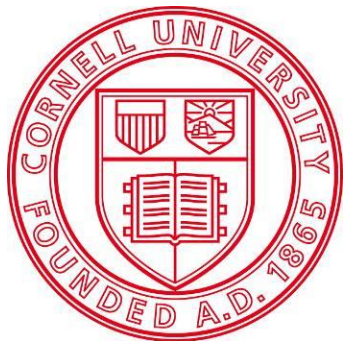


Disease Management Highlights from 2018 Apple Research at Cornell AgriTech

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Outline

- **Efficacy of new fungicides for apple scab and powdery mildew management**
- Prohexadione Ca^{2+} for fire blight management
 - Blossom blight
 - Shoot blight

Apple scab & powdery mildew concerns in 2018

- Secondary apple scab pressure light April to July rains: 7 infections in 2018 vs 13 in 2017
- SDHI fungicides – remain effective
- Dry warm weather kept mildew pressure high in 2018 vs wet cold in 2017



Apple scab & powdery mildew trials



- 3.1-acre planting site 'Empire' and 'Jonagold'-M.9/M.111 interstem (18-20 years old)
- Widely-spaced two tree plots

Apple scab & powdery mildew trials



- Fungicide treatments
 - Dilute handgun application timed at **7-10 day intervals from TC- 2nd cover** or 14-21 days from 3rd-7th cover
 - Alternated with effective protectant standards → not to exceed max applications (4 applications)

Apple scab trials

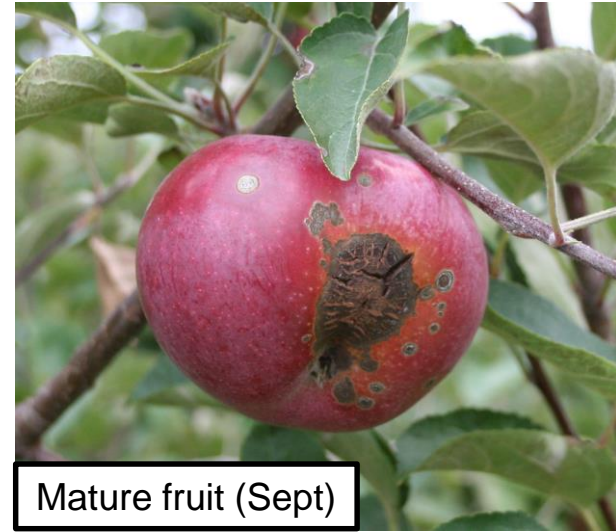
- Apple scab evaluation
 - Incidence any lesion on cluster leaves and fruit (June), terminal leaf scab (July), & **fruit (Sept)**



Cluster leaves & fruit (June)

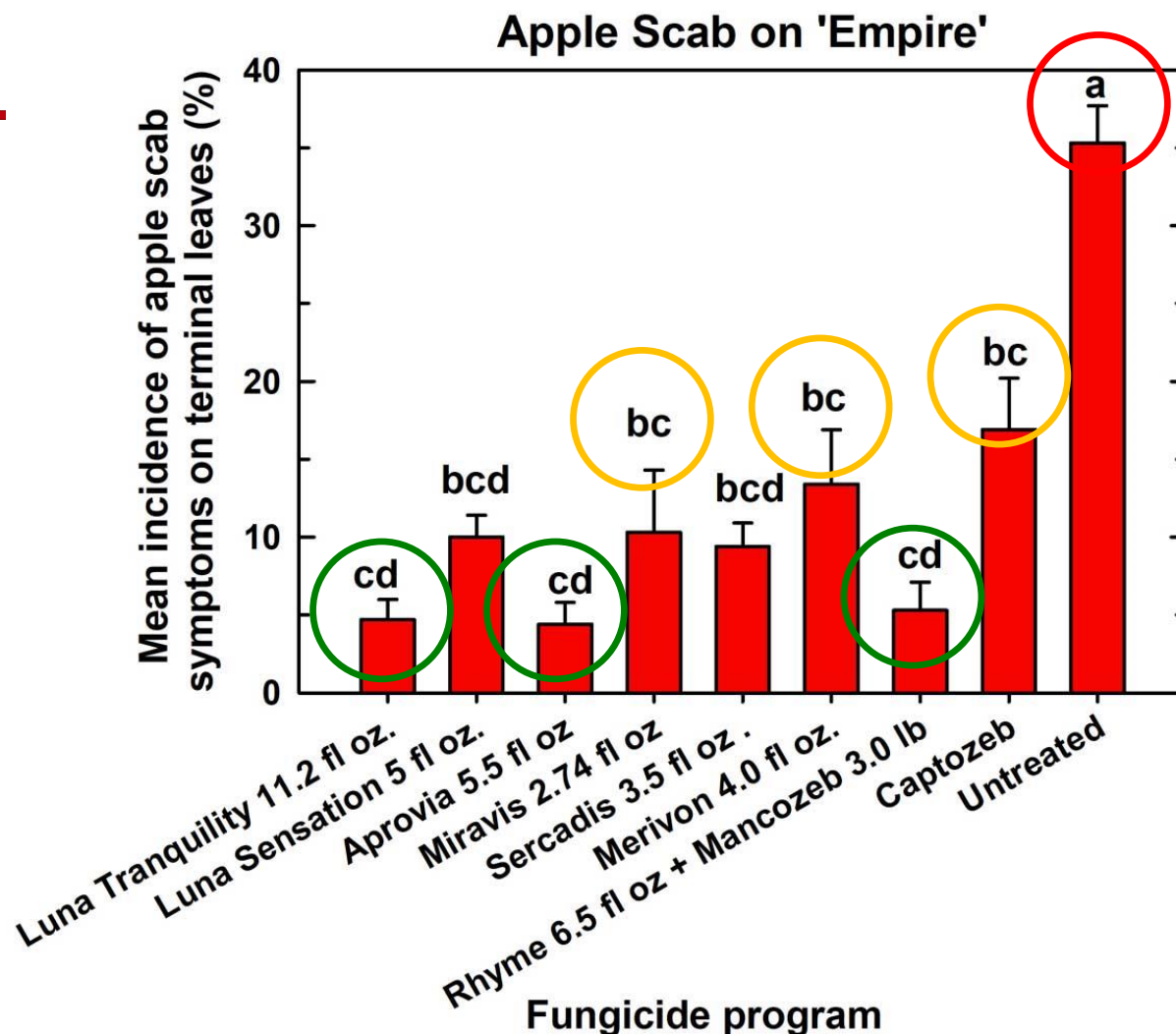


Terminal leaves (July)



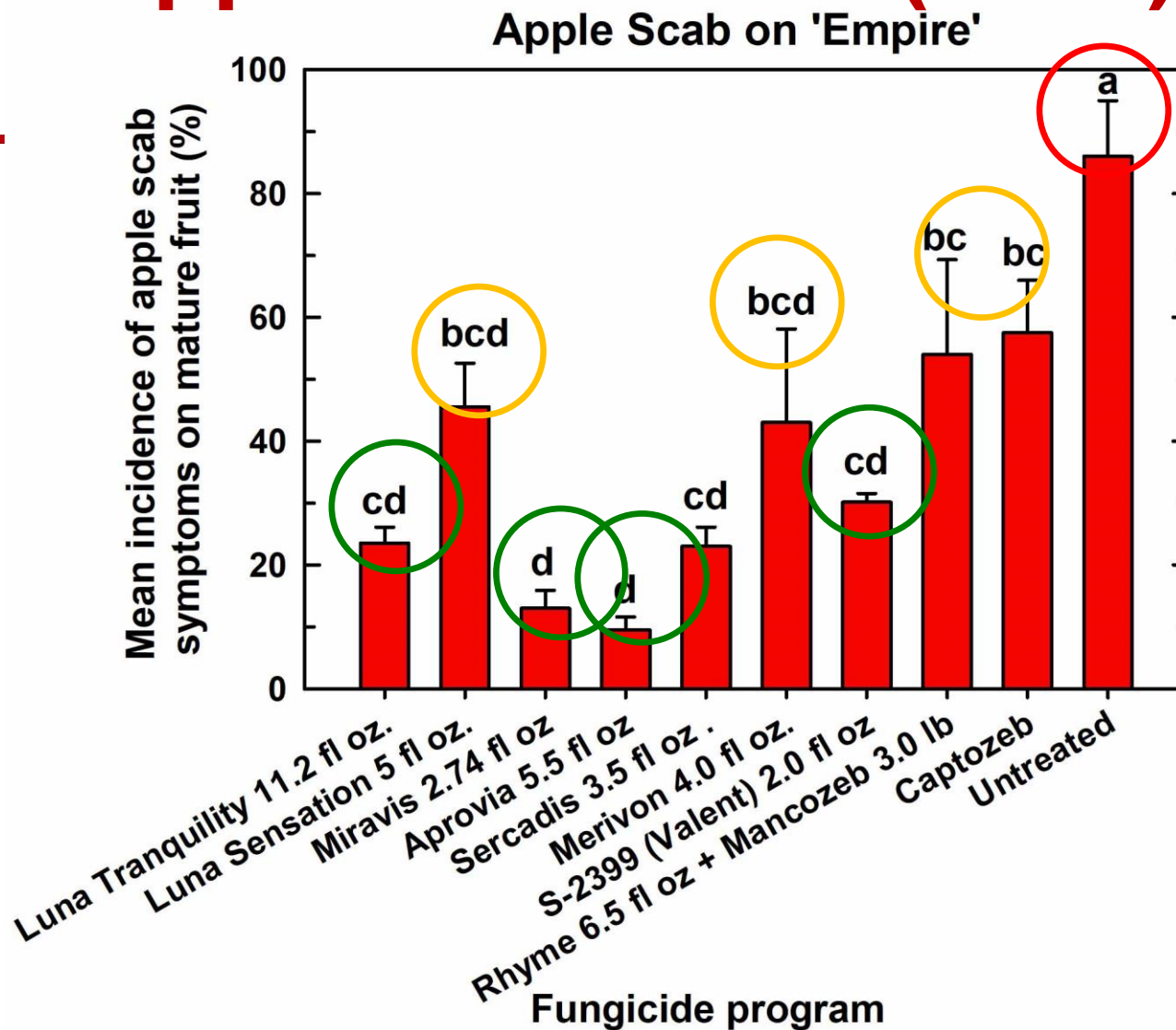
Mature fruit (Sept)

Apple scab trials (2016)



- **Dry year – little fruit infection:** SDHI(premixes) better than protectants, Miravis, Luna tranquility, Aprovia \geq DMIs

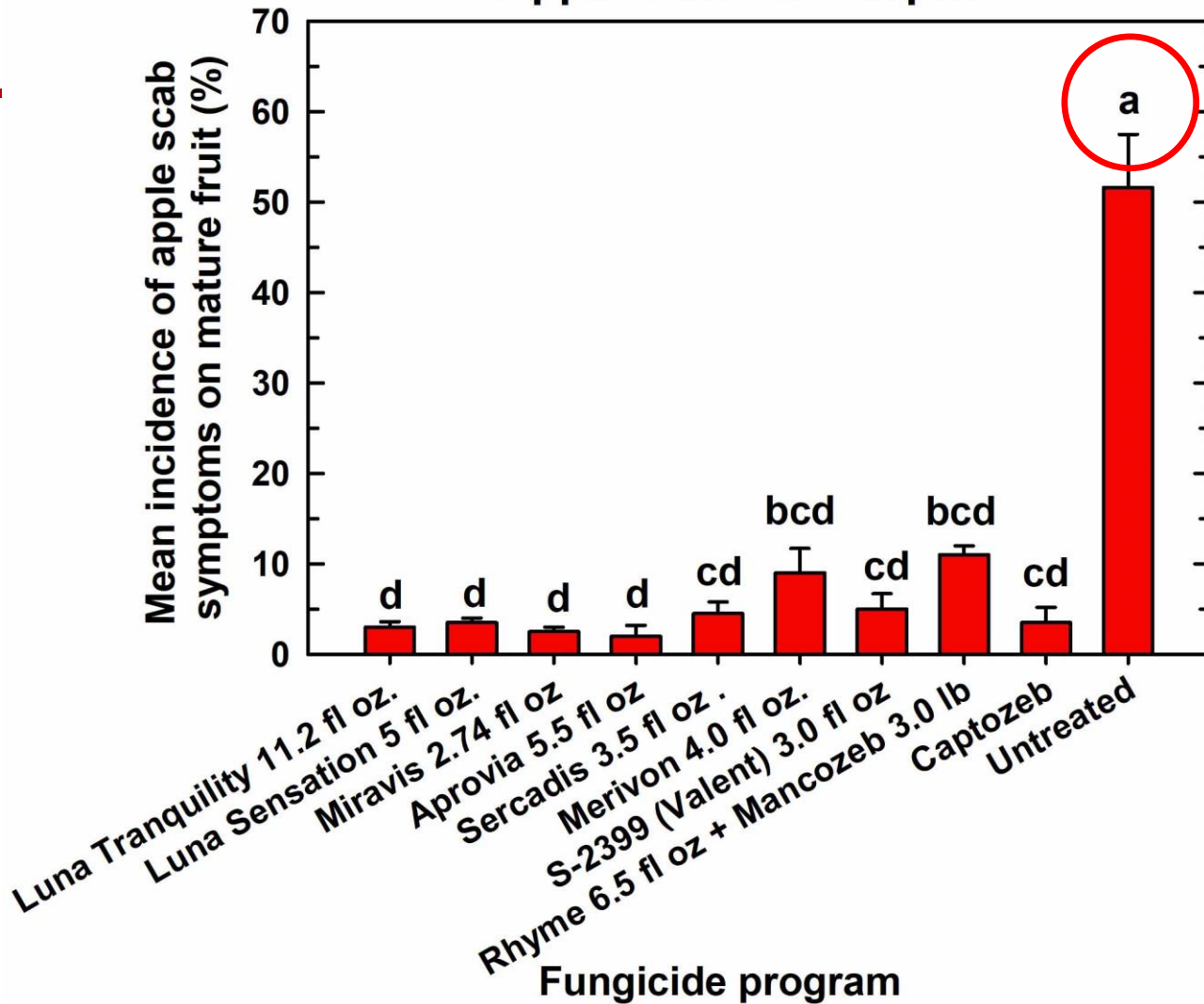
Apple scab trials (2017)



- **Wet year – high levels of fruit infection:** Aprovia, Miravis, Luna tranquility, Sercadis, SDHI(premixes), > protectant & DMIs

Apple scab trials (2018)

Apple Scab on 'Empire'



- **Dry year – low levels of fruit infection:** Aprovia, Miravis, Luna tranquility, Sercadis, SDHI(premixes) – work well

Apple scab trials: Trends and considerations

- Apple Scab
 - DMIs still work on DMI resistant populations in dry years
 - QoI/SDHI premixes **may be affected** by practical resistant to QoI fungicides in wet years
 - Stand alone SDHI fungicides strong against apple scab: Aprovia & Miravis highly potent

Powdery mildew trials

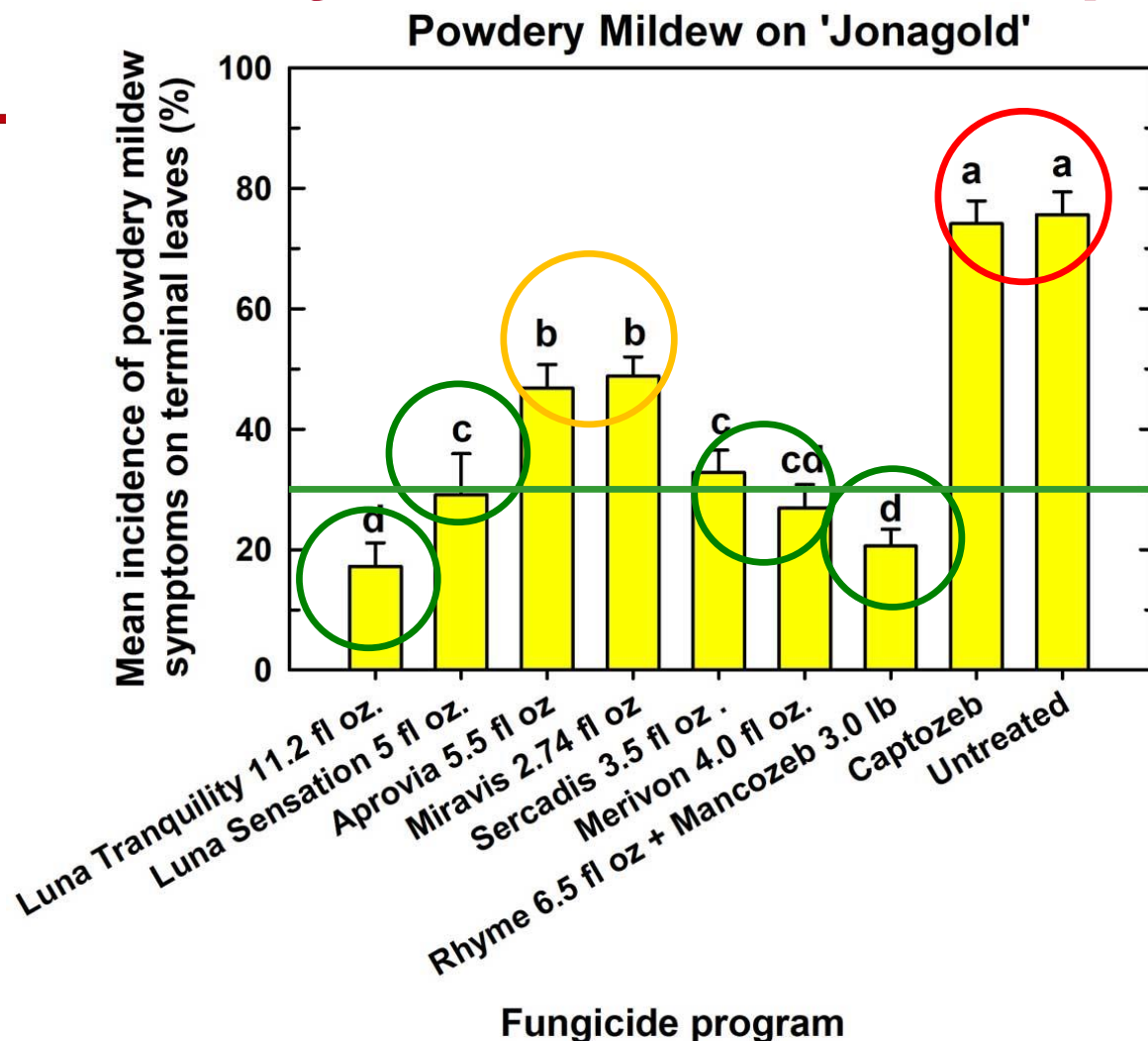
Disease assessment

- Powdery mildew:
 - Primary mildew (June) & Secondary mildew (July)



- **Incidence (any lesion) & Severity (% leaf area)**

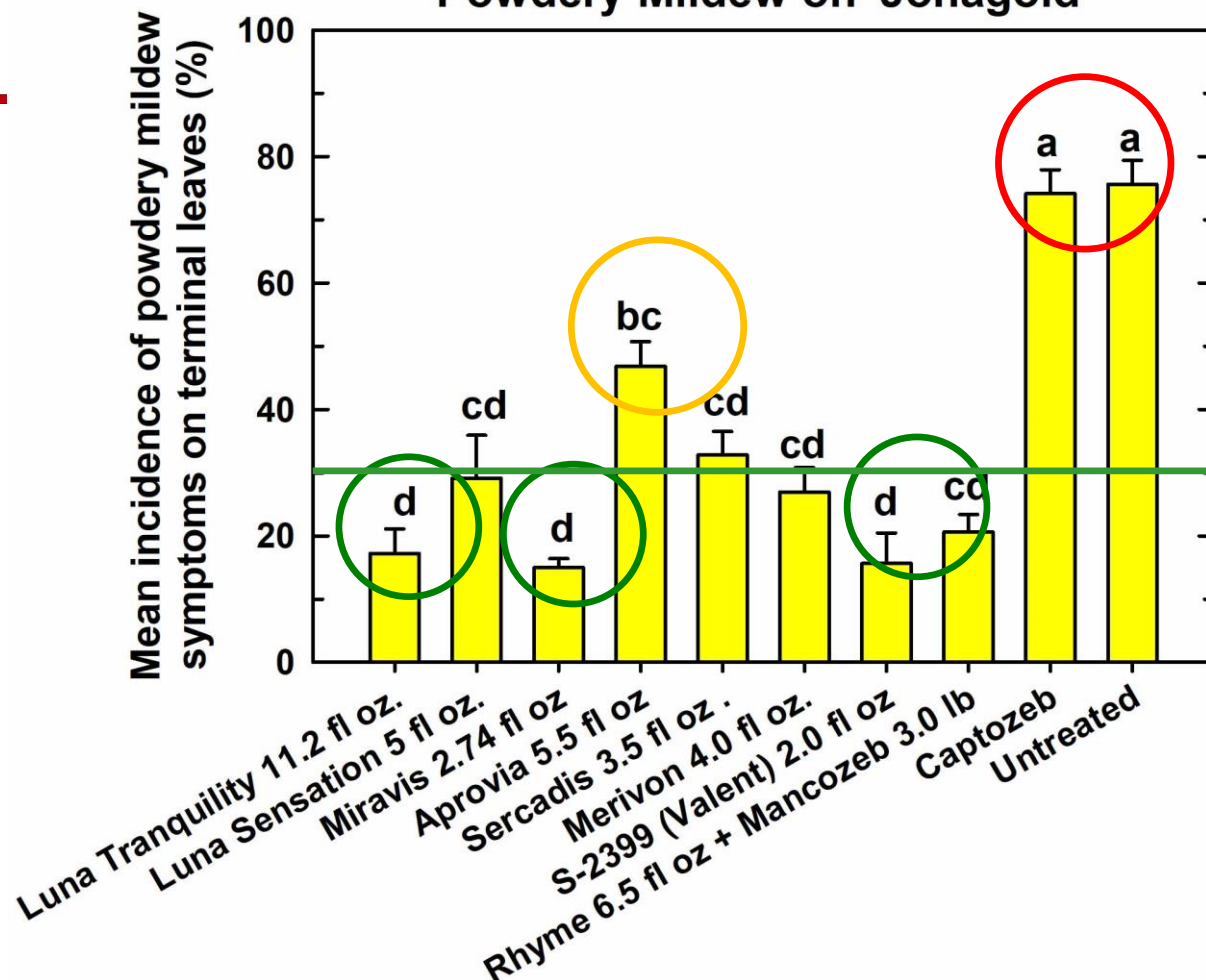
Powdery mildew trials (2016)



- **Dry year high mildew pressure:** SDHI premixes, HS DMIs (Rhyme & Rally) > standalone SDHIs

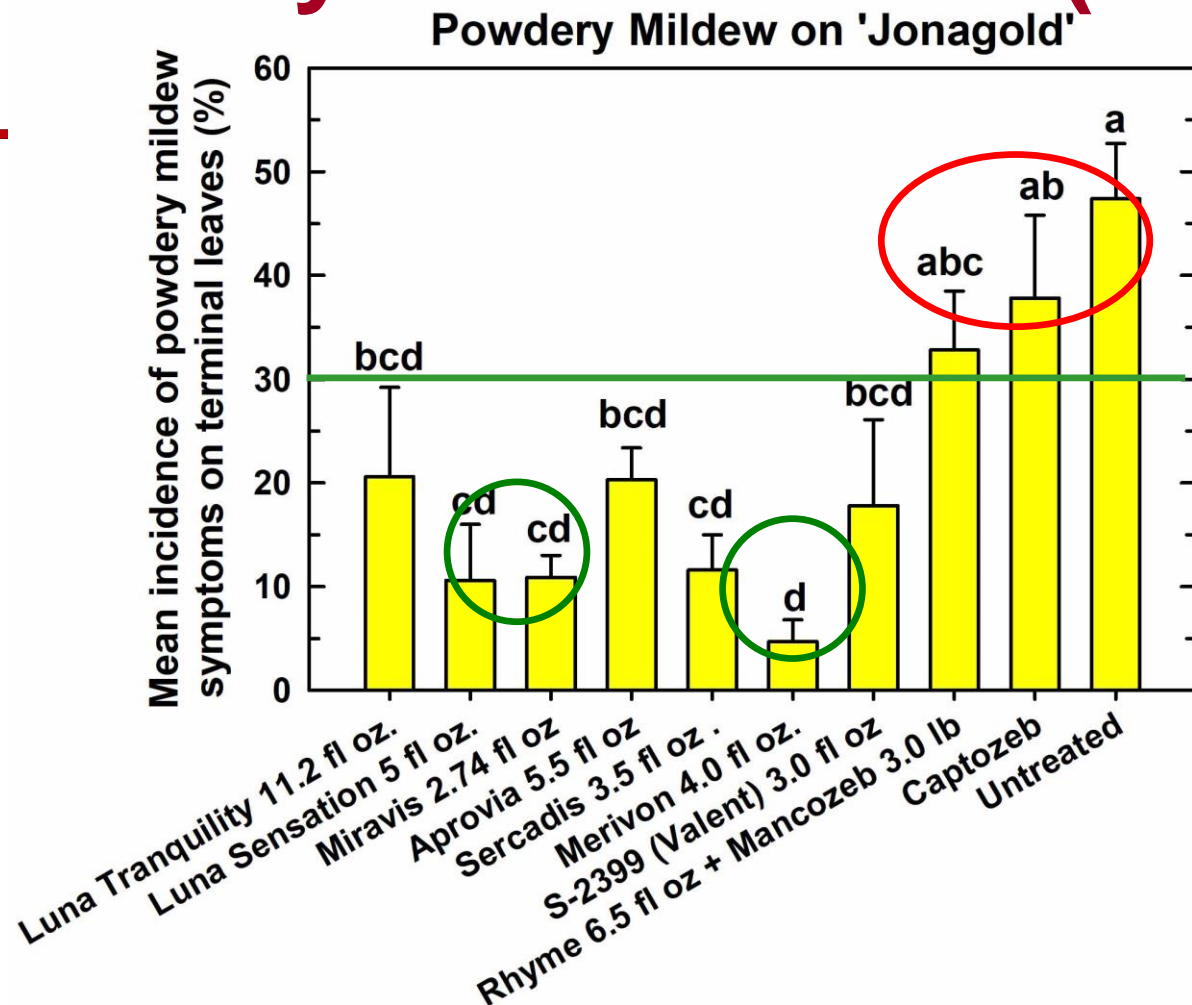
Powdery mildew trials (2017)

Powdery Mildew on 'Jonagold'



- **Wet year low mildew pressure** : SDHI premixes, HS DMIs (Rhyme & Rally), Miravis

Powdery mildew trials (2018)



Fungicide program

- **Dry year high mildew pressure** : SDHI premixes, HS DMIs (Rhyme), Miravis

Powdery mildew trials: Trends and considerations

- Powdery mildew
 - Resistance to DMIs in 2018: Topguard (Rhyme) or Rally
 - Qols & SDHI-Qol premixes next best line of defense – even with Qol resistance
 - Stand alone SDHI fungicides slight effect against mildew under high pressure, **Miravis**
 - Sulfur 3.33 lbs/100 7-10 day intervals from bloom to end of terminal growth = **Qols**: **phyto & smell**

Outline

- Efficacy of new fungicides for apple scab powdery mildew management
- **Prohexadione Ca^{2+} for fire blight management**
 - Blossom blight
 - Shoot blight

Shoot Blight Management

- Prohexadione calcium (PhCa; Apogee): **most effective** > works internally > **slows establishment of young trees**
- Could prohexadione calcium help control blossom blight and reduce shoot blight if applied at pink?
- Could we use prohexadione calcium more effectively with low rates and different timings?

2016-18 PhCa Research

- 13 year old 'Gala' on B.9 rootstock
- Artificial inoculum for blossom blight (Ea 273 at 1×10^6 CFUml⁻¹) > serve as inoculum for shoot blight
- Inoculated @ 80% bloom



2018 PhCa Research

- 2nd leaf 'Gala' on G.202 rootstock
- No inoculum: measure effects on fruit set, shoot growth, & TCA only
- Assessments in late June & early Oct



2016-18 PhCa Research

Treatments

- **Untreated:** no control of fire blight, no impact on tree productivity
- **Antibiotics:** Streptomycin and Kasugamycin; impact on fire blight, no impact on tree productivity
- **Natural SAR:** Regalia; organic option, impact on fire blight, no impact on tree productivity
- **Apogee** (prohexadione calcium – growth regulator) pink applications, standard program, season-long programs of low rate applications

2016-18 PhCa Research

Assessments

- Blossom and shoot blight
- Crop load, fruit size, TCA, & shoot length: late June – early Oct

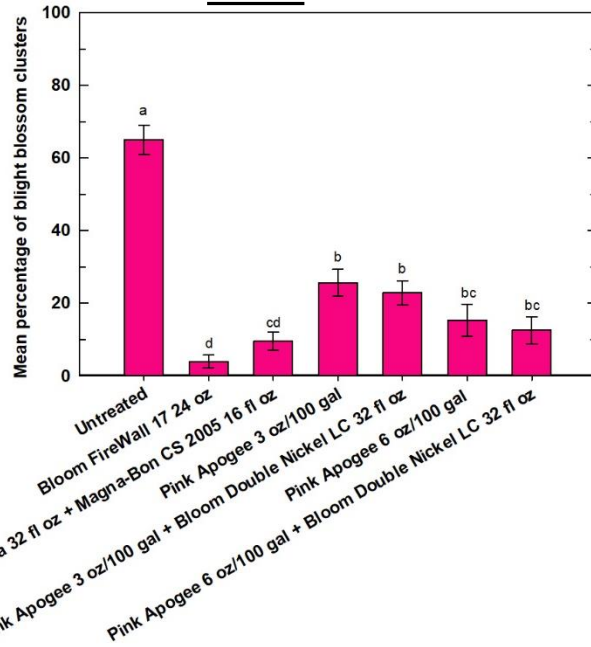


Research Question

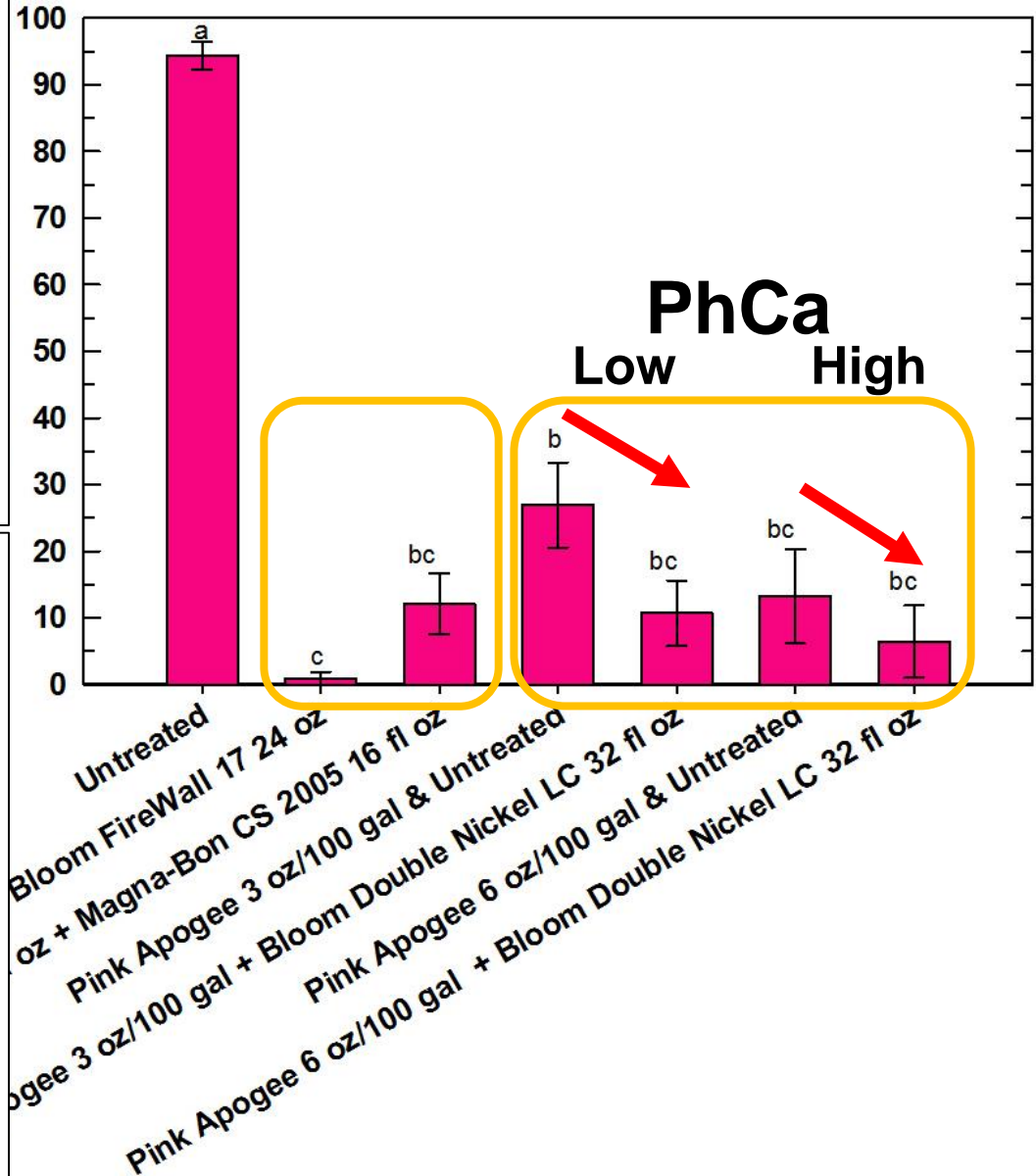
Could prohexadione calcium help control blossom blight and reduce shoot blight if applied at pink?

Considerable number of reports from Europe on using PhCa prior to bloom, but few from peer reviewed literature & not practiced?

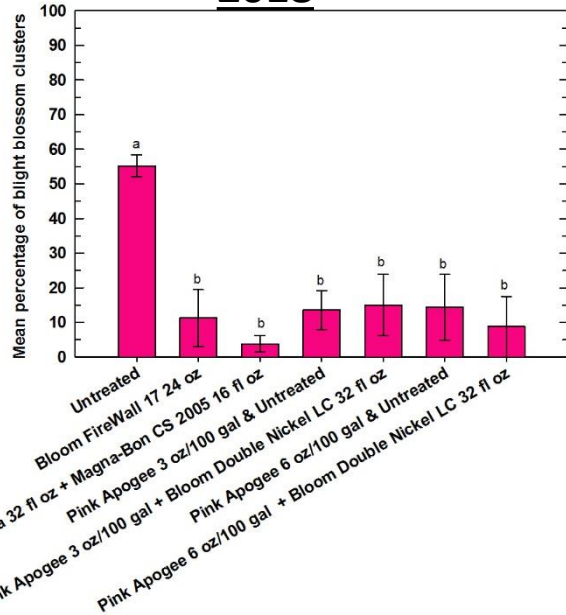
2016



2017



2018

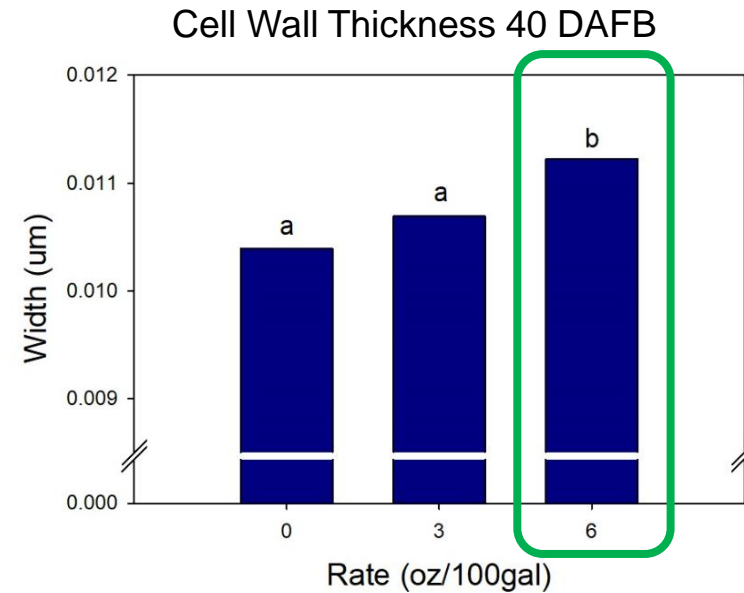


Cell wall widths in cortical parenchyma of petiole cross sections

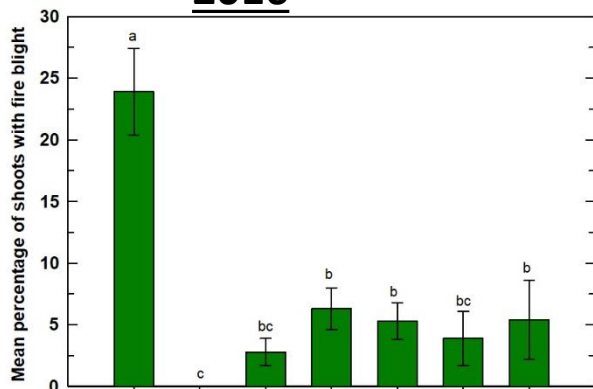
Treatments
5/11

Full Bloom
5/18

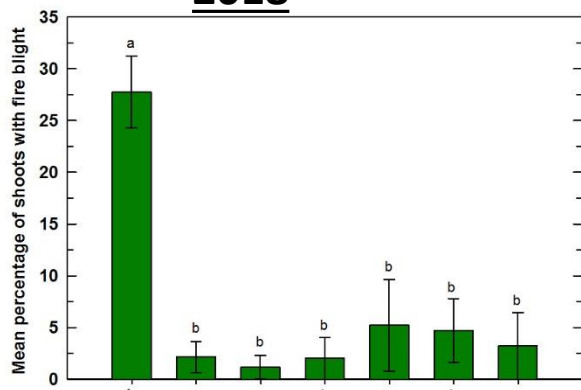
Sampling
Pre-treatment:
5/11
Post 1: 5/22
Post 2: 6/27



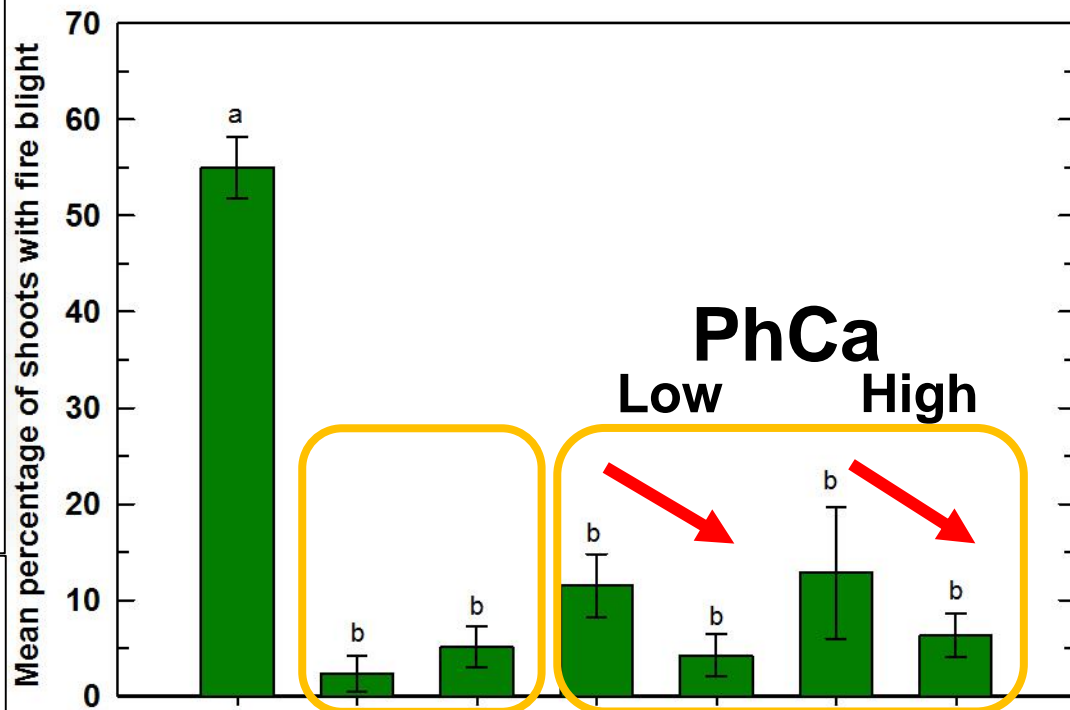
2016



2018



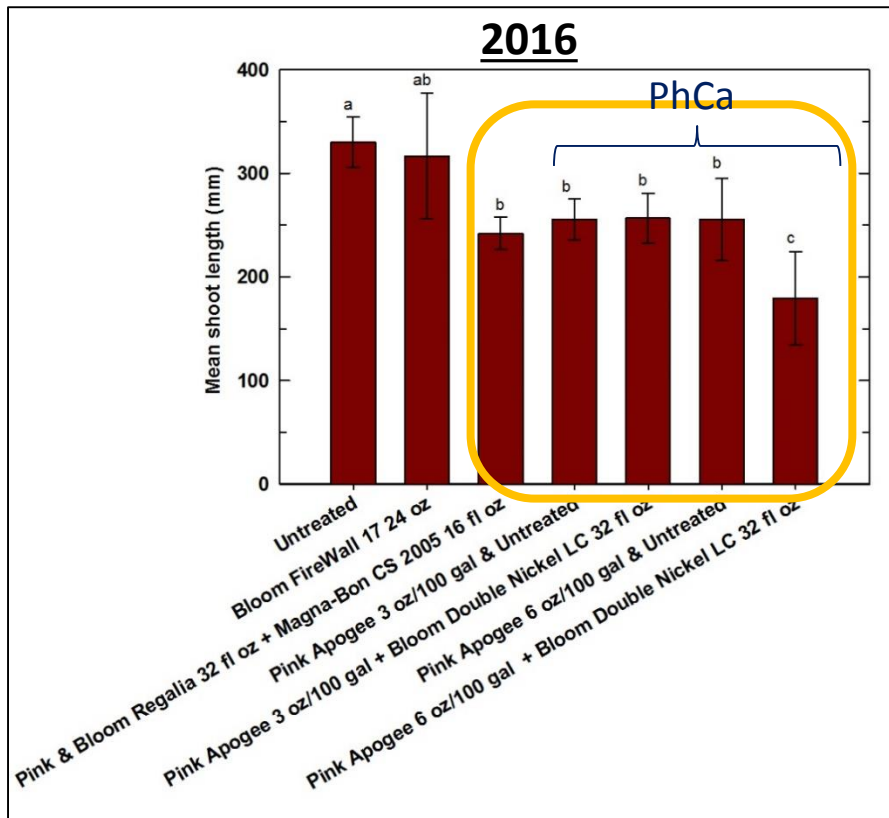
2017



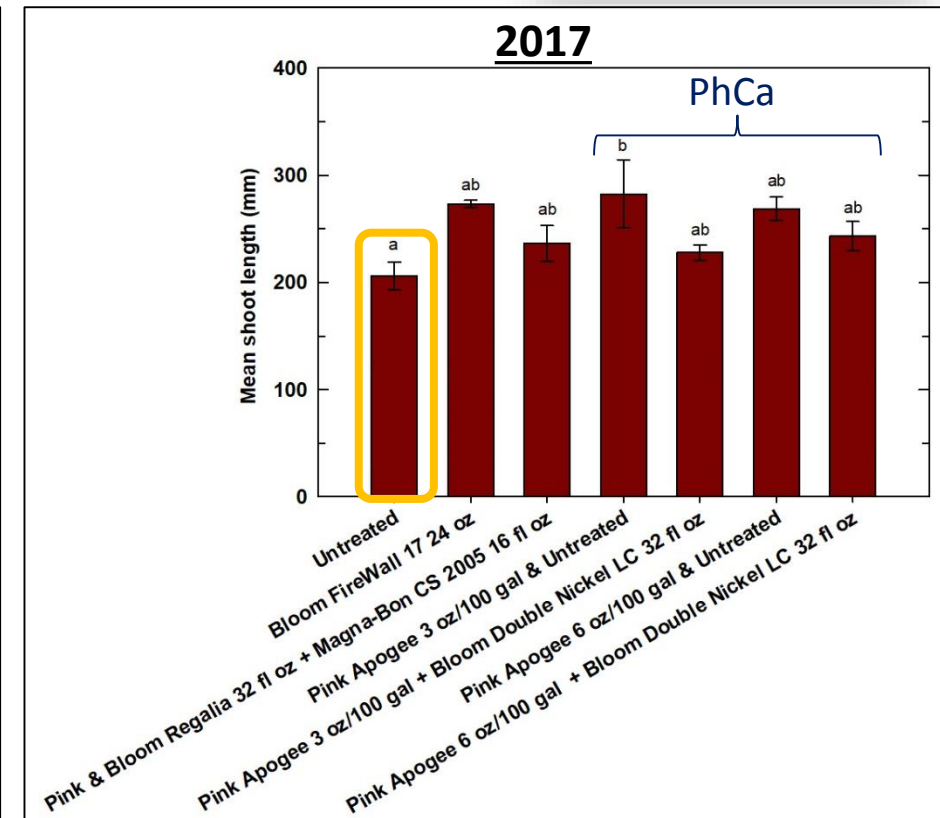
Pink applications > Shoot Length



Dry Year

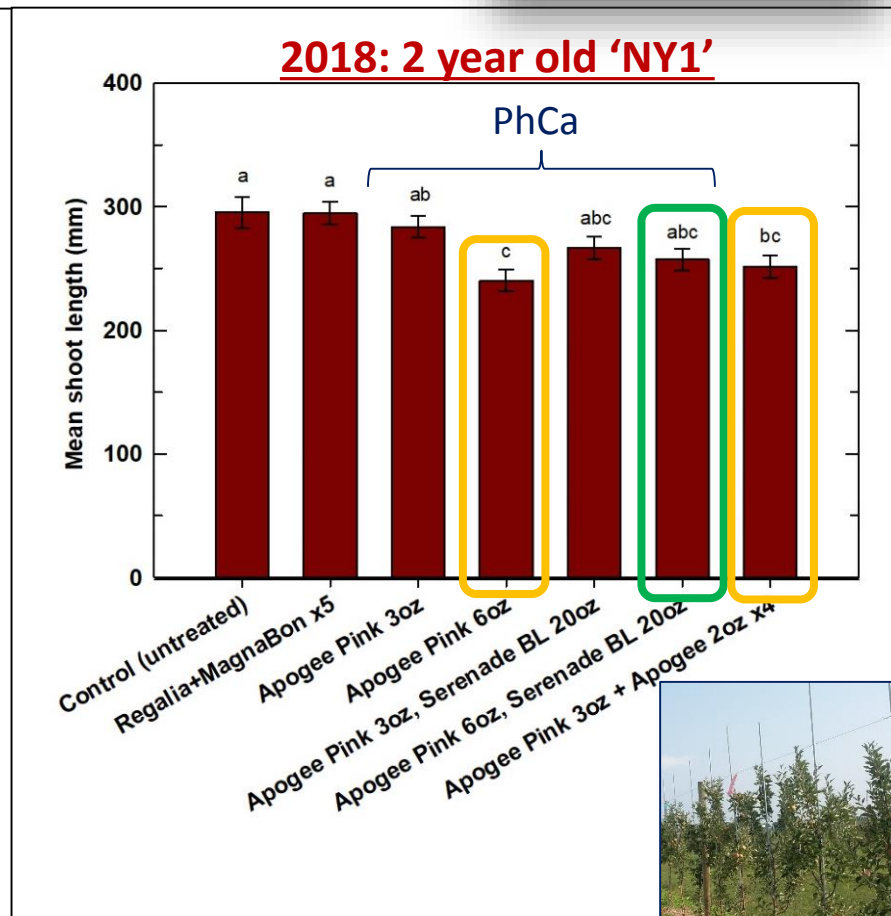
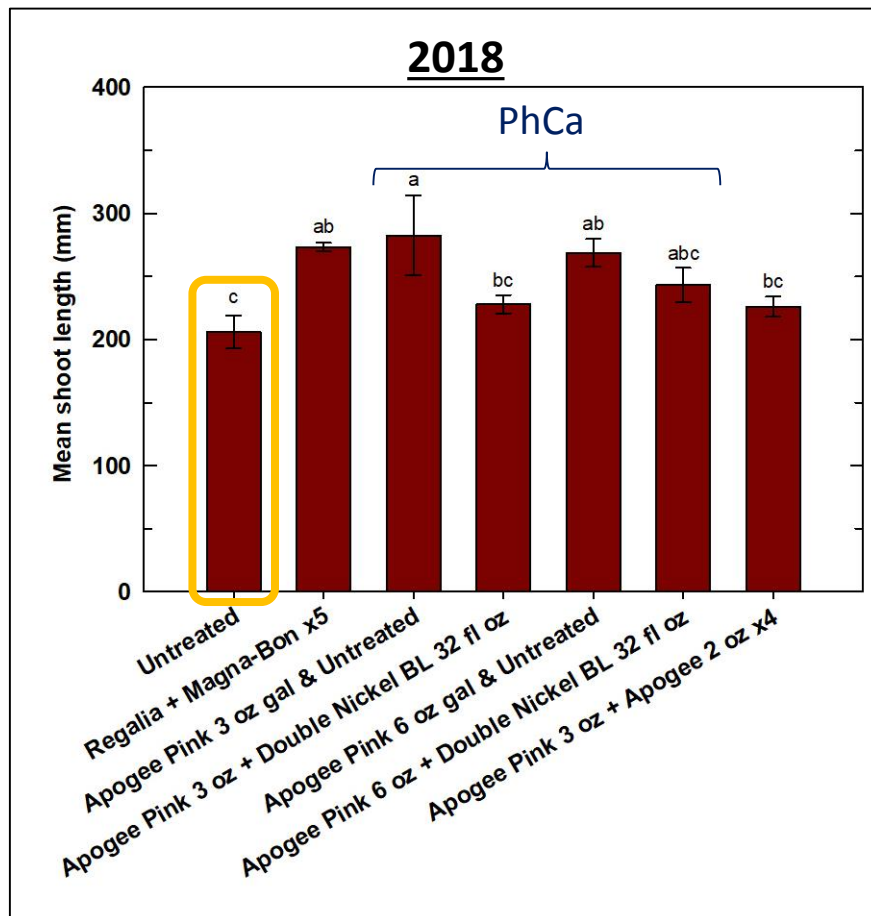
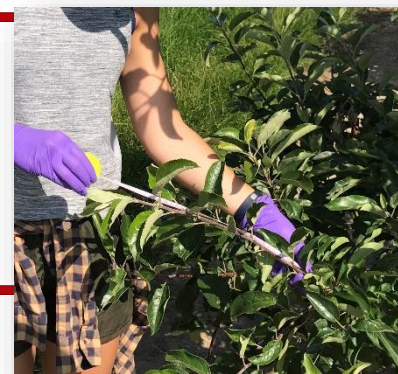


Wet Year



Pink applications > Shoot Length

Dry (June) then Wet (August) Year



Pink > Fire blight & Growth

- **PhCa at Pink:**
 - 1) Decent BB & SB control (best at 6 oz)
 - 2) Reduce bitter pit too? Pink application is recommended for cultivars prone to bitter rot
 - 3) Manage high vigor varieties – holding tree training



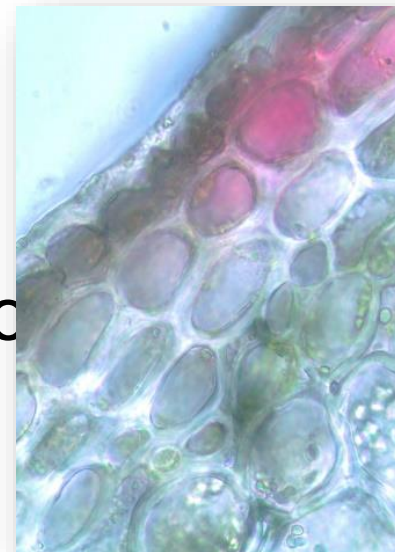
Pink > Fire blight & Growth

- **PhCa at Pink:**

- 4) Better with biological at bloom reduce inoculum;
- 5) No impact on shoot growth by end of season (early on yes)
- 6) Thickened pedicel cell walls 40 DAFB – apply earlier, Tight Cluster?

- **Regalia (natural SAR):**

- 1) Decent BB & SB control (best with co)
- 2) No impact on shoot growth

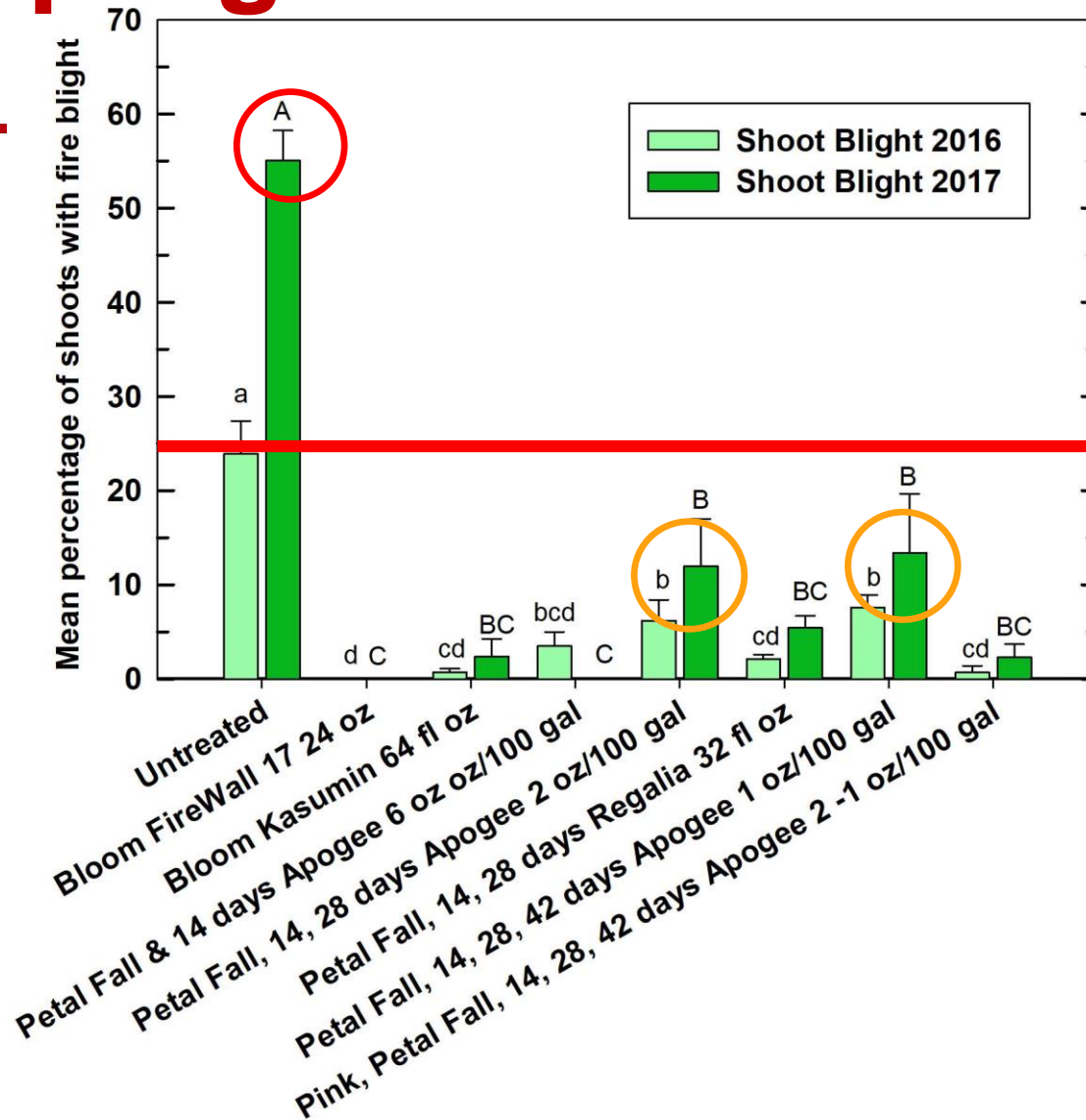


Research Question

Can we use prohexadione calcium more effectively with low rates and multiple timings after petal fall?

Considerable number of reports from consultants using PhCa at low rates with multiple applications?

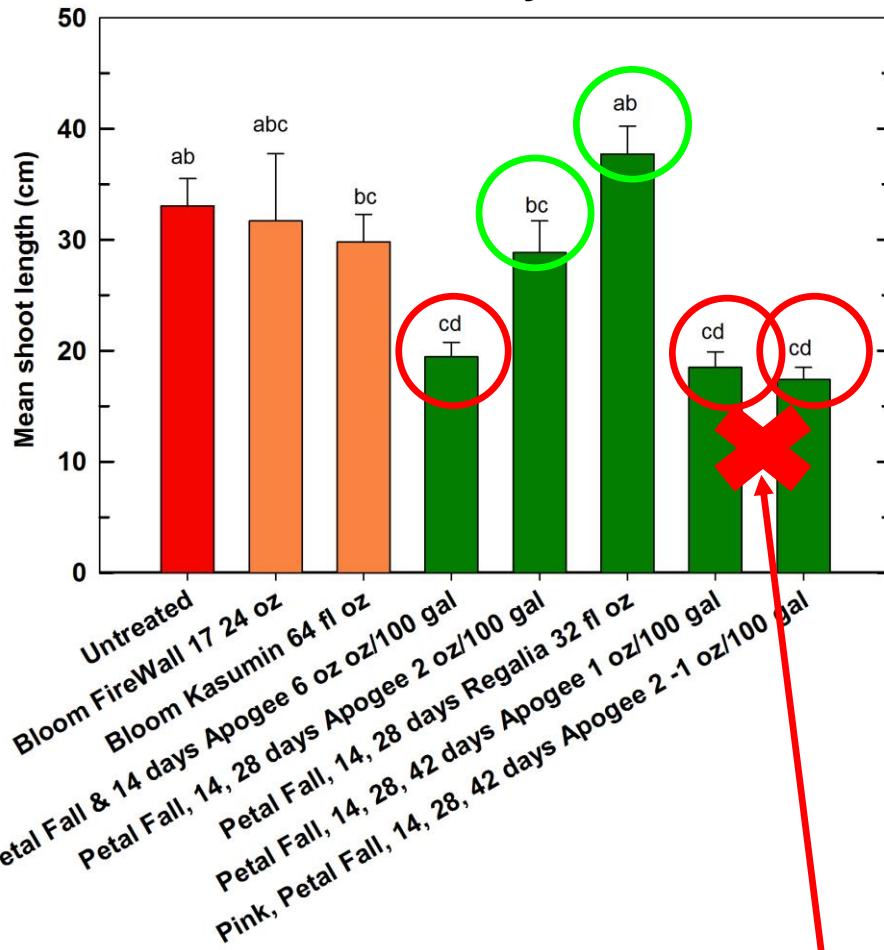
PF+ programs on Shoot blight



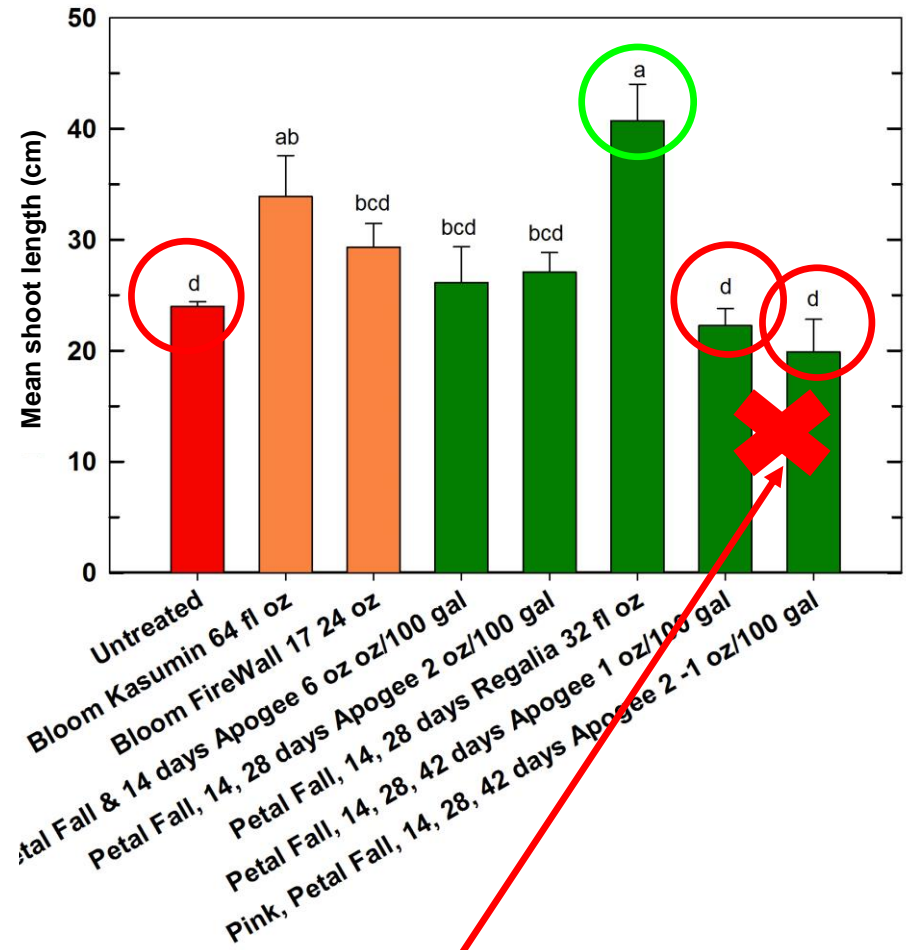
Petal Fall programs: Double Nickel LC 32 fl oz @ Bloom

PF+ on shoot length in Sept

2016 Dry Season



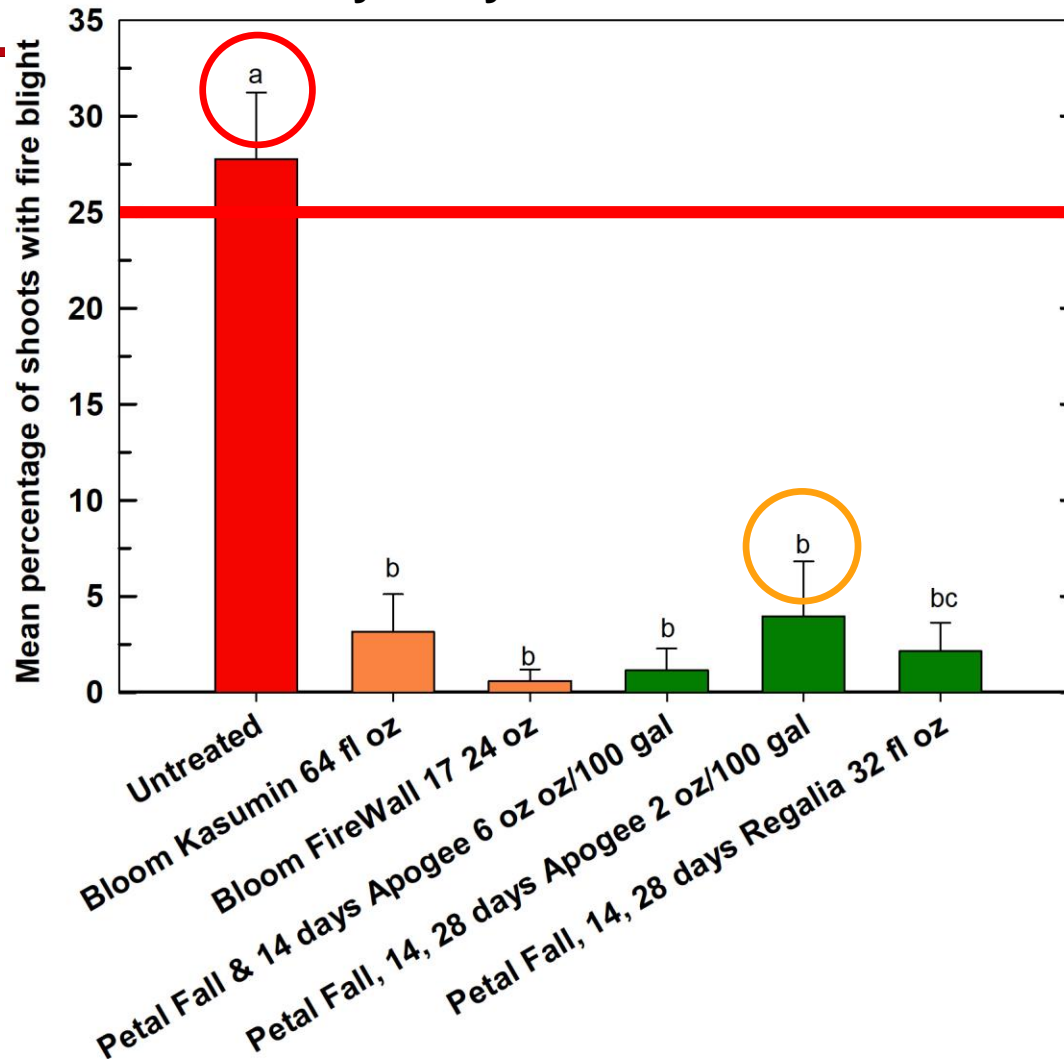
2017 Wet Season



Prolonged use programs of Apogee most impact on growth both years

PF+ programs on Shoot blight

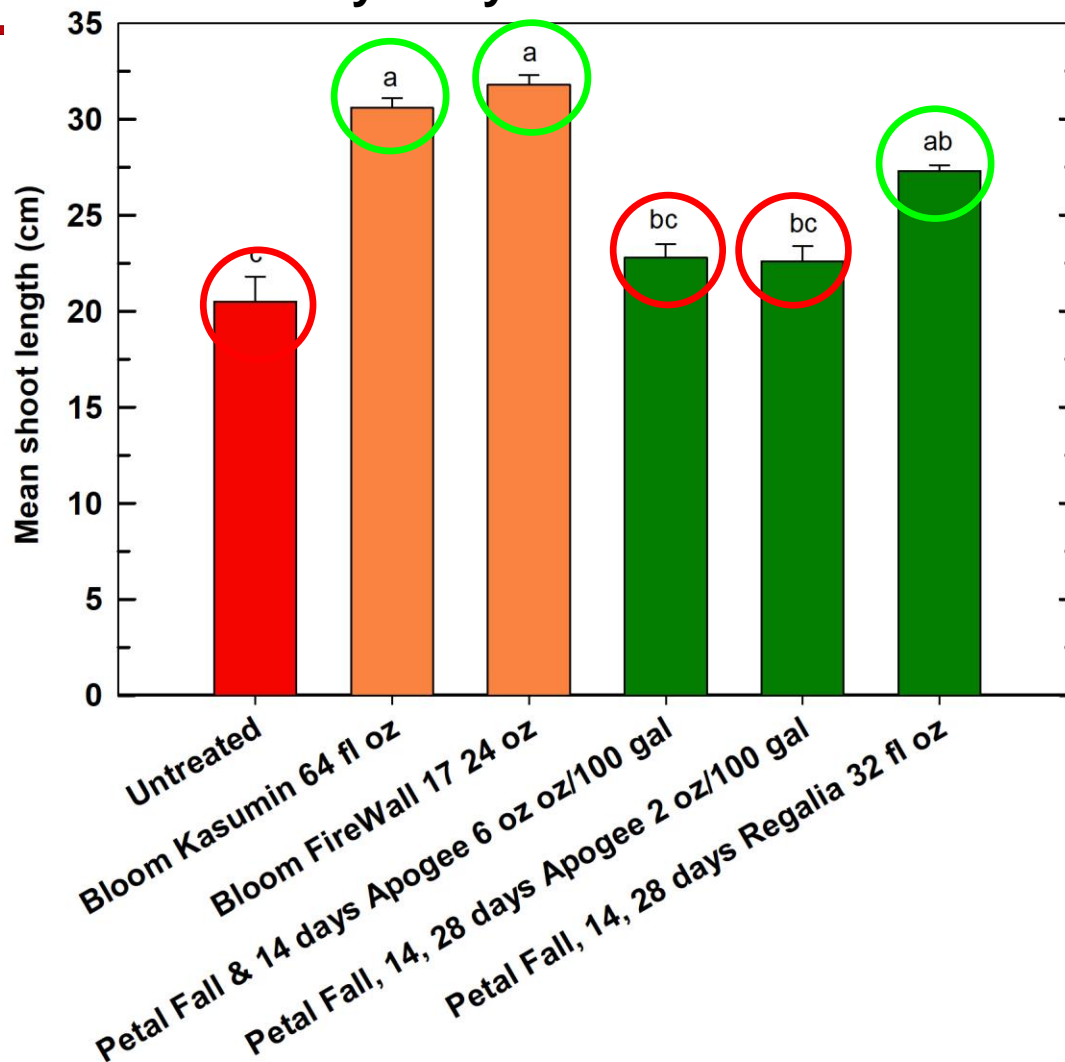
2018 Dry Early & Wet Late Season



Petal Fall programs: Double Nickel LC 32 fl oz @ Bloom

PF+ on shoot length in Sept

2018 Dry Early & Wet Late Season

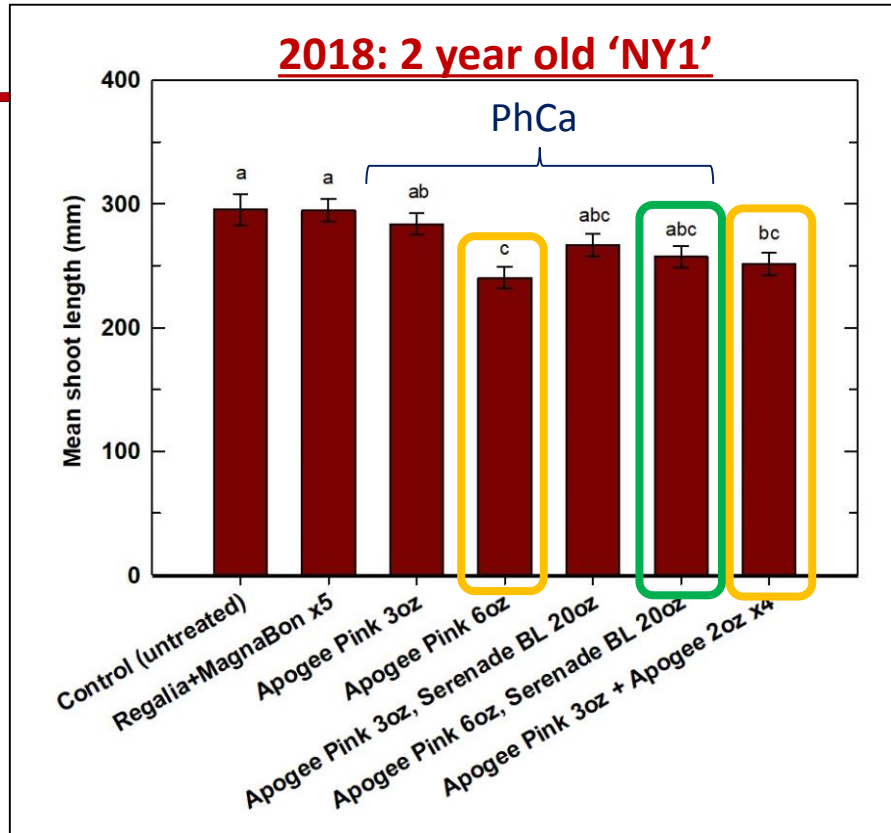


Both std and low rate apogee similar in impact on growth in 2018

PF + on Shoot blight & Growth

- **Low rates of PhCa after petal fall:**
 - 1) Can effectively manage shoot blight > not always be improved over std program
 - 2) Start early with low rate programs
 - 3) Prolonged programs of low doses > slightly impede trees
- **Regalia (natural SAR):**
 - 1) Good control of SB infections
 - 2) No impact on shoot growth

2019 PhCa Research



Further refine prohexadione calcium applications at “pink” & season-long prohexadione calcium programs on young trees with no fire blight

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