Fire blight management in high density orchards

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MICHIGAN STATE UNIVERSITY

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Very large initial planting, establishment costs
Potential for some yield in 2nd year
Growers are pushing these trees

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- Trees are most susceptible to killing by fire blight in YRS 1-6
- High-vigor shoots are highly susceptible to infection
- Risk is the potential for significant tree loss to fire blight

- **Very large initial planting, establishment costs**
- **Potential for some yield in 2nd year**
- **Growers are pushing these trees**

- **Trees are most susceptible to killing by fire blight in YRS 1-6**
- **High-vigor shoots are highly susceptible to infection**
- **Risk is the potential for significant tree loss to fire blight**

- **Trees invariably have some short shoots – infection can move quickly to central leader**

Two critical factors for successful fire blight management

- **Prevent blossom blight**
- **Prevent early shoot blight**


Ginger Gold

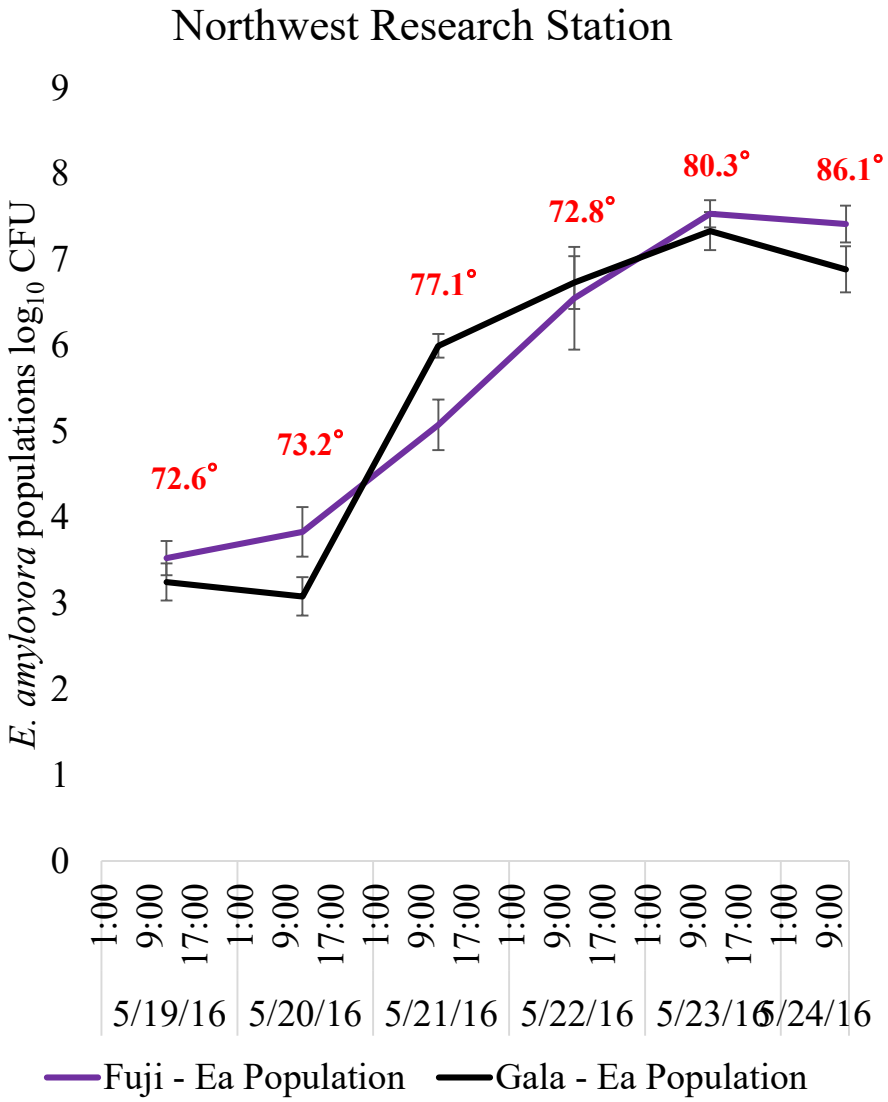

Ginger Gold
2 lbs metallic copper / A
Fixed copper, Kocide
etc. work best
Coat trees

2016 – bloom, NW Michigan

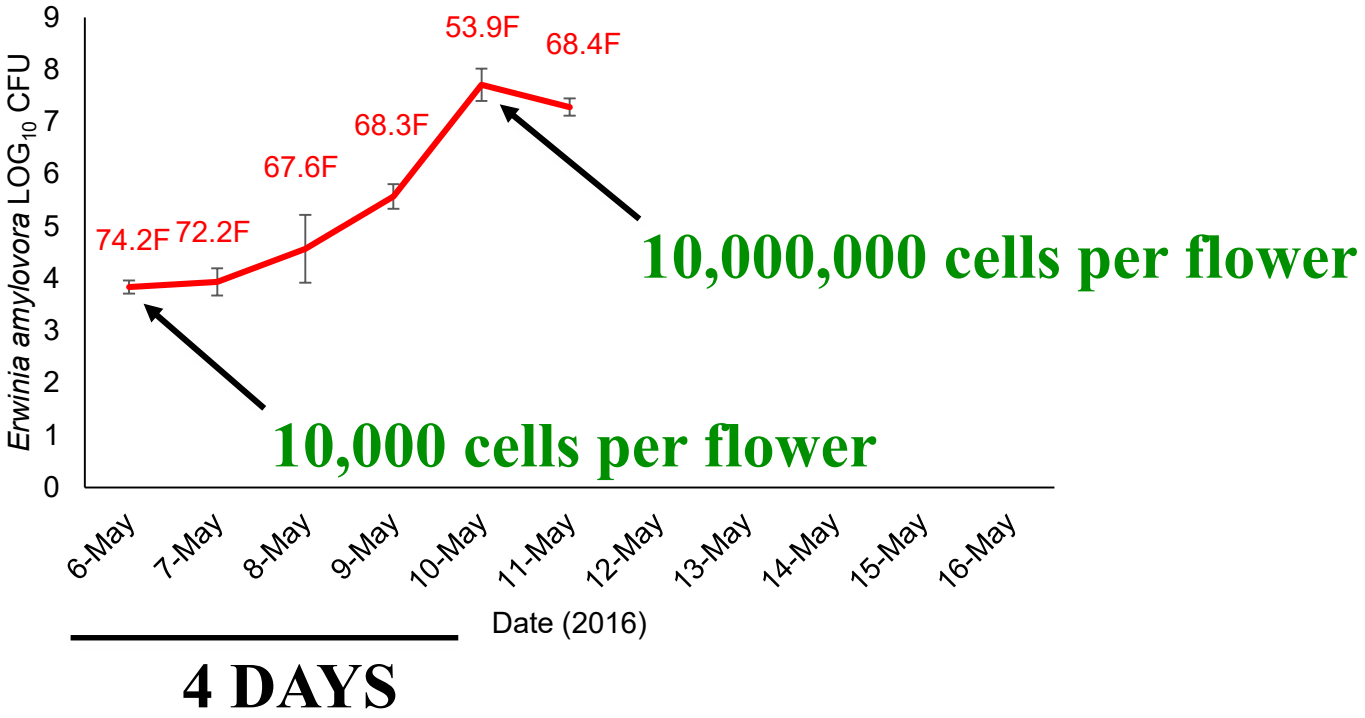
Growth of the fire blight pathogen on flowers at the NWMHRC

Growth was very fast due to warm temps

High population thresholds on flowers, major disease risk



Suzanne Slack et al.



Red – High Temp

Cultivar – Jonathan

Flowers tagged, opened May 5

Inoculated May 6

Erwinia amylovora populations on Gala from NW Michigan, 2017

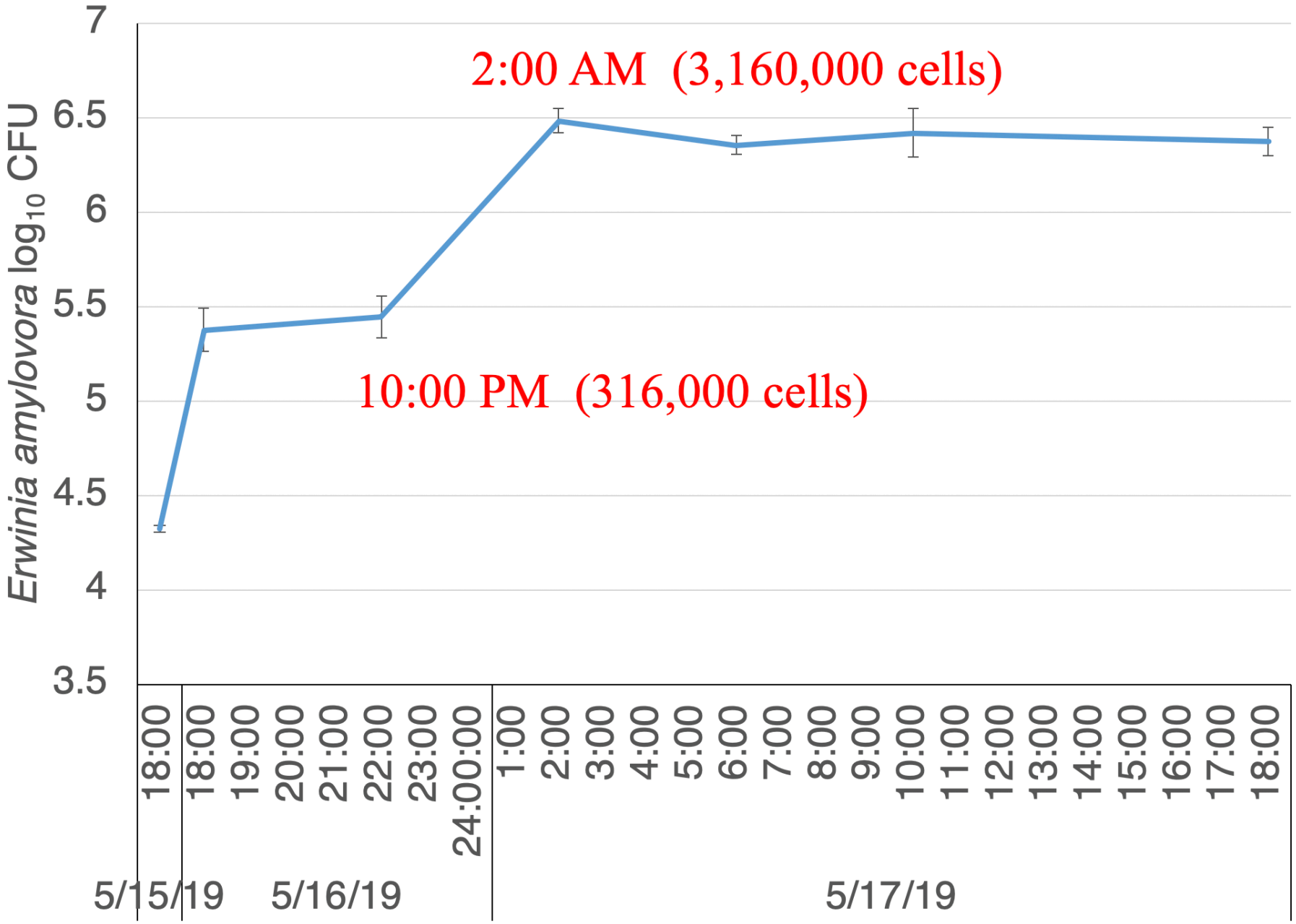
1,000,000 cells

1,000 cells

Erwinia amylovora log10 CFU

8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00

0	4	18	20	23	25	27	29	42
Hours after inoculation								
2 PM	6 PM	8 AM	10 AM	1 PM	3 PM	5 PM	7 PM	8 AM

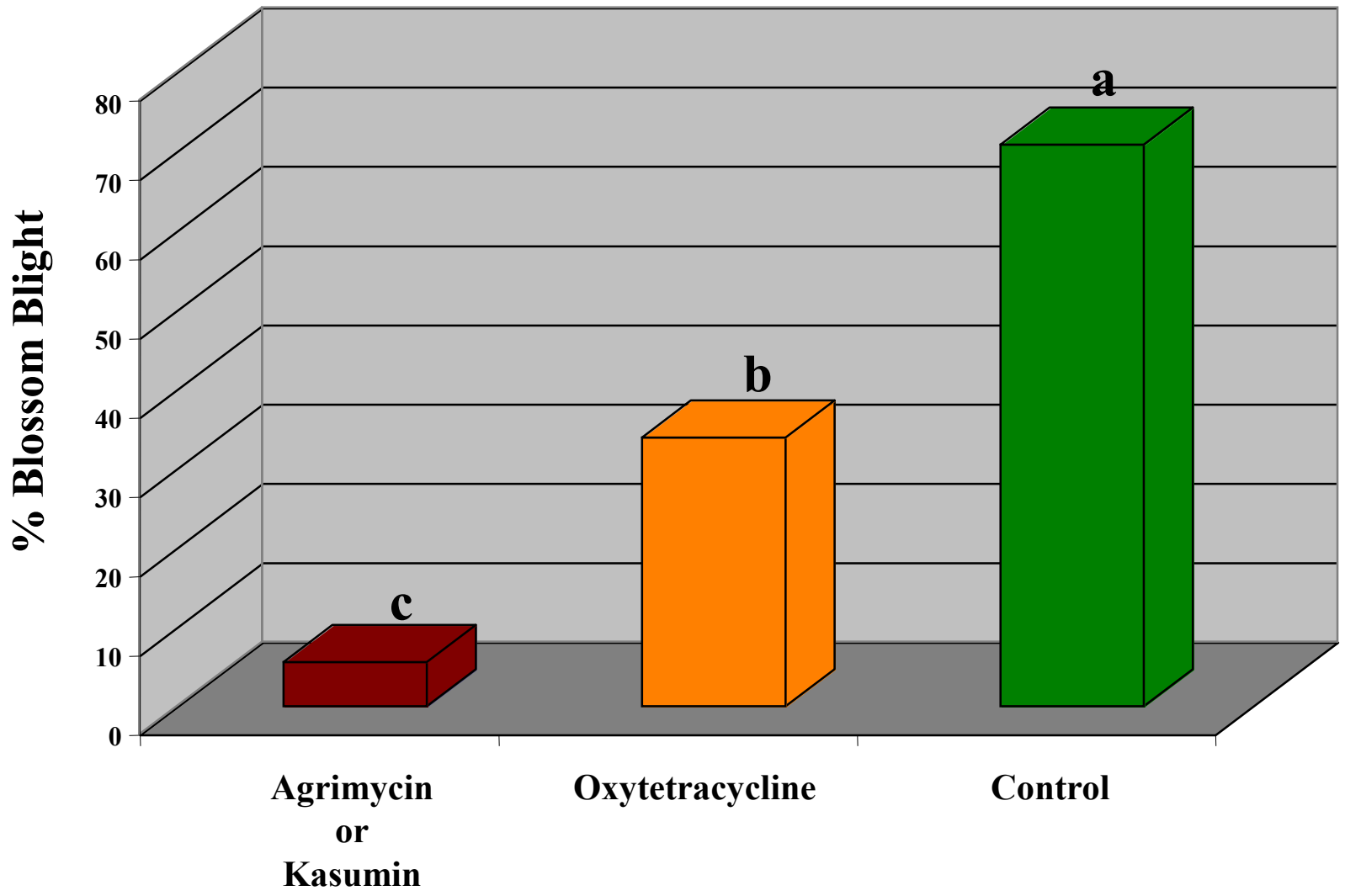

2:00 AM (3,160,000 cells)
10:00 PM (316,000 cells)
Erwinia amylovora log10 CFU
7
6.5
6
5.5
5
4.5
4
3.5
18:00
18:00
19:00
20:00
21:00
22:00
23:00
24:00:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
5/15/19
5/16/19
5/17/19

Macintosh

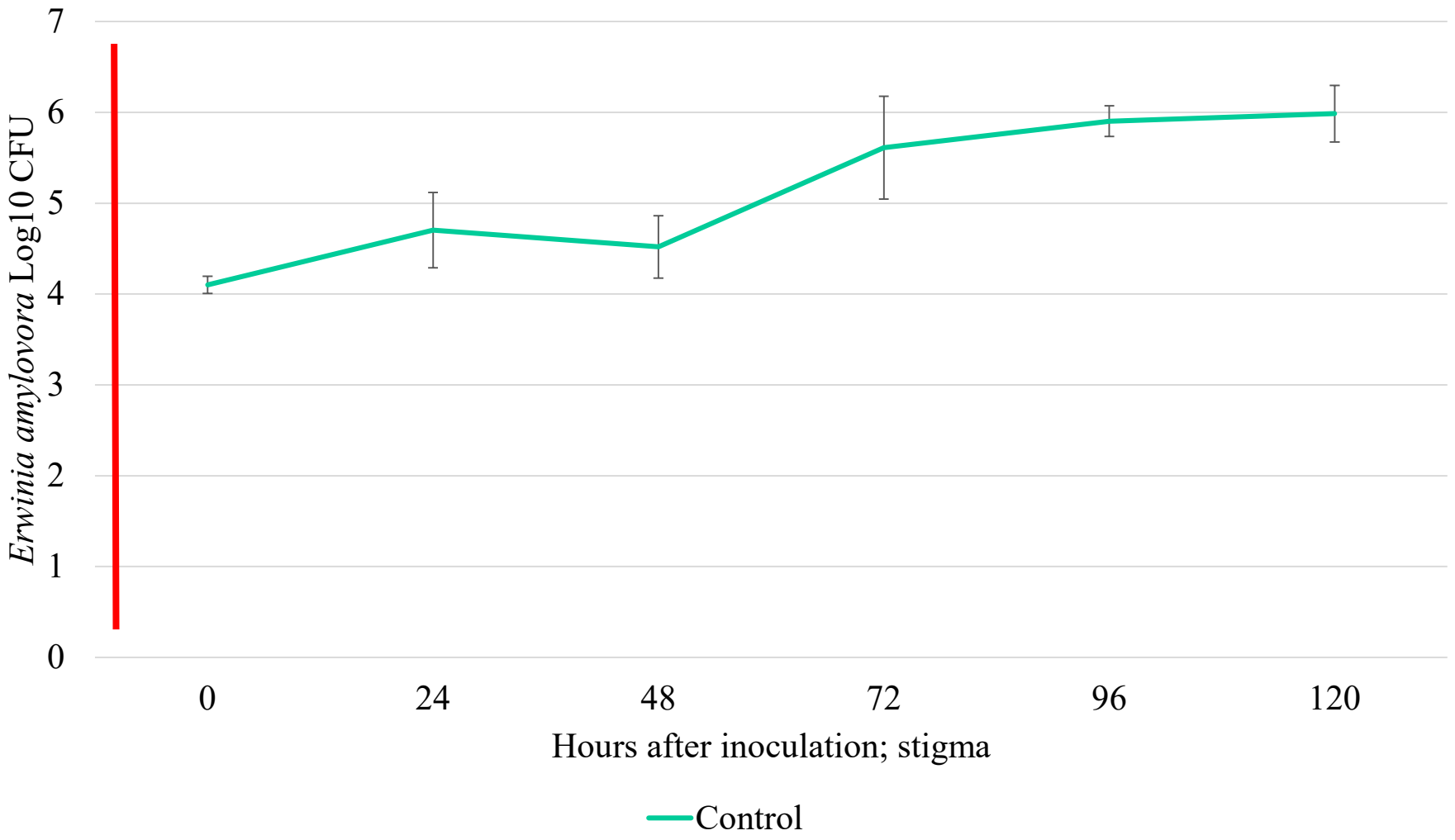
Materials Currently Available for Fire Blight Disease Management

- **Blossom Blight**
  - **Streptomycin (Agrimycin and generics)**
  - **Kasumin**
  - **Oxytetracycline (Mycoshield, FireLine)**
  - **Serenade Opti, Serifel, Stargus, Double Nickel**
  - **Blossom Protect – *Aureobasidium pullulans***
- **Shoot Blight**
  - **Prohexadione-Ca (Apogee)**
- **Other compounds**
  - **Actigard, LifeGard – host resistance inducers**
  - **Low-metallic coppers, (Cueva, Previsto)**

Oxytetracycline and Blossom Blight Control Under Higher Pressure



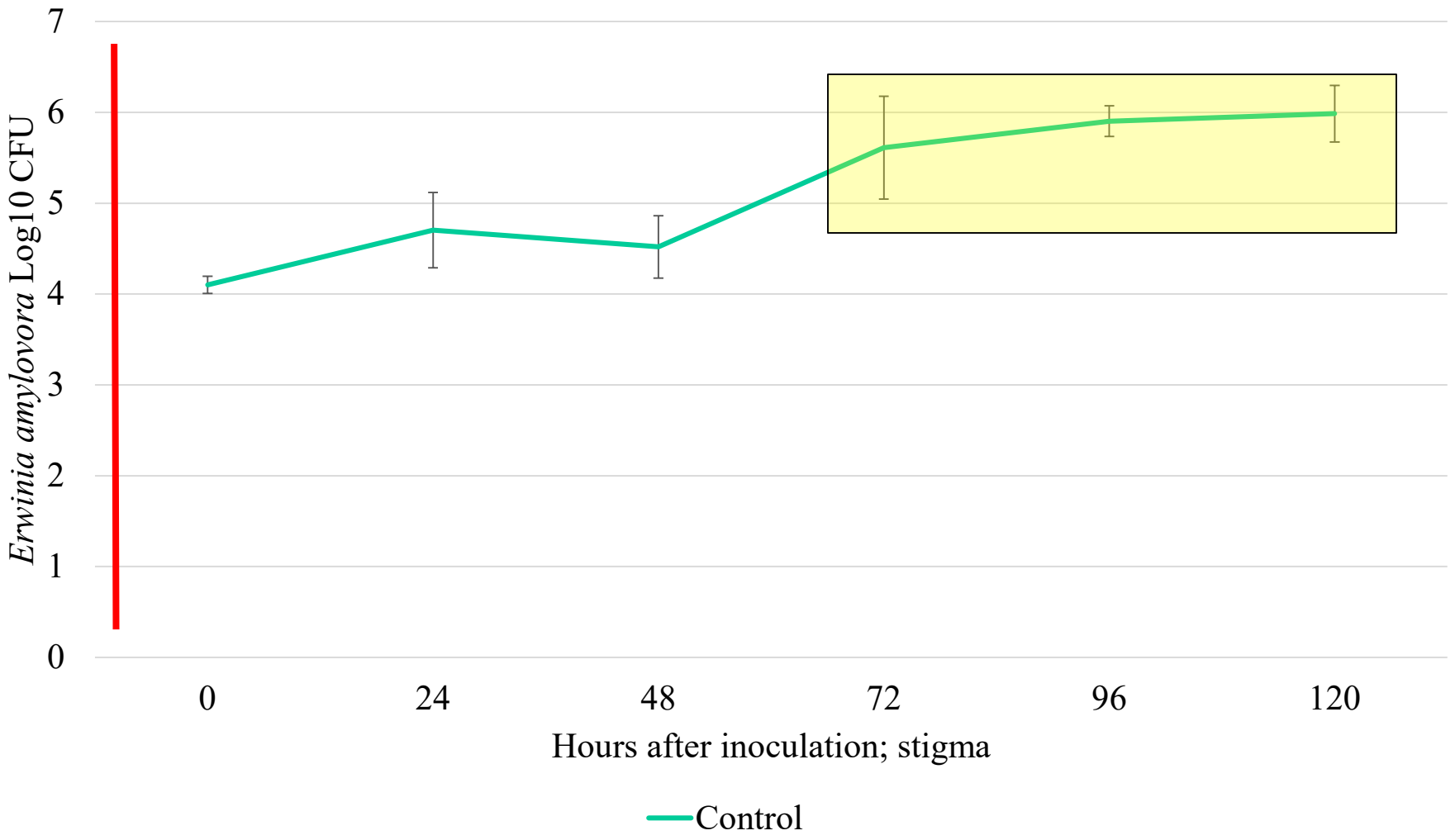
Effect of Antibiotics on Populations of the Fire Blight Pathogen



Antibiotics applied 4 hours before inoculation

Suzanne Slack, Cory Outwater

Effect of Antibiotics on Populations of the Fire Blight Pathogen



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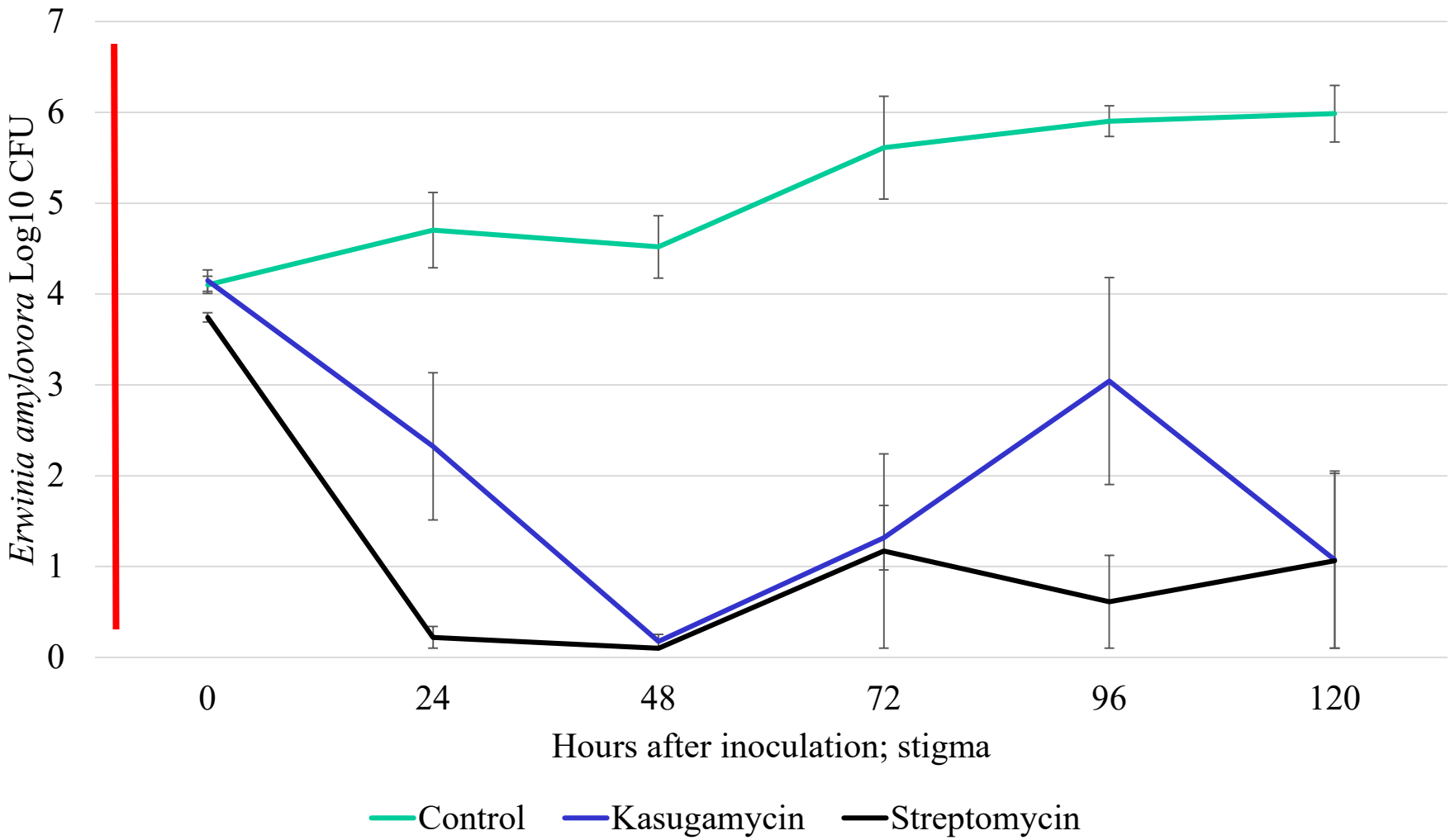

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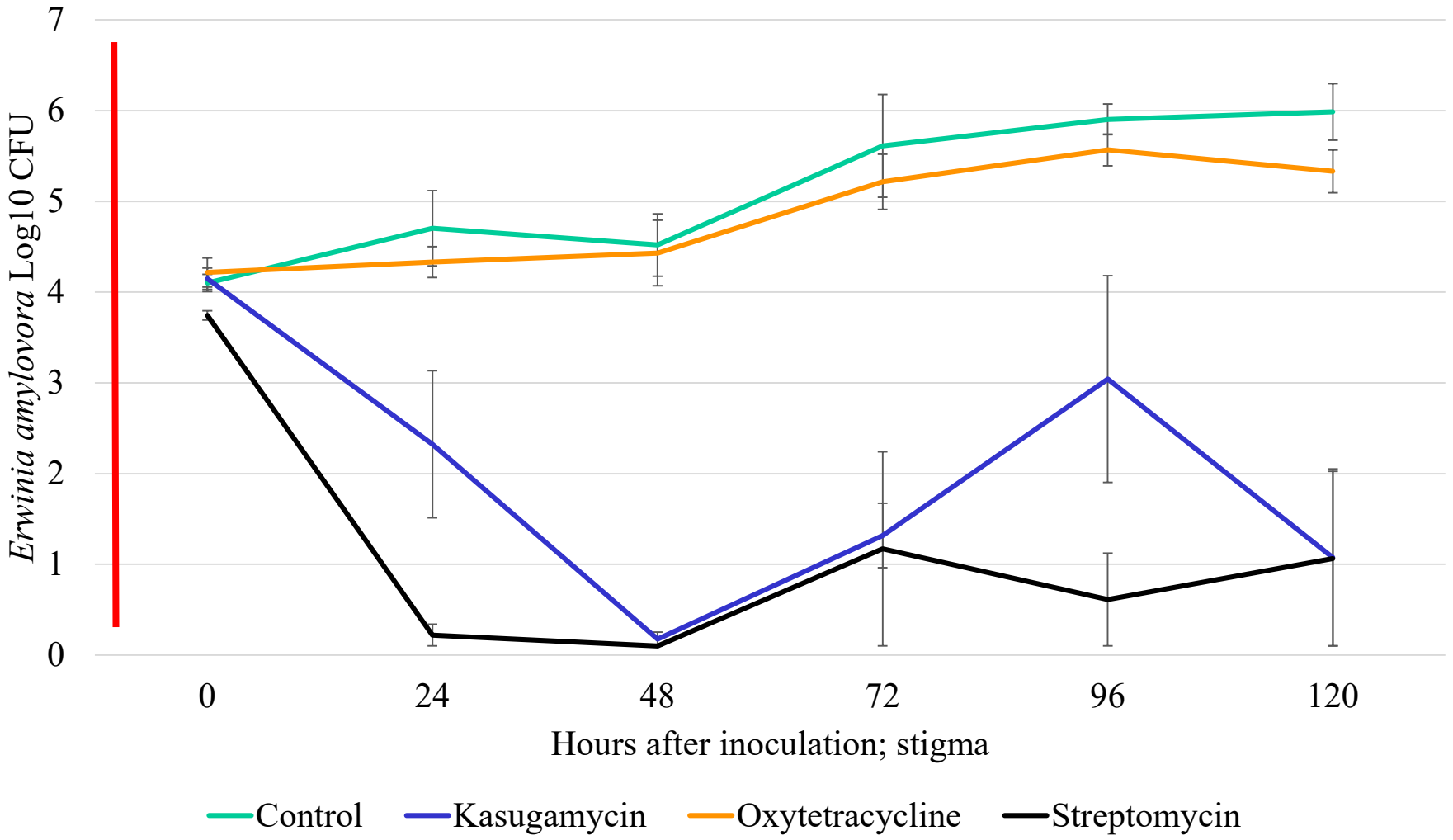

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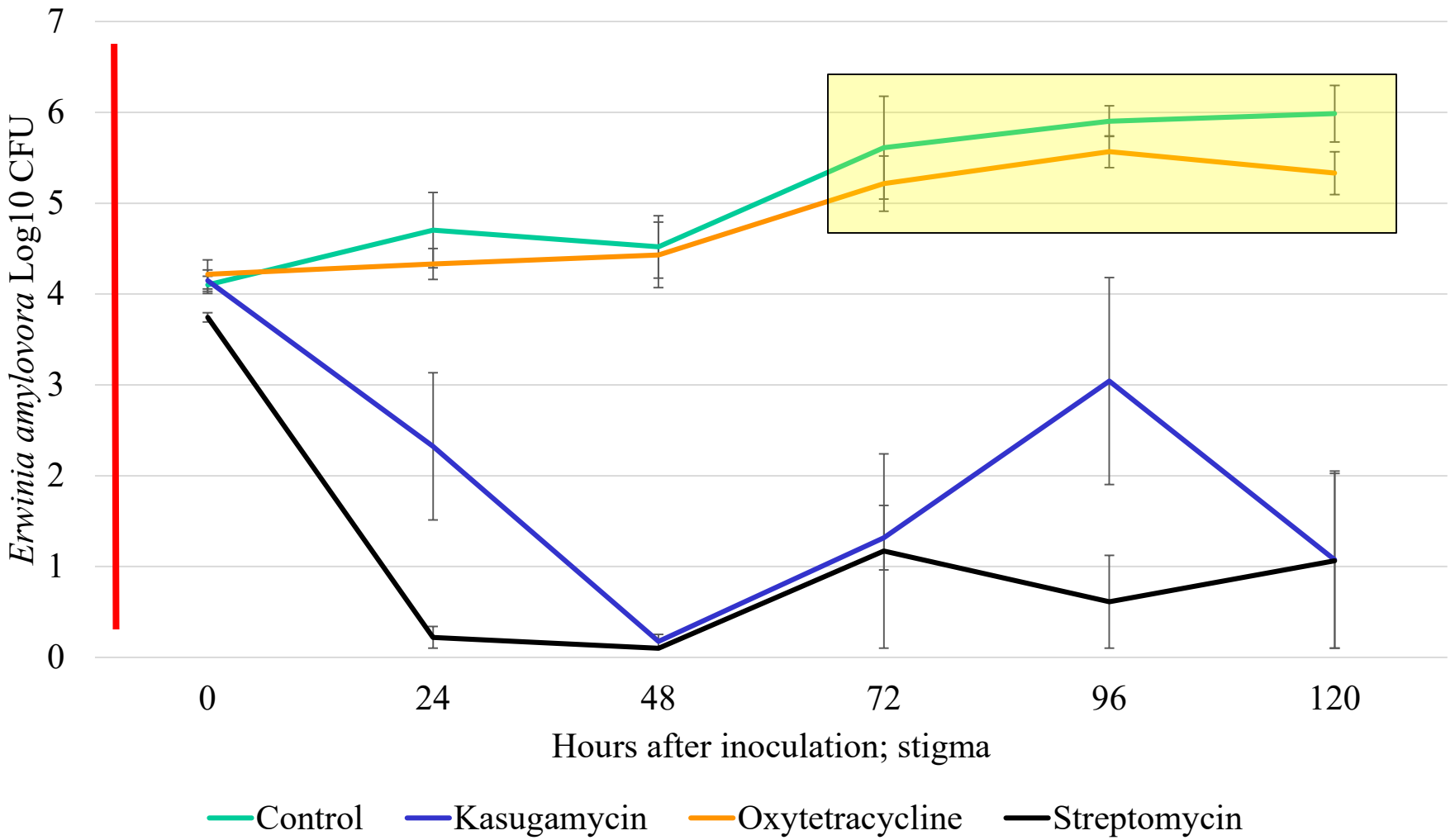

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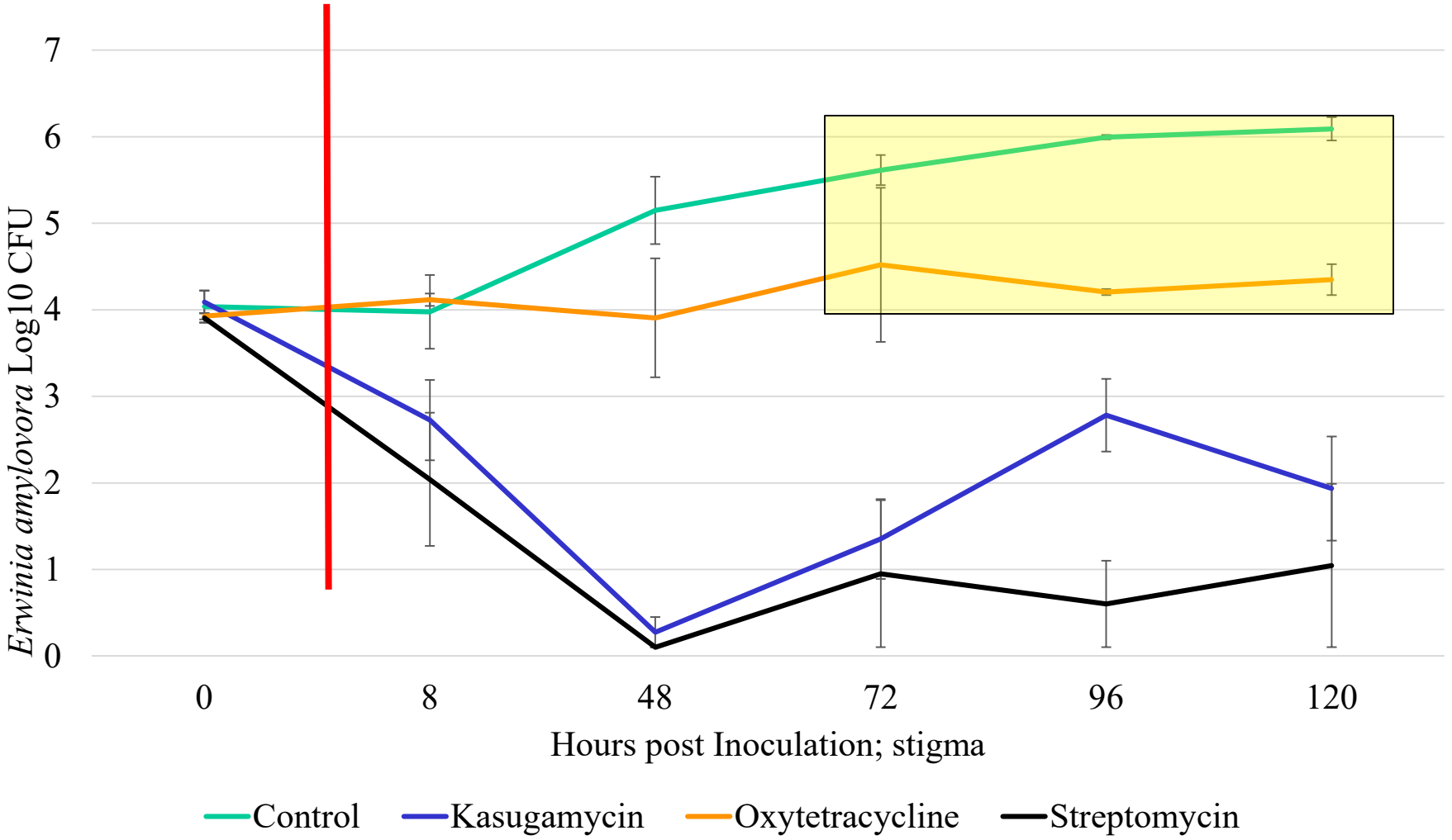


Antibiotics applied 4 hours after inoculation

Streptomycin and Kasumin use for blossom blight control

- **Use a fire blight disease prediction model**
  - **MaryBlyt – MSU Enviroweather site**
  - **MaryBlyt EIP > 70**
- **Antibiotic sprays (streptomycin and Kasumin) are bactericidal; time sprays to reduce/eliminate pathogen populations on flower stigmas**
  - **Evening applications best**
- **Maximum 3 sprays per bloom period to optimize resistance management**

Blossom blight – biological control options

2017 MSU Fire Blight Trial 'Jonathan'		% Infection
		Blossom blight
Treatment and product per acre	Timing	12 Jun
3–Serenade Optimum 20 oz	70-80%[z]; FB[y]	14.8 b[x]
6–FireWall 1.5 lb + Regulaid 3 pt	70-80%; FB	2.3 c
9–Untreated control		32.0 a

DAY 1 **70-80% bloom – treatment spray**

DAY 2 **Next evening – inoculate pathogen**

DAY 3 **Next morning – treatment spray**

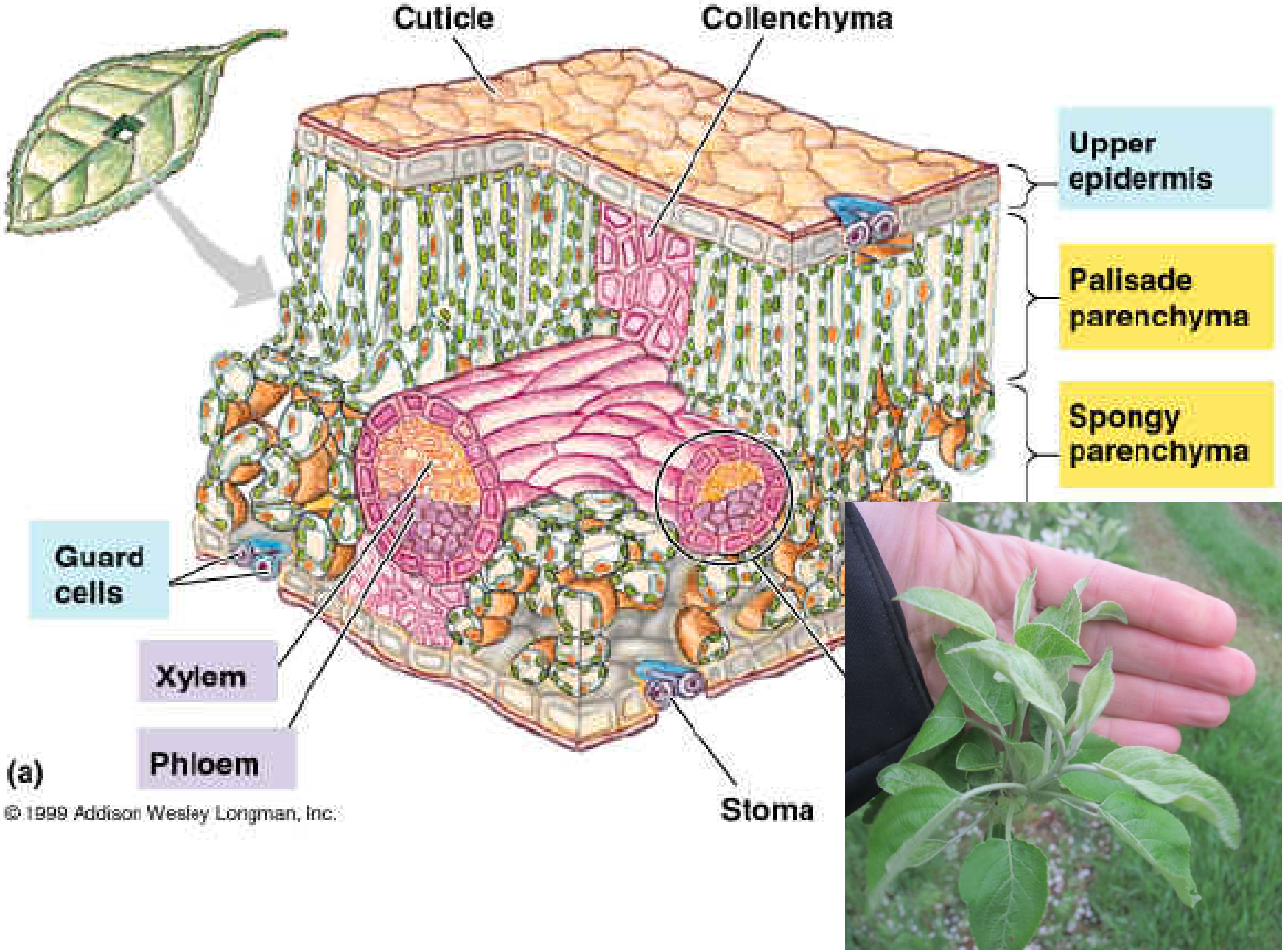
Oxytetracycline and biologicals use for blossom blight control

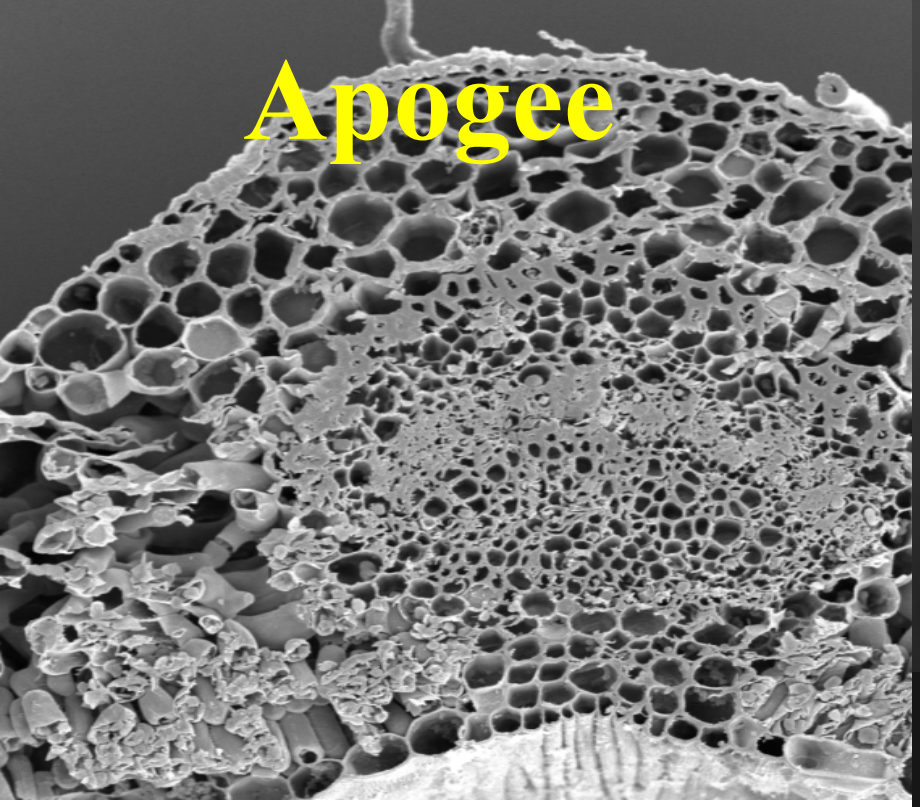
- **Use a fire blight disease prediction model**
  - **MaryBlyt – MSU Enviroweather site**
  - **MaryBlyt EIP 40 -- 70**
- **These sprays are bacteriostatic; only inhibit growth of pathogen**
  - **Evening applications best**

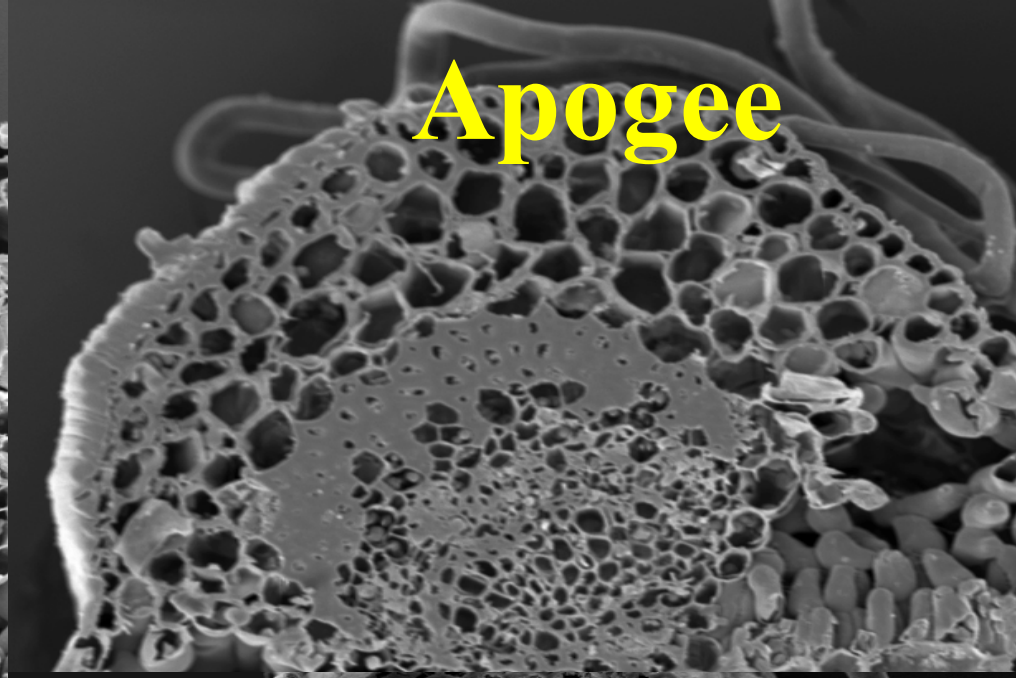
Apogee (Prohexadione-Ca)

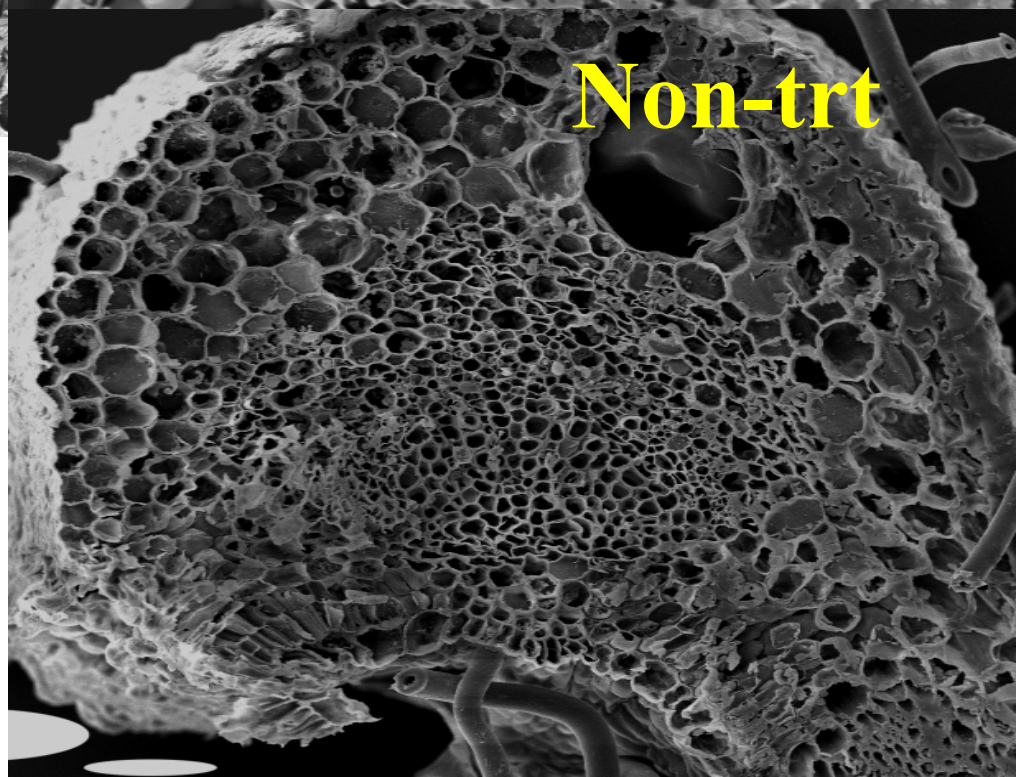
- **Reduces shoot growth**
- **Absorbed by apple foliage, transported acropetally to growing shoot tip**
- **Shoot-specific treatment**
- **Excellent control of shoot blight**
- **(Do not use on Empire or Winesap due to fruit cracking issues)**

Tree collapse and death due to girdling canker at scion:rootstock junction







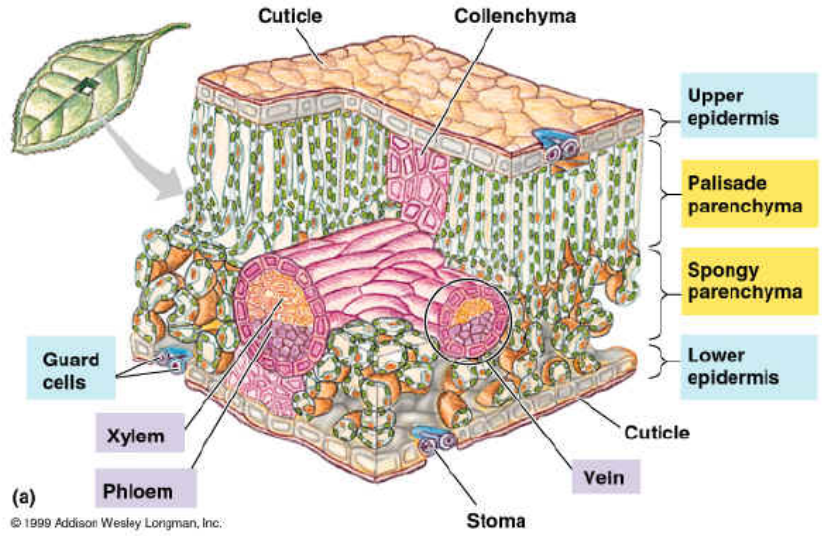


- "Apogee effect" -- Barrier to infection

Apogee

Apogee

Non-trt



"Apogee Effect"

- **~ 2 weeks after application**
- **Reduction in shoot growth**
- **Byproduct is shoot blight control**
- **Initial application – petal fall of king bloom (when shoots are 1-3" long)**

- **PHYSICAL inhibition of pathogen infection**

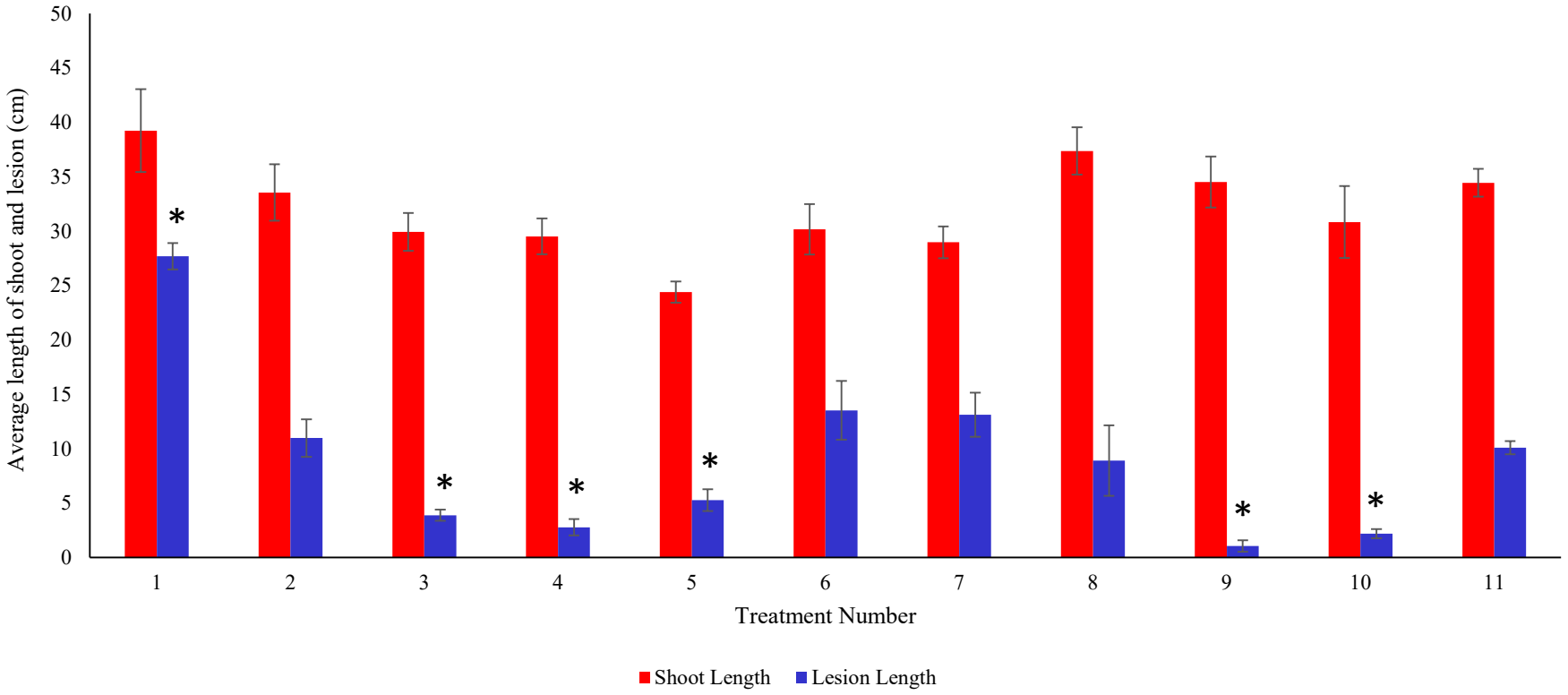
Apogee / Actigard experiment on Gala

1. Apogee, 1 oz / A
2. Apogee, 2 oz / A
3. Apogee, 3 oz / A
4. Apogee, 4 oz / A
5. Apogee, 8 oz / A
6. Actigard, 1 oz / A
7. Actigard, 2 oz / A
8. Apogee, 1 oz + Actigard, 1 oz
9. Apogee, 1 oz + Actigard, 2 oz
10. Apogee, 2 oz + Actigard, 1 oz
11. untreated control

Apogee trts.
King bloom PF
+ 2 wks
+ 2 wks

Actigard trts.
King bloom PF
+ 7-10 days
+ 7-10 days

Average shoot length and lesion length (26 June 2018)



2 = 2 oz / A Apogee

4 = 4 oz / A Apogee

5 = 8 oz / A Apogee

9 = 2 oz Apogee + 1 oz Actigard

10 = 2 oz Apogee + 2 oz Actigard

11 = control

6 = 1 oz Actigard

7 = 2 oz Actigard

2019 Shoot blight test

2019 MSU Fire Blight Trial "Hort Farm New Gala"		% Infection Shoot blight (% Incidence)
Treatment and product per acre	Timing	17 Jul
11–Apogee 1 oz + Actigard 1 oz + Regulaid 3 pt	KBPF; 7-8 day interval after KBPF (4 applications)	4.0 cd
12–Apogee 2 oz + Actigard 1 oz + Regulaid 3 pt	KBPF; 7-8 day interval after KBPF (4 applications)	4.5 cd
13–Apogee 2 oz + Actigard 2 oz + Regulaid 3 pt	KBPF; 7-8 day interval after KBPF (4 applications)	3.3 cd
14–Actigard 1 oz + Regulaid 3 pt	KBPF; 7-8 day interval after KBPF (4 applications)	8.3 bcd
15–Apogee 2 oz + Regulaid 3 pt	KBPF; 7-8 day interval after KBPF (4 applications)	9.5 bcd
18–Apogee 8 oz + Regulaid 3 pt	KBPF; 14 day interval after KBPF (3 applications)	7.8 cd
21–Untreated control		18.8 ab

Natural inoculation of shoots

Potential for reduced rates of Apogee and Actigard

- **Combos of Apogee + Actigard are the most promising**
  - **2 oz Apogee + 1 oz Actigard rate**
- **Second year that this reduced rate of Apogee has worked well**
- **Disease control + growth**

Antibiotic use for blossom blight control

- **Use a fire blight disease prediction model**
  - **MaryBlyt – MSU Enviroweather site**
  - **MaryBlyt EIP > 70**
- **Antibiotic sprays (streptomycin and Kasumin) are bactericidal; time sprays to reduce/eliminate *Erwinia* populations on stigmas**
- **Maximum 3 sprays per bloom period to optimize resistance management**

Fire Blight Summary – NY

- Streptomycin
- Kasumin – best alternate to strep
- FireLine, Mycoshield – alternate to strep
- Can mix in biologicals
- Apogee for shoot blight control
  - 2 oz Apogee + 1 oz Actigard

- Control blossom blight, then use Apogee for shoot blight
- Copper early if necessary

Acknowledgements

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Michigan Apple Committee
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