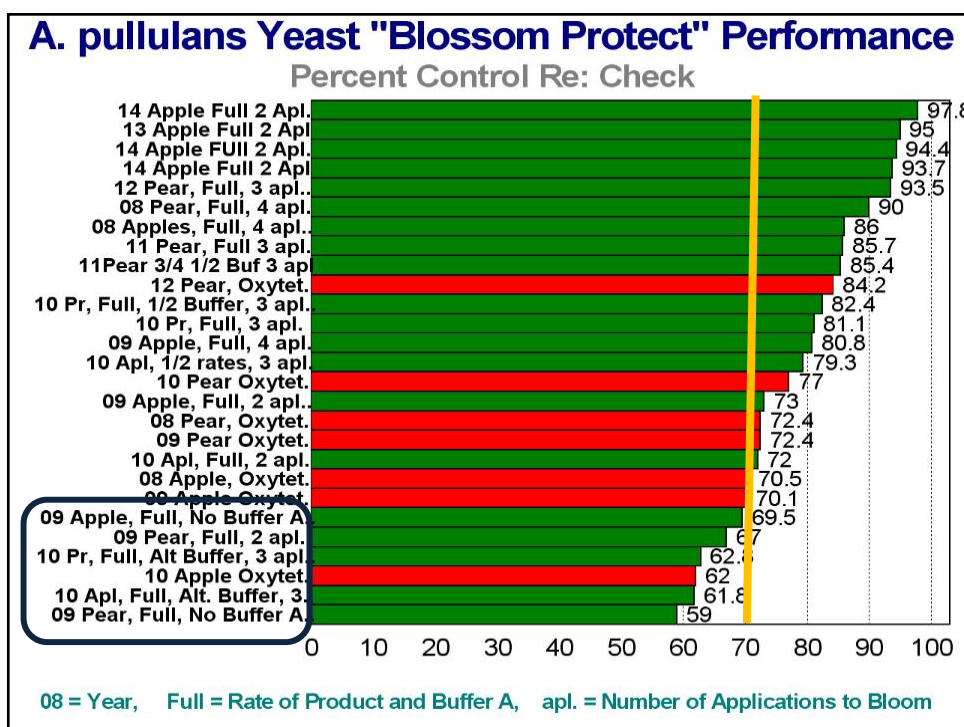
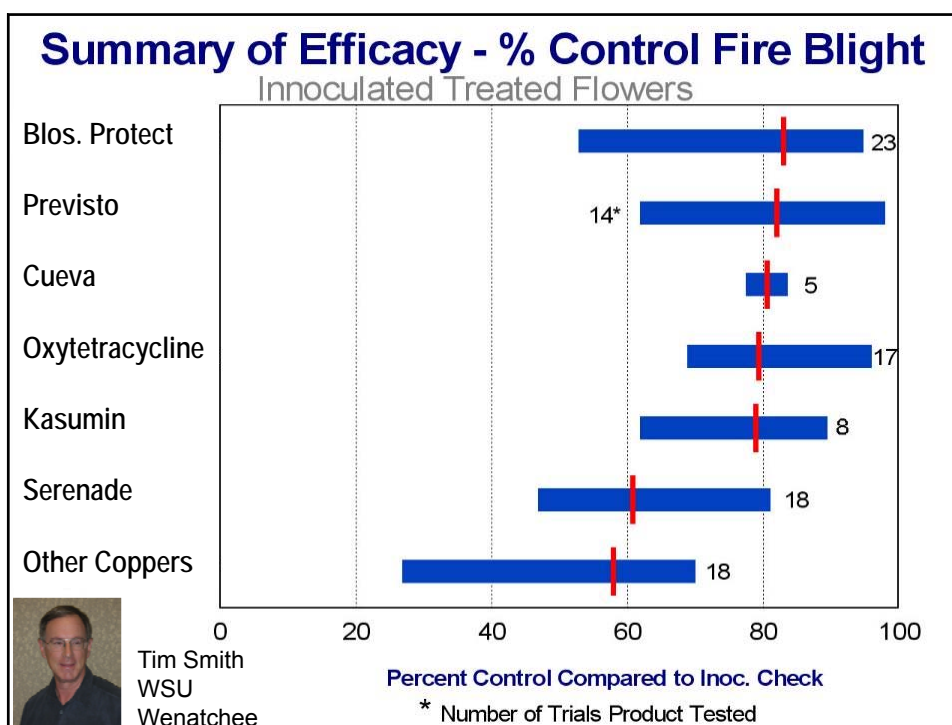
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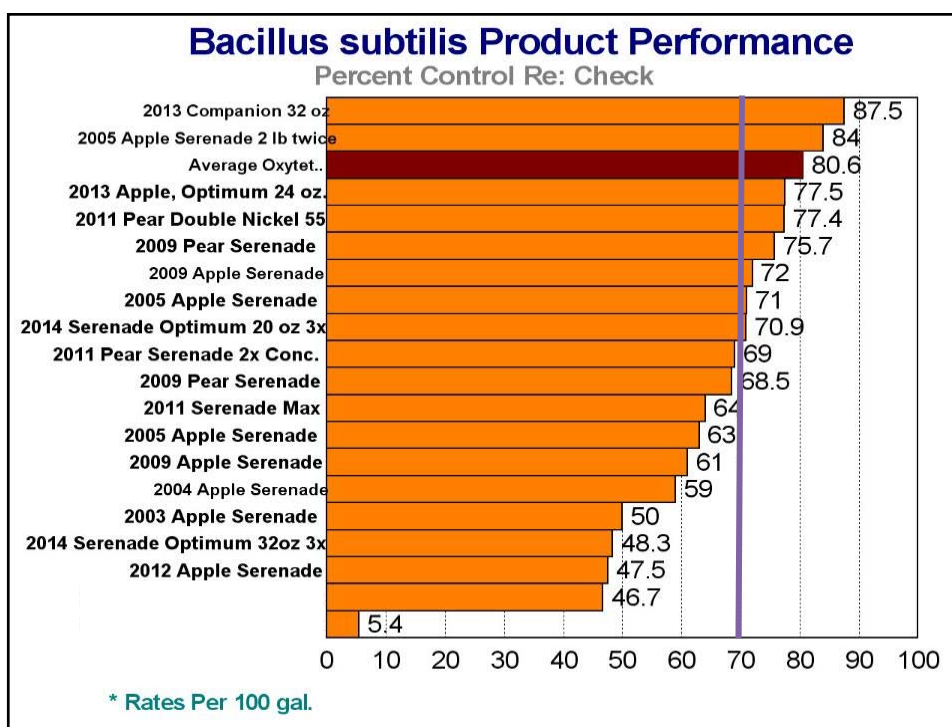
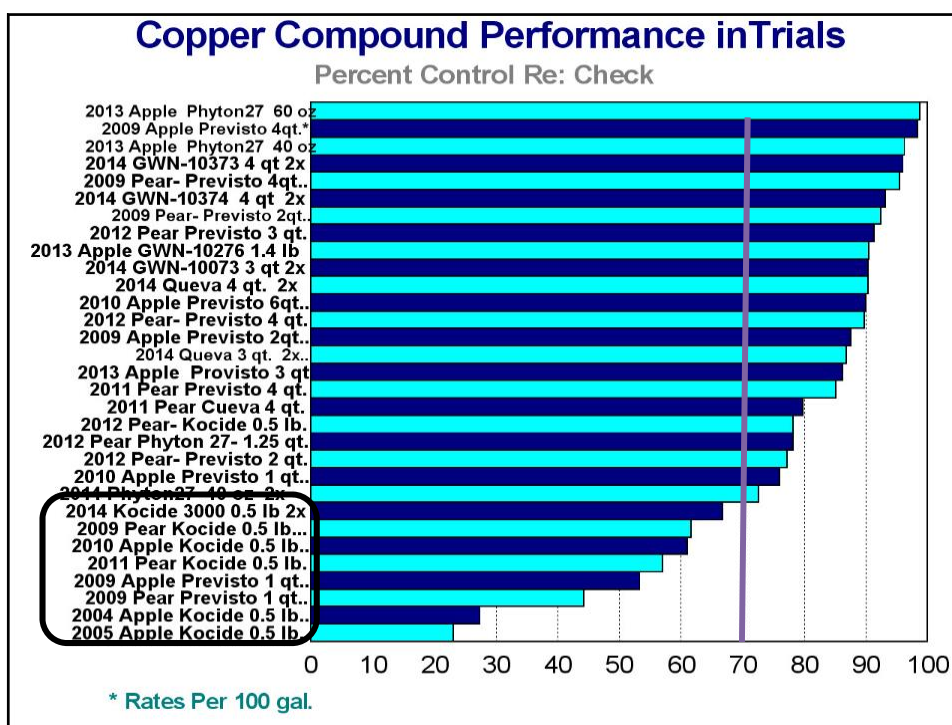
Q: Can effective non-antibiotic control be achieved?



very good to excellent control



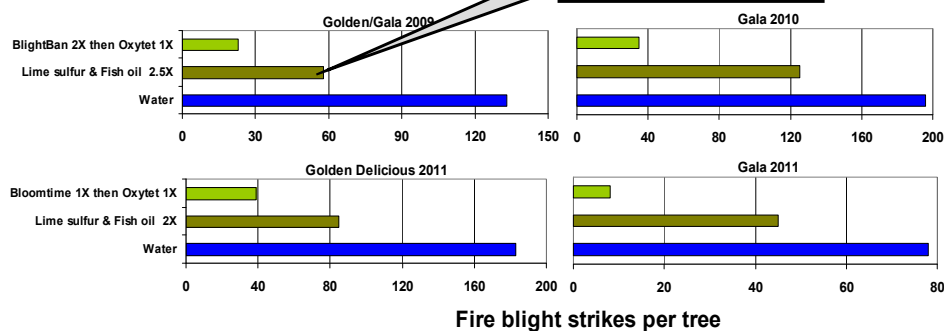




### Q3: How does bloom thinning effect fire blight control?

#### Replicated, inoculated orchard trials:

Pathogen inoculated  
after second LS+FO

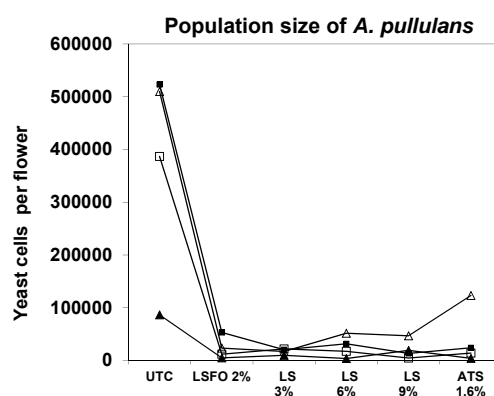


Primary effect of LS+FO is fewer flowers

Second, LS+FO is toxic to epiphytic pathogen cells (and epiphytic biologicals)

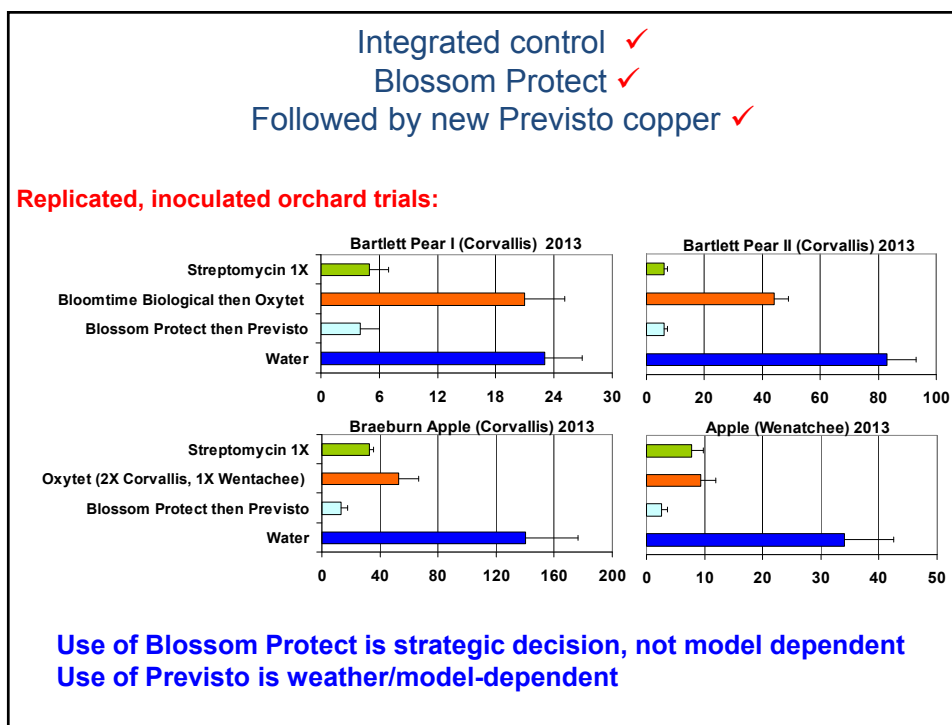
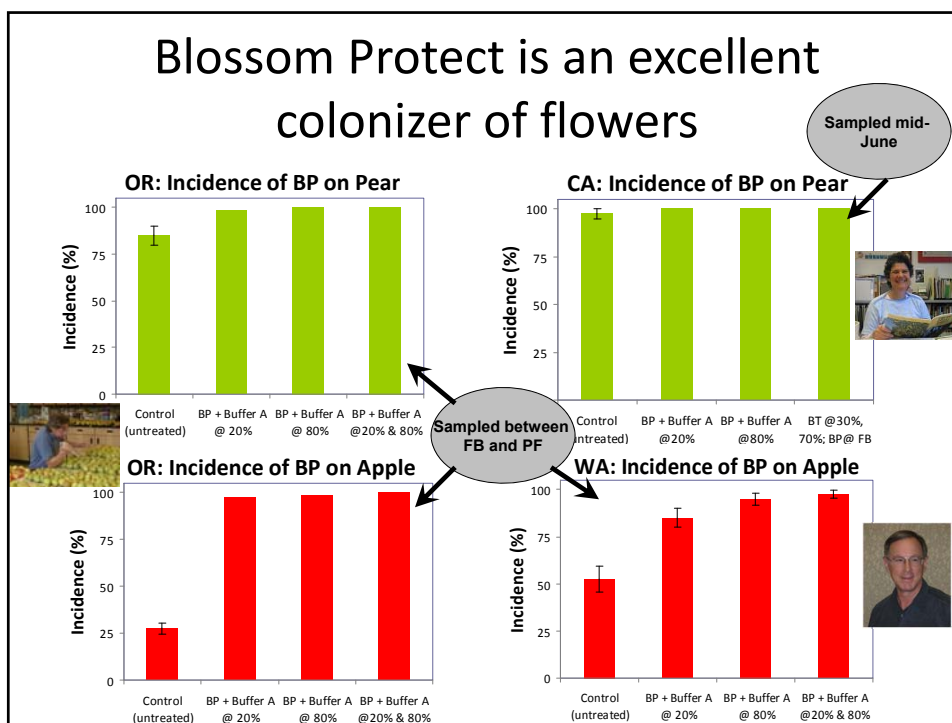
Third, LS+FO probably makes orchard somewhat less attractive to bees

### Why the sequence is important: Lime sulfur suppresses biological agents



Biologicals should be applied (re-applied)  
after lime sulfur treatments

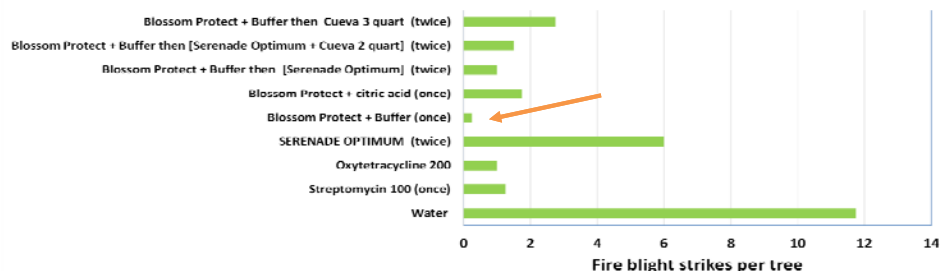




## Putting integrated non-antibiotic control to the test:

Replicated, inoculated orchard trials:

Bartlett Pear 2014 - Corvallis, OR

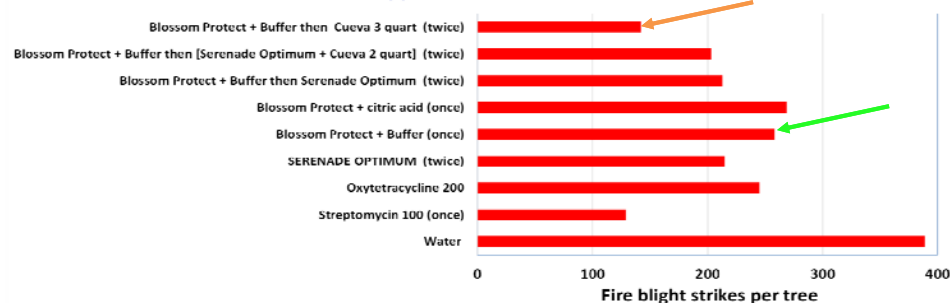


- In this trial, Blossom Protect (applied once) carried the load
- Corvallis is a wet climate: An amount of russet above water-control was attributable to Blossom Protect; a bit more to Cueva

## Putting integrated non-antibiotic control to the test:

Replicated, inoculated orchard trials:

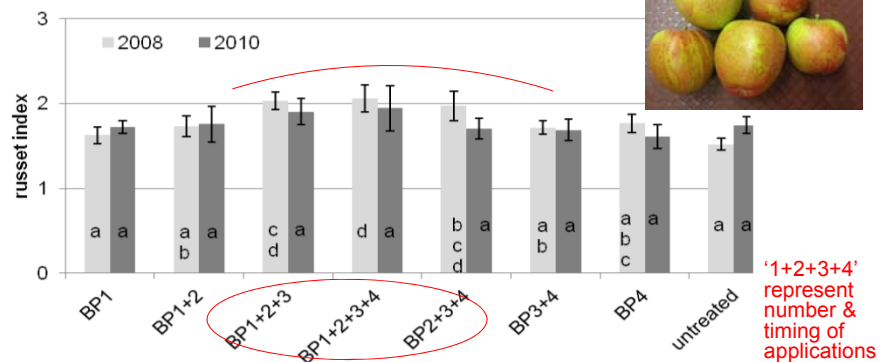
Gala apple 2014 - Corvallis, OR



- In this trial, Blossom Protect (applied once) was intermediate
- Control improved with Serenade and Cueva oversprays

## Blossom Protect: A potential for fruit russet

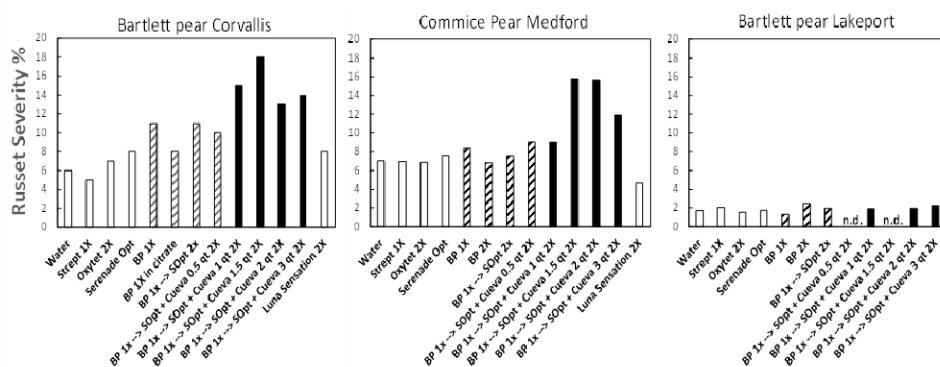
Kunz 2011 – Apples in Germany



More applications & wetter conditions raise the concern

Pears are more susceptible than apples

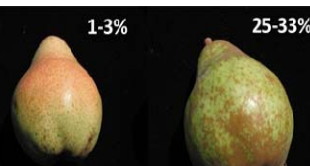
## Fruit russet severity on pear



Open bar: low russet potential

Hatched bar: Blossom Protect

Solid bar: BP then Cueva



# Non-antibiotic fire blight control

## Cultivar specific recommendations:

### Russet-susceptible, smooth skinned pears (d'Anjou, Comice)

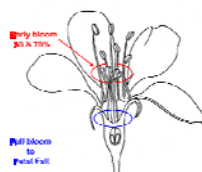
- Avoid Blossom Protect and Cueva
- Utilize Bloomtime Biological and Serenade Optimum

### More russet-tolerant, smooth skinned pears (Bartlett) and apples

- In wet climate, russet risk with Cueva is probably unacceptably high. Blossom Protect should be restricted to early/mid-bloom.
- Dry climate, create program to minimize Blossom Protect and Cueva apps. E.g., 1-2 apps. of each is better than 3-4 apps. either alone.

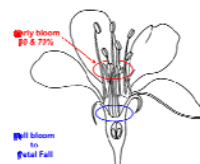
### All pear and apple cultivars (including Bosc)

- Sequence copper to follow Blossom Protect (not the other way around!)



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## Questions?

- delayed dormant, fixed copper
- lime sulfur effects on fire blight pathogen
- integrated, non-antibiotic control
- Blossom Protect yeast product
- *Bacillus* based biorationals
- soluble copper materials during bloom
- fruit russet risk
- other



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