Fungal foliar disease management

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POSTBLOOM FRUIT DROP

Postbloom fruit drop

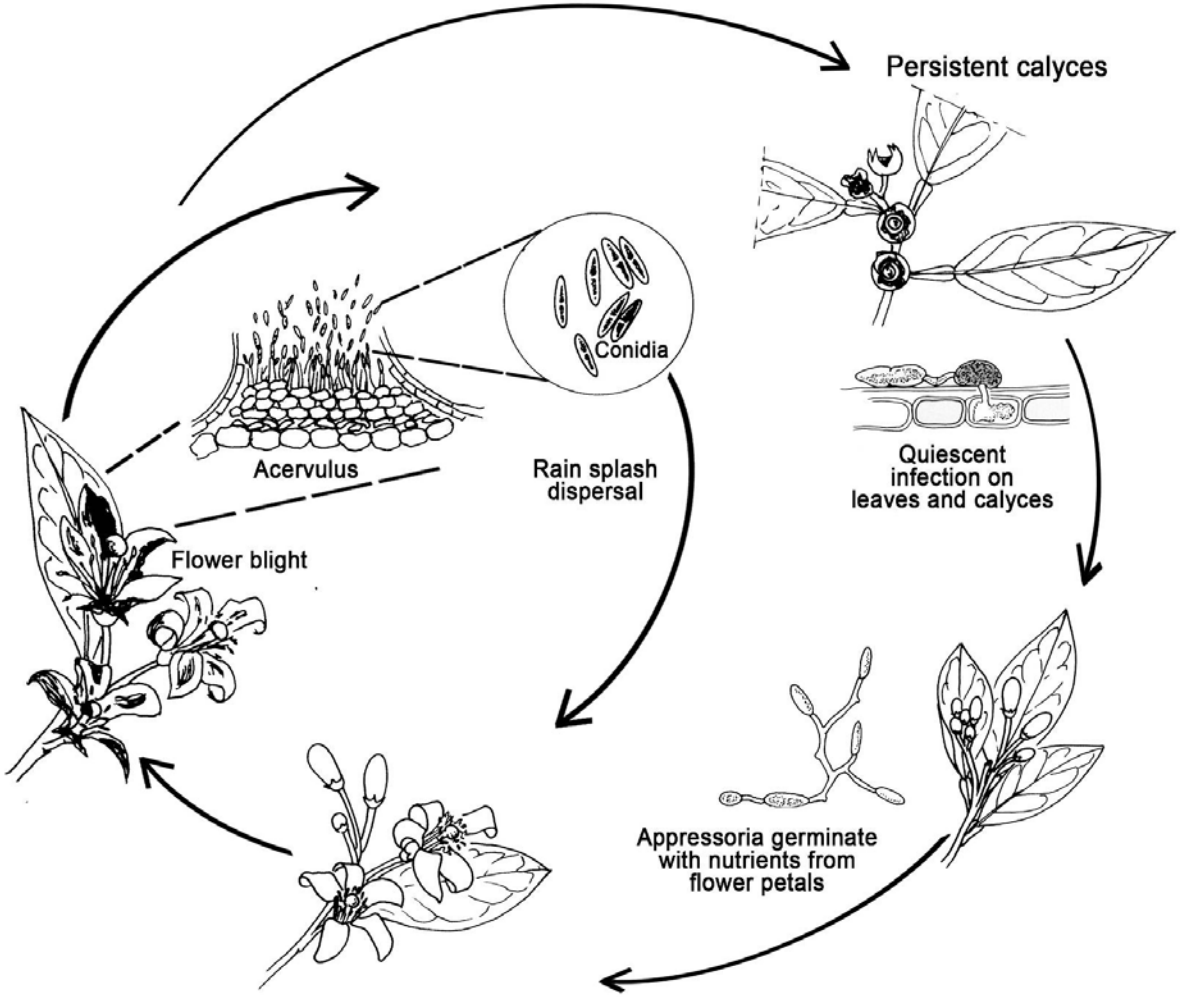
- Preferred climate is humid, subtropical
- Fungus moves with rain-splash, wind-borne rain
  - Human activities such as equipment movement and workers with petals can also move fungus
- Disease more severe in areas with multiple blooms
  - Multiple blooms promoted by other diseases

Symptoms

- Peach to orange-colored lesions on petals
  - Can blight entire blossom or cluster when severe
- Fruit and petals fall leaving button
  - Can last up to 18 months on tree
  - Diagnostic for disease
- Leaves around infected flowers often twisted and small
  - Can look like a rosette

Symptoms

Post-bloom fruit drop disease cycle *Colletotrichum acutatum*



Disease cycle highlights

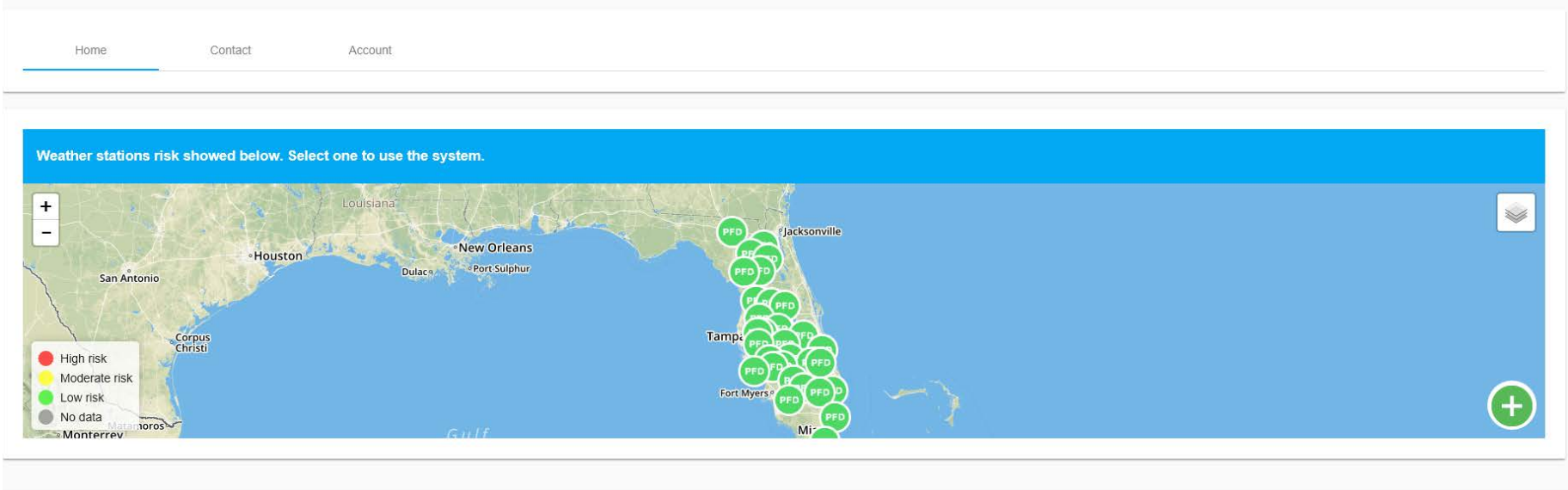
- Fungus survives on leaf surfaces, twigs, and buttons in specialized structures
- Structures germinate and form new spores with moisture and petal extracts
- Spores are dispersed to new flowers via rain splash
- Germinate with moisture in 12-24 hours, infect in 24-48 hours
  - New symptoms and spores in 4 to 5 days

Development of new PFD advisory system

- Project in collaboration with Natalia Peres and Clyde Fraisse
- To simplify PFD predictions from PFD-FAD
  - Less data collection required
  - Automatically pulls in weather data
- Based off of the FAWN system
  - Some stations with leaf wetness probes
  - Mostly calculated from available models

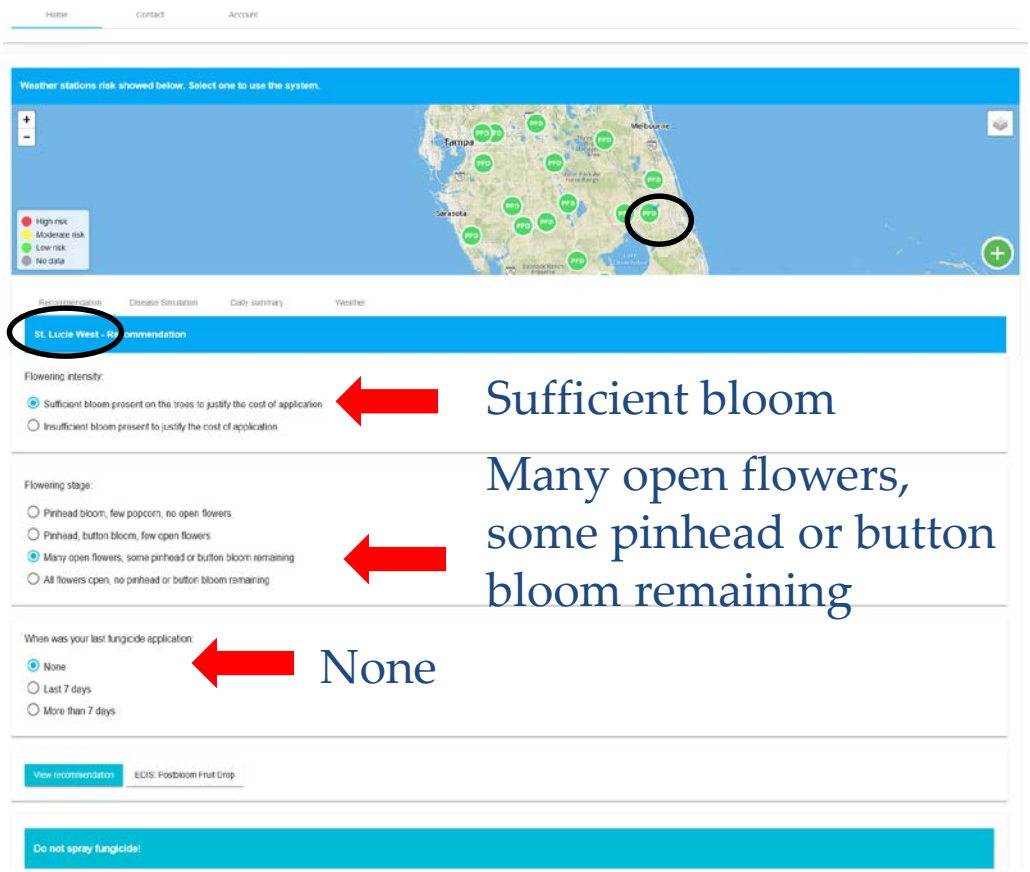
Homepage of new PFD advisory system

- Hosted on Agroclimate.org
  - Under tools/crop diseases
  - Similar to Strawberry Advisory System (SAS)
  - Each circle represents a FAWN weather station



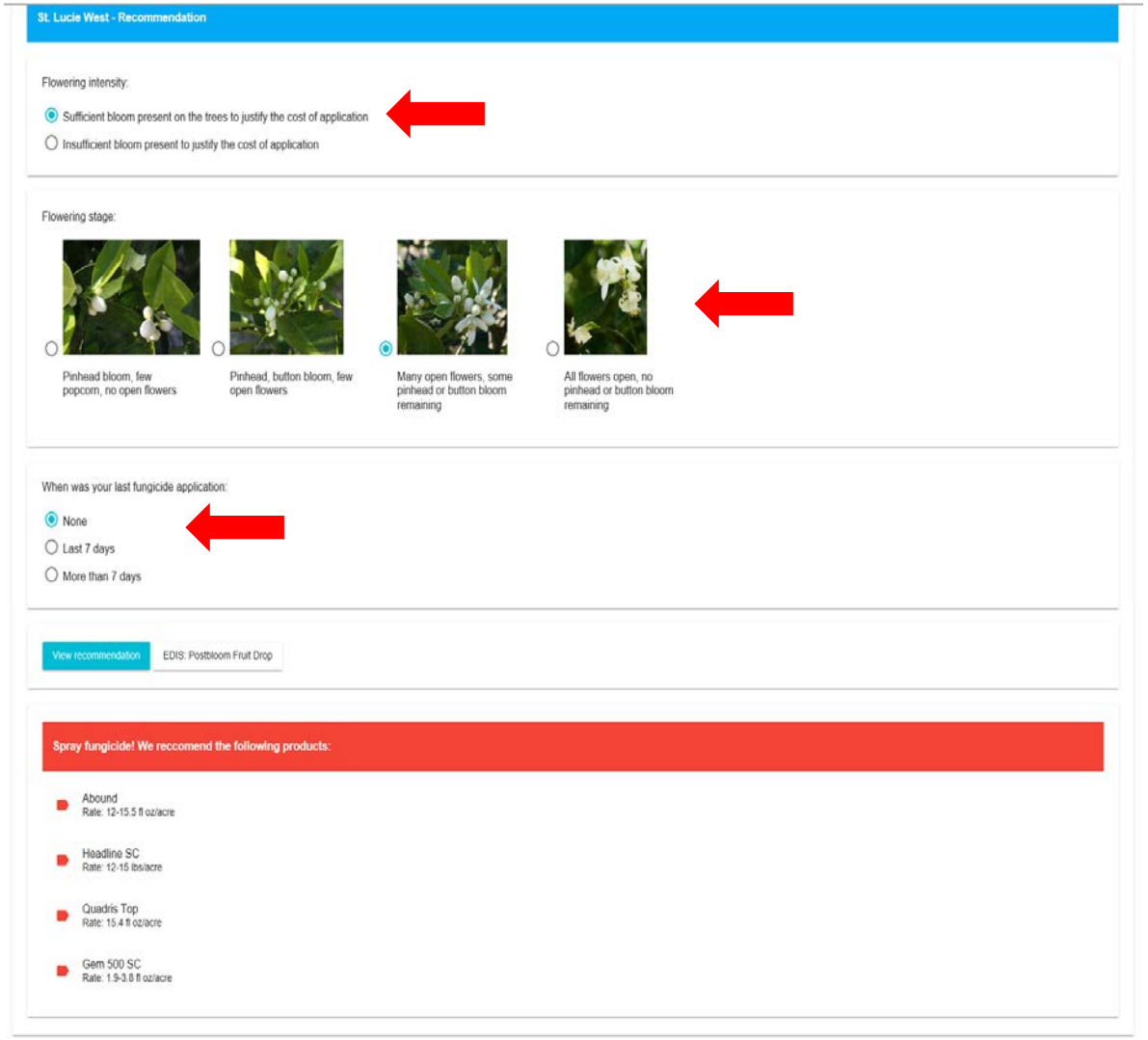
Criteria to select on model

- St. Lucie West station selected
  - Blue check
- Need to indicate bloom intensity
  - Will I recoup costs if application made?
- Flowering stage
- Last fungicide application



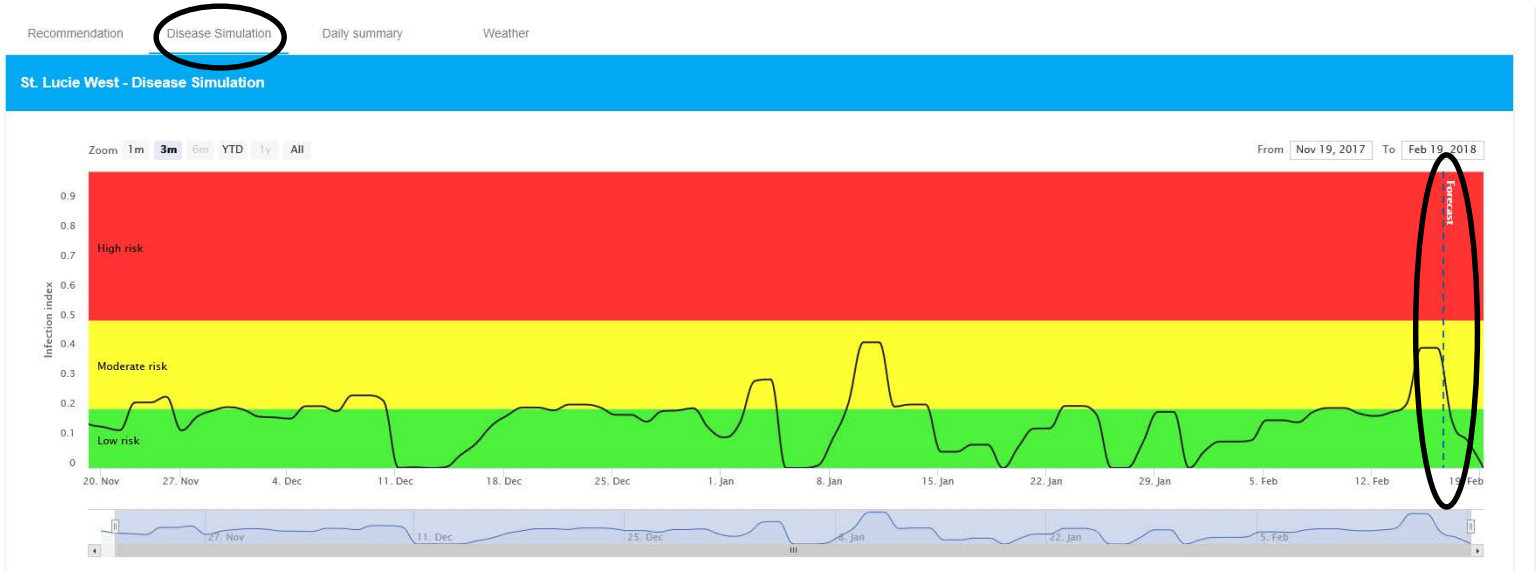
If there is an infection event

- Conditions could allow for infection event
- Still need sufficient bloom
- Fungicide applications minimum 7 days apart



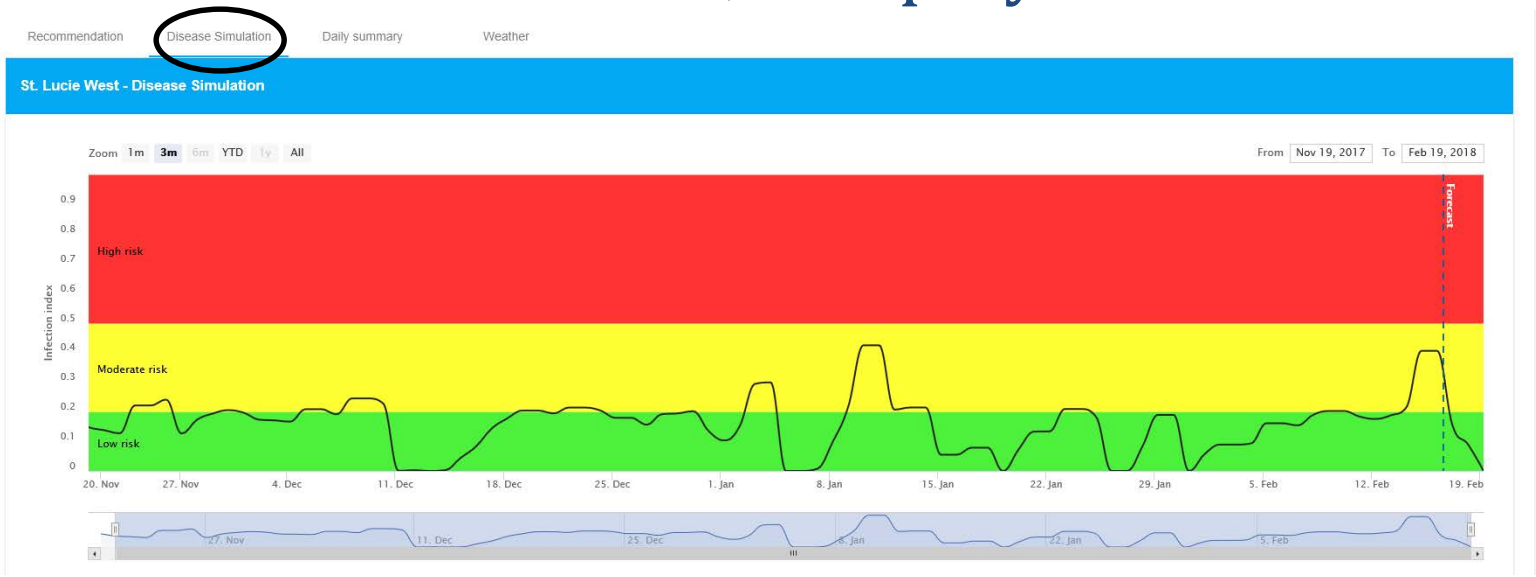
Disease simulation tab

- Graphical representation of infection risk
  - Can select time frame
- Forecasted risk (from NOAA weather data) for three days from actual date
  - Help plan if infection will be favored by weather in near term



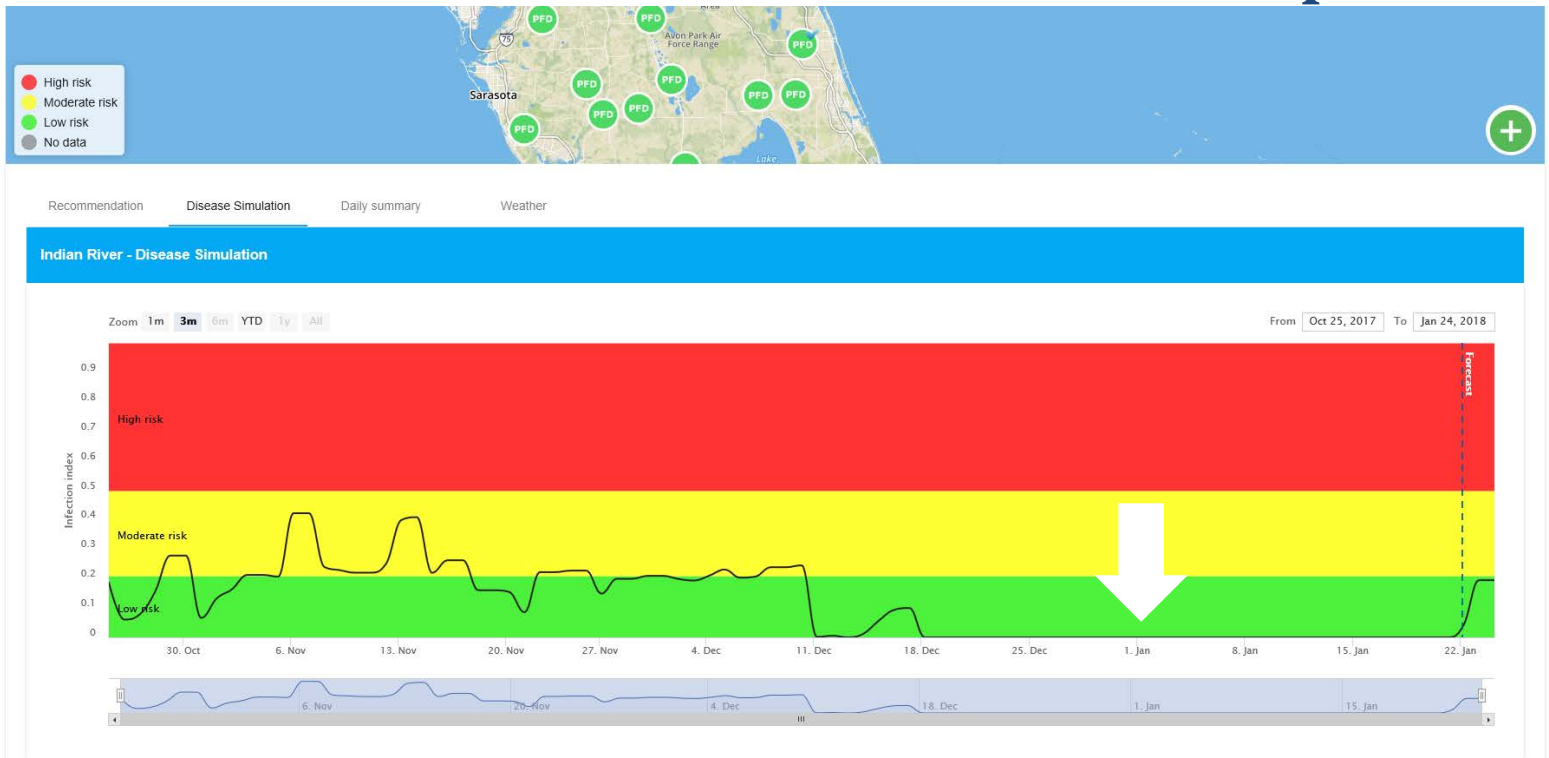
Infection risk levels

- High risk (red area)
  - Index above 0.51; Spray as soon as possible
- Moderate risk (yellow area)
  - Index between 0.21 -0.5; Spray recommended
- Low risk (green area)
  - Index between 0-0.2; No spray recommended



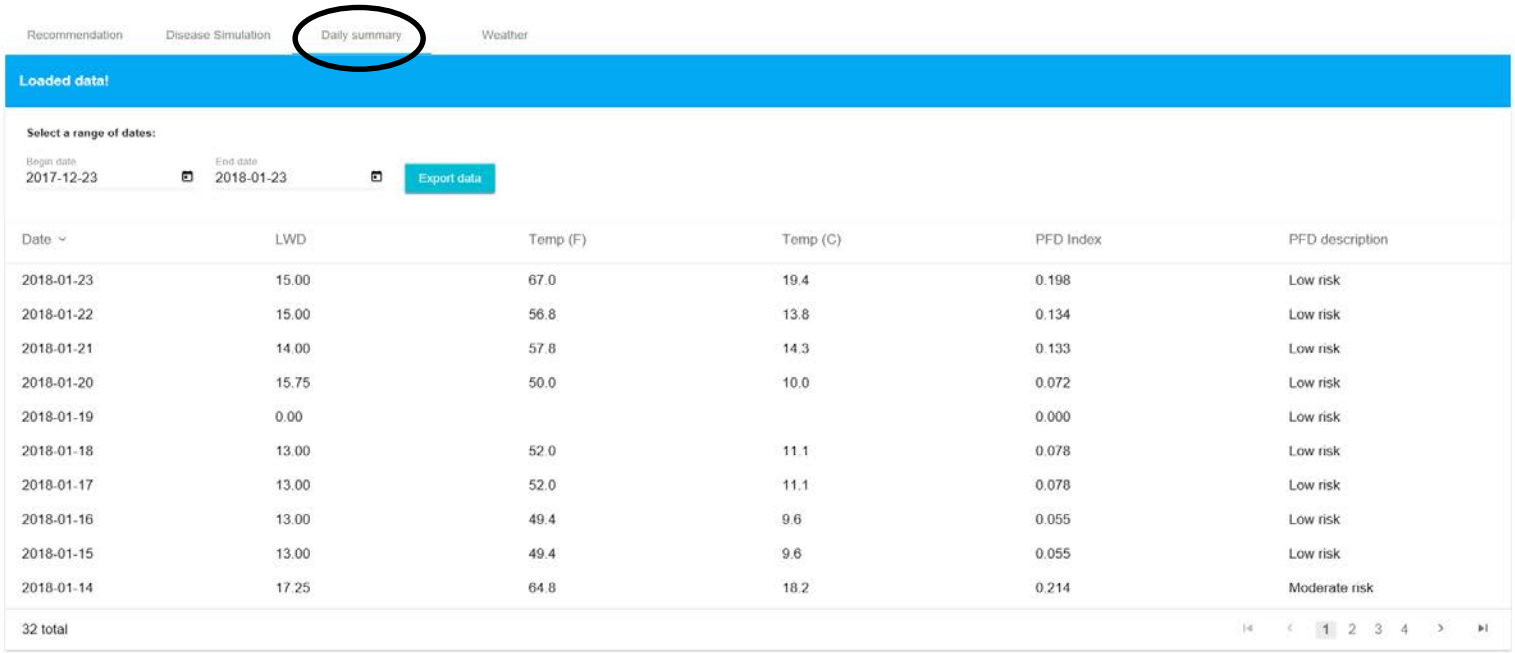
Problem with station

- Problem with leaf wetness estimates
  - Should see an increase in infection index overnight from dew
- Please let us know ASAP if there is a problem



Daily summary of data

- Gives leaf wetness, temperature, PFD index and risk level
  - Weather variables daily average
  - PFD index max. daily value



Date	LWD	Temp (F)	Temp (C)	PFD Index	PFD description
2018-01-23	15.00	67.0	19.4	0.198	Low risk
2018-01-22	15.00	56.8	13.8	0.134	Low risk
2018-01-21	14.00	57.8	14.3	0.133	Low risk
2018-01-20	15.75	50.0	10.0	0.072	Low risk
2018-01-19	0.00			0.000	Low risk
2018-01-18	13.00	52.0	11.1	0.078	Low risk
2018-01-17	13.00	52.0	11.1	0.078	Low risk
2018-01-16	13.00	49.4	9.6	0.055	Low risk
2018-01-15	13.00	49.4	9.6	0.055	Low risk
2018-01-14	17.25	64.8	18.2	0.214	Moderate risk

32 total

1 2 3 4

Weather data

- Can look at the weather data for every 15 min.
  - Temperature, relative humidity, rainfall, leaf wetness
- Find out when drying periods occur
  - After 4 hours of drying, PFD index resets to zero

Recommendation | Disease Simulation | Daily summary | Weather

Loaded data!

Select a range of dates:

Begin date 2018-01-21 | End date 2018-01-23 | Export data

Date time	Temp (F)	RH (%)	Rain (inch)	Wet	LWD	Mean temp. (F)	PFD Index
2018-01-23 11:15	75.74	88.10	0.00	NO	15.75	67.31	0.209
2018-01-23 11:00	75.04	90.40	0.00	YES	15.75	67.31	0.209
2018-01-23 10:45	74.52	92.30	0.00	YES	15.50	67.19	0.205
2018-01-23 10:30	73.63	94.50	0.00	YES	15.25	67.07	0.202
2018-01-23 10:15	72.99	95.80	0.00	YES	15.00	66.96	0.198
2018-01-23 10:00	72.57	96.90	0.00	YES	14.75	66.85	0.195
2018-01-23 09:45	71.89	98.80	0.00	YES	14.50	66.76	0.191
2018-01-23 09:30	71.24	100.00	0.00	YES	14.25	66.67	0.188
2018-01-23 09:15	70.54	100.00	0.00	YES	14.00	66.58	0.184
2018-01-23 09:00	69.57	100.00	0.00	YES	13.75	66.51	0.181

238 total

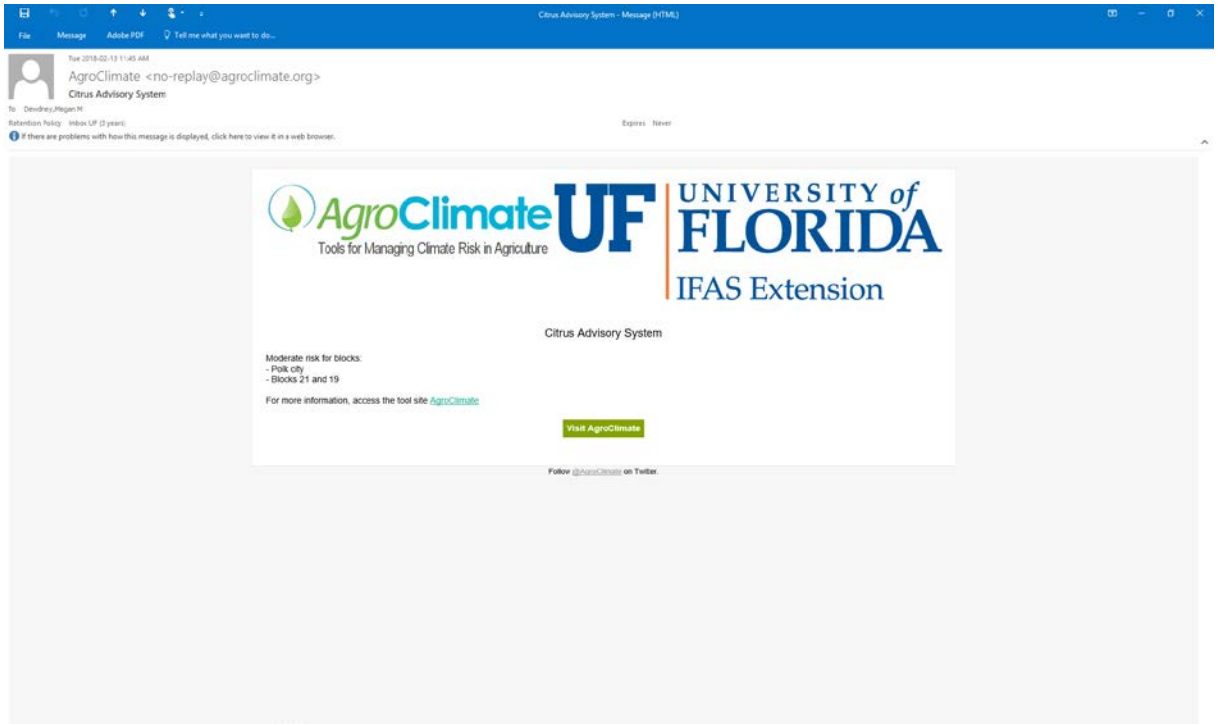
1 2 3 4 5

With an account

- Can mark specific blocks of interest
  - Map and satellite views
  - Use map to find block and satellite to mark
- Specific risk assessment for location

Will send alerts

- SMS alerts for each location
- E-mail notification
- Can choose both

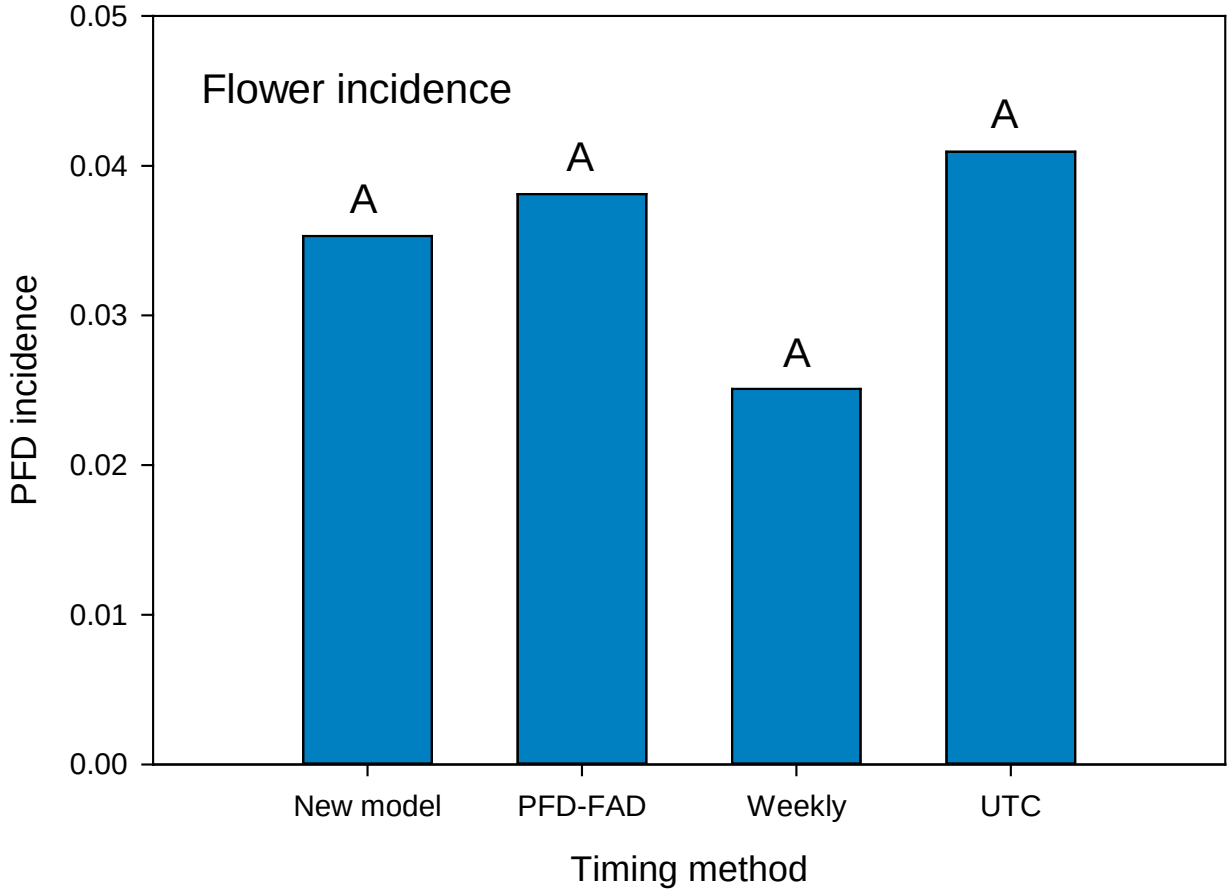


How do application timings compare?

- Fort Meade grove in 2017
  - Valencia on Swingle with history of PFD
  - Headline at 15.5 fl. oz./acre
- Four timing treatments:
  - No applications
  - Weekly for three applications
    - March 8th, 15th, 22nd
  - PFD-FAD (fungicide application decision)
    - Two applications recommended on March 15th, 24th
  - New PFD model
    - No applications recommended

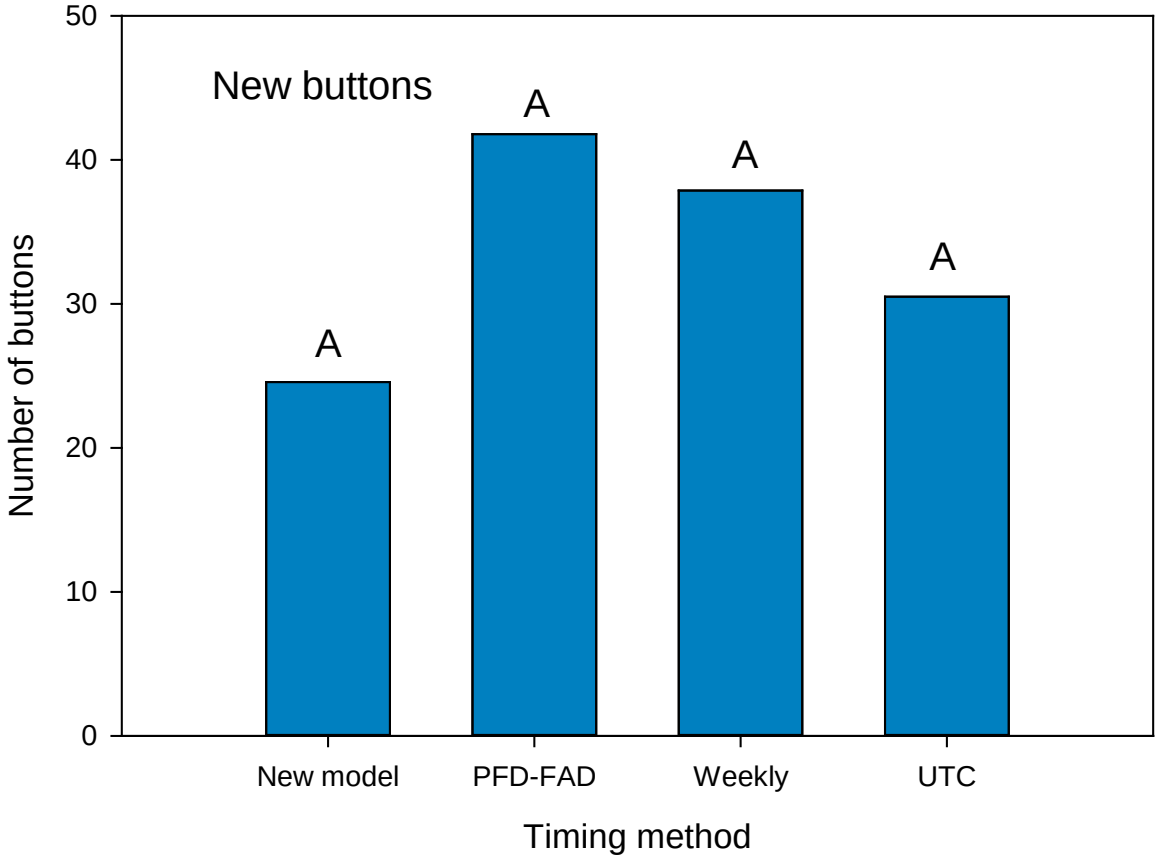
Flower incidence

- Data collected March 27th



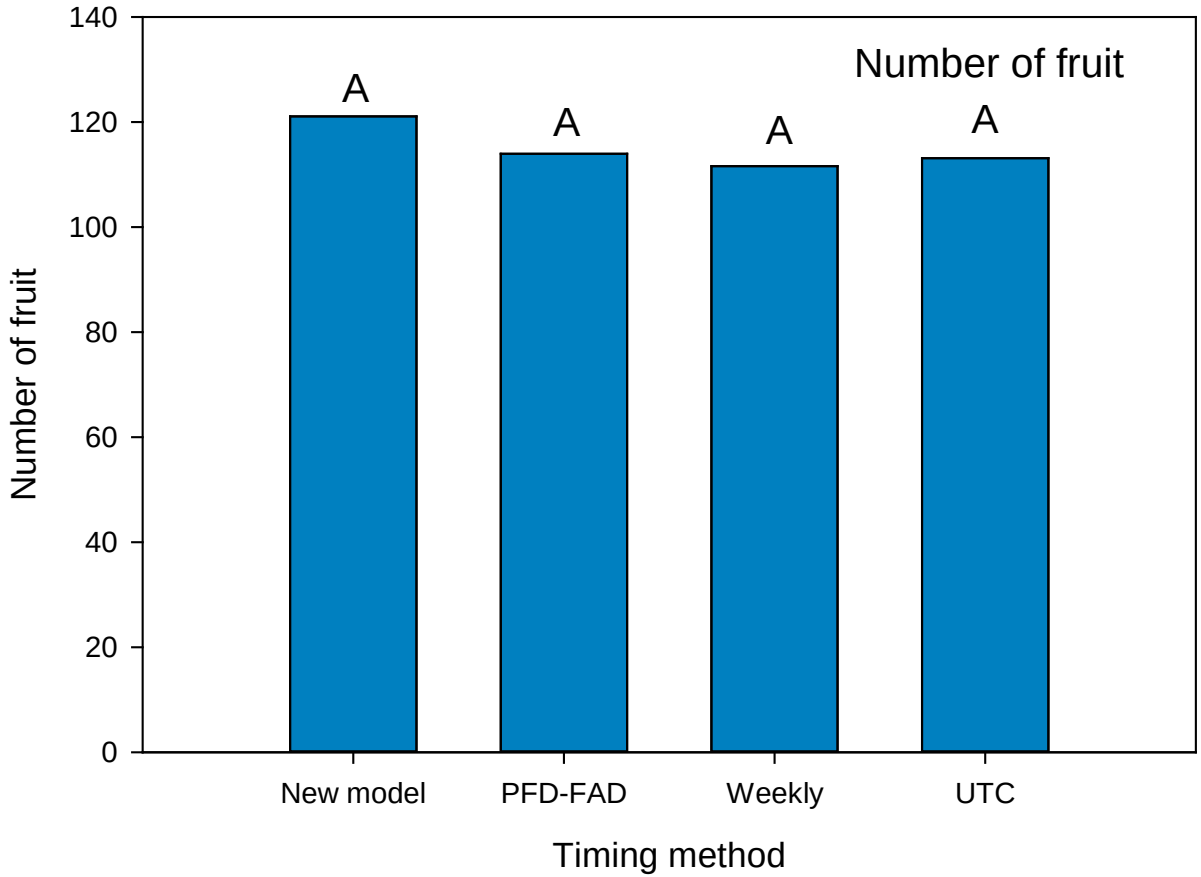
Post-application buttons

- Button data collected June 8-9th



Number of fruit

- Data collected July 20th



Conclusions

- New model was released this week for the 2018 PFD season
  - Fewer data inputs; easier to use
  - Login system should make block-by-block planning easier
  - When infection triggered should make fungicide recommendation
- Working with programmer to detect and fix bugs
  - Expect occasional difficulties with program first year
    - Want your feedback on problems and ways to improve

Model performance conclusions

- 2017 season had low PFD incidence
- New model did not recommend a spray
  - There were no disease intensity differences among treatments
  - Means that the 'no application' recommendation was correct
  - Cost savings of three applications compared to weekly applications
  - Repeating experiment in 2 locations in 2018
    - Validation is an important part of model design

Control options

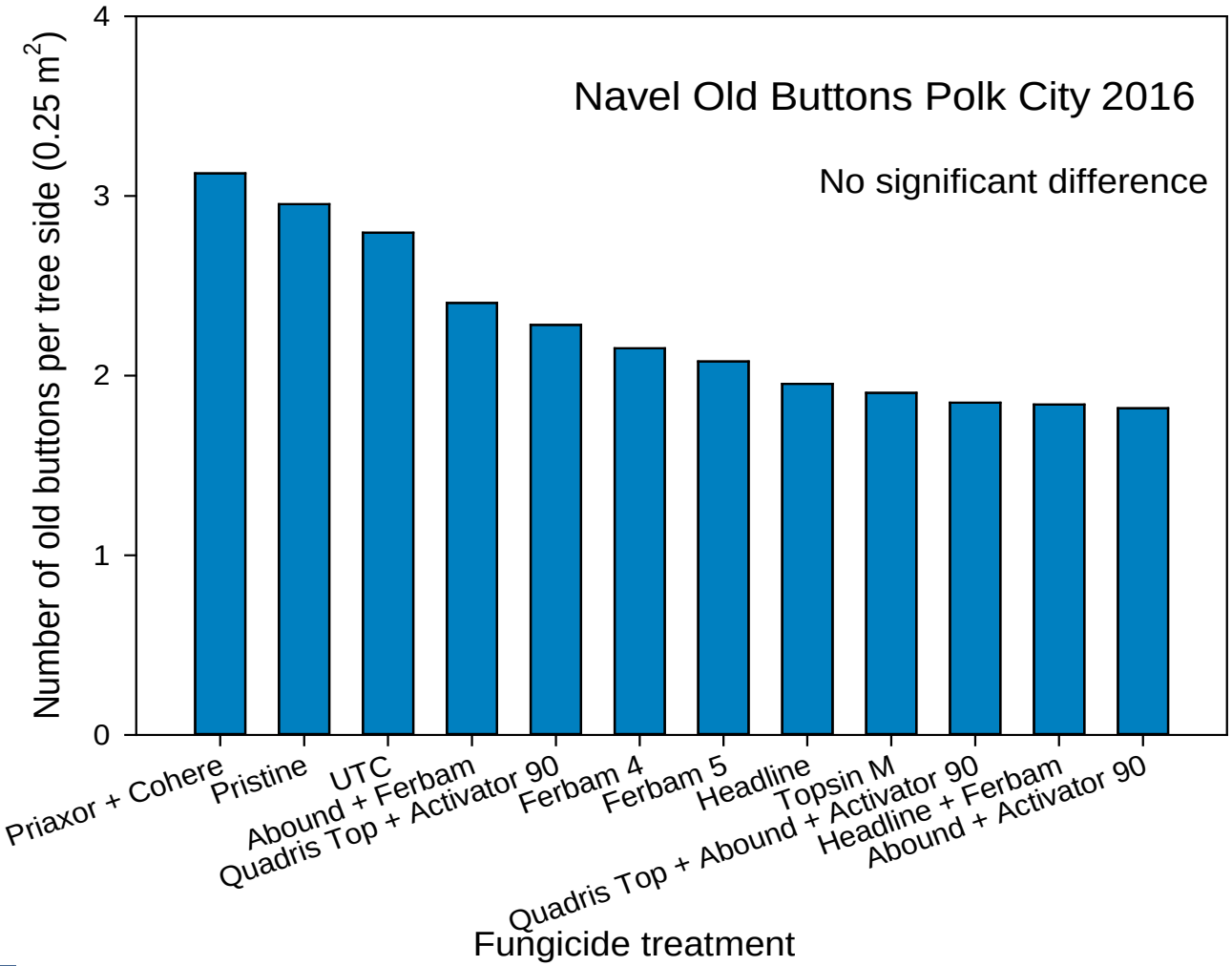
- Remove declining trees to reduce inoculum
  - Prune out HLB-affected branches if only 1 or 2 per tree?
- Fungicides
  - Strobilurin containing fungicides – Abound, Gem, Headline, Quadris Top, Pristine, Priaxor
    - Best combined with Ferbam
    - Strict label limits for these fungicides for resistance management
- 2015-2016 trial data with newer pre-mix fungicides Pristine, Priaxor, and Quadris Top
- Low volume ground and aerial applications are options

2016 TRIAL RESULTS

Trial details

- Navel oranges in Polk City area
  - Heavily infected with HLB
  - Off-season bloom on most trees
  - Trees hedged in January
    - Consequence much of bloom concentrated at the middle to end of March
    - More uniform than previous year
  - Trees selected for uniform disease pressure
    - HLB and PFD
- Applications made on recommendation of PFD model
- Applications on March 16 and 22

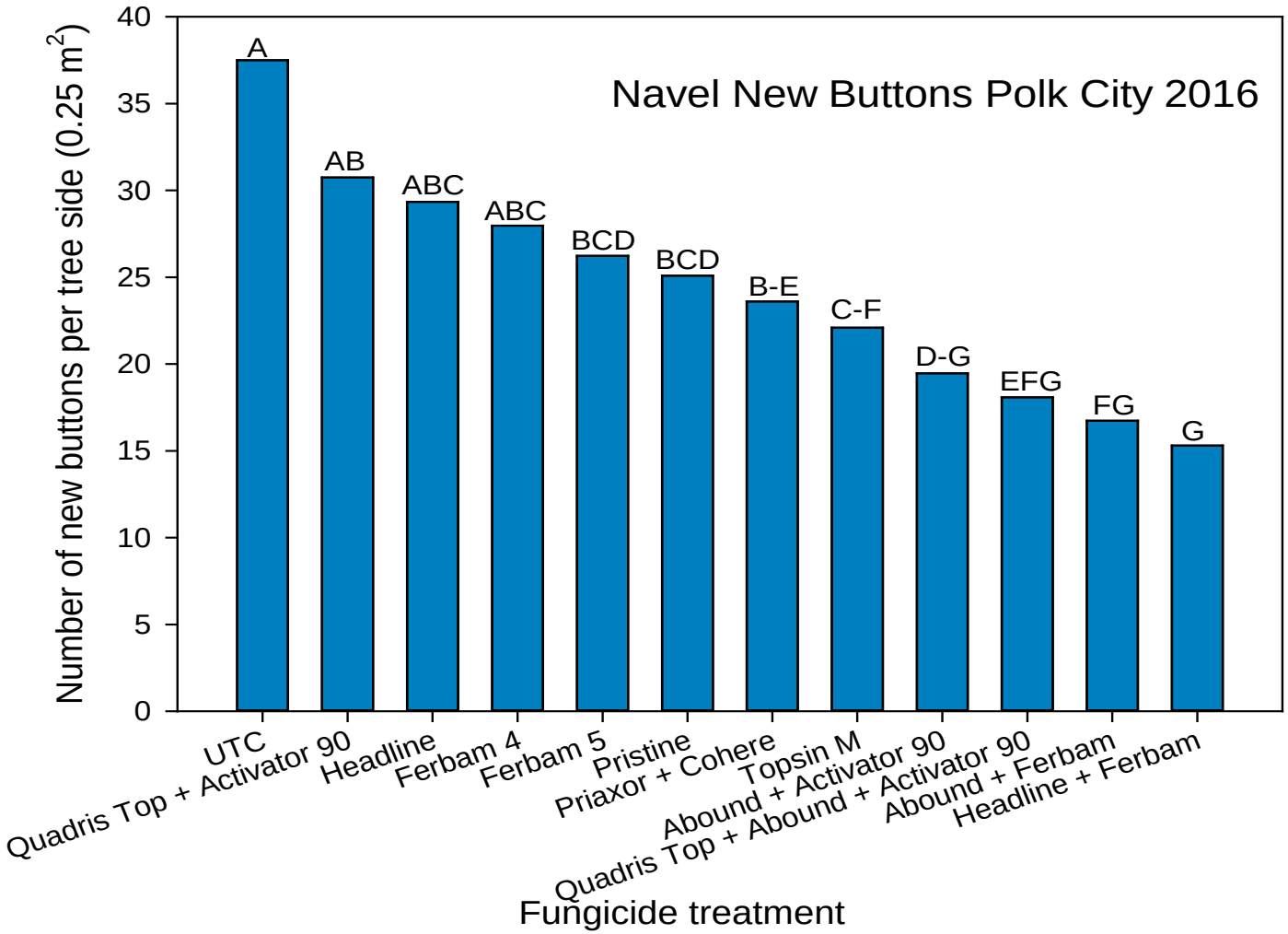
Buttons in 0.25m^2/tree side April 20th, 2016



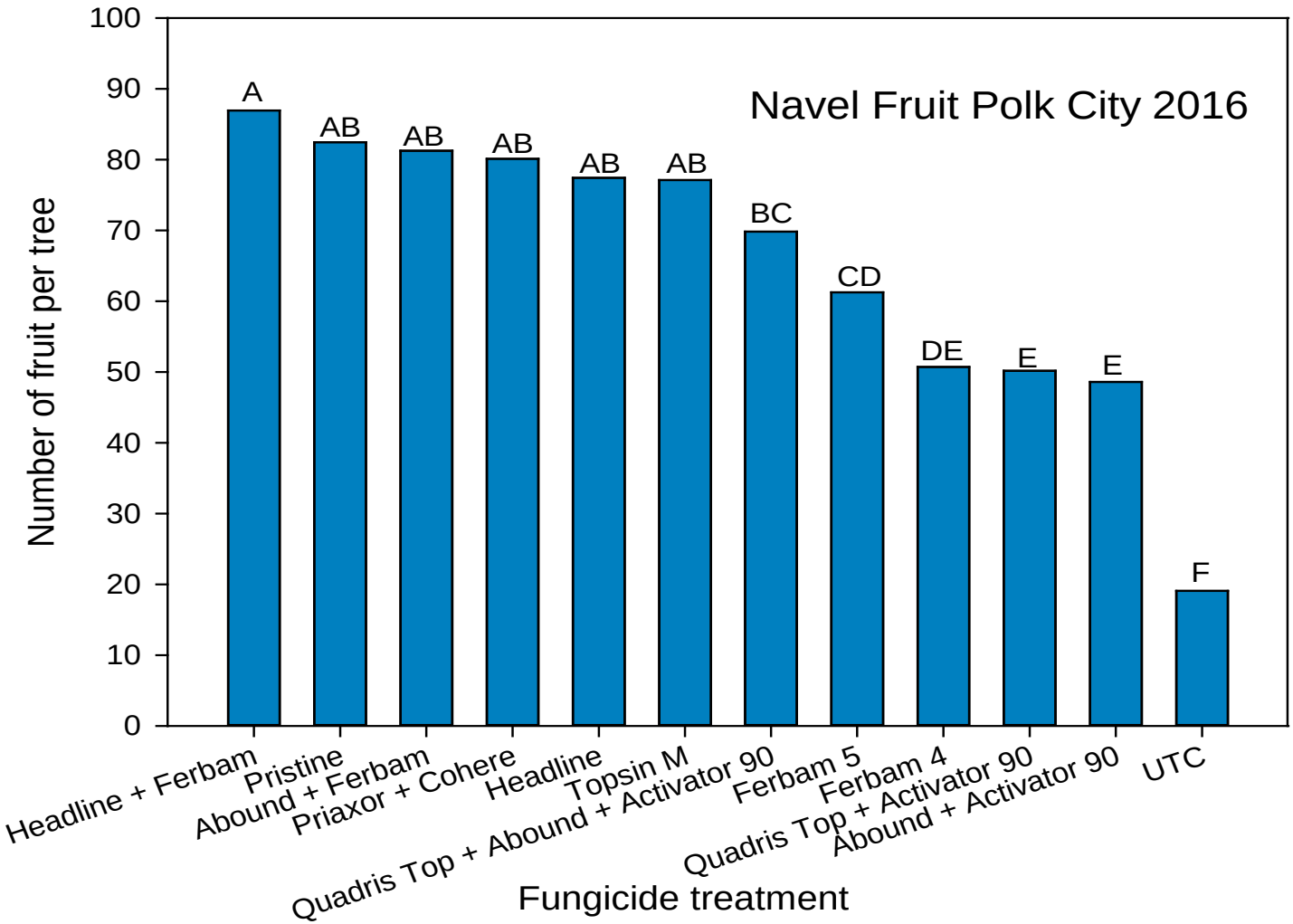
PFD trials 2016 – Navels

Product	Active Ingredient	Rate/acre
Quadris Top Activator 90	Azoxystrobin + difenoconazole	15.4 fl oz. 0.25% v/v
Quadris Top Abound Activator 90	Azoxystrobin + difenoconazole Azoxystrobin	15.4 fl oz. 3.2 fl oz. 0.25% v/v
Abound Activator 90	Azoxystrobin	15.5 fl oz. 0.25% v/v
Abound Ferbam	Azoxystrobin Ferbam	15.5 fl oz. 6 lb
Headline	Pyraclostrobin	15 fl oz.
Headline Ferbam	Pyraclostrobin Ferbam	15 fl oz. 6 lb
Pristine	Pyraclostrobin + boscalid	18.5 oz.
Priaxor Cohere	Pyraclostrobin + fluxapyroxad	6 fl oz. 16 fl oz.
Topsin M	Thiophanate-methyl	2.0 lb
Ferbam Granuflo	Ferbam	4 lb
Ferbam Granuflo	Ferbam	5 lb
Untreated control	--	--

Buttons in 0.25m^2/tree side April 20th, 2016



Number of fruit per tree side June 24-28th, 2016



Conclusions

- No difference in the number of buttons prior to trial initiation
- The number of buttons from 2016 infection, does not always match fruit counts
- All treatments significantly better than UTC
- Topsin M did not perform better than strobilurin containing fungicides
- Ferbam is best when mixed with other fungicides
  - Similar conclusion to Pete Timmer's work in 1990s
- Will be looking at pre-harvest fruit drop

Cost analysis details

- Conducted with Ariel Singerman
- Navel prices high in 2016-2017
  - If fruit has a lower price, a profit may not be realized from more expensive treatments
- All pesticide prices based on retail prices in March through April 2017
- Yield and economic analysis based on per tree basis
  - No fixed costs considered in analysis including labor and application costs

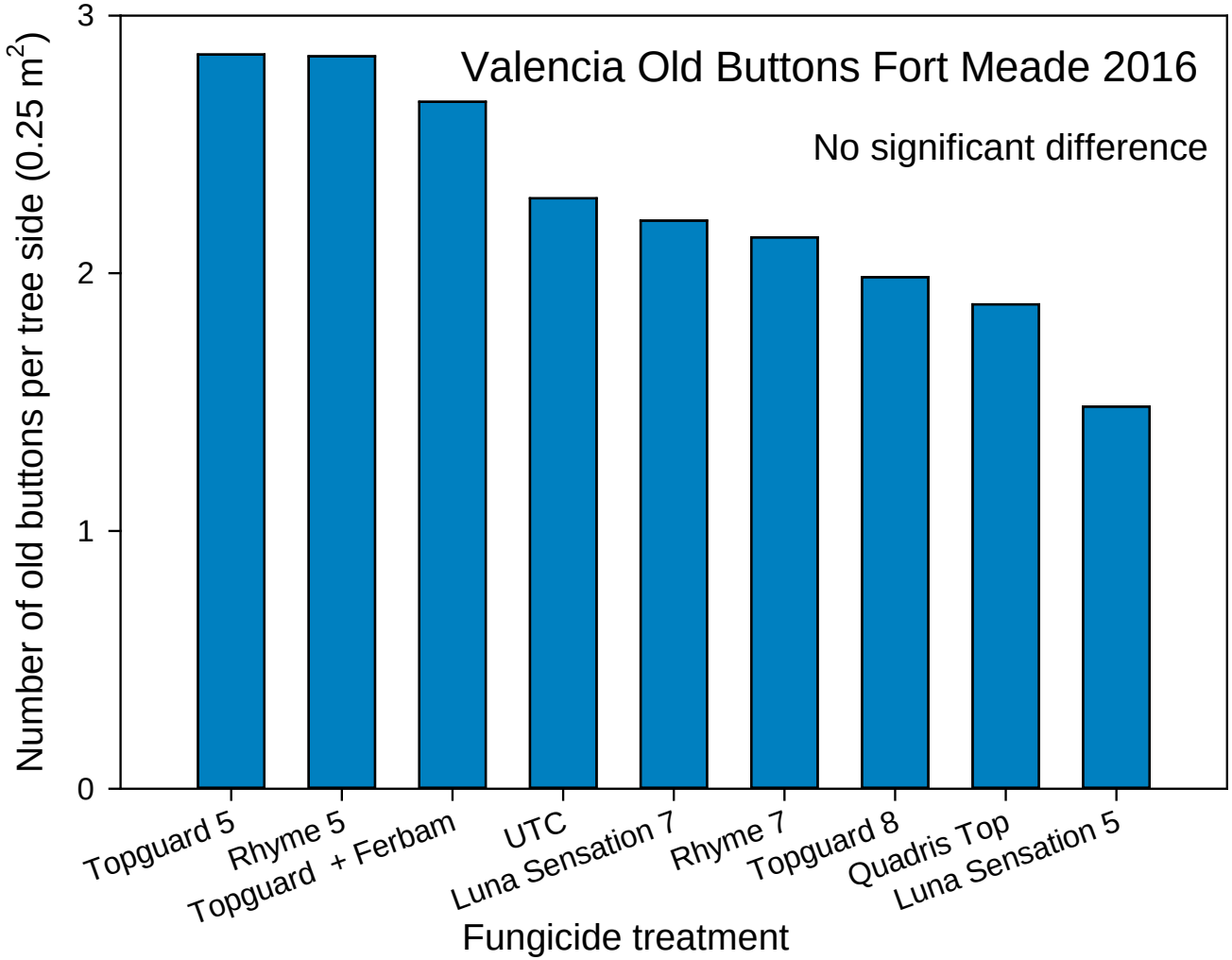
Cost analysis

Treatment	Ave. # of fruit/ tree	Boxes/ tree	Revenue/ tree ($)	Cost/ tree ($)	Profit/ tree ($)	Ranking Yield	Ranking Profit
Headline + Ferbam	150	0.55	9.52	1.33	8.18	1	3
Abound + Ferbam	148	0.54	9.38	1.17	8.20	2	2
Pristine	143	0.53	9.08	1.27	7.81	3	5
Topsin M	141	0.52	8.97	0.67	8.30	4	1
Priaxor + Cohere	136	0.50	8.62	0.80	7.83	5	4
Headline	128	0.47	8.10	0.88	7.22	6	6
Quadris Top + Abound + Activator 90	125	0.46	7.91	0.92	6.99	7	7
Ferbam 5lb.	109	0.40	6.92	0.77	6.15	8	8
Abound + Activator 90	88	0.32	5.55	0.73	4.83	9	10
Ferbam 4lb.	87	0.32	5.54	0.69	4.85	10	9
Quadris Top + Activator 90	84	0.31	5.31	0.86	4.46	11	11
UTC	32	0.12	2.04	0.00	2.04	12	12

Trial details

- Valencia oranges in Fort Meade area
  - Infected with HLB but relatively healthy
  - Off-season bloom on most trees
  - Trees in block were slow to bloom compared to others in area
  - Trees selected for uniform disease pressure
    - HLB and PFD
- Applications made on recommendation of PFD model
- Applications on March 17, 23, and April 1

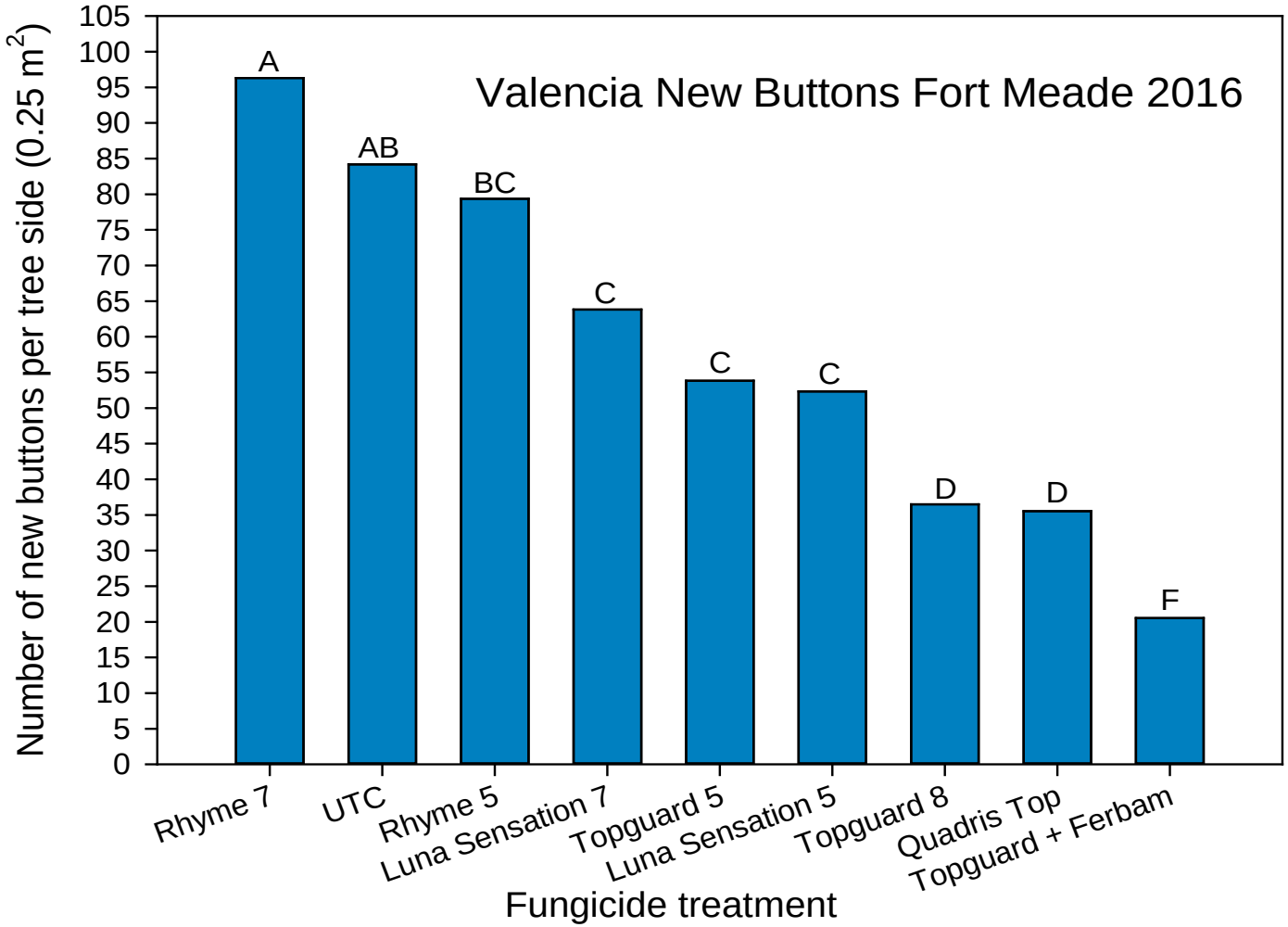
Buttons in 0.25m^2/tree side May 27th, 2016



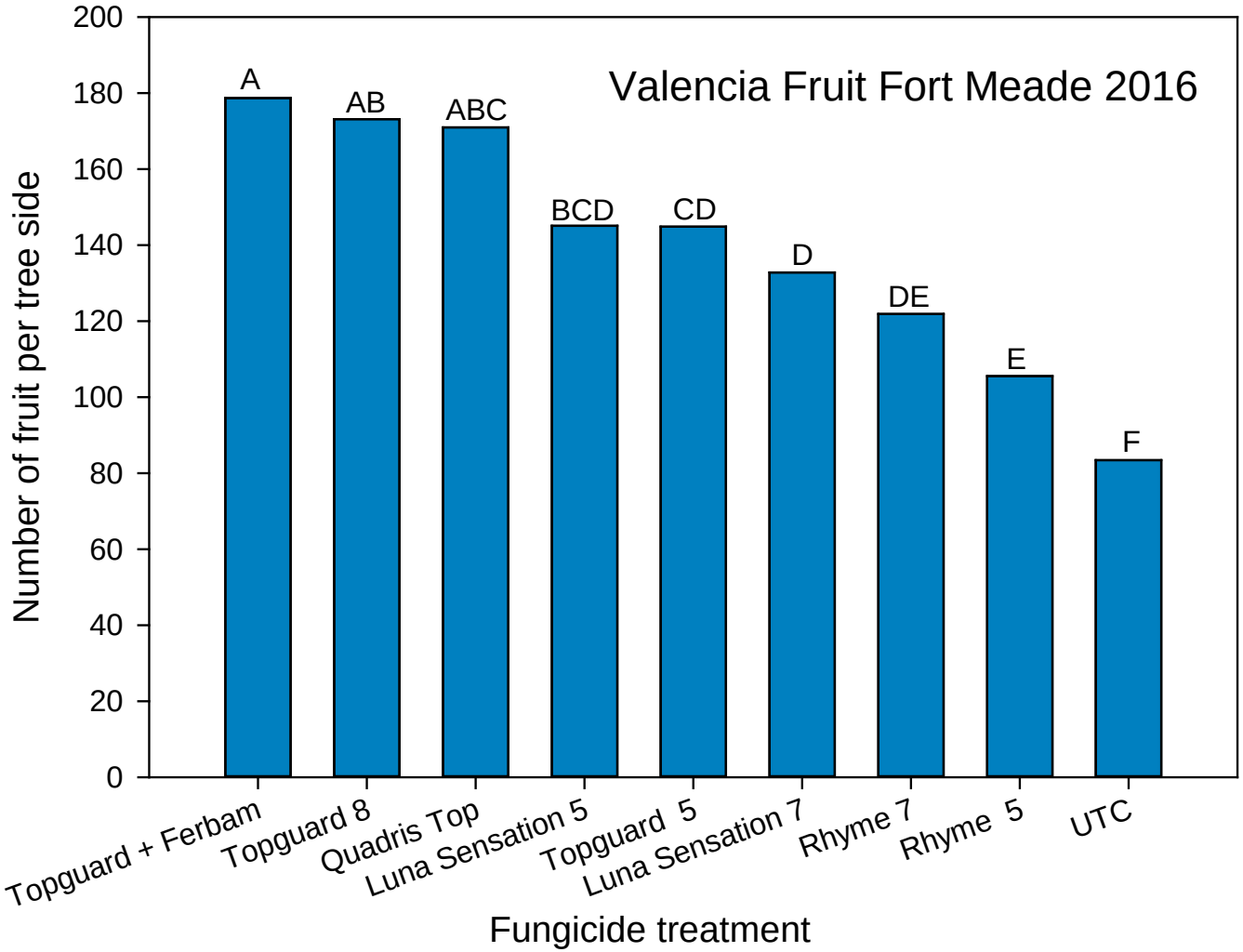
PFD trials 2016 – Valencia

Product	Active Ingredient	Rate/acre
Rhyme 2.08 SC	Flutriafol	5 oz.
Rhyme 2.08 SC	Flutriafol	7 oz.
Topguard EQ 4.3SC	Flutriafol + azoxystrobin	5 oz.
Topguard EQ 4.3SC	Flutriafol + azoxystrobin	8 oz.
Topguard EQ 4.3SC Ferbam	Flutriafol + azoxystrobin Ferbam	5 oz. 5 lb
Quadris Top	Azoxystrobin + difenoconazole	15.4 fl oz.
Luna Sensation	Trifloxystrobin + fluopyram	5 oz.
Luna Sensation	Trifloxystrobin + fluopyram	7 oz.
Untreated control	--	--

Buttons in 0.25m^2/tree side May 27th, 2016



Number of fruit per tree side June 30th-July 1st, 2016



Conclusions

- No difference in the number of buttons prior to trial initiation
- The number of buttons for 2016 followed similar trend as fruit
- All treatments significantly better than UTC
- The addition of ferbam to Topguard treatment significantly improved performance
- Three best treatments all contained a mixture of strobilurin and DMI fungicides

Up-coming season

- Bloom should be more concentrated than last year
  - Still at least three waves of flowers
  - Not sure what Irma did to bloom
- Key to season will be timing of rain in relation to flowers
  - If have open flowers with rain, could be setting up initial round of infections
  - No more rain - no PFD
    - La Niña season like last year; supposed to be dry
  - If continues to rain – PFD very likely
  - Would still conserve fungicides for largest bloom period
  - Use a model to time applications

Recommended products

- Nearly all recommended products contain a strobilurin (Abound, Gem, Headline)
  - Rotation is difficult
  - Ferbam with a strobilurin is a good combination
    - Preformed well in several seasons of trials
- Premixes with alternate modes of action (in addition to a strobilurin)
  - Priaxor (SDHI), Pristine (SDHI), Amistar Top (DMI)
- Remember 4 applications of strobilurins within year is legal limit
  - 3 applications of ferbam

Low volume rates*

Product	Ground	Aerial
Abound	No restrictions listed	No restrictions
Quadris Top	10 GPA (15 GPA recommended)	5 GPA (10 GPA recommended)
Headline	10 GPA (recommended)	10 GPA
Pristine	10 GPA (recommended)	10 GPA
Ferbam	No restrictions listed	Prohibited

*Provided as a guide. Always verify what is written on the label.

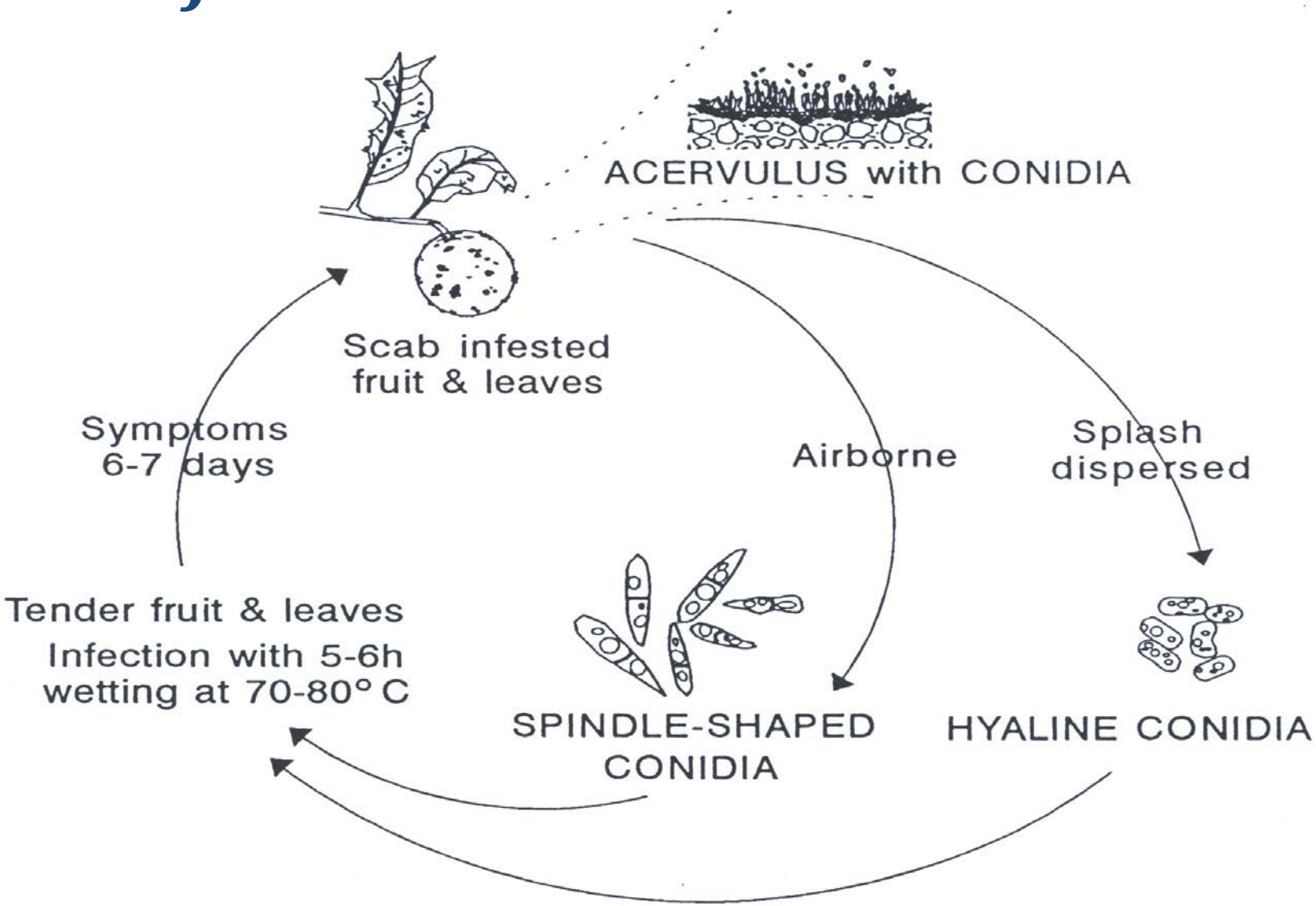
CITRUS SCAB

Symptoms






Citrus Scab Disease Cycle Caused by *Elsinoë fawcettii*



Citrus Scab Control

- Common control products
  - Enable
  - Strobilurin fungicides (Abound, Gem, Headline)
    - Good for first application because kills fungus in lesions from previous year

Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
Tangerines								
Grapefruit								

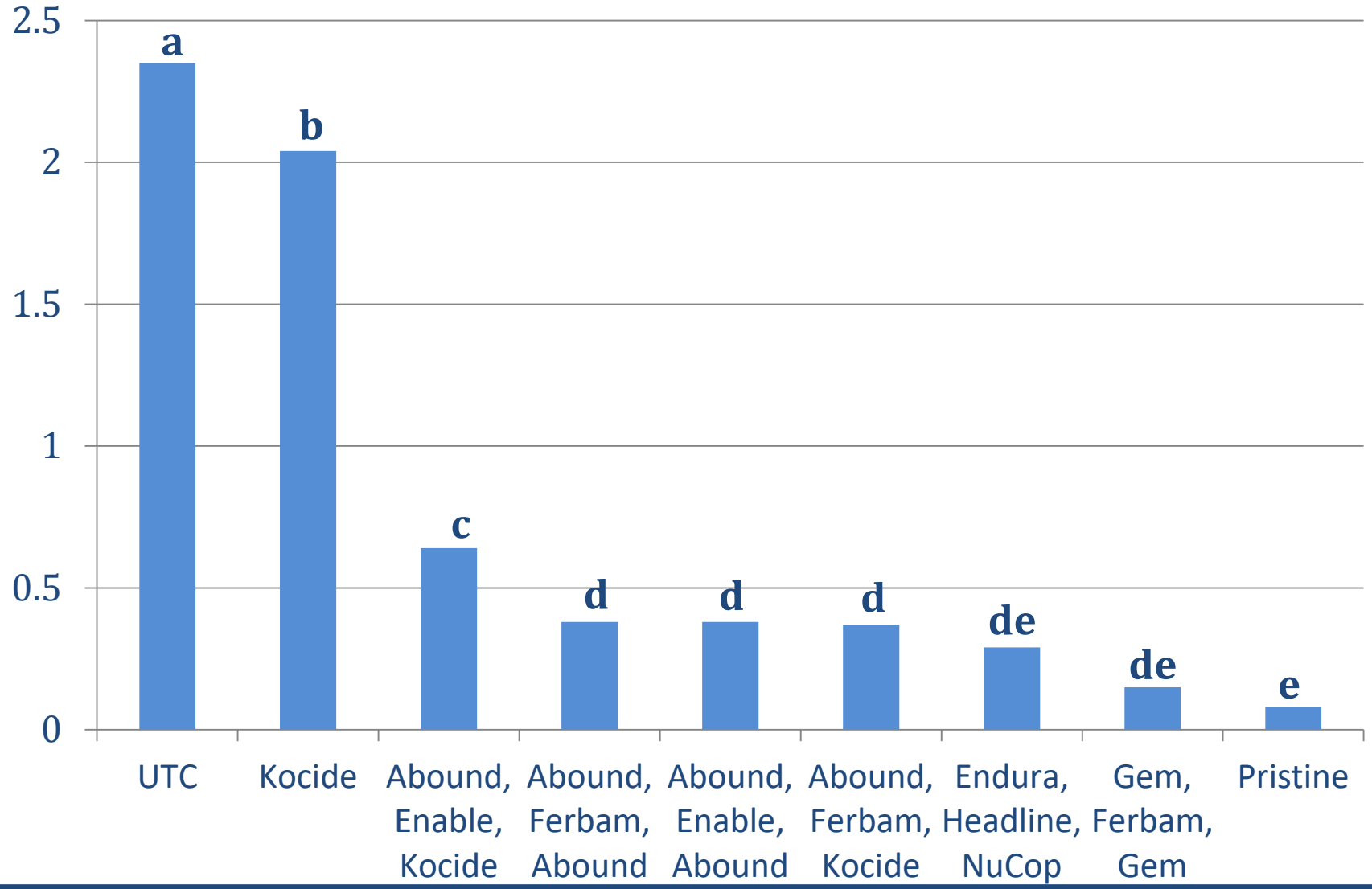
Other Controls

- Ferbam
- Copper - All formulations
  - Use later in the season as it is not as effective as other products
- If infestation is light, disease can be pruned out

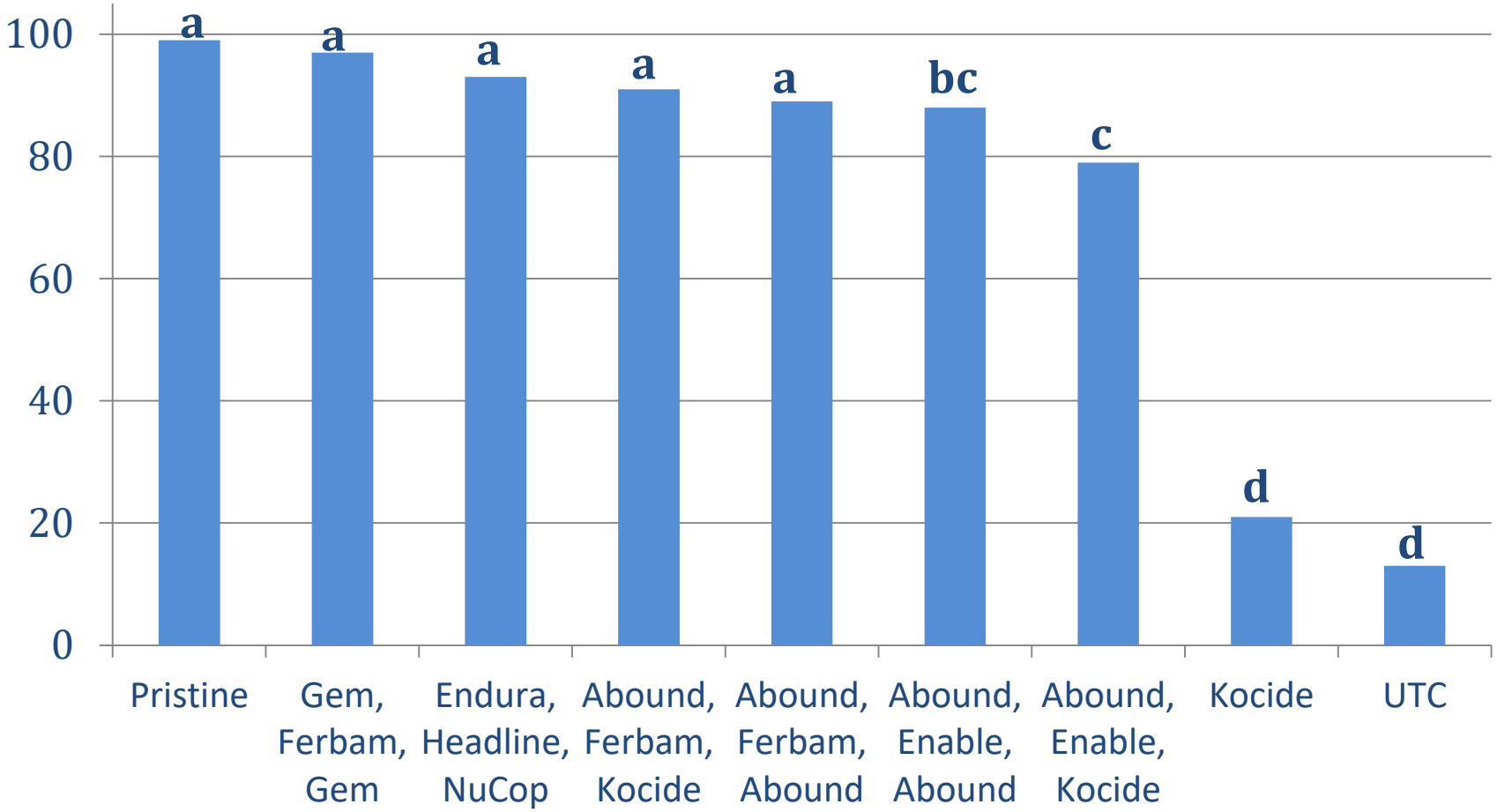
Grapefruit Spray Trial 2004

Date	March 6-7	April 4-5	May 3
Prog. 1	Untreated control (UTC)	Untreated control	Untreated control
Prog. 2	Pristine 38WG (16 oz)	Pristine 38WG (16 oz)	Pristine 38WG (16 oz)
Prog. 3	Abound 2.08EC (12.4 floz)	Enable 2F (8.0 floz)	Kocide 2000 (4.5 lb)
Prog. 4	Gem F (2 floz)	Ferbam Granuflo (5.0 lb)	Gem F (2 floz)
Prog. 5	Endura 70WG (4.5 oz)	Headline 2.09EC (9.2 floz)	NuCop 50DF (4.0 lb)
Prog. 6	Abound 2.08EC (12.4 floz)	Ferbam Granuflo (7.5 lb)	Abound 2.08EC (12.4 floz)
Prog. 7	Abound 2.08EC (12.4 floz)	Ferbam Granuflo (7.5 lb)	Kocide 2000 (4.5 lb)
Prog. 8	Abound 2.08EC (12.4 floz)	Enable 2F (8.0 floz)	Abound 2.08EC (12.4 floz)
Prog. 9	Kocide 2000 (2 lb)	Kocide 2000 (2 lb)	Kocide 2000 (2 lb)

Severity Rating



% Marketable Fruit



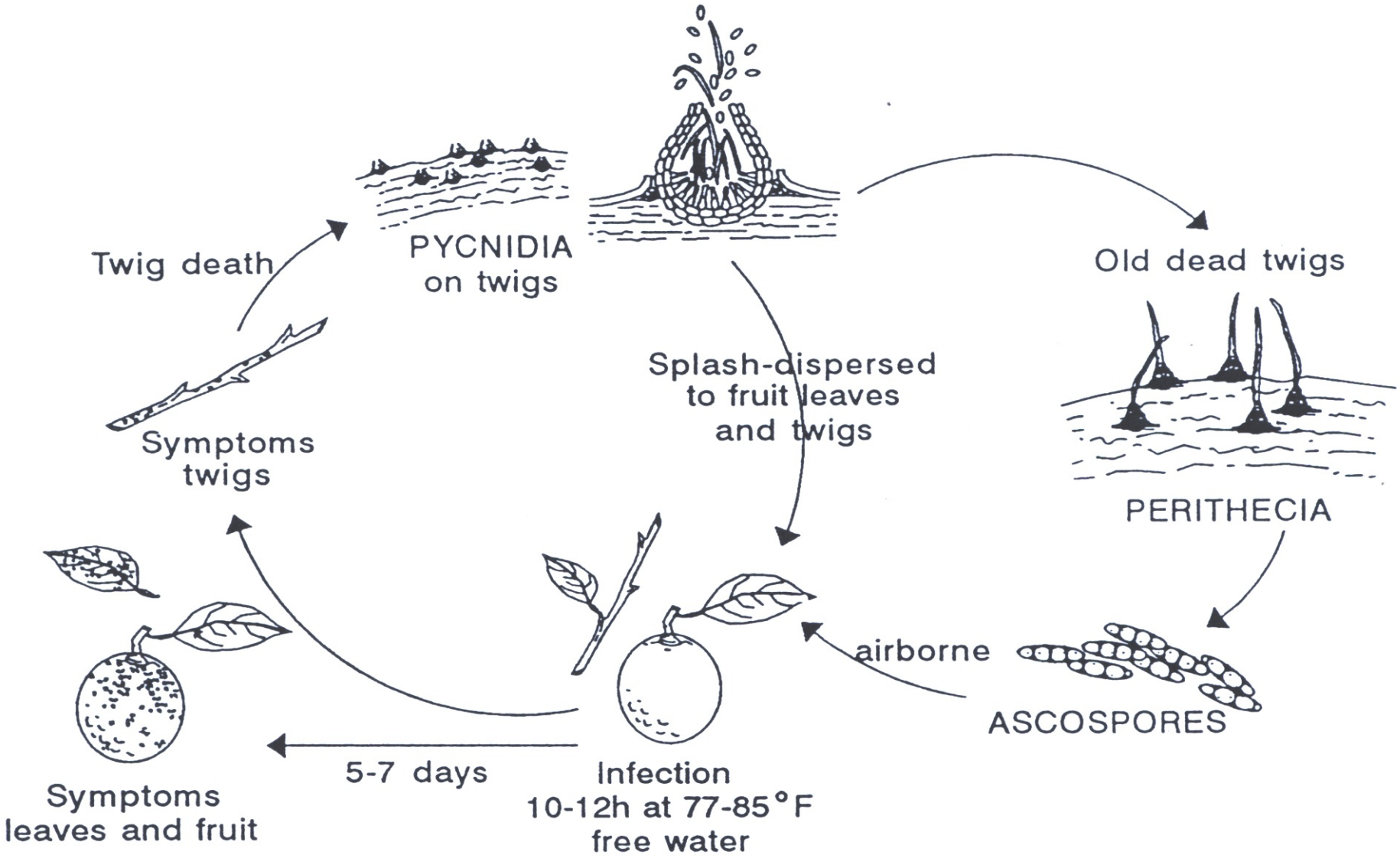
Timing

- Key to good scab control is timing
- 1st application at ¼ flush expansion
  - Enable, ferbam or strobilurin fungicide
- 2nd application at petal fall
  - Different chemistry from 1st application
- 3rd application 3 weeks post-petal fall
  - Copper can fit well in this application

MELANOSE

Symptoms

Melanose Disease Cycle Caused by *Diaporthe citri*



Melanose Control

- Common control products
  - Copper - All formulations
  - Strobilurin fungicides (Abound, Gem, Headline, Quadris Top and Pristine)
    - Reserved for hot weather

Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
	Grapefruit						

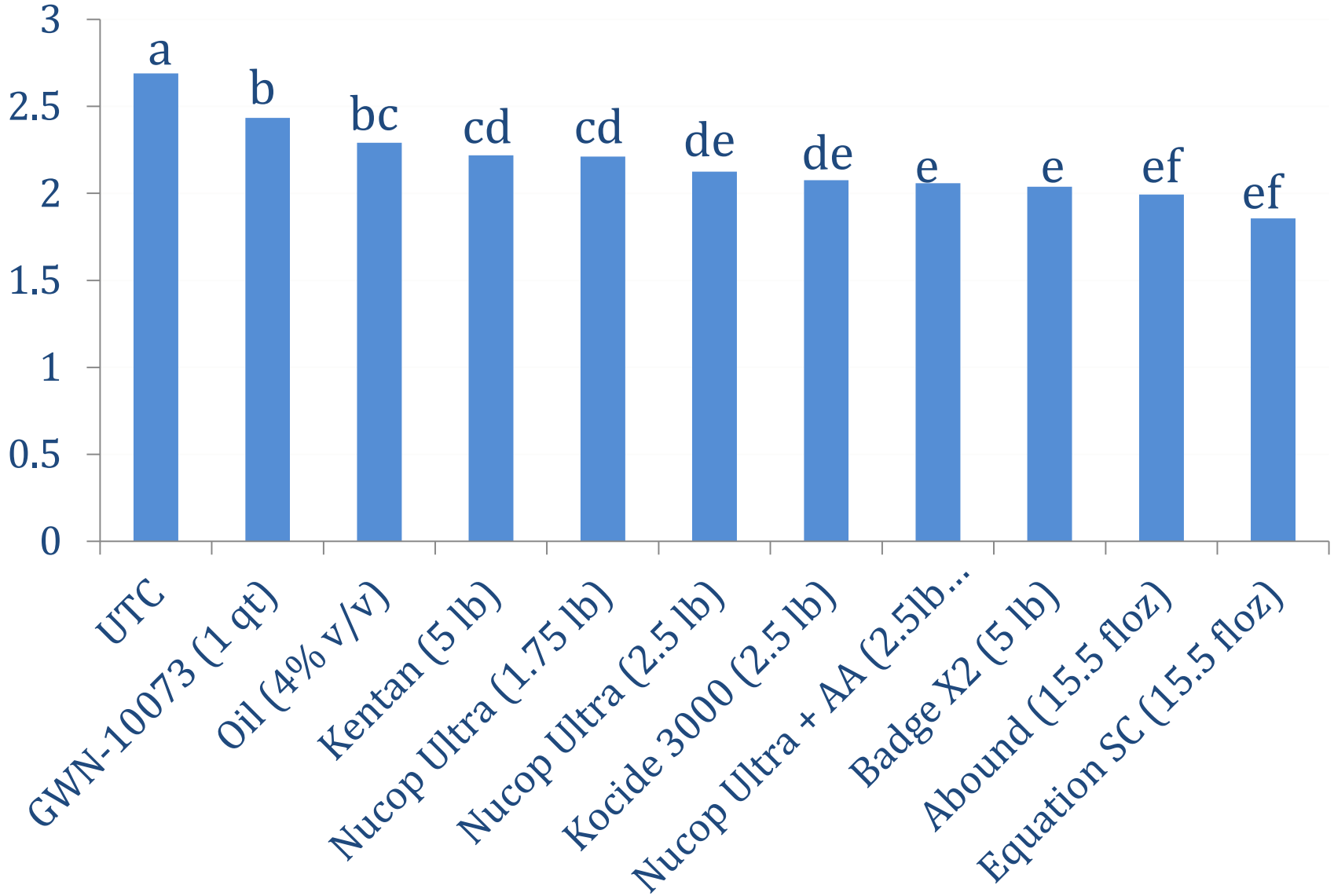
Formulations and Products Rates Tested on Grapefruit (2015)

Treatment	Metallic Cu (%)	Rate/acre	Metallic Cu/acre
Equation SC	--	15.5 fl oz	--
Abound	--	15.5 fl oz	--
GWN-10073	--	1 qt	--
Kentan	40	5.0 lb	2
Badge X2	28	5.0 lb	1.4
Petroleum Oil	--	4% v/v	--
NuCop Ultra + AA	30	2.5 lb + 8 fl oz	0.75
NuCop Ultra	30	2.5 lb	0.75

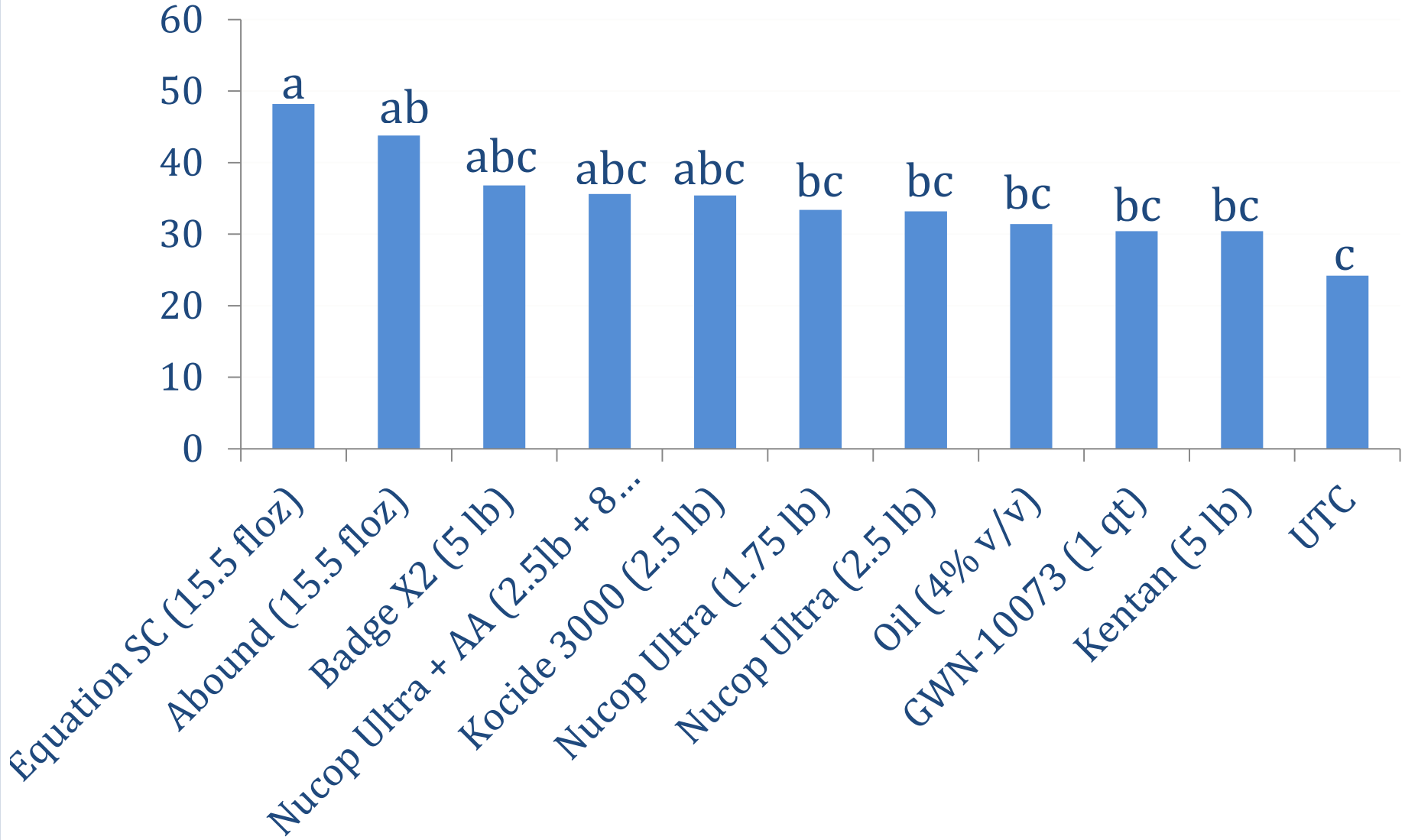
Copper Formulations and Products Rates Cont.

Treatment	Metallic Cu (%)	Rate/acre	Metallic Cu/acre
NuCop Ultra	30	1.75	0.525
Kocide 3000	30	2.5	0.75
Untreated Control (UTC)	--	--	--

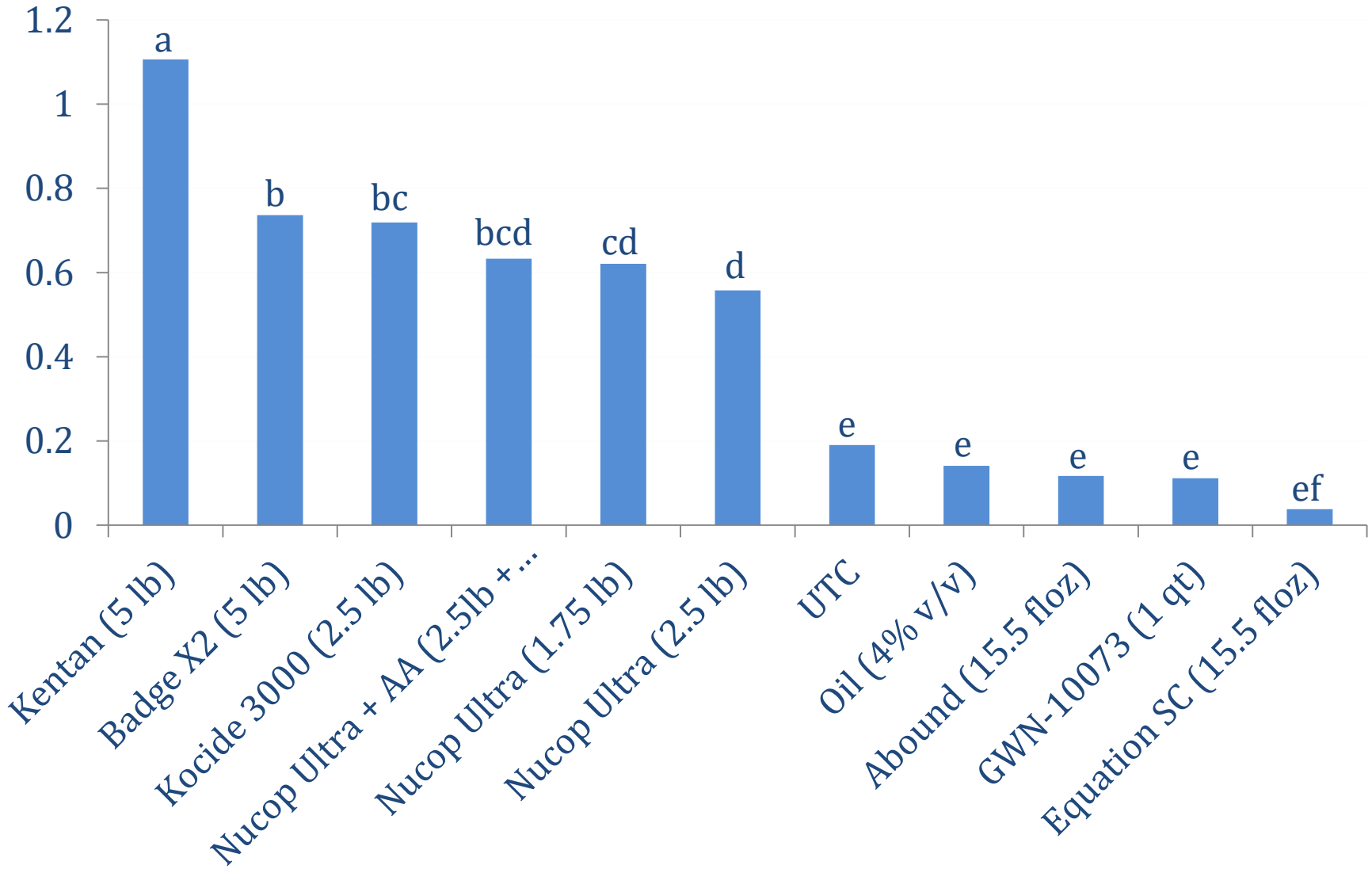
Melanose Control on Fruit (2015)



% Marketable Fruit



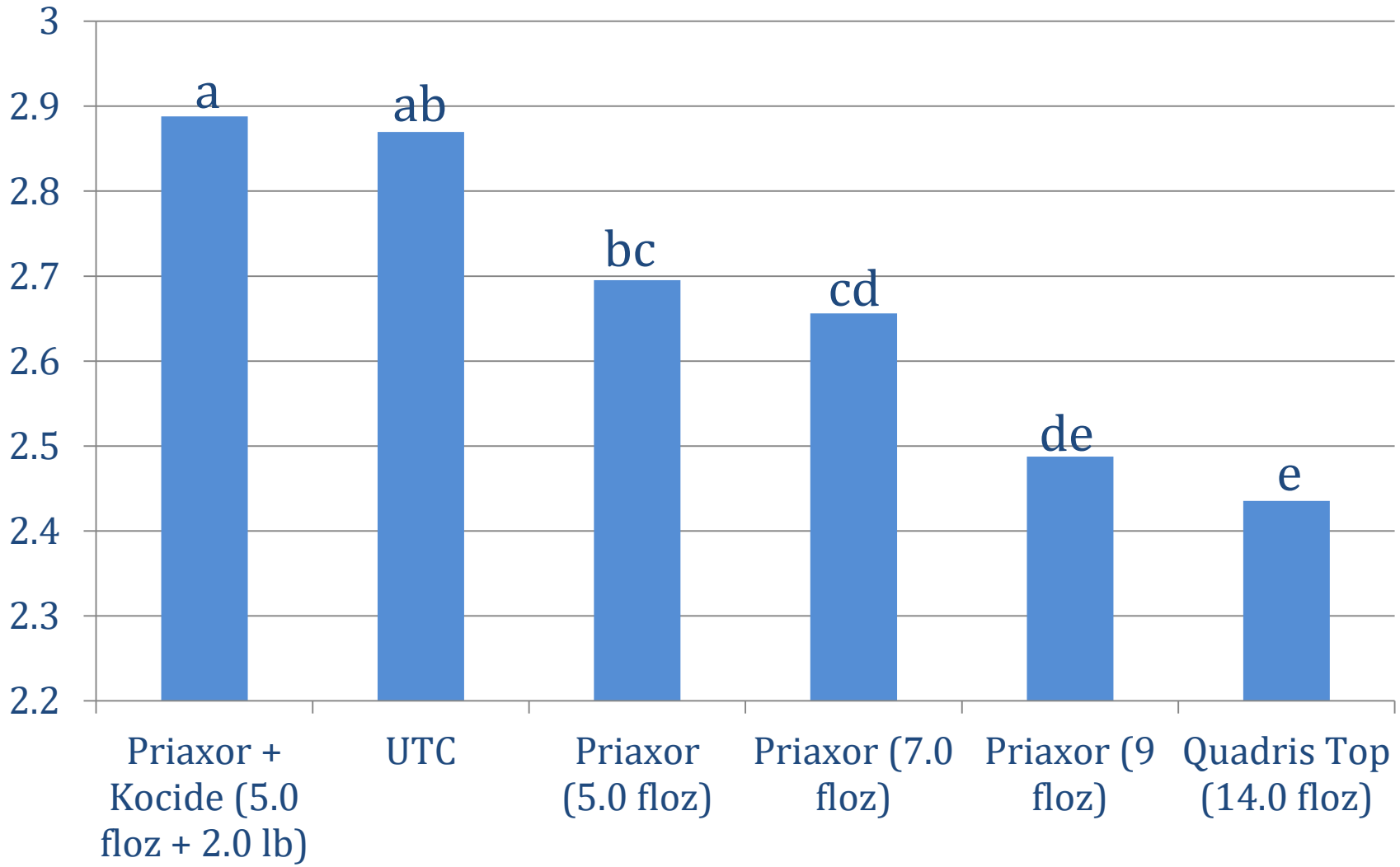
Phytotoxicity (leaves)



Formulations and Products Rates Tested on Grapefruit (2015)

Treatment	Rate (/acre)	Lb Metallic/acre
Priaxor + Cohere	5.0 + 16.0 fl oz	--
Priaxor + Cohere + Kocide 2000	5.0 + 16.0 + 2.0 lb	0.70
Priaxor + Cohere	7.0 + 16.0 fl oz	--
Priaxor + Cohere	9.0 + 16.0 fl oz	--
Quadris Top +Cohere	14.0 + 16.0 fl oz	--
Untreated Control	--	--

Melanose Control on Fruit (2015)



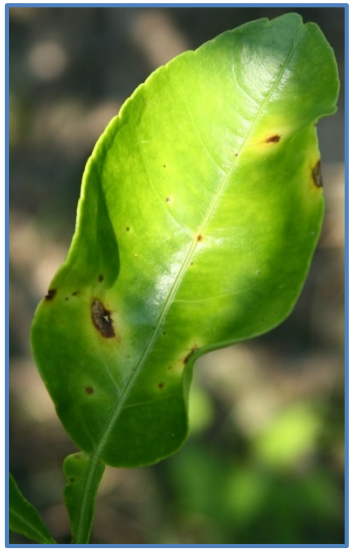
ALTERNARIA BROWN SPOT

Symptoms

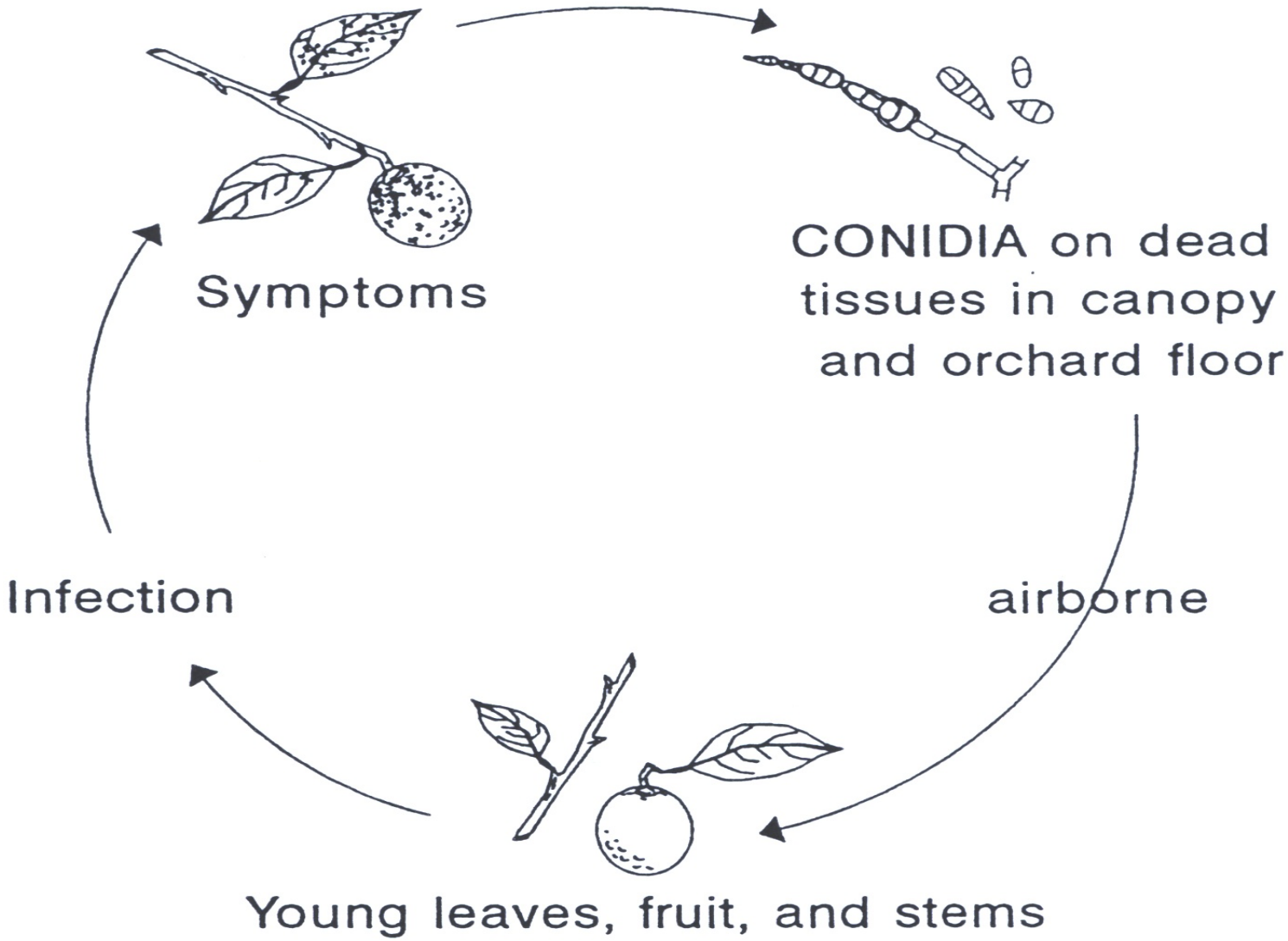





Symptoms

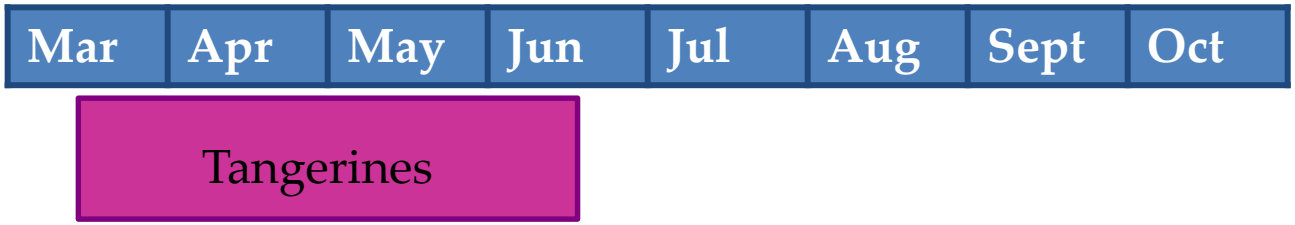


Alternaria Brown Spot Disease Cycle Caused by *Alternaria alternata*



Alternaria Brown Spot Control

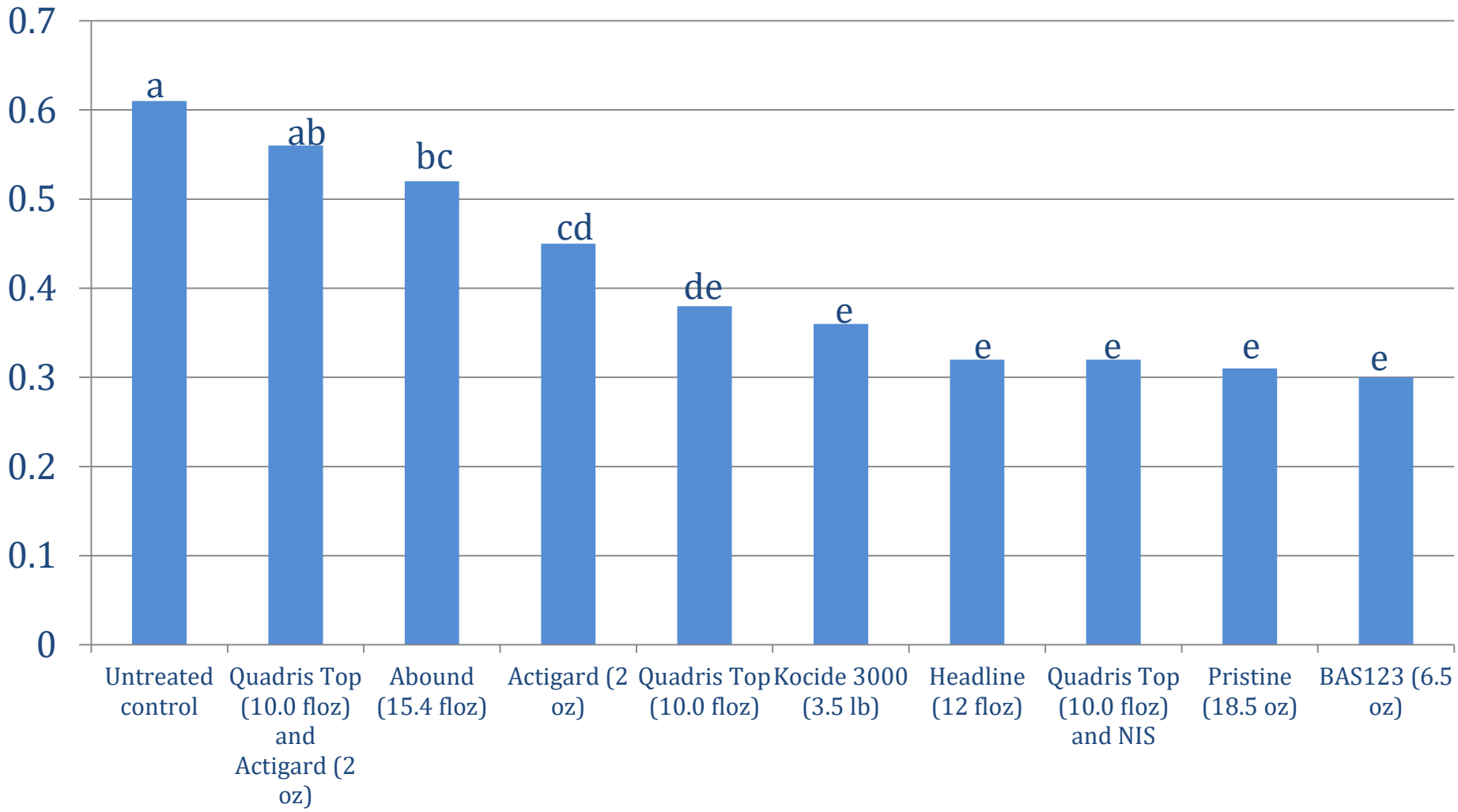
- Common control products
  - Copper - All formulations
  - Strobilurin fungicides (Abound, Gem, Headline, **Quadris Top** and **Pristine**)
    - If severity high, useful for early sprays but also when hot



Cultural Controls

- Ferbam
- Start with clean trees
- Increase air drainage in grove when planting
- Avoid excessive growth promotion
  - Too much nitrogen
  - Overwatering
  - Severe hedging
  - High vigour rootstocks

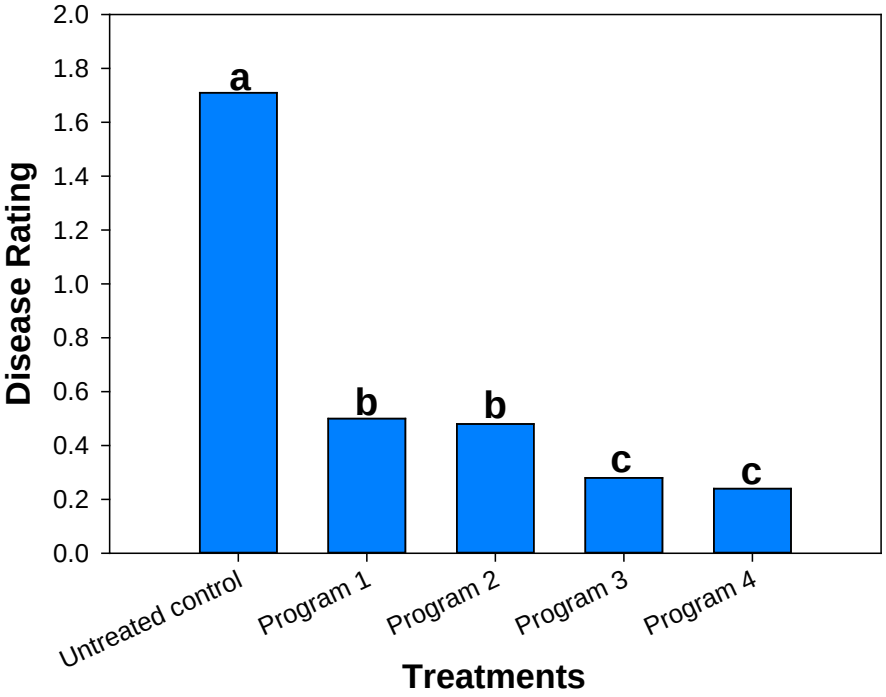
Alternaria Brown Spot on Sunburst (2009)

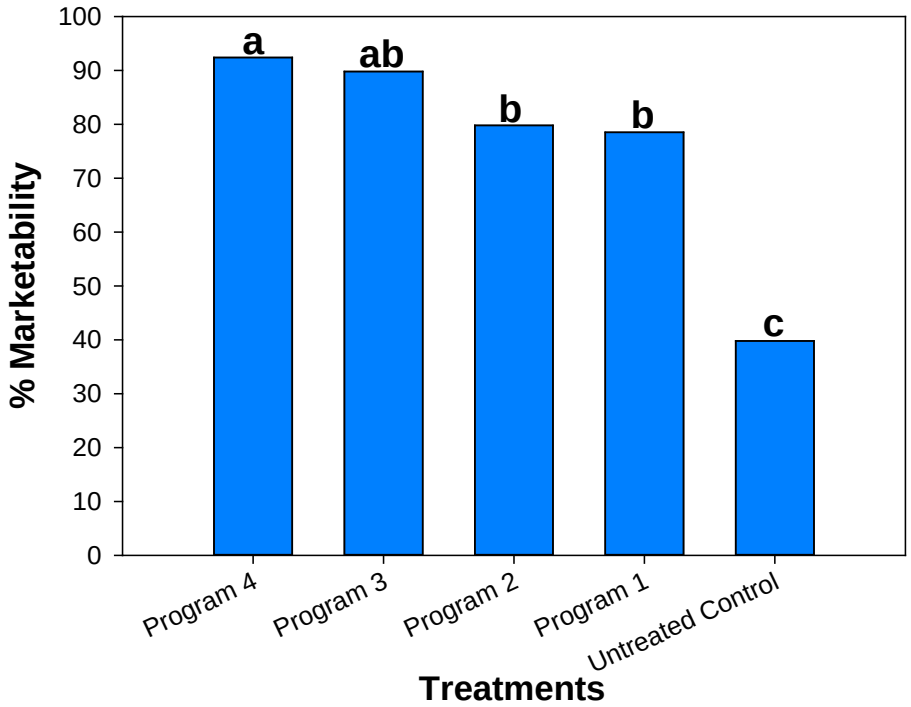


Programs with Pristine in 2010

Program	April 20	May 21	June 16	July 7
1	Boscalid (6.5 oz/acre) + Kocide 3000 (2.5 lb/acre)	Kocide 3000 (3.5 lb/acre)	Boscalid (6.5 oz/acre) + Kocide 3000 (2.5 lb/acre)	Kocide 3000 (3.5 lb/acre)
2	Boscalid (6.5 oz/acre)	Kocide 3000 (3.5 lb/acre)	Boscalid (6.5 oz/acre)	Kocide 3000 (3.5 lb/acre)
3	BAS703 (5.48 oz/acre) + Non-ionic surfactant (1 pint/acre)	Kocide 3000 (3.5 lb/acre)	BAS703 (5.48 oz/acre) + Non-ionic surfactant (1 pint/acre)	Kocide 3000 (3.5 lb/acre)
4	Pristine (18.5 oz/acre)	Kocide 3000 (3.5 lb/acre)	Pristine (18.5 oz/acre)	Kocide 3000 (3.5 lb/acre)
5	Untreated control	Untreated control	Untreated control	Untreated control

Efficacy on Minneola

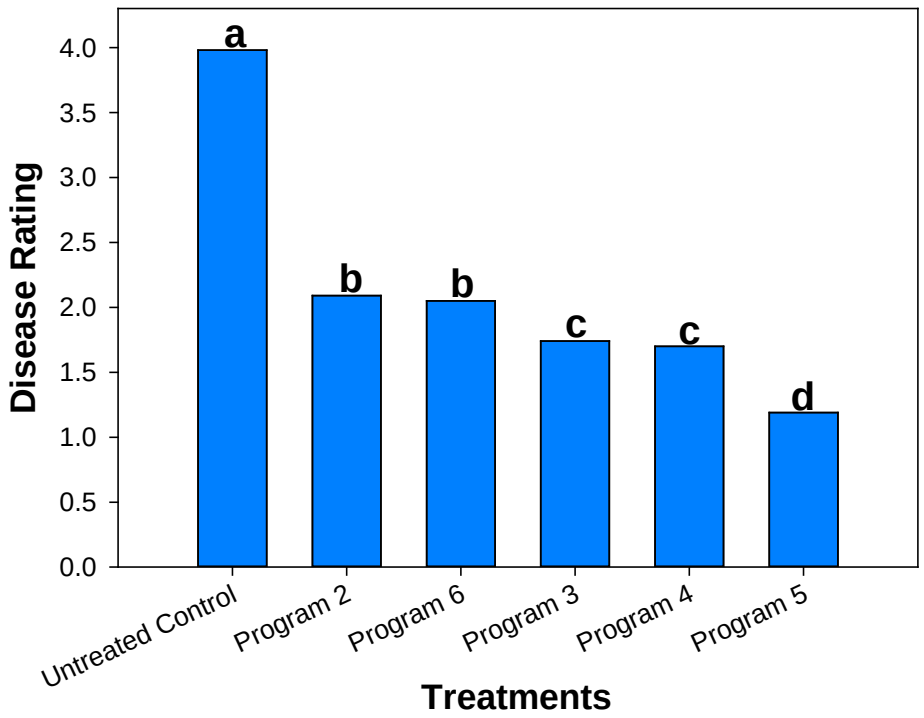


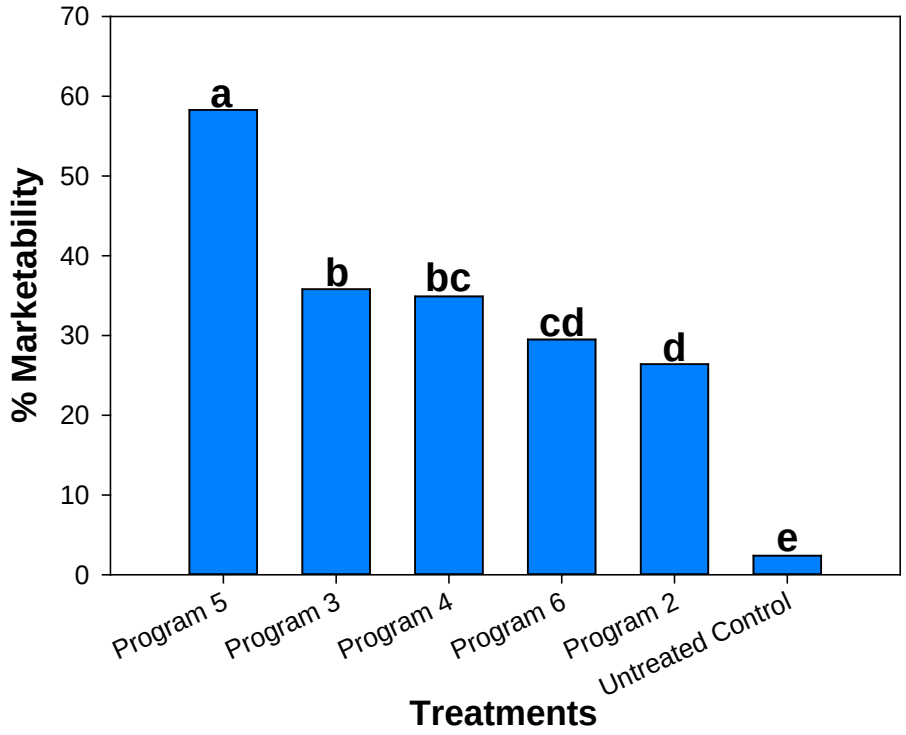


Programs with Quadris Top, 2010

Date	April 1	May 4	June 2	June 14	July 9	Aug. 9
Program 1	Untreated control	Untreated control	Untreated control	Untreated control	Untreated control	Untreated control
Program 2	Headline (12 fl oz)	Kocide 3000 (3.5 lb)	Headline (12 fl oz)	Kocide 3000 (3.5 lb)	Kocide 3000 (3.5 lb)	Headline (12 fl oz) + 2% 435 Oil
Program 3	Quadris Top (12 fl oz)	Kocide 3000 (3.5 lb)	Quadris Top (12 fl oz)	Kocide 3000 (3.5 lb)	Kocide 3000 (3.5 lb)	Quadris Top (12 fl oz) + 2% 435 Oil
Program 4	Quadris Top (15.4 fl oz)	Kocide 3000 (3.5 lb)	Quadris Top (15.4 fl oz)	Kocide 3000 (3.5 lb)	Kocide 3000 (3.5 lb)	Quadris Top (15.4 fl oz) + 2% 435 Oil
Program 5	Quadris Top (15.4 fl oz)	SA 123 (6 pints)	Quadris Top (15.4 fl oz)	SA 123 (6 pints)	SA 123 (6 pints)	Quadris Top (15.4 fl oz) + 2% 435 Oil
Program 6	SA 123 (6 pints)	Kocide 3000 (3.5 lb)	SA 123 (6 pints)	Kocide 3000 (3.5 lb)	Kocide 3000 (3.5 lb)	SA 123 (6 pints)

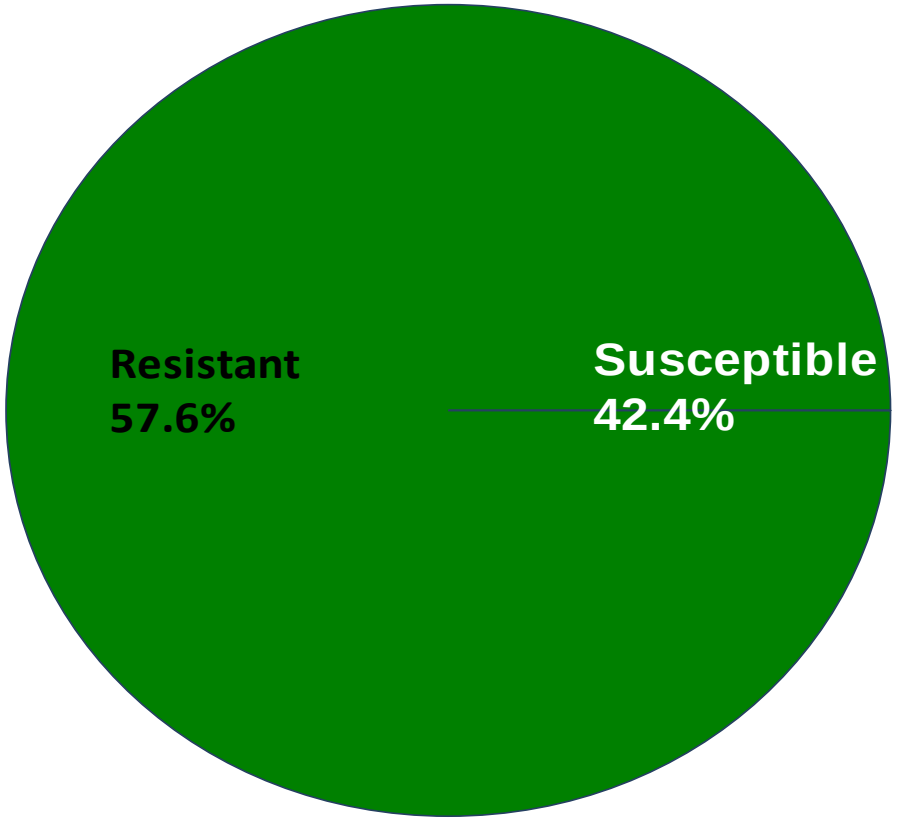
Efficacy on Murcott with Strobilurin Resistance



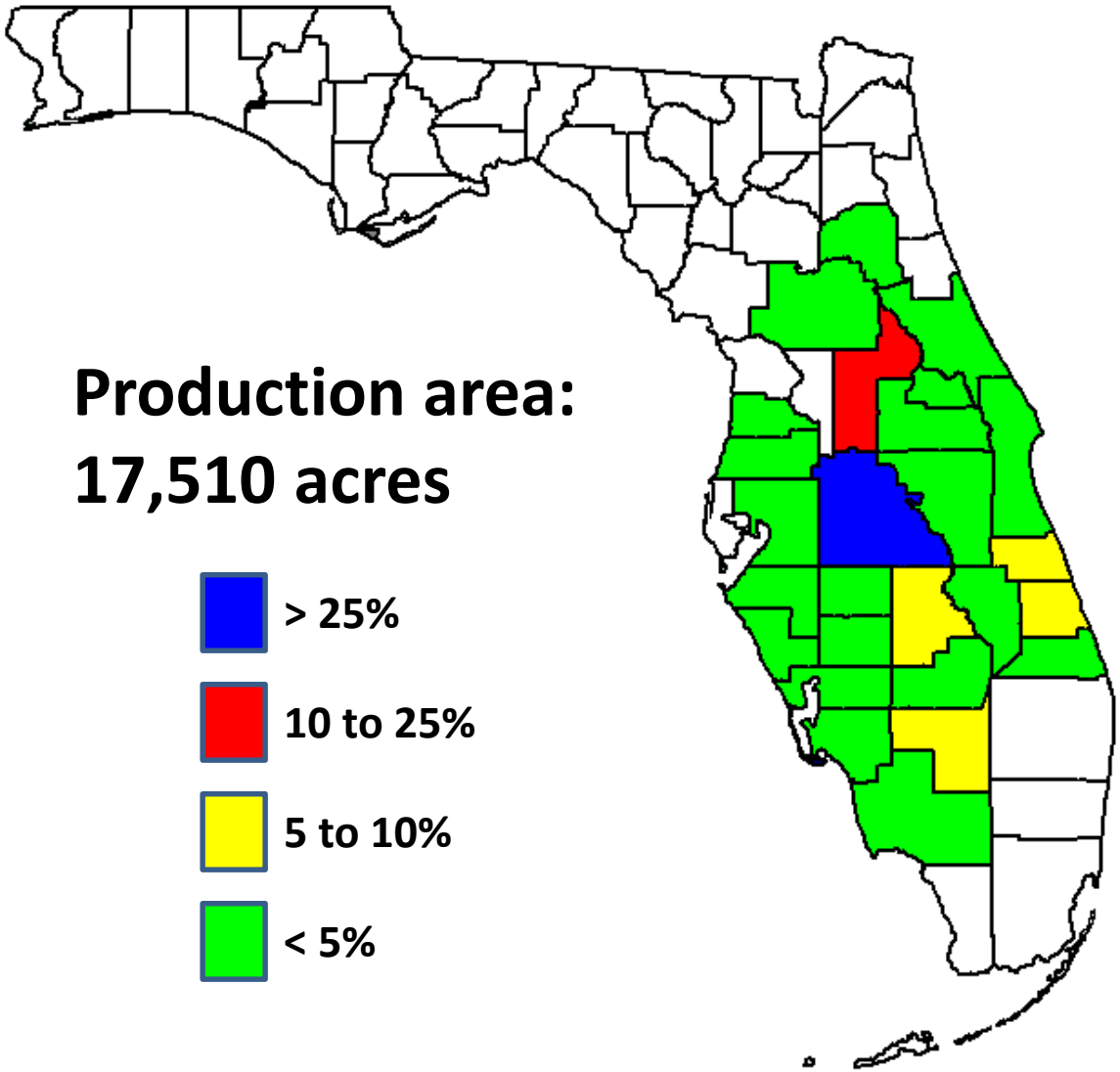


Proportion of Population Sampled

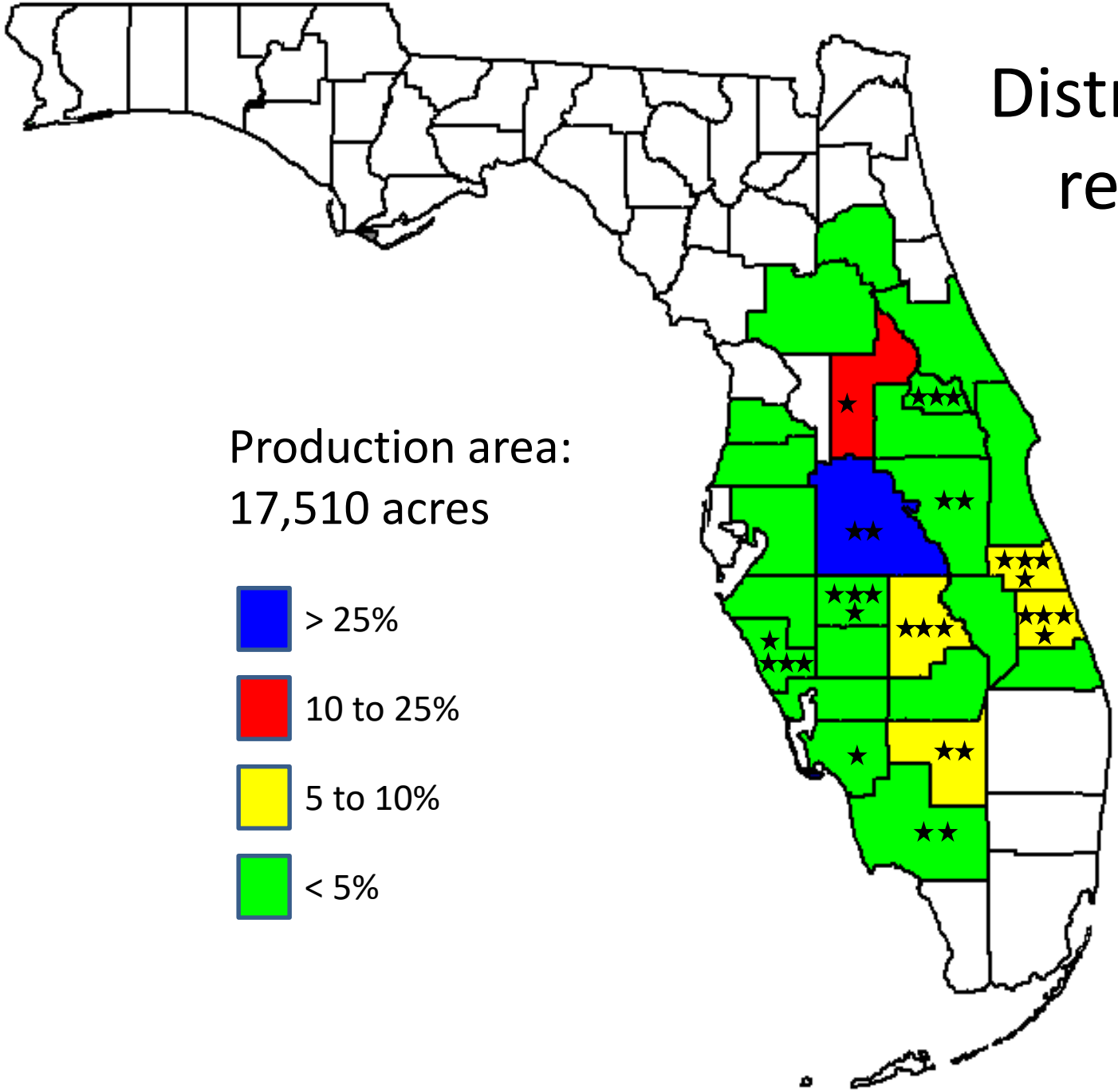
- 2008 - 2012



Tangerine Production in Florida



Distribution of resistance



Production area:
17,510 acres

- > 25%
- 10 to 25%
- 5 to 10%
- < 5%

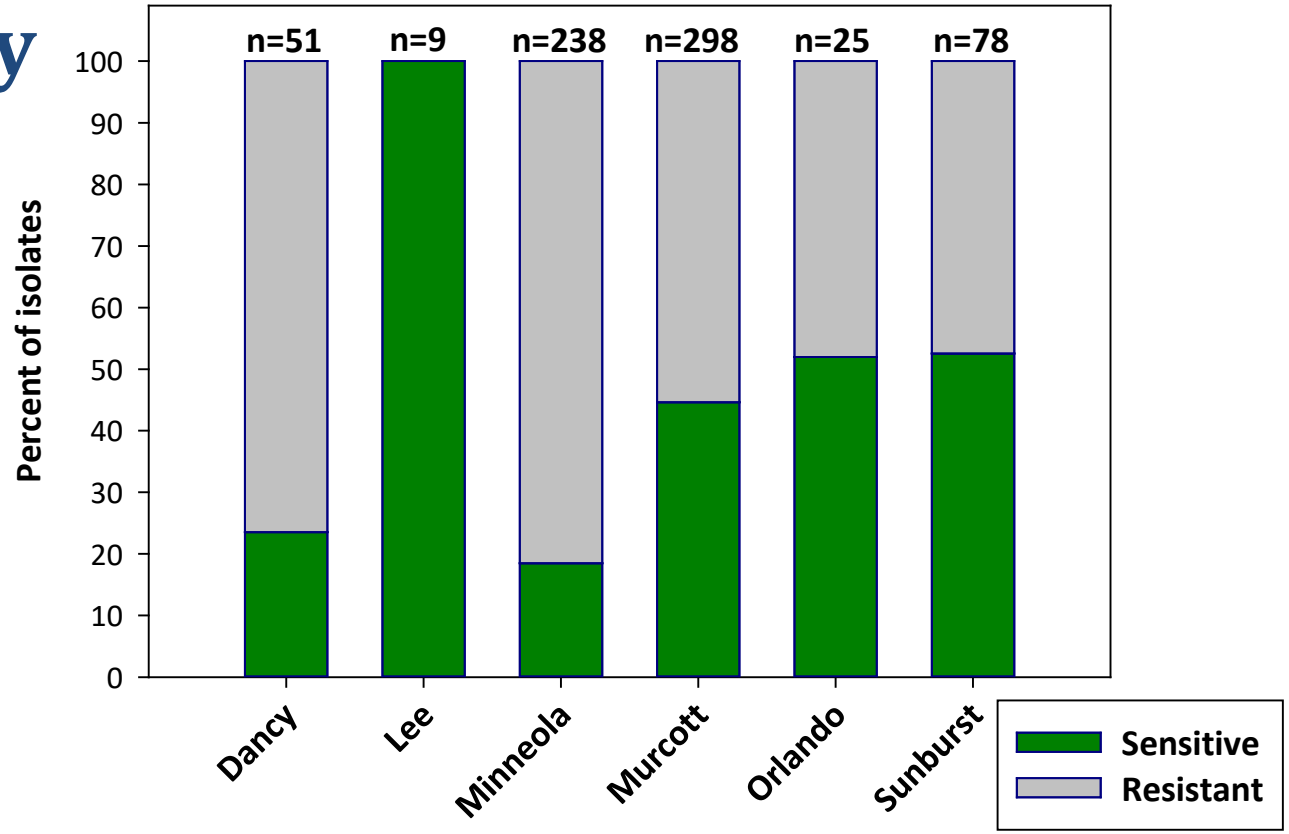
Resistance:

- ★ < 50%
- ★★ 50 to 70%
- ★★★ 70 to 90%
- ★★★★ > 90%

Cultivar

Susceptibility

- Minneola
- Dancy
- Murcott
- Orlando
- Sunburst, Lee

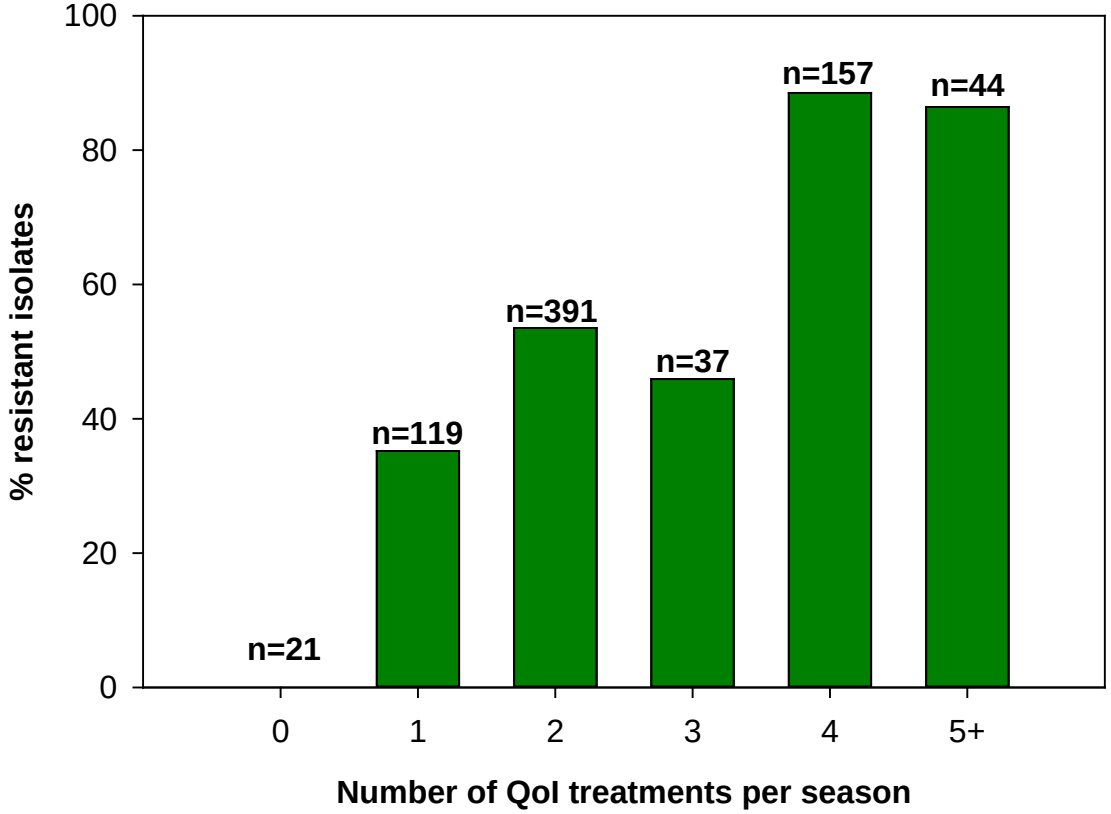


$P < 0.0001$

χ^2: 72.78

Related to QoI Exposure Number

The more applications per season, the more likely you will have resistant isolates



Manage Tangerines As If Resistance Present

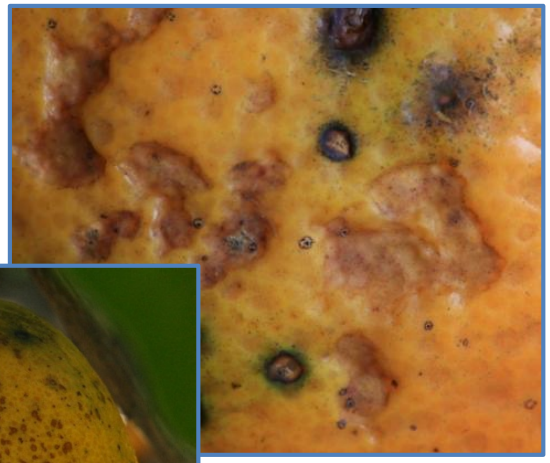
- Should use mixture fungicides with alternative modes of action (in Pest Management Guide)
  - Look at FRAC codes for recommended fungicides
- Frequent rotation with copper or other multisite fungicides like ferbam
- Sample spray program

Quadris Top or Pristine	Copper	Oppo-site premix	Ferbam	Copper	Quadris Top or Pristine
11/3 or 11/7	M1	11/7 or 11/3	M3	M1	11/3 or 11/7

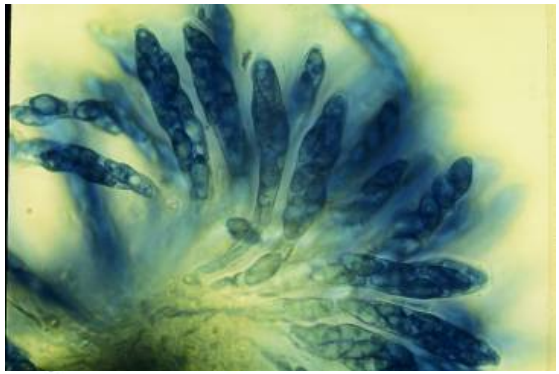
CITRUS BLACK SPOT

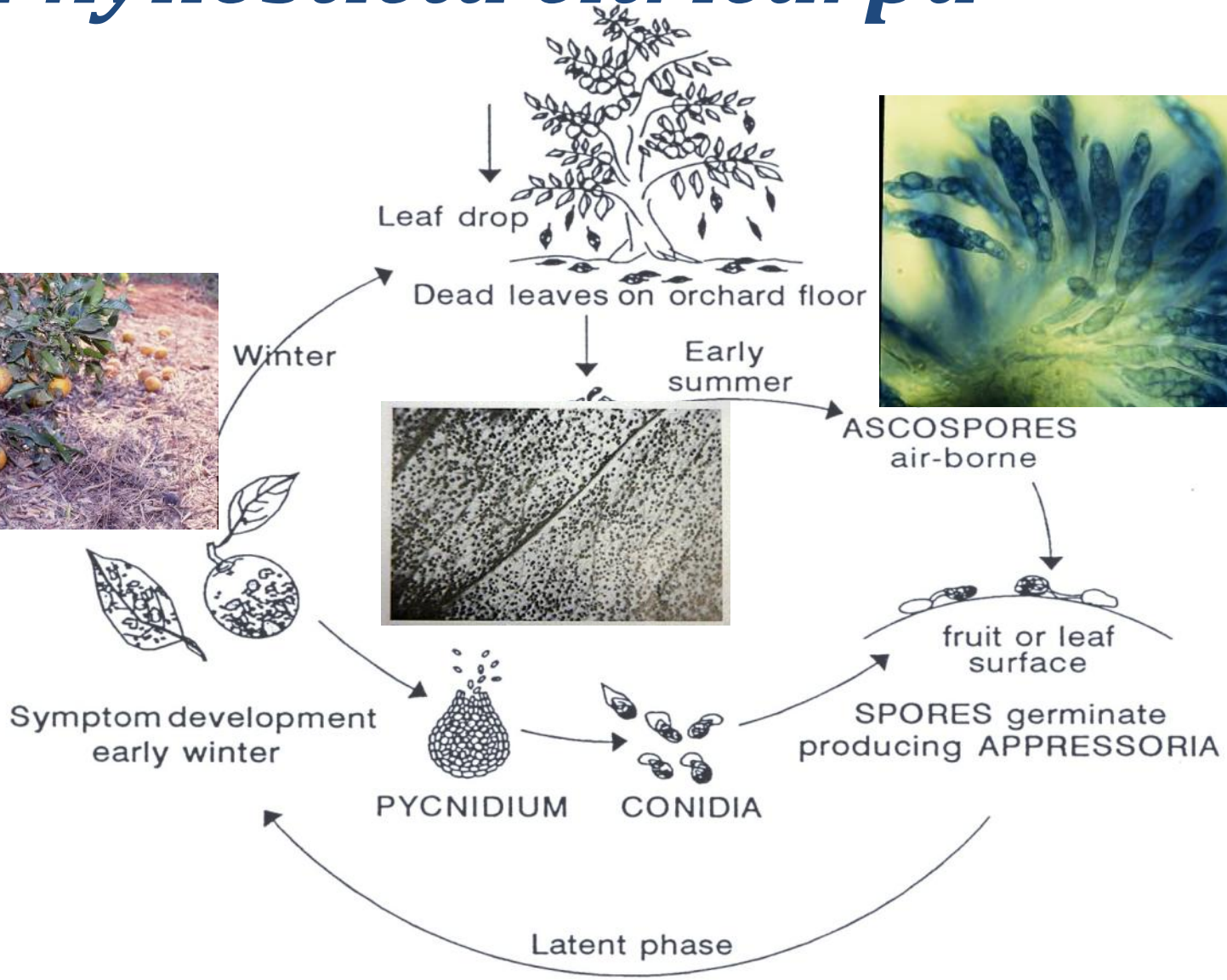
Cracked Spot and Hard Spot

False Melanose and Virulent Spot



Black Spot Disease Cycle Caused by *Phyllosticta citricarpa*





Leaves Are Nearly Symptomless

- On oranges, if chemical control used, symptoms rare
- Does not mean leaves are not infected
  - Certain proportion will harbor the organism
- When symptomatic trees removed, not likely removing disease from grove
- Need to balance between cost of lost trees, likely replant success with HLB, and cost of living with black spot

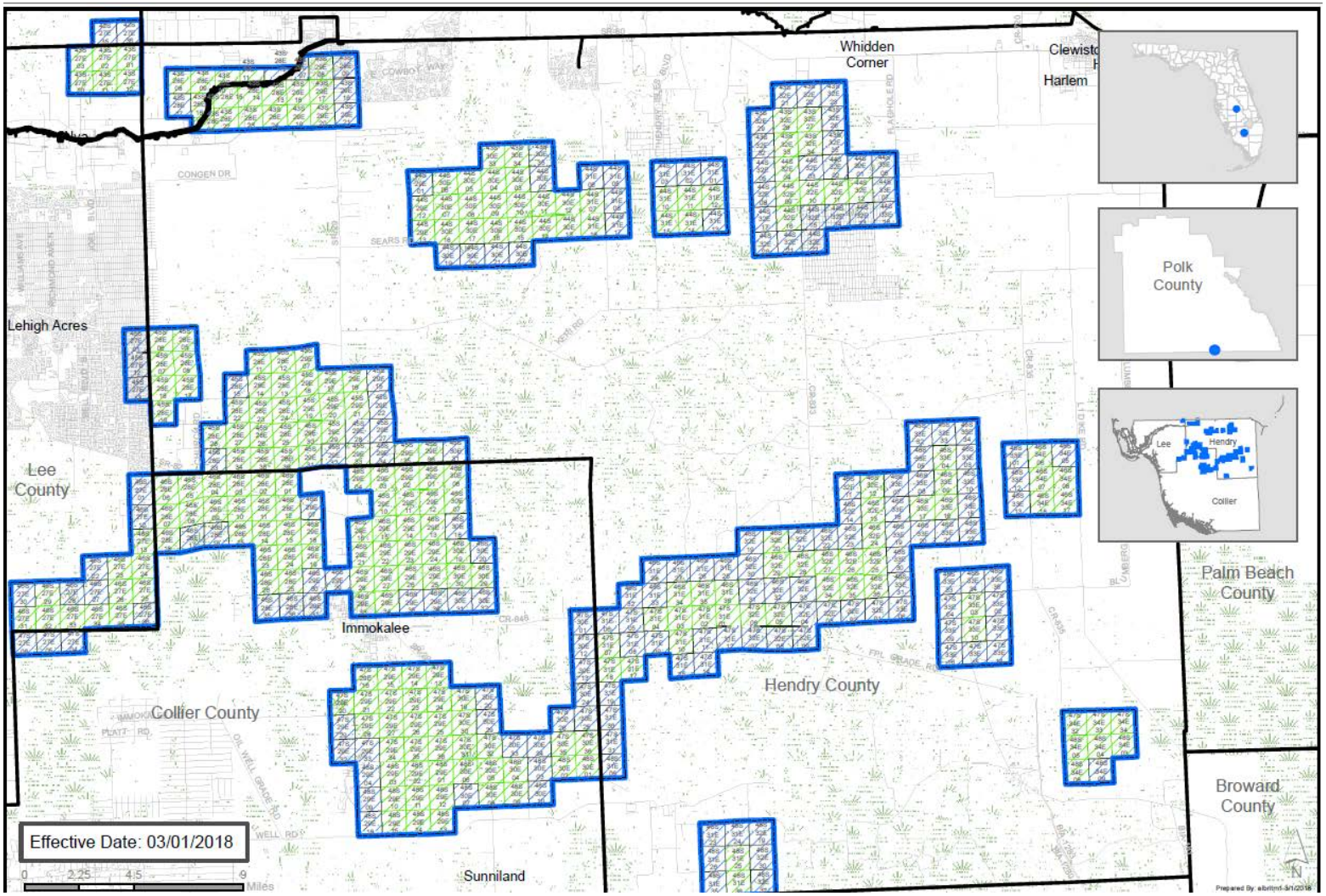
Spores of importance

- Only one spore type present in Florida
  - Only splash dispersed conidia present
  - Every other location with disease has two: ascospores and conidia
- Known to be abundant in the leaf litter
  - Present in high numbers all year
  - When in canopy, tend to move down more than splash up
  - Rain splash likely moves spores into lower canopy from leaf litter

Effects of Irma

- Irma likely moved black spot to new areas
  - Difficult to determine how far may have moved
  - May not see result for up to five years
    - Latent period of disease in groves
- If downwind of black spot groves at significant risk of outbreak
  - Should be scouting regularly for symptoms
  - Ask for FDACS multipest survey if concerned that disease in grove
- This is in addition to current spread

Current locations in Florida



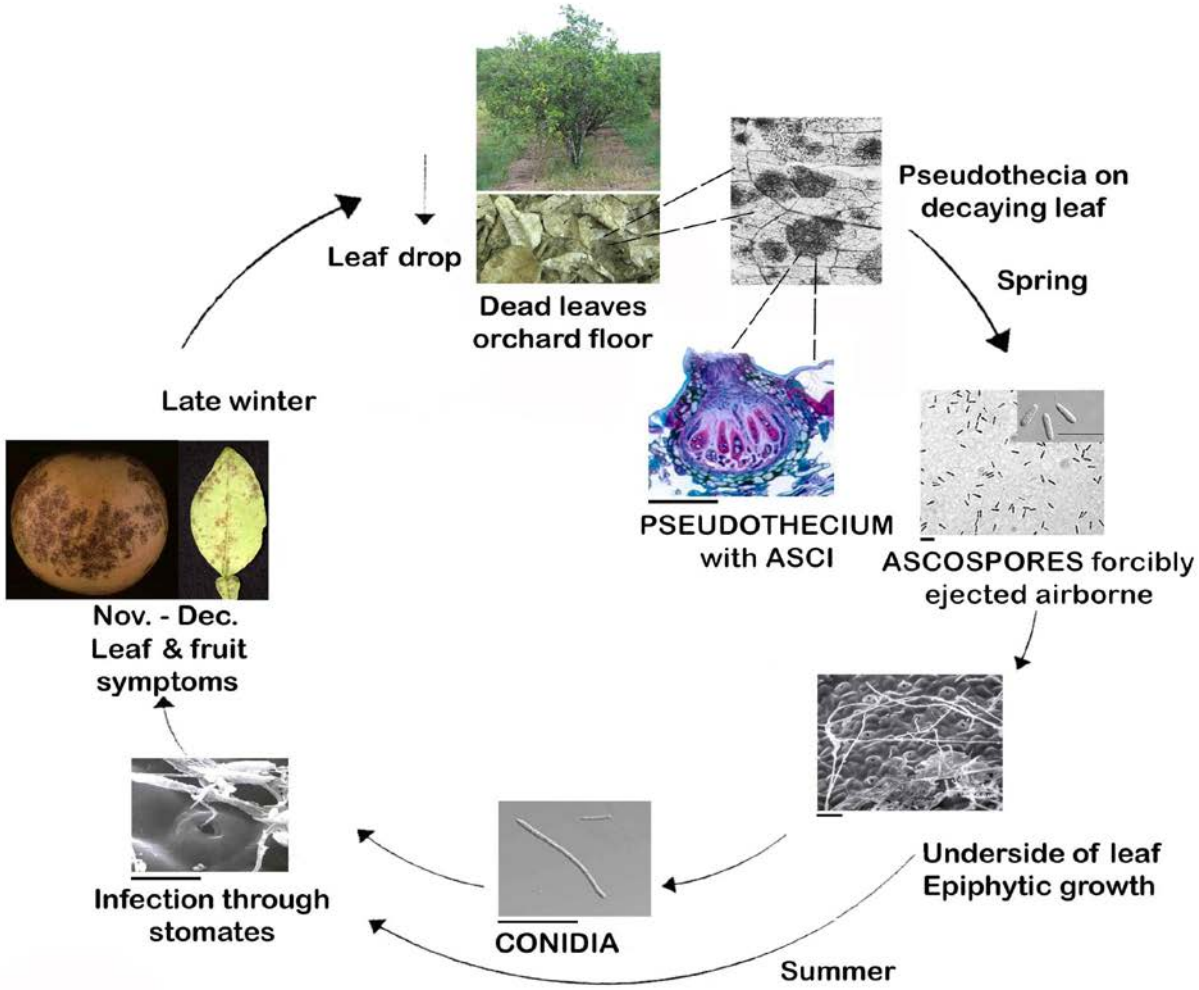
Black spot program

- Fungicide applications should start mid-April to early-May
  - Dependent on April rainfall
- Monthly applications until September of fungicide
- Alternate copper (full rate of chosen product) with a strobilurin, a premix, or Enable
  - Preferable to alternate among modes of action
  - Strobs are Abound, Gem, Headline
  - Premixes are Pristine (SDHI), Amistar Top (DMI), and Priaxor (SDHI) and contain a strobilurin
- Coverage is key so at least 125 gal/acre and slow!

GREASY SPOT

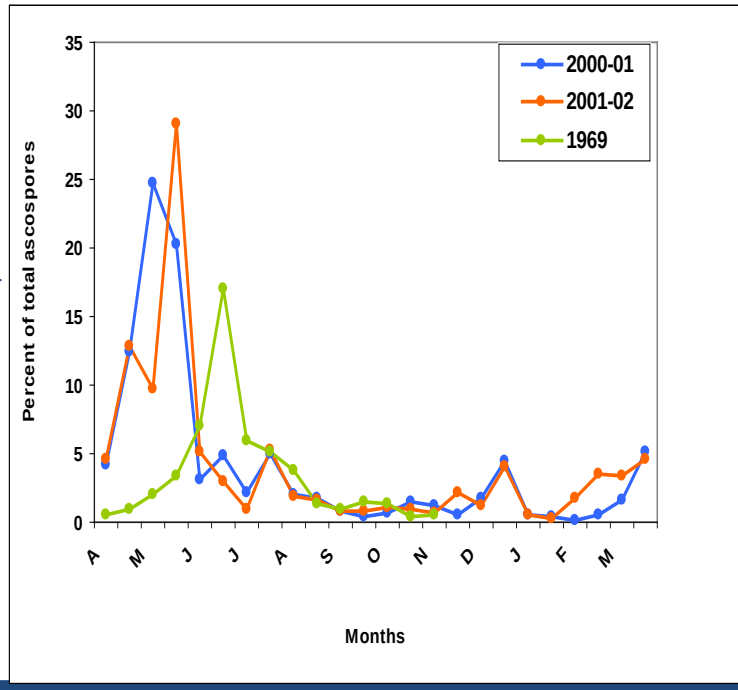
Symptoms

Greasy Spot Disease Cycle
Mycosphaerella citri



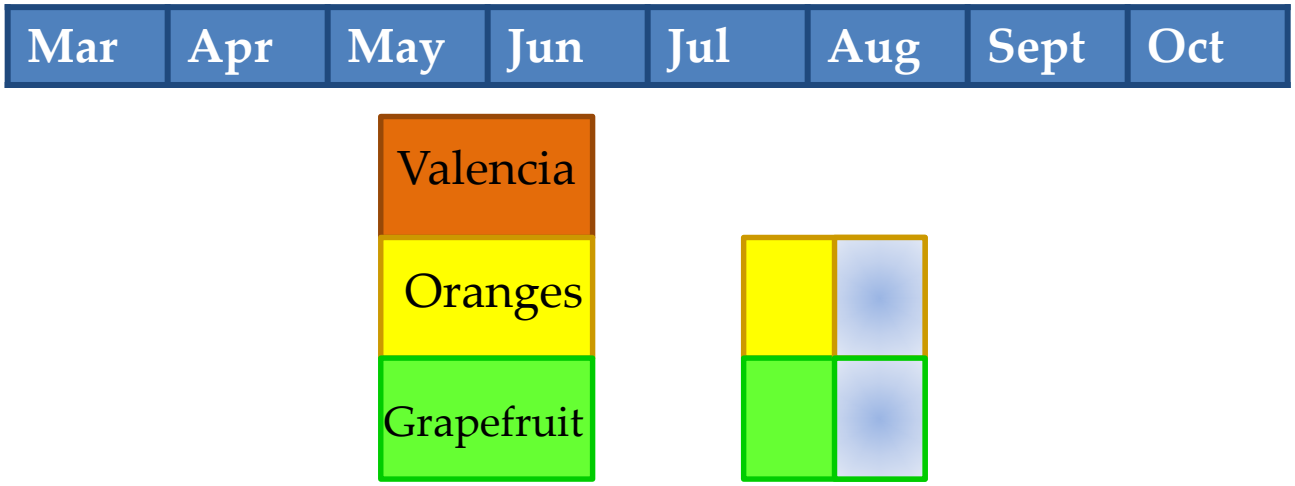
Inoculum Production

- Primary inoculum from leaf litter
  - Ascospores (sexual) ejected during wetting events
  - Spores form in structures in partially decomposed leaf litter
  - Wetting and drying of litter important for spore formation



Greasy Spot Control

- Control products
  - Copper - All formulations
  - Strobilurin fungicides (Abound, Gem, Headline, Quadris Top and Pristine)
    - Only once a year for greasy spot



Further Products

- Fungicides effective for greasy spot
  - Enable – good substitute for copper if concerned with stippling
- Petroleum oil
  - Less consistent control on fruit than copper
  - Can be mixed with all other fungicides

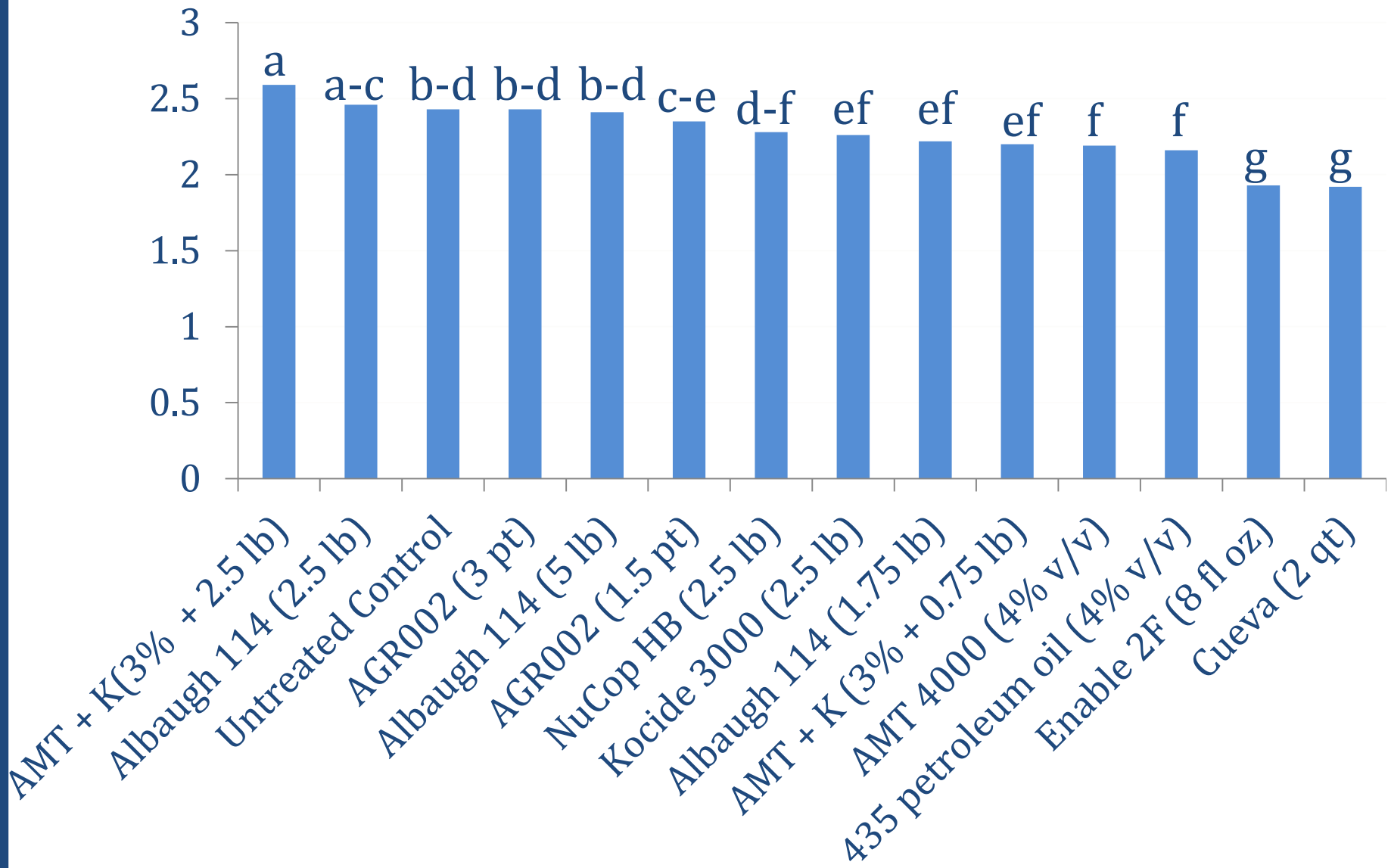
Copper Formulations and Products Rates Tested on Grapefruit

Treatment	Metallic Cu (%)	Rate /acre	Metallic Cu/acre
AGR002	--	1.5 pt	--
AGR002	--	3.0 pt	--
Cueva	1.8	2.0 qt	--
Nu-Cop HB	50	2.5 lb	1.25
AMT 4000	--	4% v/v	--
AMT 4000 + Kocide 3000	30	3 % v/v + 0.75 lb	0.225
AMT 4000 + Kocide 3000	30	3 % v/v + 2.5 lb	0.75
Albaugh 114	--	1.75	--

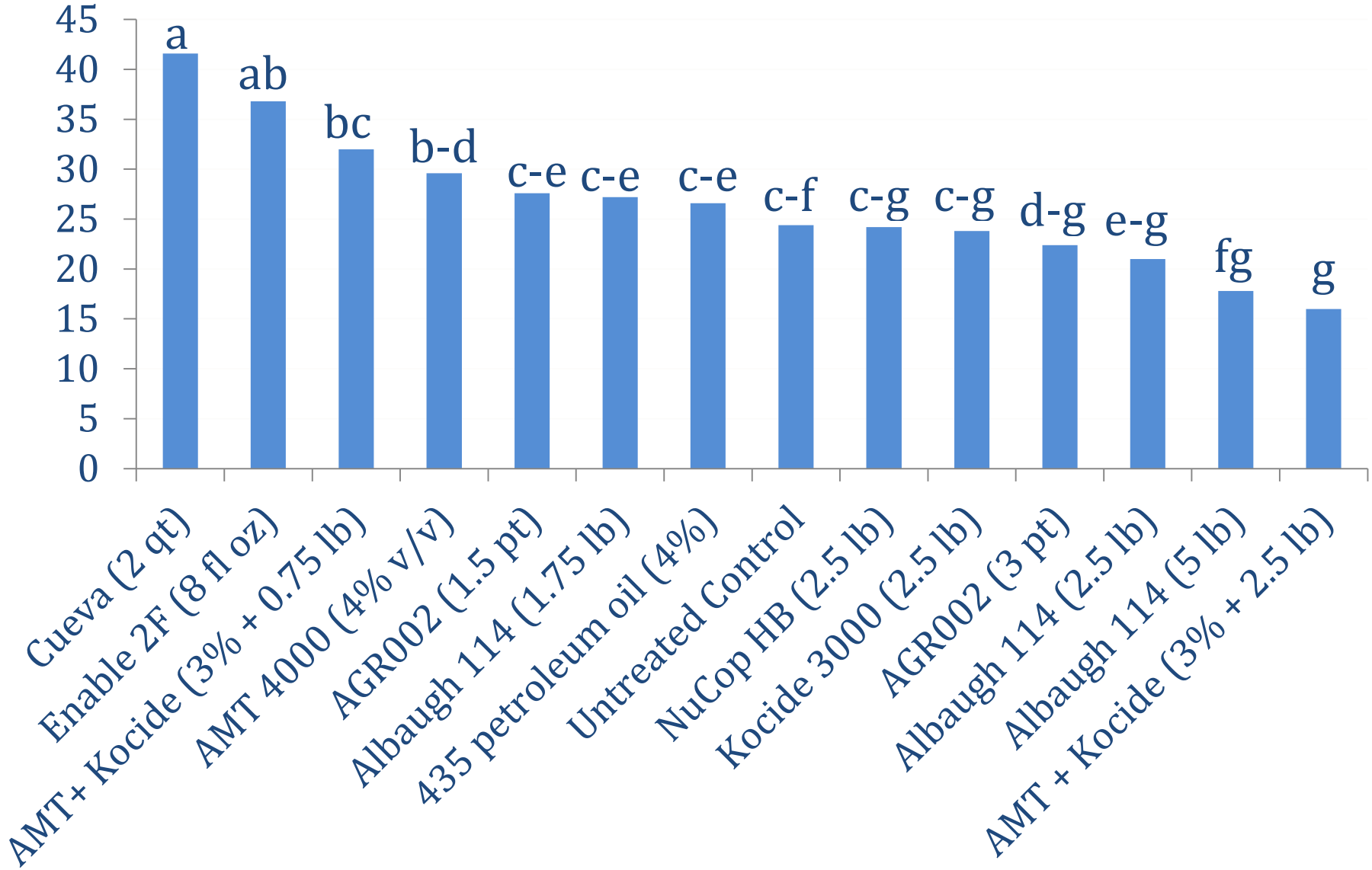
Copper Formulations and Products Rates Cont.

Treatment	Metallic Cu (%)	Rate (lbs/acre)	Metallic Cu/acre
Albaugh 114	--	2.5	--
Albaugh 114	--	5.0	--
435 Petroleum Oil	--	4% v/v	--
Untreated Control (UTC)	--	--	--
Enable 2F	--	8 fl oz	--
Kocide 3000	30	2.5 lb	0.75

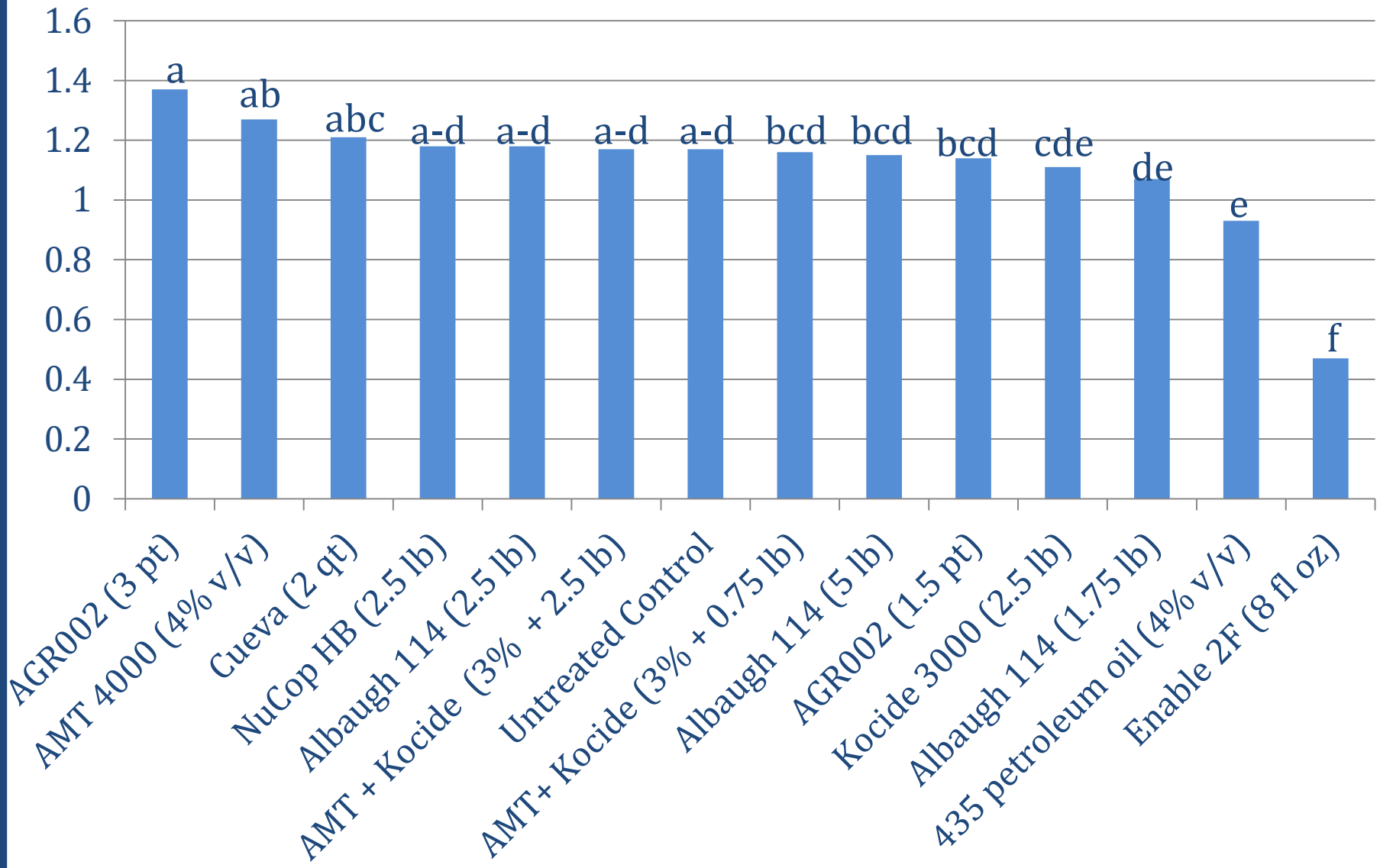
Rind Blotch Control



% Marketable Fruit



Greasy Spot (Leaves)



Summary

- Disease incidence consistently increased over the four years of the trial
- Despite conidia being only spore type present, enhanced leaf litter management improved disease management
- Soilset had the greatest reduction in disease incidence and severity
  - Urea did not have the same effect

Acknowledgments

- Ke Zhang
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- André Bueno Gama
- Daniel Perondi
- Katia Rodrigues
- Funding sources:

USDA United States Department of Agriculture

National Institute of Food and Agriculture

CRDF Citrus Research and Development Foundation, Inc.

UF IFAS Extension UNIVERSITY of FLORIDA

Any Questions?