

Life Without Antibiotics:

Non-antibiotic Systems Approach to Fire Blight Control

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Non-antibiotic Systems Approach

Four questions:

- When is the fire blight pathogen active in orchards?
- Does delayed dormant copper effect pathogen activity?
- How does bloom thinning effect fire blight control?
- Can effective non-antibiotic control be achieved?

Pathogen overwinters here



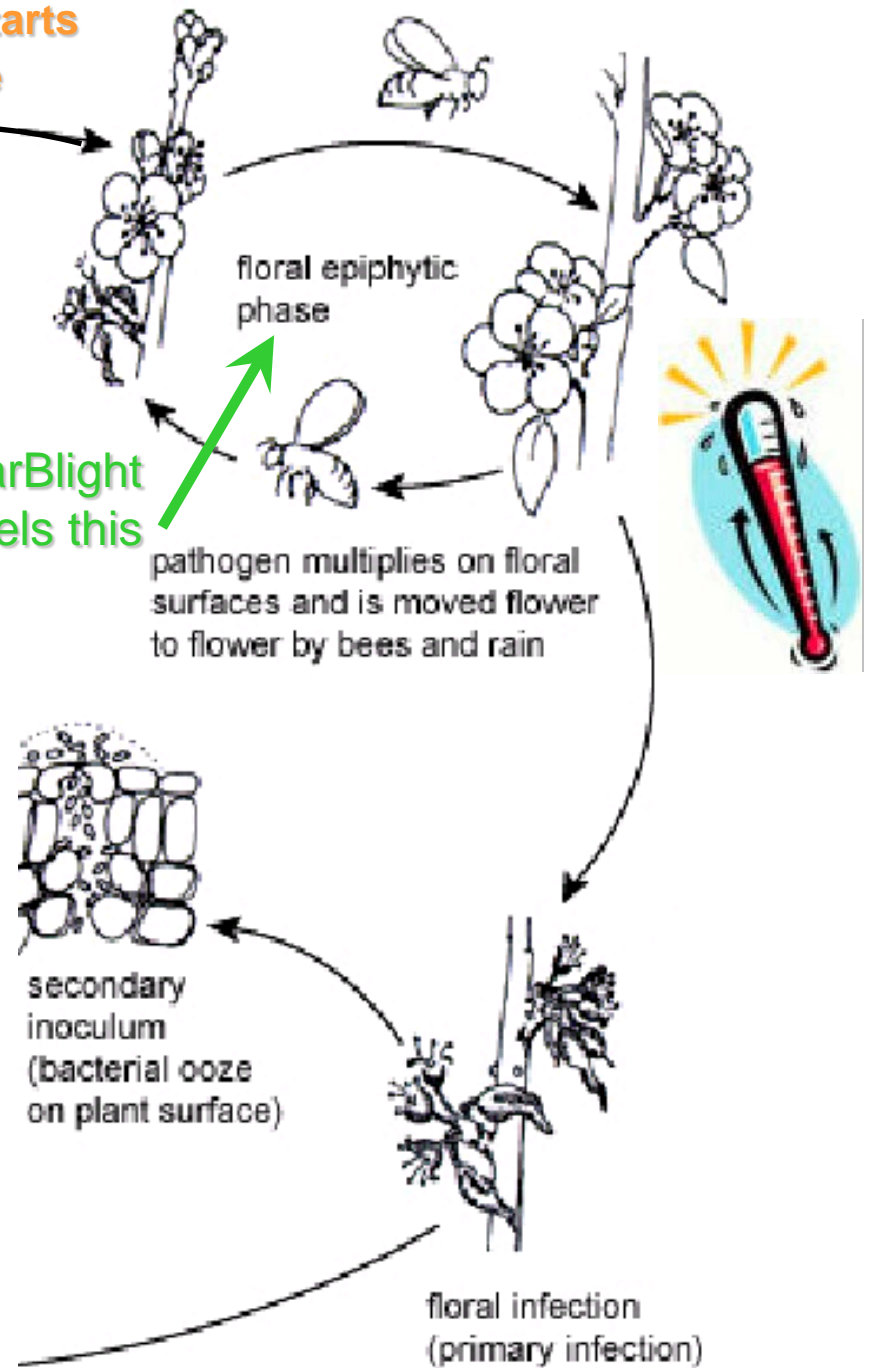
A. Jones, APSnet

This jump starts the cycle



CougarBlight models this

Not this



Significance of old fire blight cankers

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

**Is the fire blight pathogen
in this bag of flowers?**



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**Is the fire blight pathogen
in this bag of flowers?**



**Answered by 'LAMP'
assay that detects
pathogen DNA:**



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:

1-2 hours to get an answer

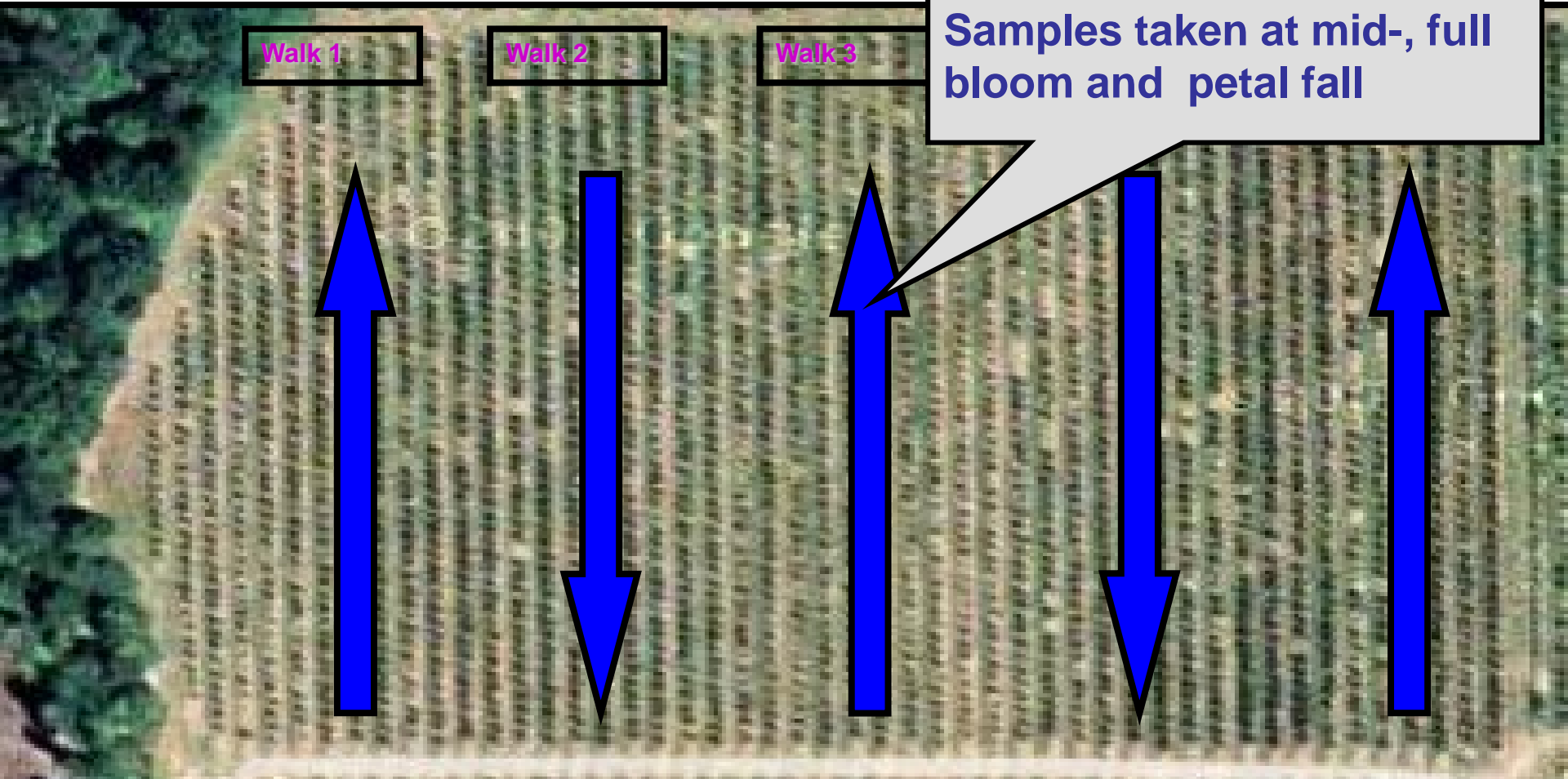


LAMP Surveys in Commercial Orchards

100 blossom clusters per walk (~600 flowers)

Five walks per orchard

Samples taken at mid-, full bloom and petal fall



Walk 1

Walk 2

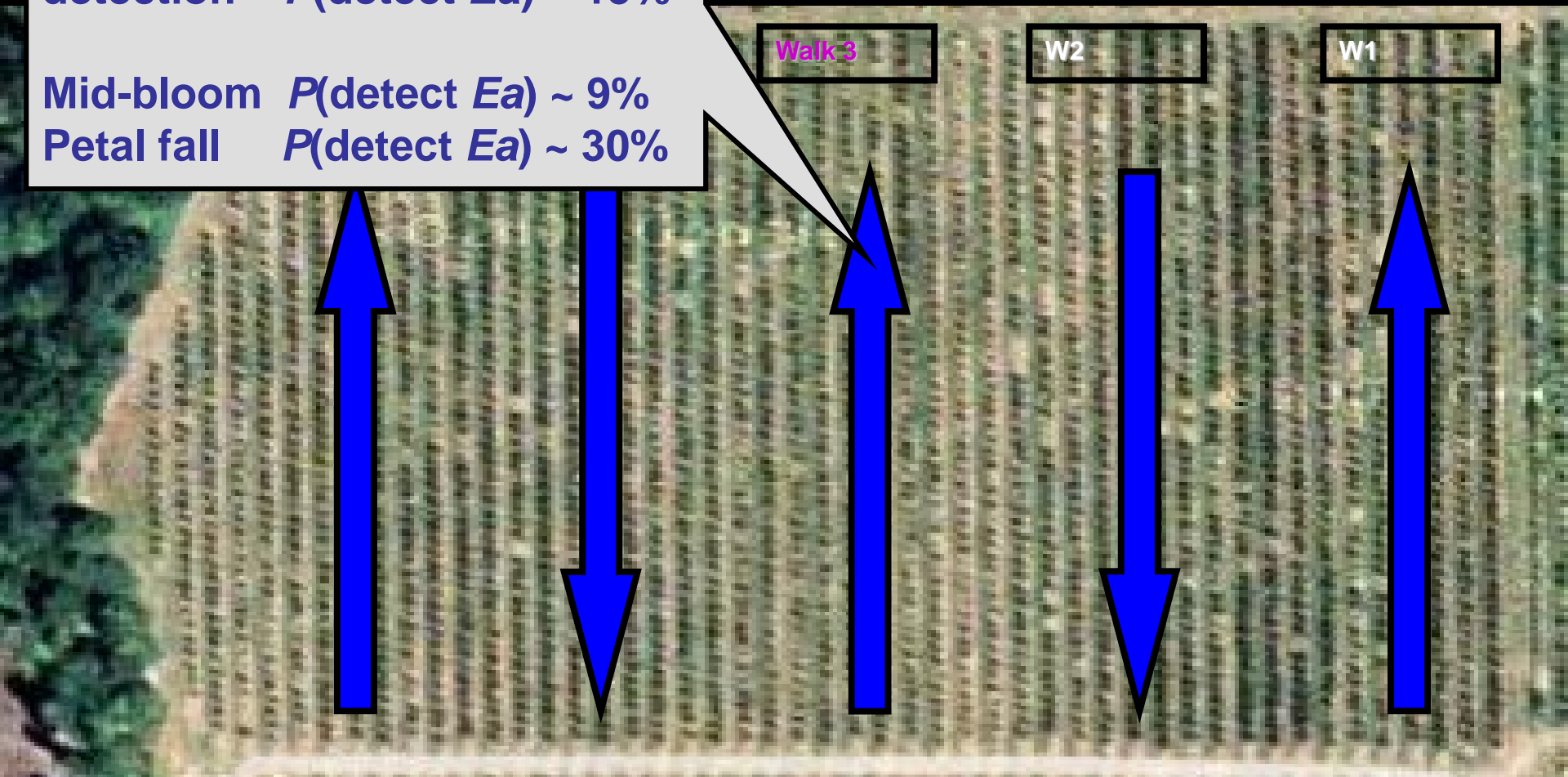
Walk 3

LAMP Surveys in Commercial Orchards

Since 2008 we've sampled
~100 orchards

Overall probability of pathogen
detection $P(\text{detect } Ea) \sim 15\%$

Mid-bloom $P(\text{detect } Ea) \sim 9\%$
Petal fall $P(\text{detect } Ea) \sim 30\%$



Walk 3

W2

W1

LAMP Survey Results:

Year	State	Production area	Host	No. of orchards	Mid-bloom	Full bloom	Petal fall
2009	OR	Rogue Valley	Pear	3	3 of 20	0 of 20	2 of 20
		Hood River Valley	Pear	6	6 of 30	6 of 30	7 of 25
		Hood River Valley	Apple	2	0 of 8	2 of 8	4 of 8
		Walla Walla Valley	Apple	4	0 of 20	4 of 20	11 of 20
	CA	Lake County	Pear	4	2 of 15	2 of 15	1 of 15
	WA	Okanogan Valley	Pear	1	0 of 4	0 of 6	2 of 4
		Wenatchee Valley	Pear	2	0 of 10	0 of 10	0 of 10
		Columbia Basin	Apple	3	0 of 15	0 of 15	0 of 10

11/122

14/124

27/112

Pathogen positive walks
Total walks

LAMP Survey Results:

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		Wenatchee Valley	Pear	2	0 of 10	0 of 10	0 of 10
		Columbia Basin	Apple	3	0 of 15	0 of 15	0 of 10
					11/122	14/124	27/112

Dirty Orchard (orange arrow pointing to '3 of 20')

Clean Orchard (green arrow pointing to '0 of 4')

Pathogen positive walks / **Total walks** (red arrow pointing to '11/122')

Think about Questions 'LAMP Survey

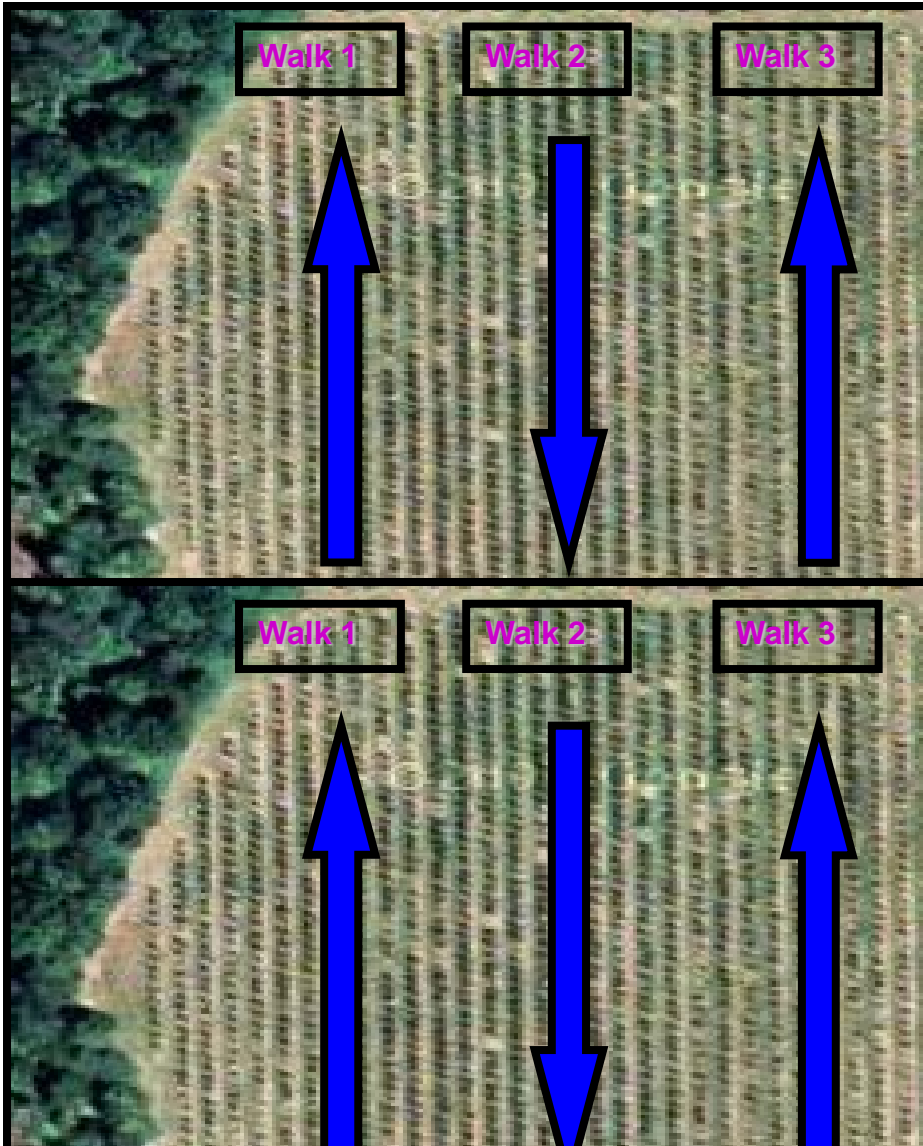
Q2: Does delayed dormant copper effect pathogen activity?

LAMP Surveys

- Delayed dormant oil plus **CuOH** (6 lbs/A)

In 2010 & 2011 we split fourteen ~10-acre blocks

- Delayed dormant oil



Rachel Elkins
Farm Advisor
UC Lake County

Q2: Does delayed dormant copper effect pathogen activity?

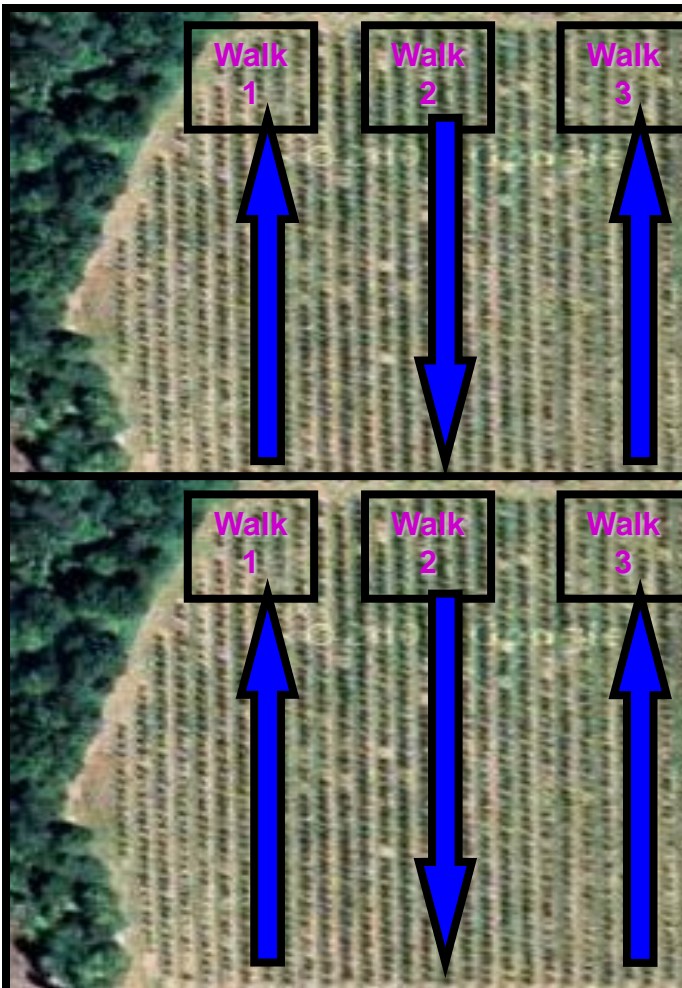
2011 LAMP Survey Results

	Mid Bloom	Full Bloom	Petal Fall	Total
Treatment	3/31-4/19	4/8-22	4/26-5/26	
Copper + oil	1/41	0/39	9/28	10/108
Oil alone	0/38	5/37	18/29	23/104

Overall probability of pathogen detection ~ 16%

Mid-bloom $P(\text{detect } E_a) < 5\%$
 Petal fall $P(\text{detect } E_a) \sim 50\%$

$P(\text{detect } E_a)$ in 'Copper + Oil' $\frac{1}{2}$ of 'Oil alone'



Does delayed dormant copper effect pathogen activity?

Treatment ¹	Average Russeting	Russet Severity	
		(greater than 7%)	(less than 3%)
Copper + oil	2.7	10.5	76.0
Oil alone	2.7	10.2	76.1

Rachel has obtained fruit finish data from all plots

Over two years, russet severity has been similar in both the 'Copper & Oil' and 'Oil only' plots



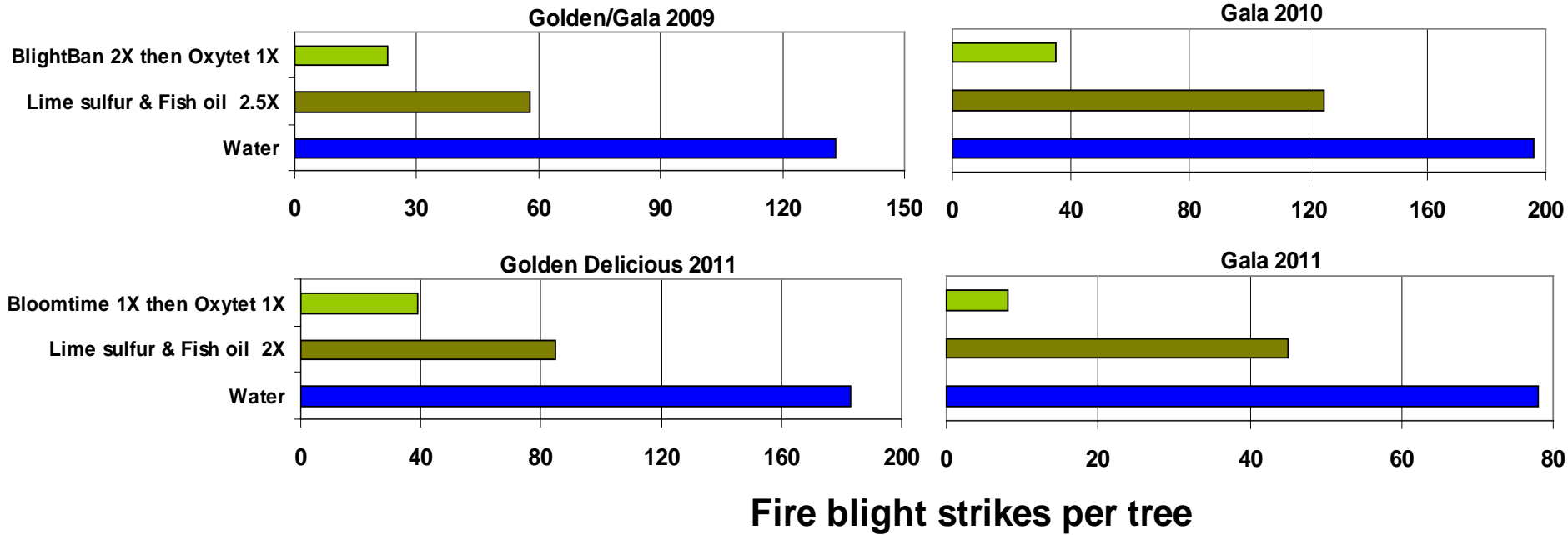
Think about Questions
on 'Delayed Dormant Copper'

Q3: How does bloom thinning effect fire blight control?

2% Lime sulfur plus 2% fish oil

- As used for bloom thinning in apples, does it provide a benefit to fire blight suppression?
- It's not compatible in tank mix with any of the other fire blight control products.

Q3: How does bloom thinning effect fire blight control?



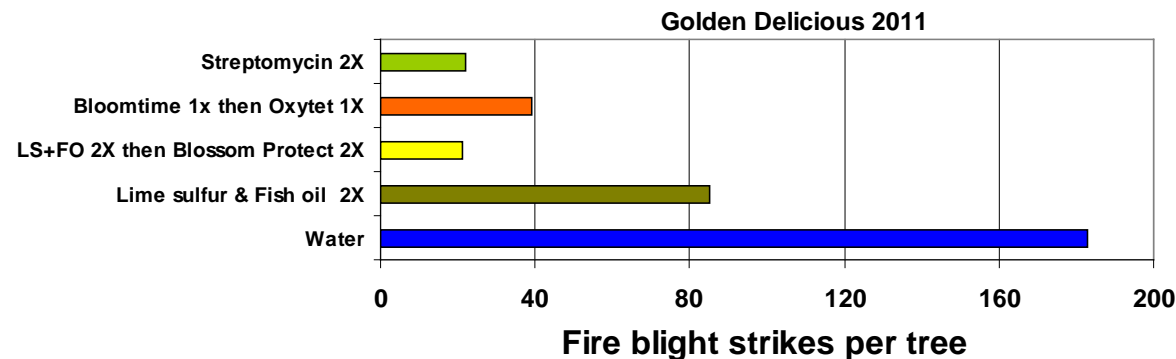
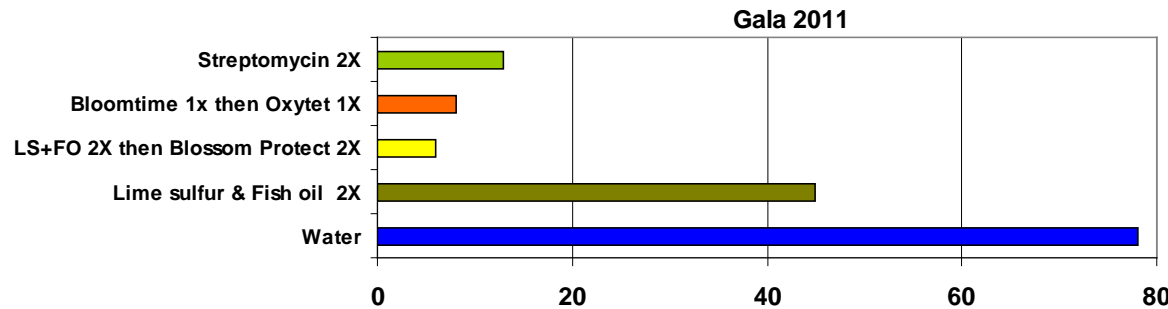
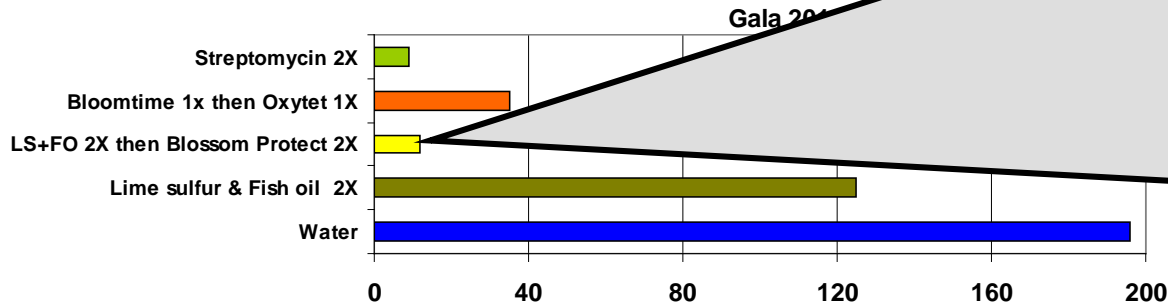
Integrated control ✓
 Frequency of treatment ✓
 What is this new yeast product ✓
 Lime sulfur plus fish oil ✓

LS+FO
 shortens the
 period when
 fire blight
 products are
 needed

Fire blight
 treatments
 started after
 2nd bloom
 thinning:

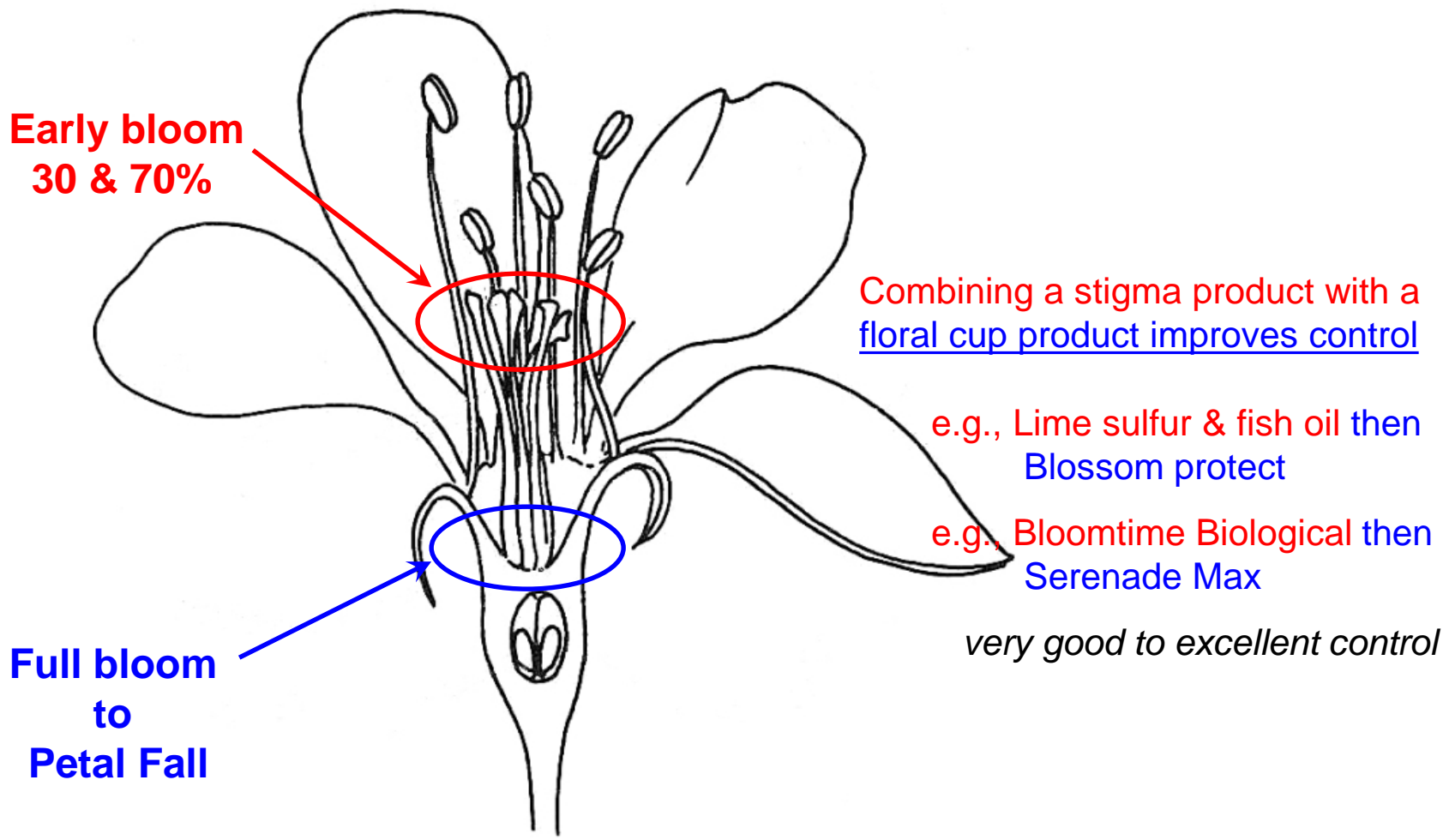
20&70% bloom
 LS & FO

FB, PF
 fire blight
 products



Think about Questions
on 'Bloom Thinning'

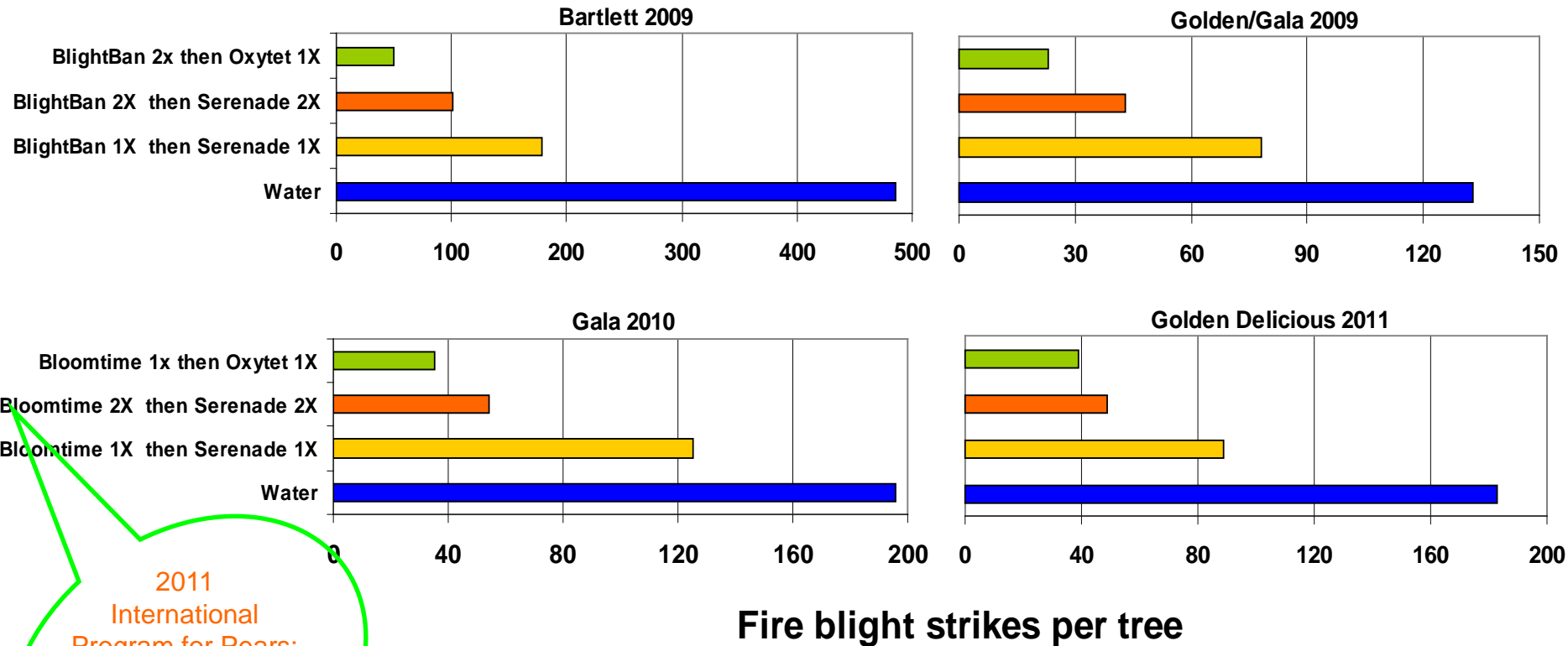
Q4: Can effective non-antibiotic control be achieved?



'Integrated control'

Q4: Can effective non-antibiotic control be achieved?

Integrated control ✓
Frequency of treatment ✓



2011 International Program for Pears:
Bloomtime Biological 30%, 70%
Serenade Max FB, PF

Fire blight strikes per tree

Non-antibiotic Systems Approach:

- When is the fire blight pathogen active in orchards?
Depends on orchard, but late (PF) is more the norm
- Does delayed dormant copper effect pathogen activity?
- How does bloom thinning effect fire blight control?
- Can effective non-antibiotic control be achieved?

Non-antibiotic Systems Approach:

- When is the fire blight pathogen active in orchards?
- Does delayed dormant copper effect pathogen activity?
Delays time to when the pathogen is detectable (PF)
- How does bloom thinning effect fire blight control?
- Can effective non-antibiotic control be achieved?

Non-antibiotic Systems Approach:

- When is the fire blight pathogen active in orchards?
- Does delayed dormant copper effect pathogen activity?
- How does bloom thinning effect fire blight control?
LS+FO shortens period when fb products are needed
- Can effective non-antibiotic control be achieved?

Non-antibiotic Systems Approach:

- When is the fire blight pathogen active in orchards?

Does delayed dormant copper effect pathogen activity?

- How does bloom thinning effect fire blight control?
- Can effective non-antibiotic control be achieved?

Yes, via 'integrated control', but more treatments needed

Questions on 'Integrated Control'?

and Lamp Survey, DD Copper
and Bloom Thinning