Fire blight prevention and suppression strategies

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New Haven, CT

CAES

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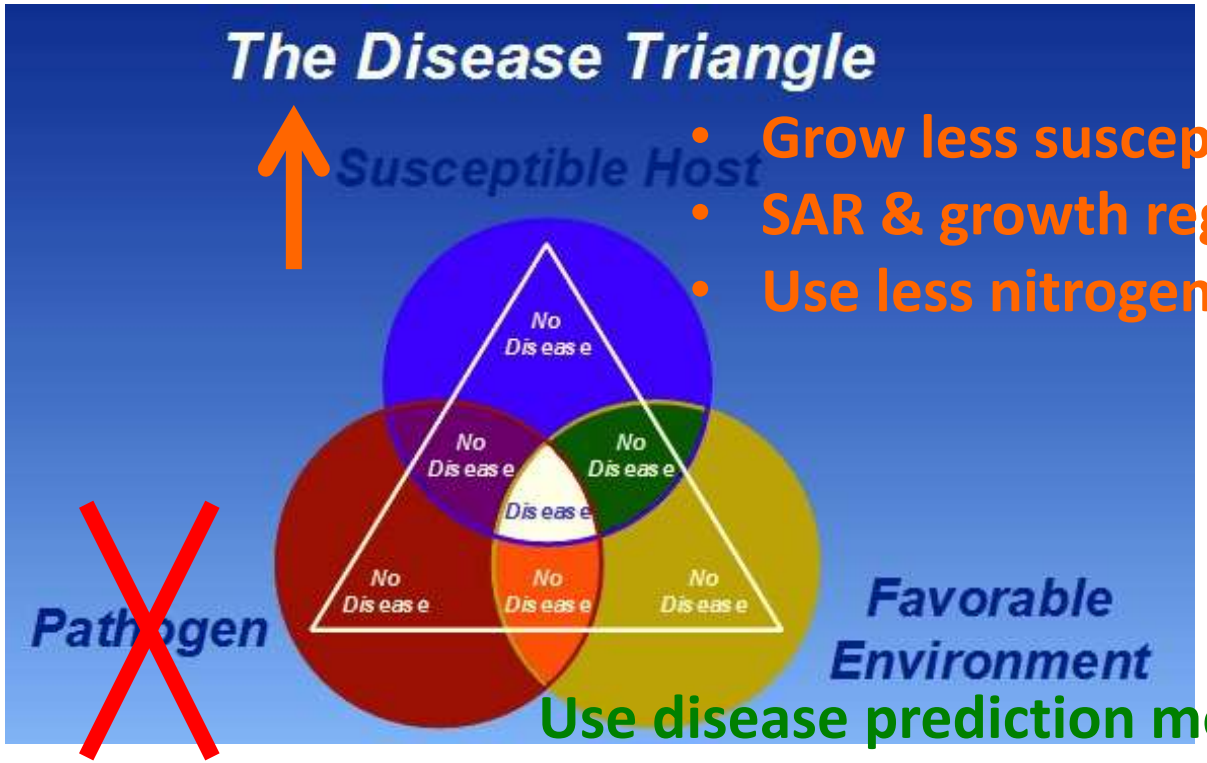
Strategies to control fire blight

- Disease will occur when three components are fulfilled: the host, the pathogen, and the environment.



- Grow less susceptible varieties
- SAR & growth regulators
- Use less nitrogen fertilizer

Limit pathogen growth

Use disease prediction model to time application.

A year-round management strategy – the basics

Winter / Early spring	**Prune off fire blight cankers**
Green tip	**Delayed dormant copper**
Bloom	**Use antibiotics, copper, biological controls to limit pathogen growth**
Petal fall	**Post-Bloom Petal Fall- Plant growth regulator treatment**
Active shoot growth	**Prune off infected shoots**
Terminal bud set	

Prune off cankers

- Scout and prune out fire blight cankers
- Do not need to follow the 12 to 18 inches from edge of symptoms rule for winter pruning.
- Do not need to sterilize pruners during winter pruning!

Delayed dormant copper

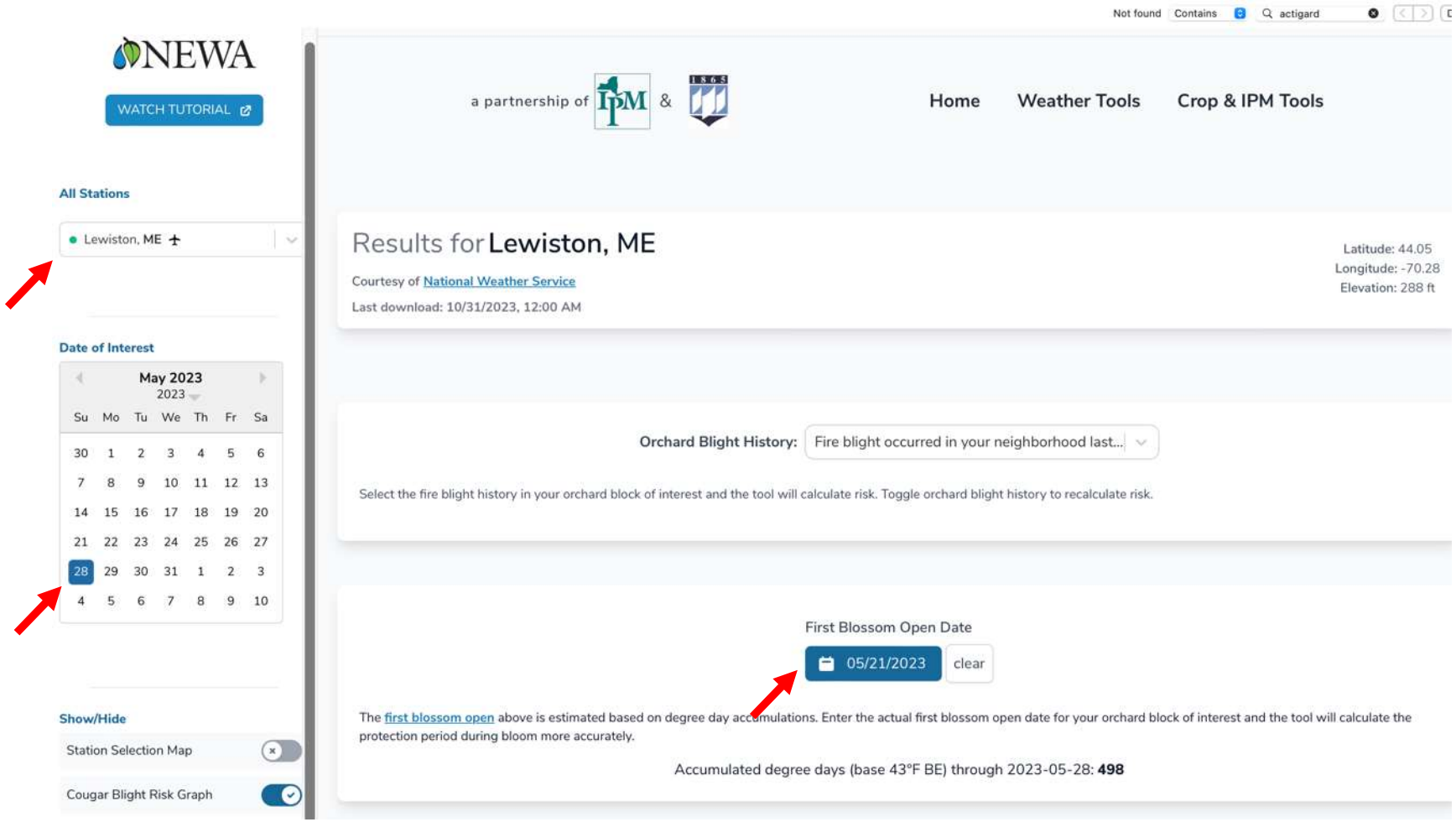
- Only needed for blocks with fire blight history, with fire blight cankers.
- Helps to sanitize the orchard, kill any bacterial ooze produced from cankers.
- Also helps with apple scab control.
- Apply at green tip / tight clusters to avoid phytotoxicity, 1 application.
- Fixed copper at 15% metallic copper equivalent.

Bloom antibiotic spray

- Streptomycin (24 fl oz/A) for the 1st spray.
- Tank mix with Regulaid (1pt). It helps strep to disperse and absorb. Be wary of russeting risk of Regulaid+captan.
- Use NEWA Cougar Blight model to time your application!
- Apply in late afternoon as much as possible. Reasons: slow drying helps strep uptake, no UV degradation, Ea grows at night!
- Spray must dry before rain occurs!
- Good spray coverage is essential.
- If 2rd application needed, consider using Kasugamycin (Kasumin, 64 fl oz/A).

NEWA Cougar Blight model

https://newa.cornell.edu/fire-blight



NEWA Cougar Blight model

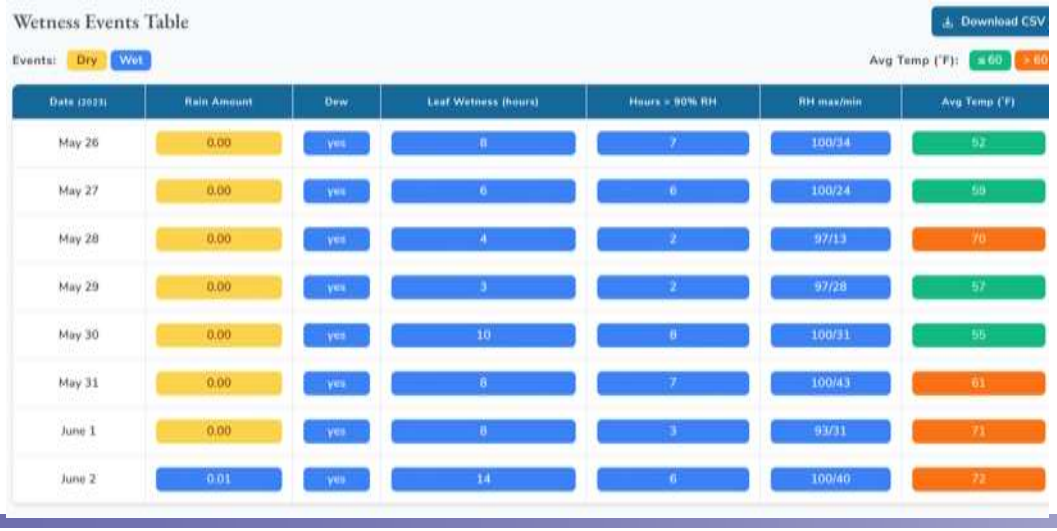
Results Table

Download CSV

Forecast Details

Date (2023)	Cougar Blight V8 Daily TRV (Risk Levels: Marginal / High / Extreme)	Infection Potential EIP value (Risk Levels: Low / Moderate / High / Infection)
May 26	20	2
May 27	206	60
May 28	709	185
May 29	735	198
May 30	750	209
May 31	741	262
June 1	714	325
June 2	1000	281

* Indicates incomplete accumulation of the 4-day DH total. The DH value may reach "Caution", "High" or "Extreme" levels before spanning the 4-day accumulation cut-off time of Cougarblight.



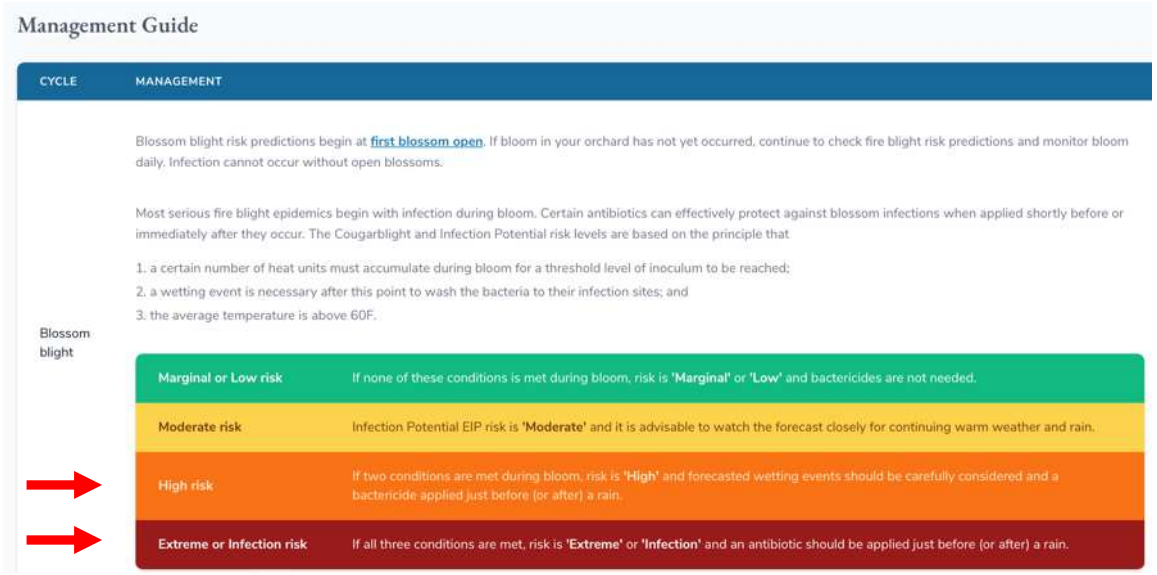
Wetness Events Table

Download CSV

Events: Dry Wet

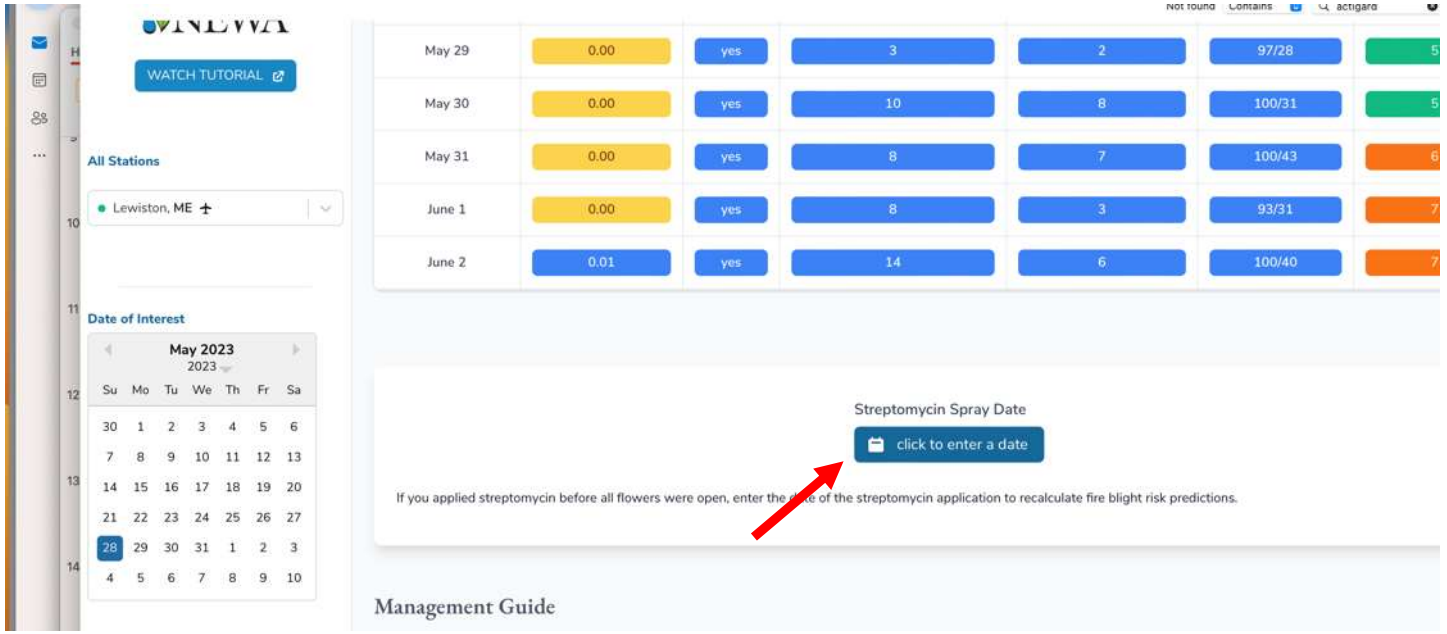
Avg Temp (°F): ≤ 60 > 60

Date (2023)	Rain Amount	Dew	Leaf Wetness (hours)	Hours > 90% RH	RH max/min	Avg Temp (°F)
May 26	0.00	yes	8	7	100/34	52
May 27	0.00	yes	6	6	100/24	59
May 28	0.00	yes	4	2	97/13	70
May 29	0.00	yes	3	2	97/28	57
May 30	0.00	yes	10	8	100/31	55
May 31	0.00	yes	8	7	100/43	61
June 1	0.00	yes	8	3	93/31	71
June 2	0.01	yes	14	6	100/40	72



Management Guide

CYCLE	MANAGEMENT
Blossom blight	Blossom blight risk predictions begin at first blossom open. If bloom in your orchard has not yet occurred, continue to check fire blight risk predictions and monitor bloom daily. Infection cannot occur without open blossoms. Most serious fire blight epidemics begin with infection during bloom. Certain antibiotics can effectively protect against blossom infections when applied shortly before or immediately after they occur. The Cougarblight and Infection Potential risk levels are based on the principle that 1. a certain number of heat units must accumulate during bloom for a threshold level of inoculum to be reached; 2. a wetting event is necessary after this point to wash the bacteria to their infection sites; and 3. the average temperature is above 60F.
	Marginal or Low risk — If none of these conditions is met during bloom, risk is **'Marginal'** or **'Low'** and bactericides are not needed.
	Moderate risk — Infection Potential EIP risk is **'Moderate'** and it is advisable to watch the forecast closely for continuing warm weather and rain.
	High risk — If two conditions are met during bloom, risk is **'High'** and forecasted wetting events should be carefully considered and a bactericide applied just before (or after) a rain.
	Extreme or Infection risk — If all three conditions are met, risk is **'Extreme'** or **'Infection'** and an antibiotic should be applied just before (or after) a rain.



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Bloom spray alternatives:

- **Low-metallic coppers**

- Cueva
- Previsto
- Badge X2

- **Biologicals**

- Blossom Protect
- Serenade Opti, Double Nickle, Stargus

- **Contact sterilants**

- Oxidate
- JetAg

Field trial set up

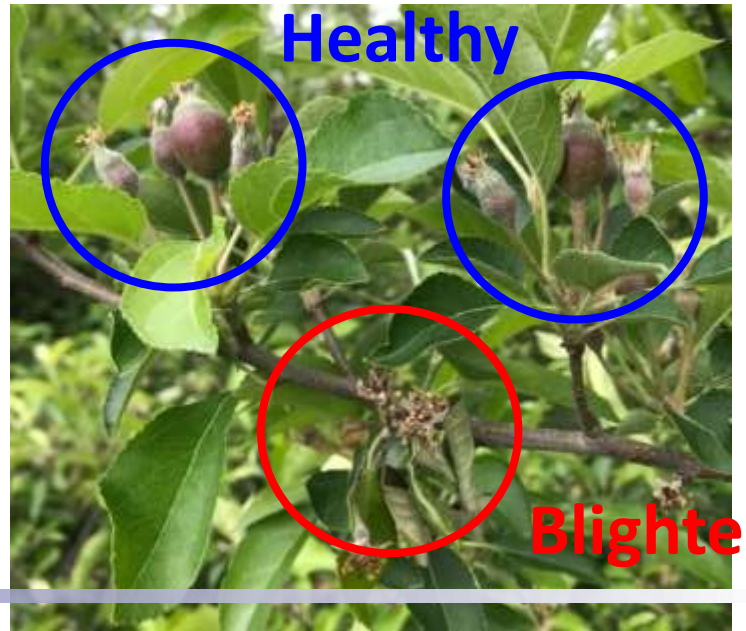
- 25-year old apple trees ‘red delicious’
- 4 reps per treatment, in a complete randomized design.

Materials tested

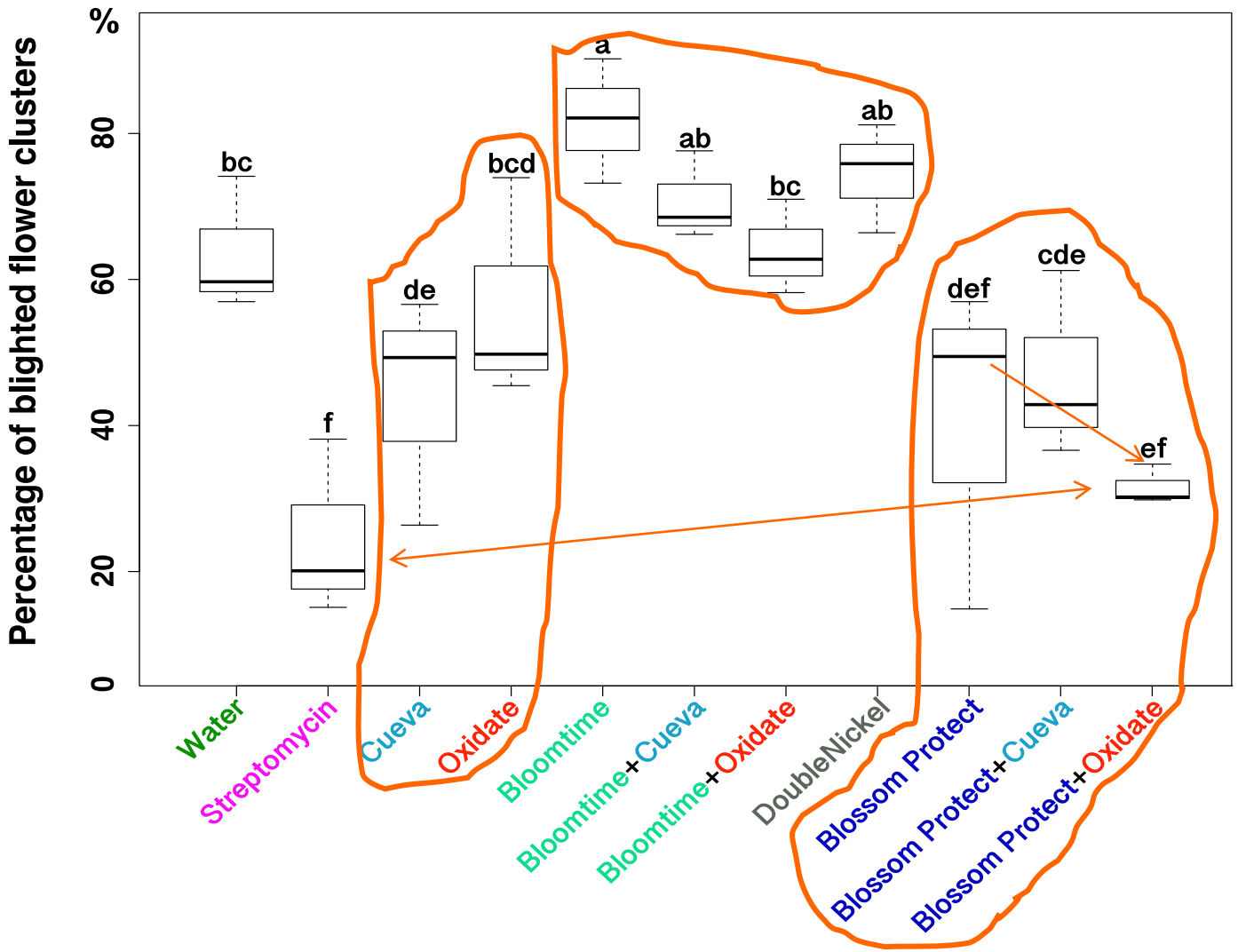
Treatment	Active ingredient
Double Nickel	*Bacillus amyloliquefaciens,* bacteria
BlightBanA506	*Pseudomonas fluorescens*, bacteria
Blossom Protect	*Aureobasidium pullulans,* yeast
Bloomtime	*Pantoea agglomerans,* bacteria
Cueva	Copper octanoate, organic bactericide
Oxidate 2.0	Hydrogen dioxide + peroxyacetic acid, surface sterilant
FireWall	Streptomycin, antibiotic
Water	control

Timing of application

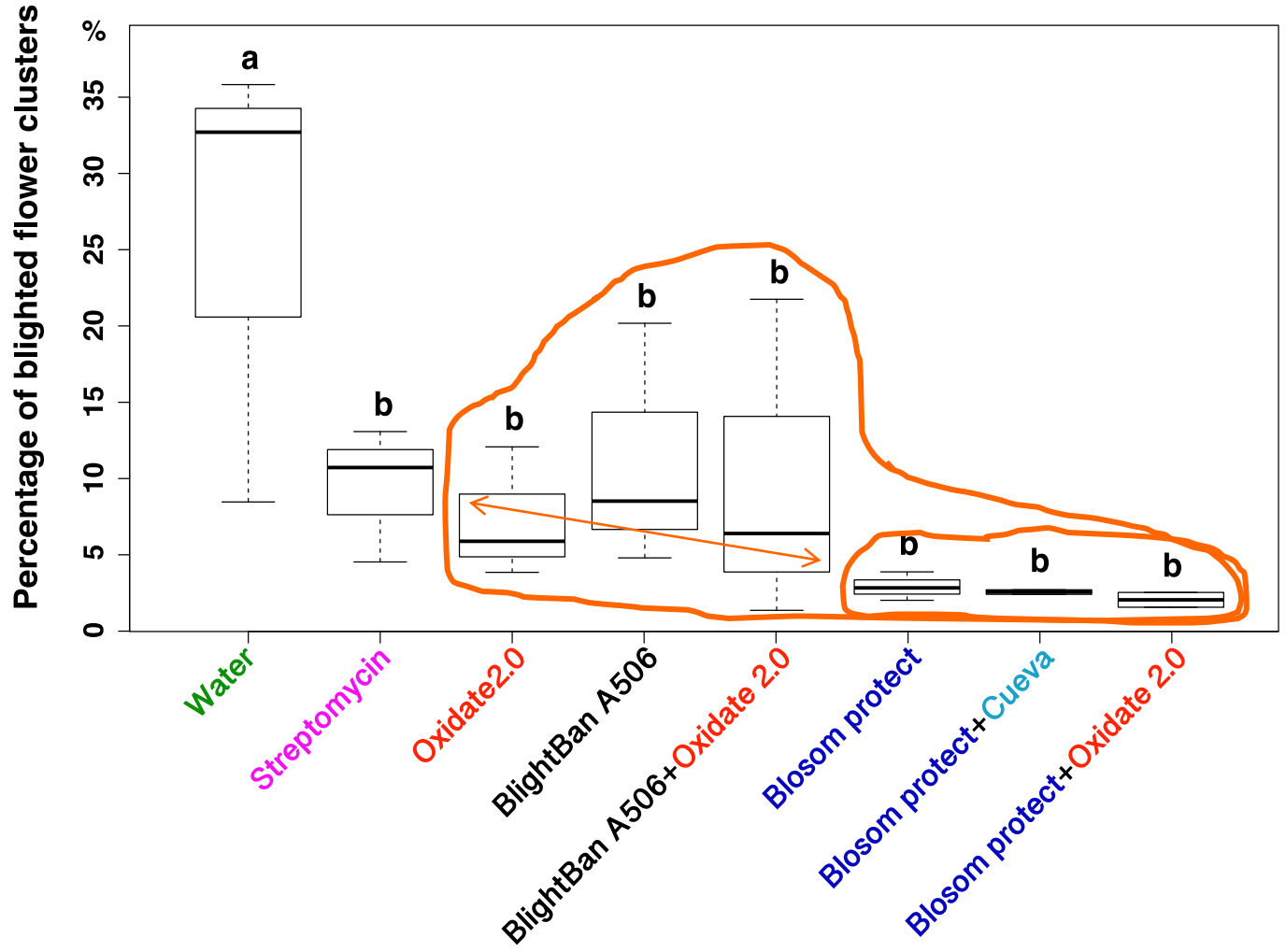
- Biological controls: @ 30% and 70% bloom
- Copper / sterilant: @100% bloom and 24 hr after.
- *E. amylovora* inoculation: 10^6 CFU/ml @ 100% bloom
- Disease rating: % of blighted clusters, 3 weeks later.



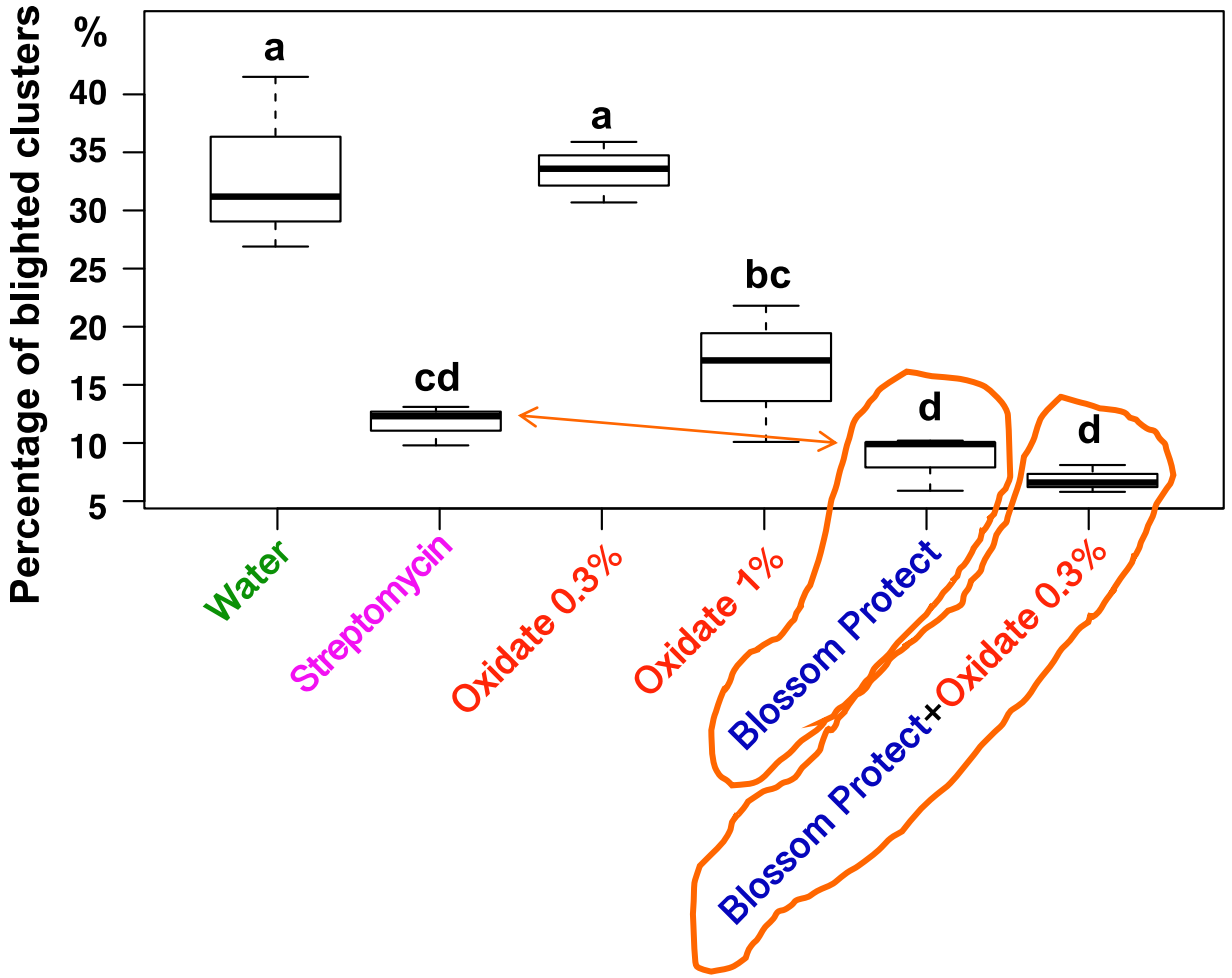
2017 Hamden CT trials



2018 Hamden, CT Trials



2019 Hamden, CT Trials

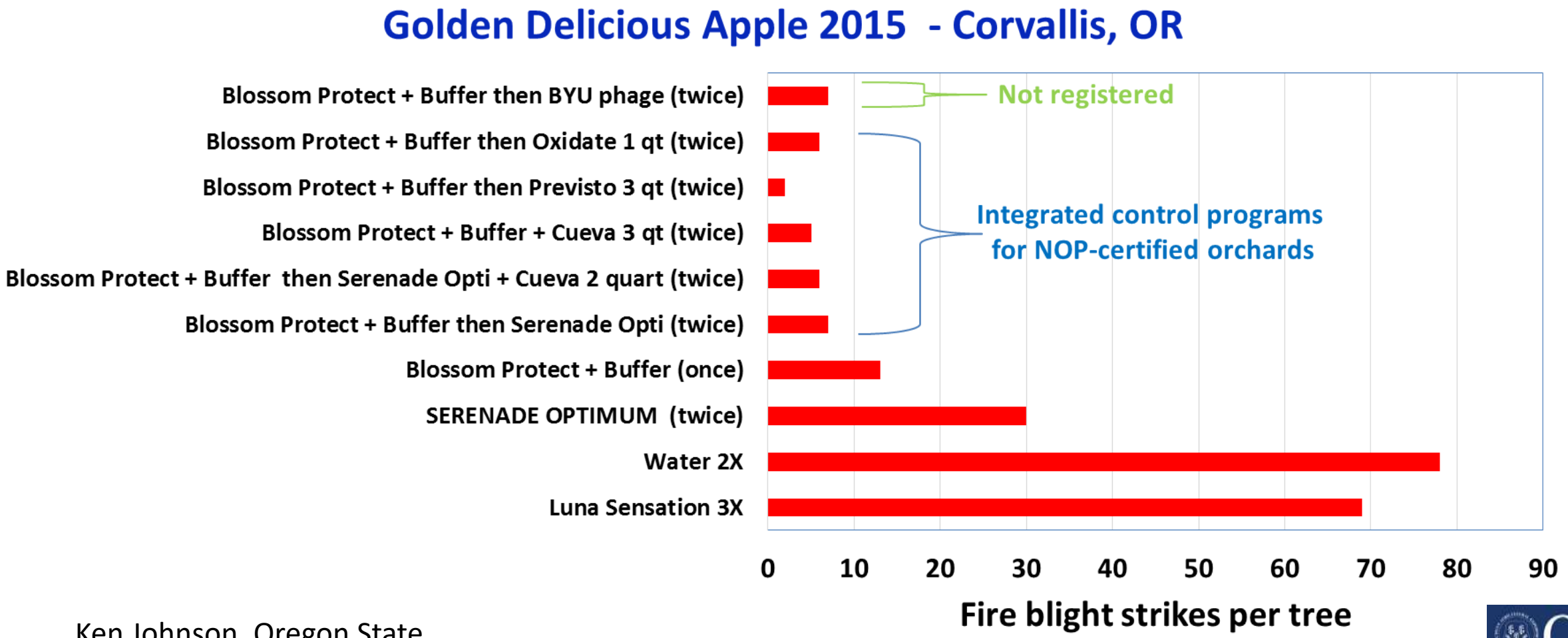


Comparison of organic and conventional controls

Equivalent to the percentage of control by Streptomycin

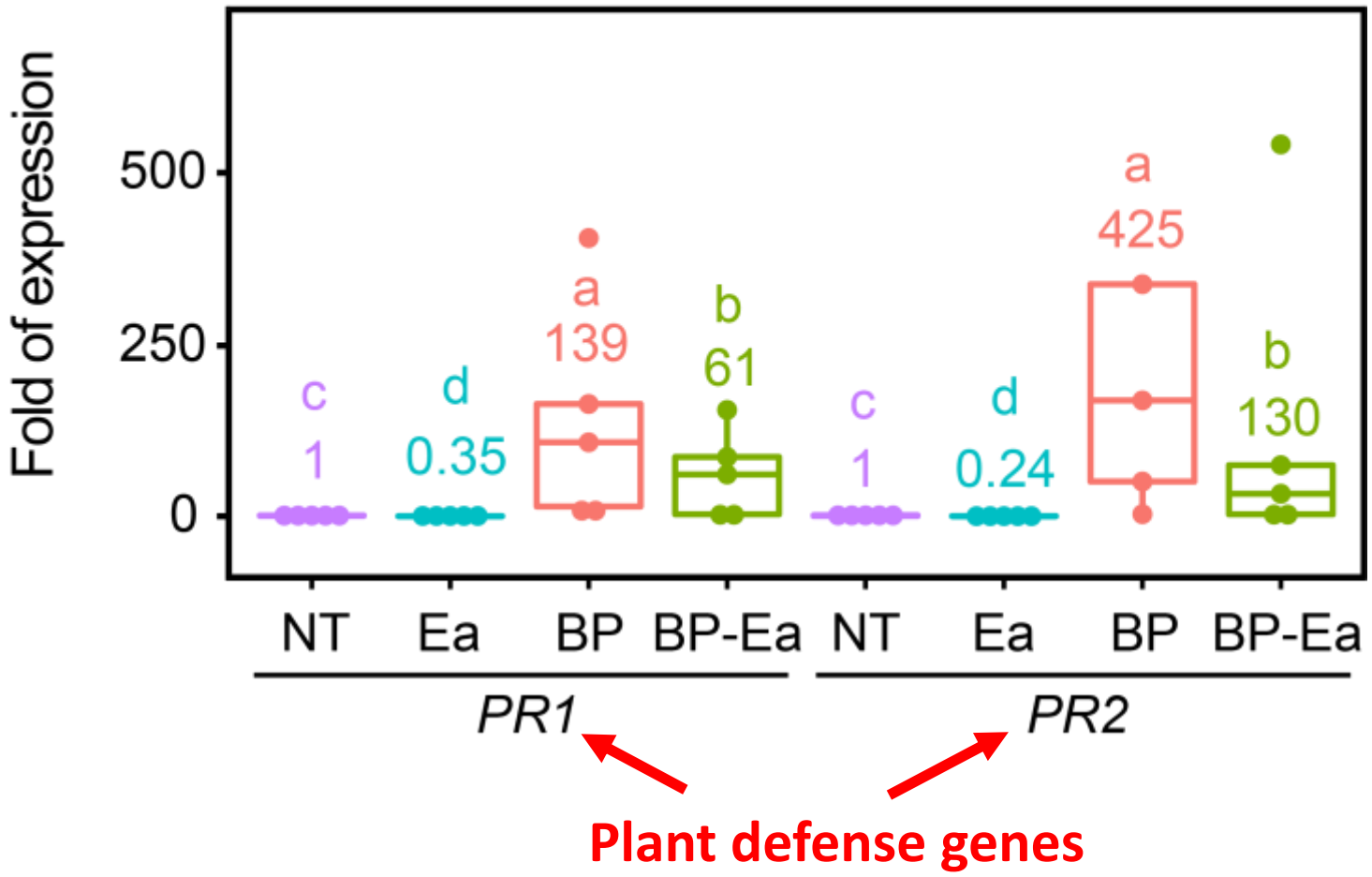
	2015	2017	2018	2019	Overall
Blossom Protect	45%	38%	138%	115%	84%
Blossom Protect + Oxidate	91%	75%	143%	130%	110%

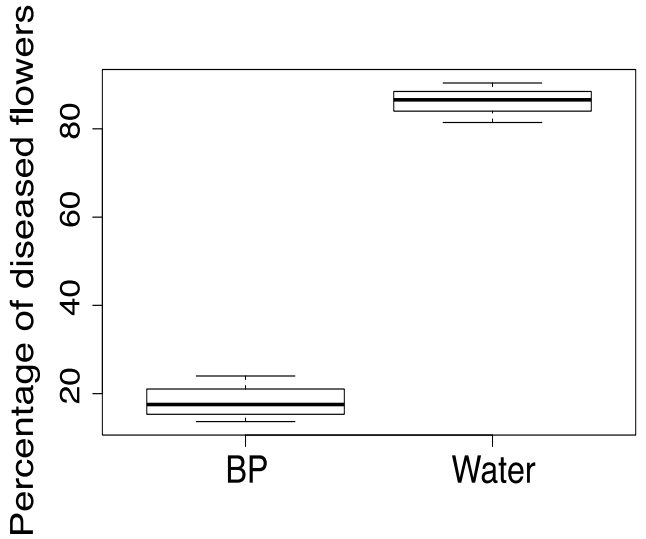
Results in Oregon



Ken Johnson, Oregon State

Disease suppression mechanism of Blossom Protect





3dpi, Empire apple, field study

Zeng et al 2023

Russeting risk, under humid conditions

Summary of observations

- *Blossom Protect* provided consistent, high level of protection against blossom blight.
- The control effect of Blossom Protect can be further enhanced by *organic bactericides*.
- Other biological and organic chemical products provide some level of control and can be useful when disease pressure is low.

Recommended non-antibiotic fire blight control protocol

- ***Early to full bloom***: two applications of Blossom protect (with buffer protect).

> **Essential, regardless of prediction model results**

- ***Full bloom***: one application of 0.3% Oxidate

↖ ↙ **Subject to adjustment based on disease prediction models**

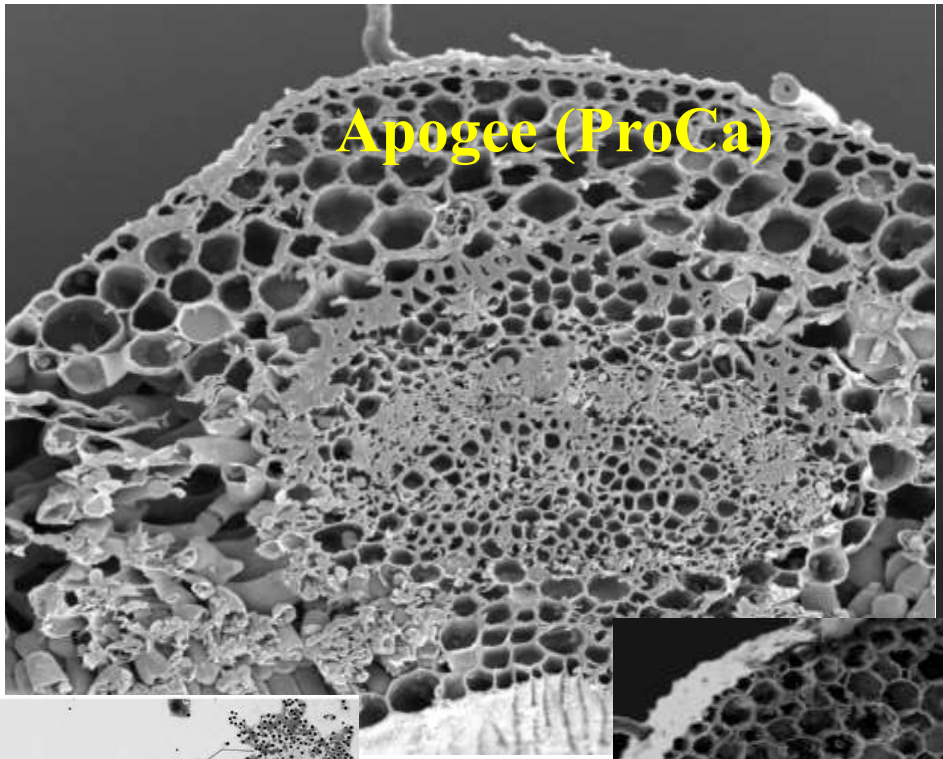
- ***24 hours after full bloom***: one application of 0.3% Oxidate (if disease pressure is high / history of fire blight).

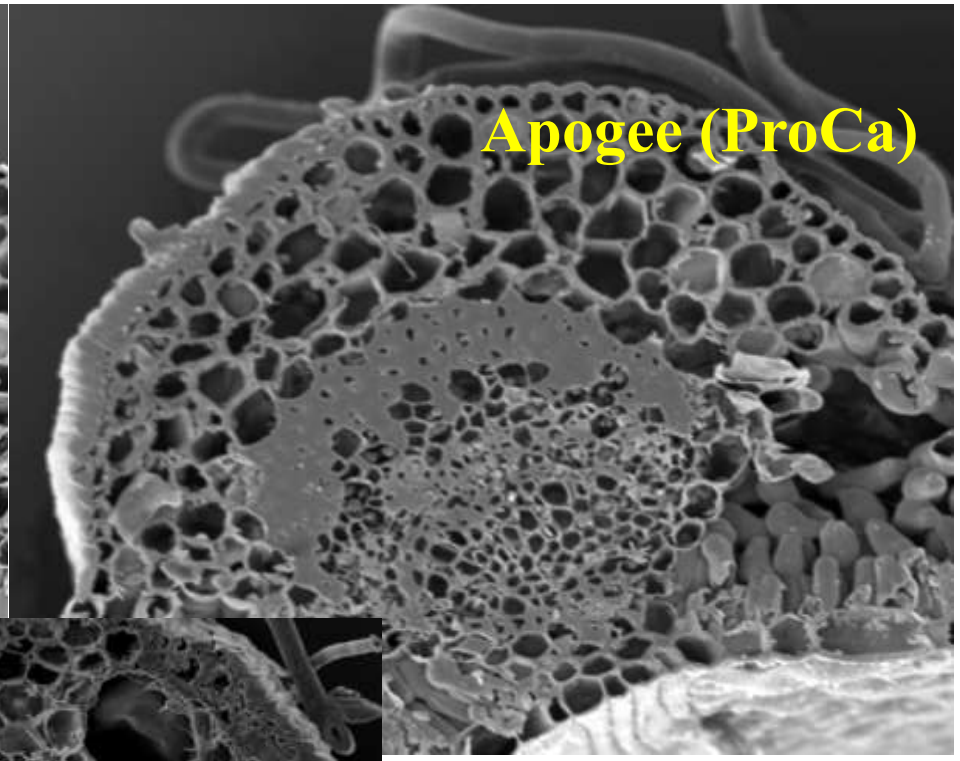
Post-Bloom Petal Fall- Plant growth regulator treatment

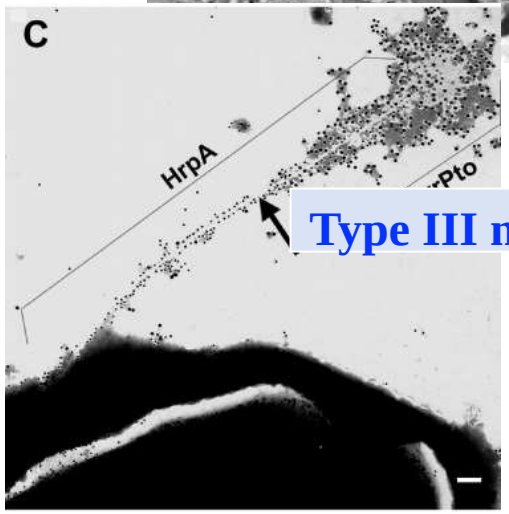
1. Prohexadione Ca (Apogee)

- Thicken cortical parenchyma cell wall, Ea virulent structure could not penetrate.
- Also induces systemic acquired resistance (SAR).

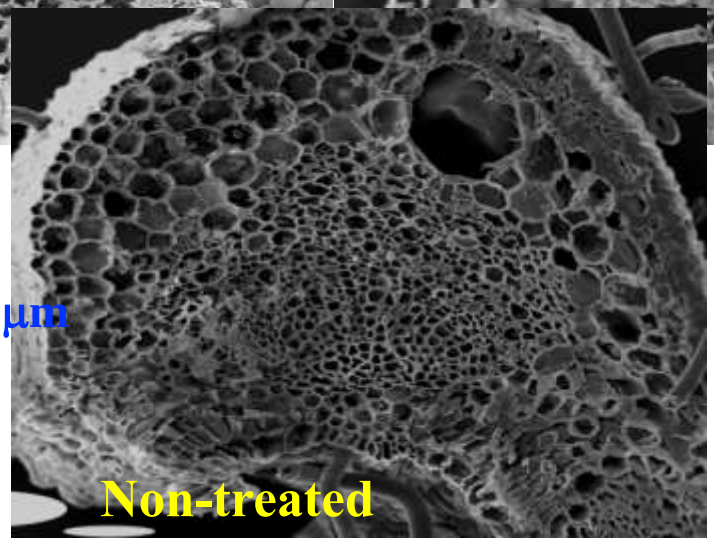
Yuan et al 2023 Phytopathology 113: 2152-2164







Type III needle = ~ 2 μm



George Sundin, MSU

Post-Bloom Petal Fall- Plant growth regulator treatment

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2. Acibenzolar-S-methyl (Actigard 50WG)

- Activates systemic acquired resistance (SAR) in the plant

Yuan et al 2023 Phytopathology 113: 2152-2164

Post-Bloom Petal Fall- Plant growth regulator treatment

1. Prohexadione Ca (Apogee)

- Apply after petal fall for 3 times, 8 oz / 100 g

2. Acibenzolar-S-methyl (Actigard 50WG)

- Apply during and after bloom, 8 oz / 100 g

	Mean no. strikes per 5 tree replicate set	
Treatment	**June 20th**	**August 9th**
Non-treated	27.7	95.7
Apogee (18 oz/A)	3.3***	9.8***

Keith Yoder, Virginia Tech

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Problem: In young high-density apple plantings, shoot growth is inhibited at these rates!

Suppression of fire blight = sacrifice the time to reach to the top wire.

Can we use reduced rates? No, reduced rates sacrifice disease suppression.

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Problem: In young high-density apple plantings, shoot growth is inhibited at these rates!

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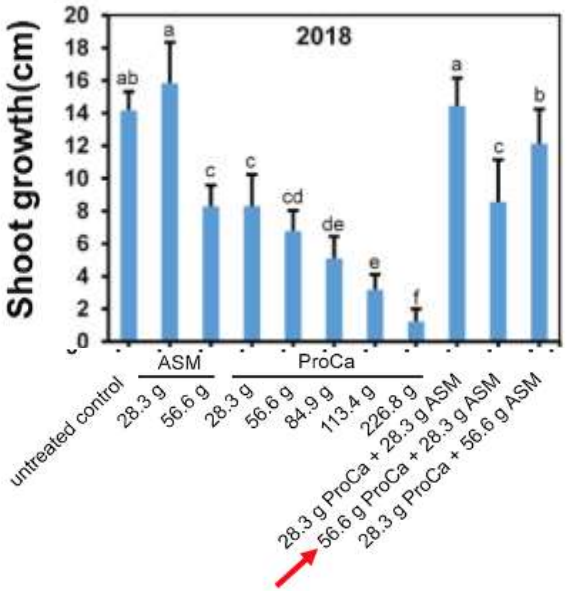
How about combining the two materials?

Combinations of low rates of ProCa and ASM for shoot blight management



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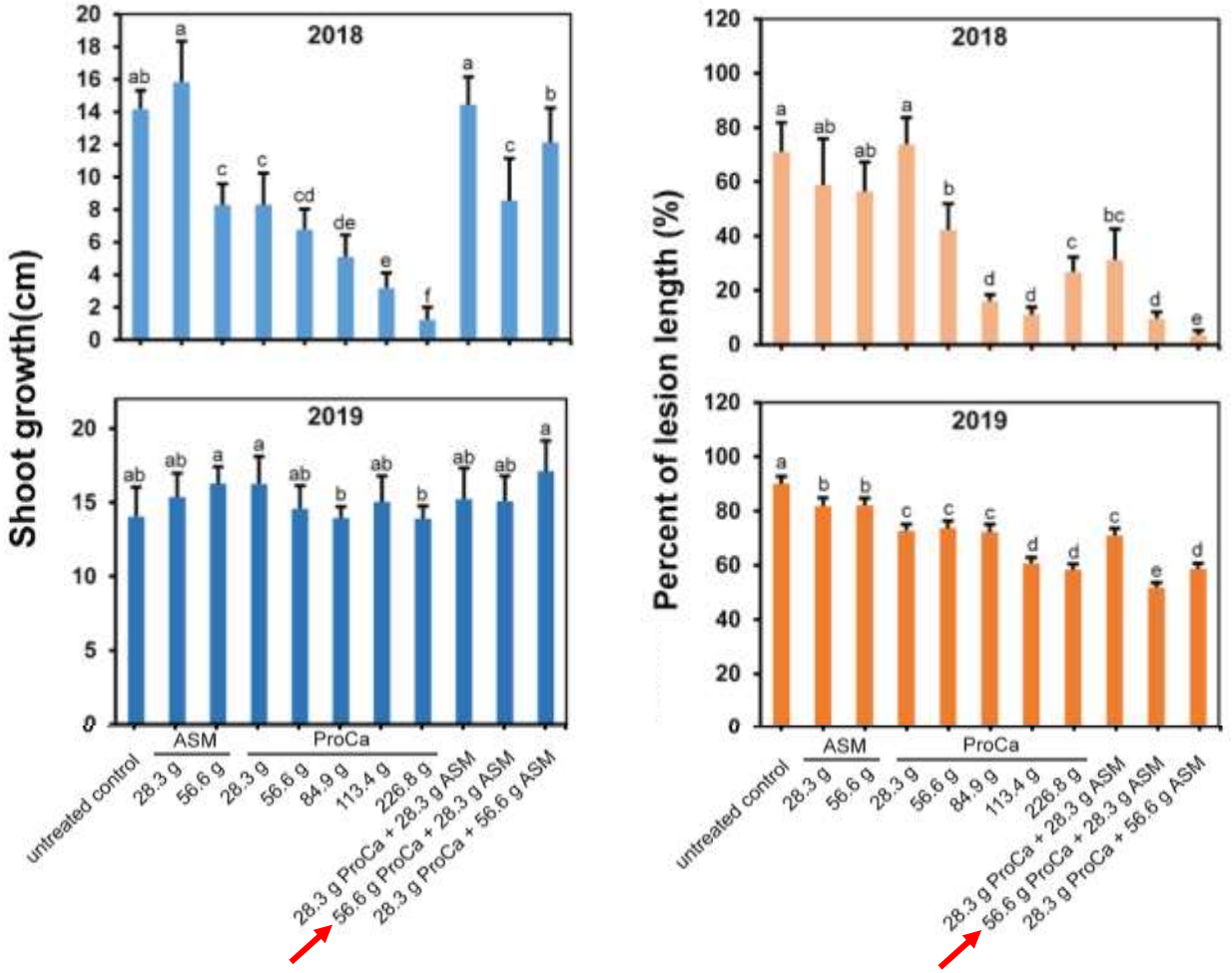
Combinations of low rates of ProCa and ASM for shoot blight management



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Post-Bloom Petal Fall:

Current protocol for balancing shoot growth and shoot blight suppression (for young high-density plantings):

- Four weekly applications of Apogee (2 oz) + Actigard (1 oz).
- Tank mix the two products
- 1st application at king bloom petal fall.
- Widely adopted in Michigan.

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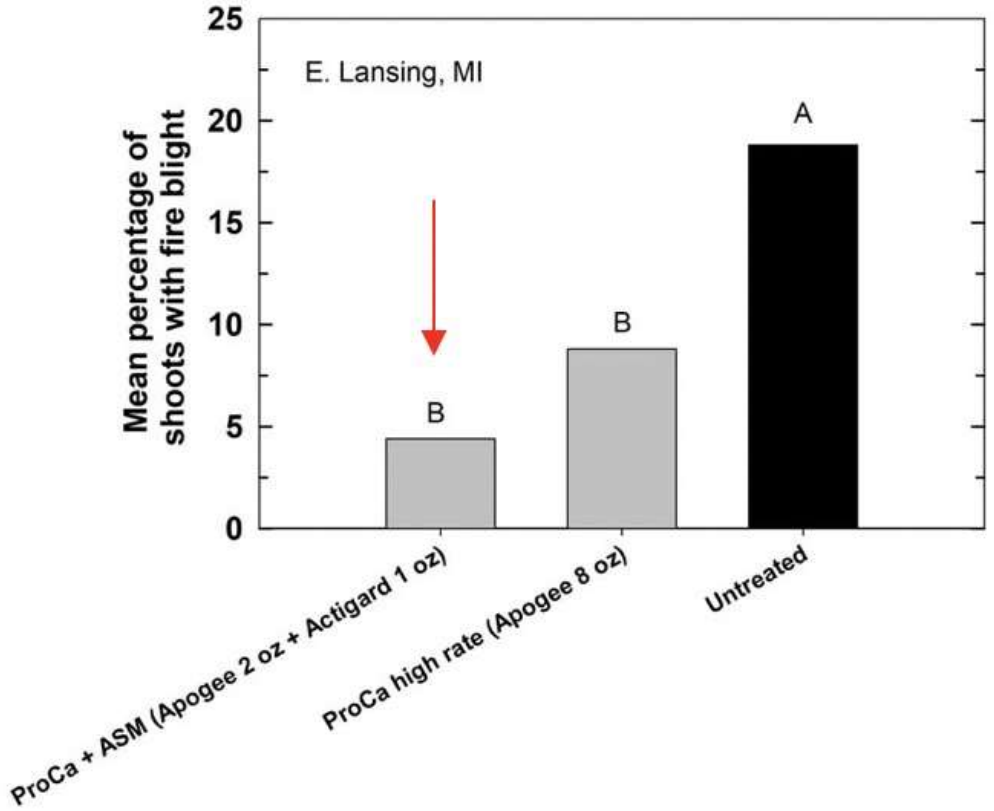
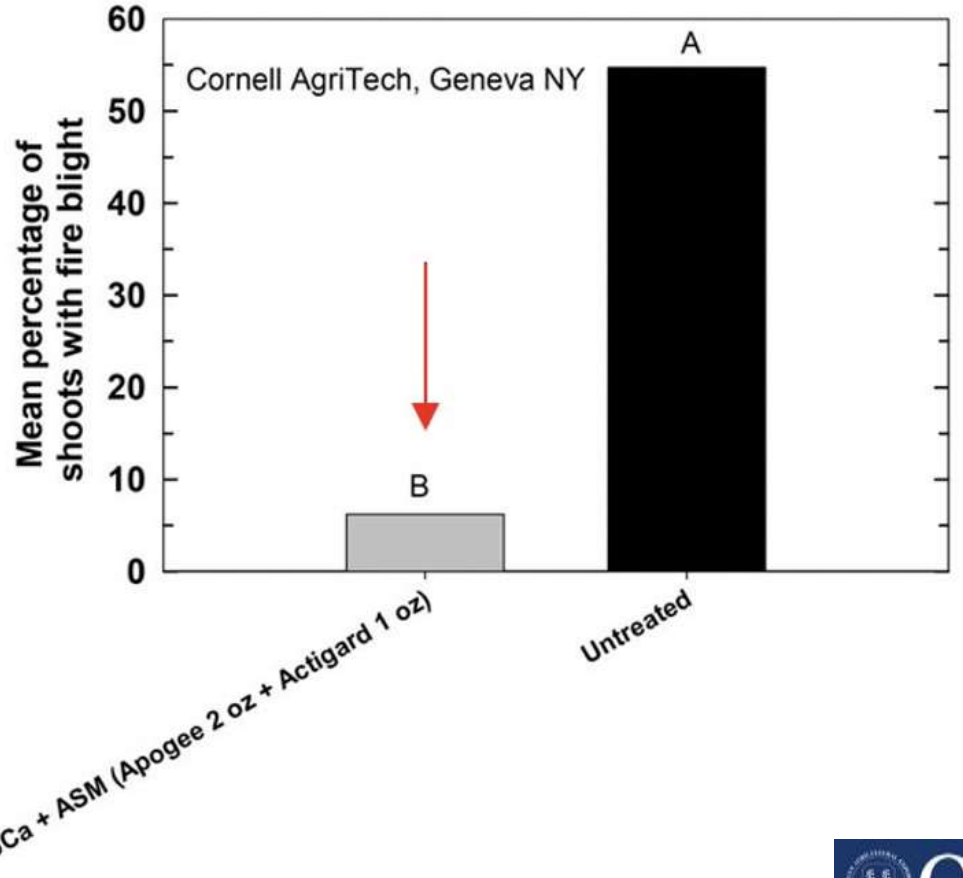
2 oz Apogee + 1 oz Actigard experiments, MI and NY, 2019

George Sundin



Kerik Cox



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