



DETECTION AND MANAGEMENT OF CITRUS BLACK SPOT

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Black spot: A Fungal Disease



- Causal agent: *Guignardia citricarpa*
 - Asexual name: *Phyllosticta citricarpa*
- Hosts: Citrus species and hybrids
 - Symptomatic: Sweet oranges, mandarins and tangerines, lemons
- Rind spots cause the economic damage
 - Internal quality unaffected
- Causes premature fruit drop reducing yield
 - Especially on late harvested cultivars

Symptoms Occur on Maturing Fruit

- Restricts export of fresh fruit
 - Mostly to European countries, Japan and U.S
- Unusual to see hard spot more than 2 months before maturity
- Exposure to sunlight increases lesion number
 - Warm temps also increase disease
- Symptoms generally occur on the 'sunny side of trees'

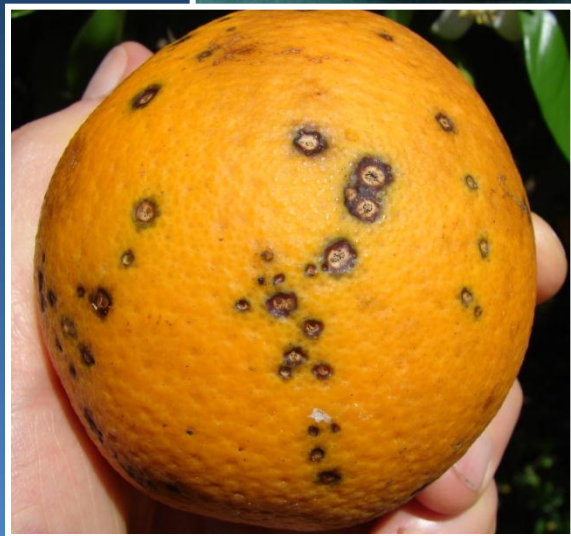
Where to Look When Scouting

- Symptoms occur on maturing fruit
- Start at least 30 days prior to harvest
 - Start scouting now as symptoms have begun to show up
- Target declining trees first
 - Often have more disease
- Examine the lower canopies carefully
- Pay particular attention to the side of the tree with most sun exposure
 - Heat (~ 81°F; 27°C) and ripening stimulate symptom expression

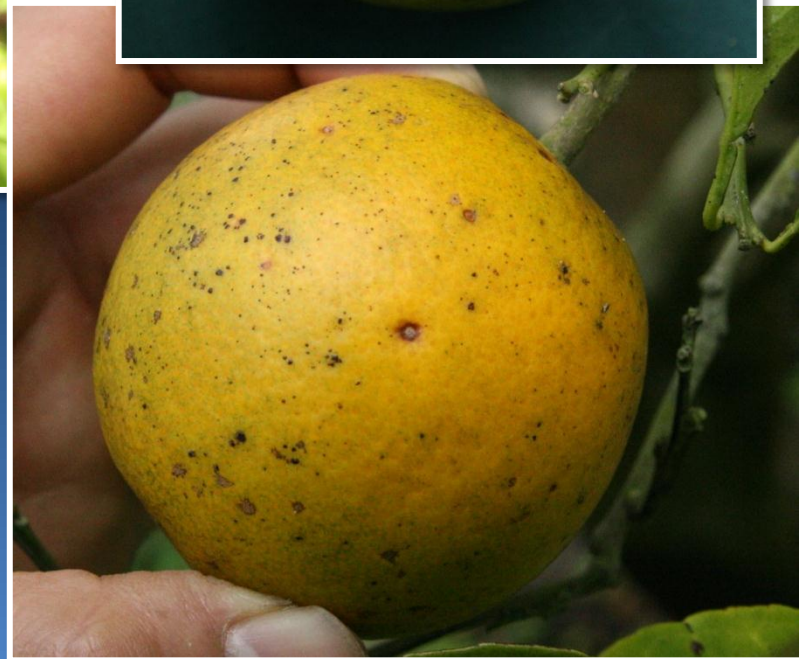
Symptoms: Hard Spot

- The most characteristic symptom
 - If hard spot is found then likely some of the other symptoms will be as well
 - If scouting for disease concentrate on this symptom
- Small round sunken lesions with brick red-chocolate brown margin and tan center
 - Fungal structures often seen as slightly raised pencil-point dots
 - Can have green halo around lesions

Hard Spot



Young Symptoms



Other Fruit Symptoms



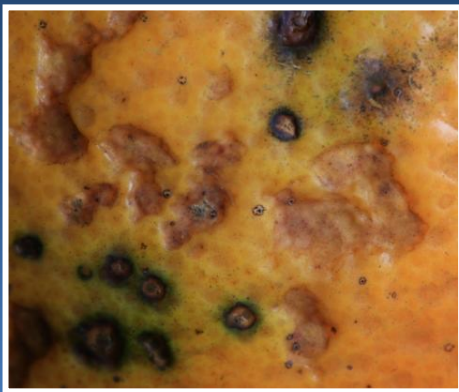
False Melanose



Cracked Spot



Leaf Lesions



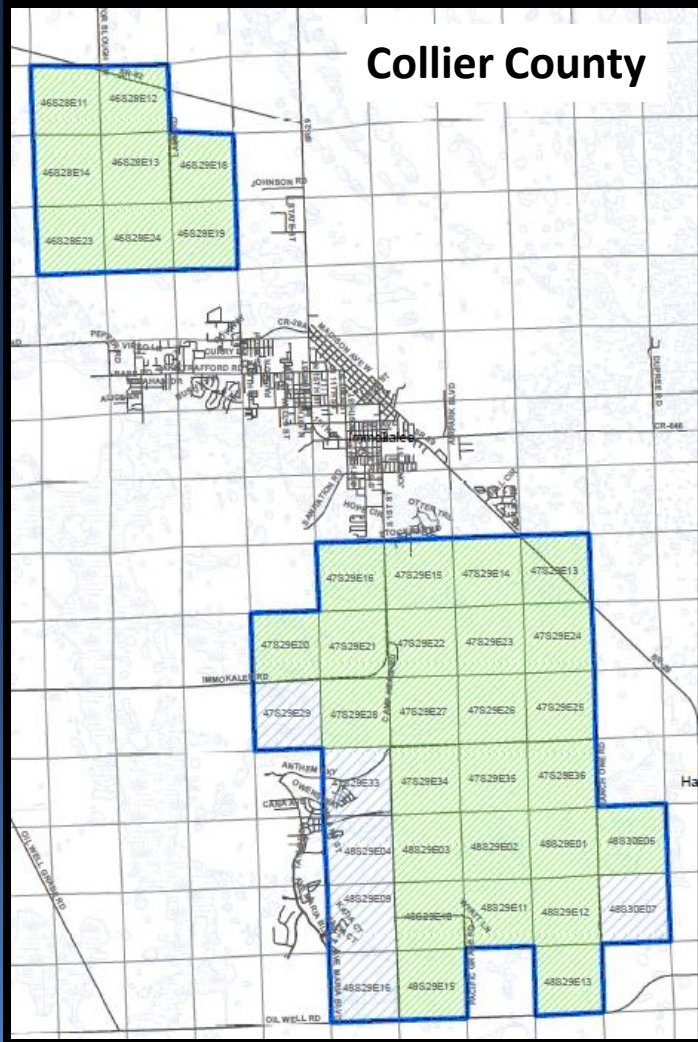
Early Virulent (Freckle) Spot



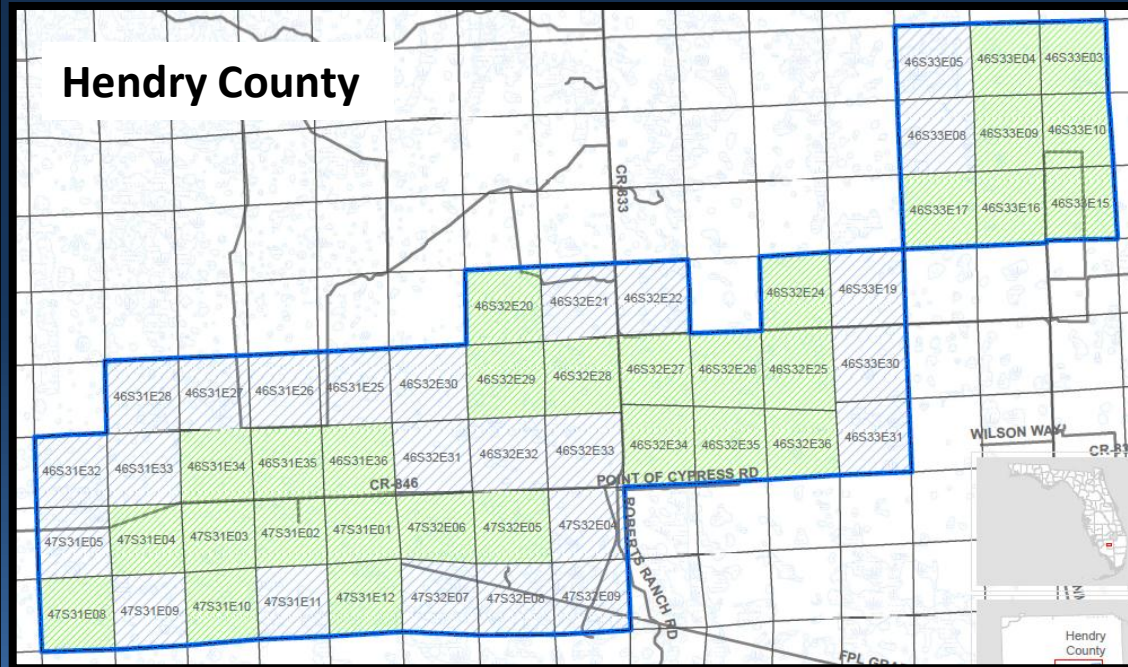
Virulent Spot

Current Locations of the Disease

Collier County

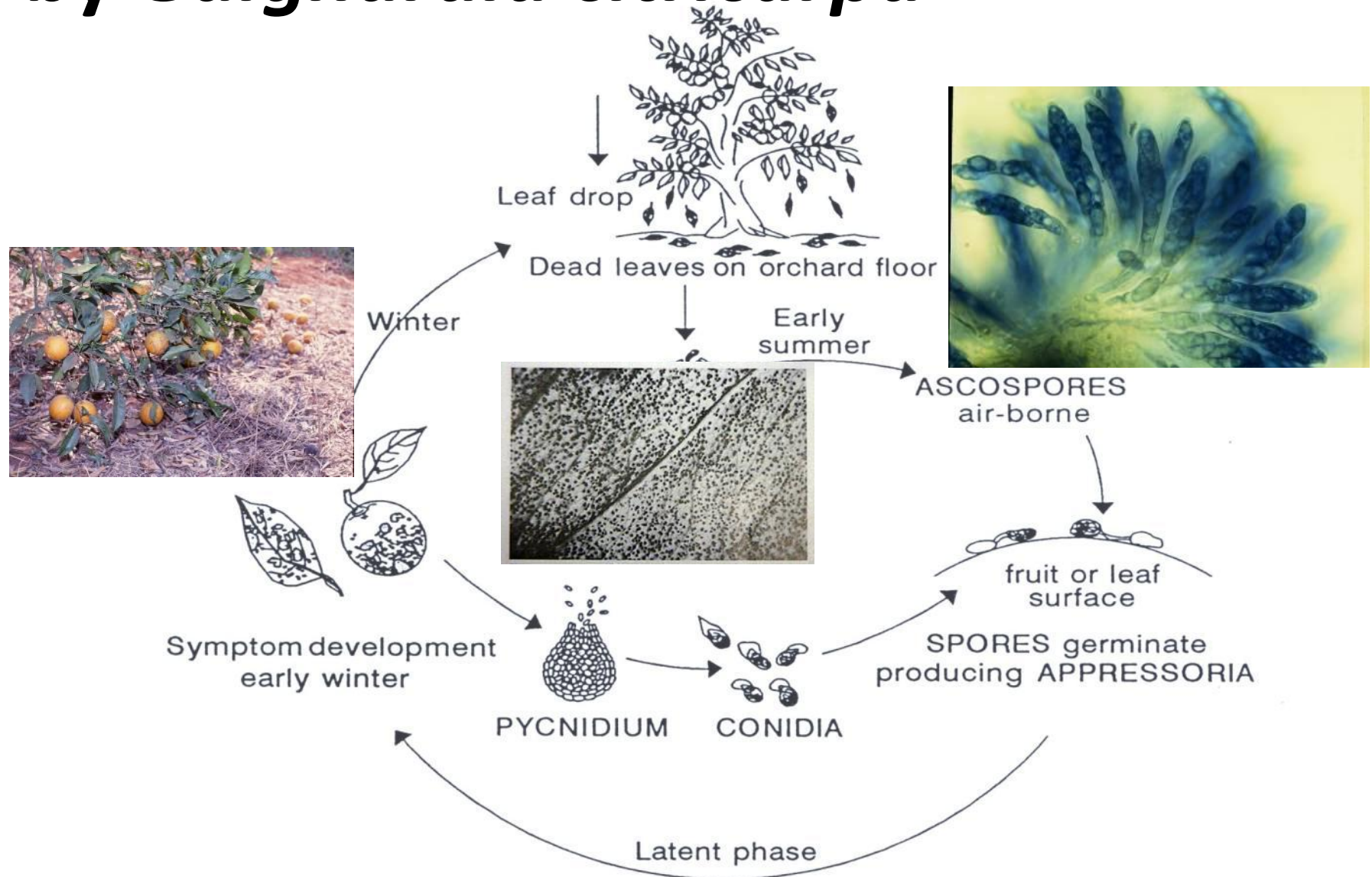


Hendry County



- The green squares contain grove
- The blue lines are the quarantine boundary

Black Spot Disease Cycle Caused by *Guignardia citricarpa*



Disease Cycle Highlights



- Major source of inoculum: decomposing infected leaves on orchard floor (ascospores)
- Additional source of inoculum: lesions on infected fruits, leaves and branches (conidia)
- Means of spread: Wind (ascospores); Water splash (ascospores and conidia)
- Survival of the fungus: leaves, leaf litter branches, fruits and peduncles

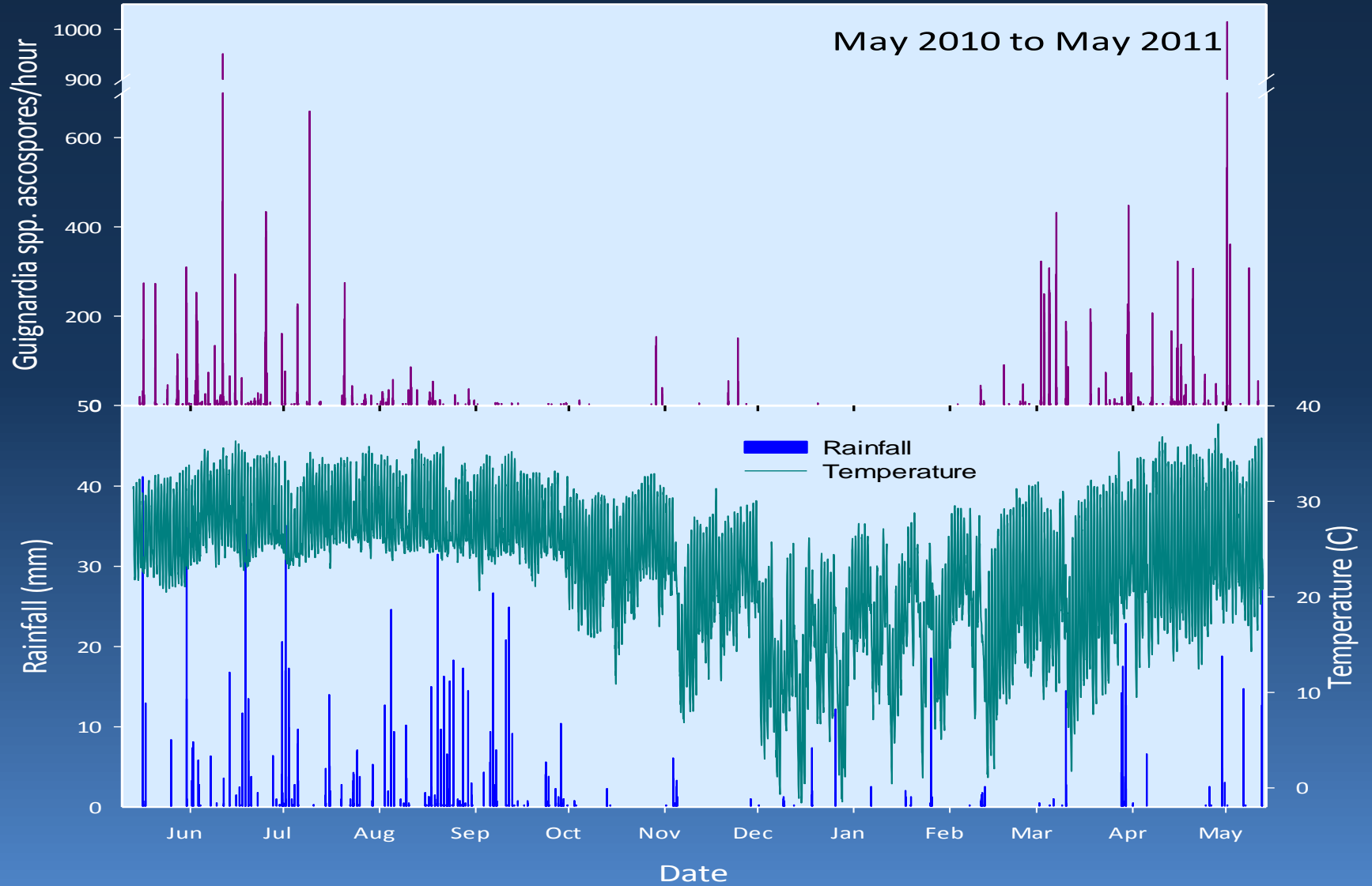
ASCOSPORE EJECTIONS

Our Set Up

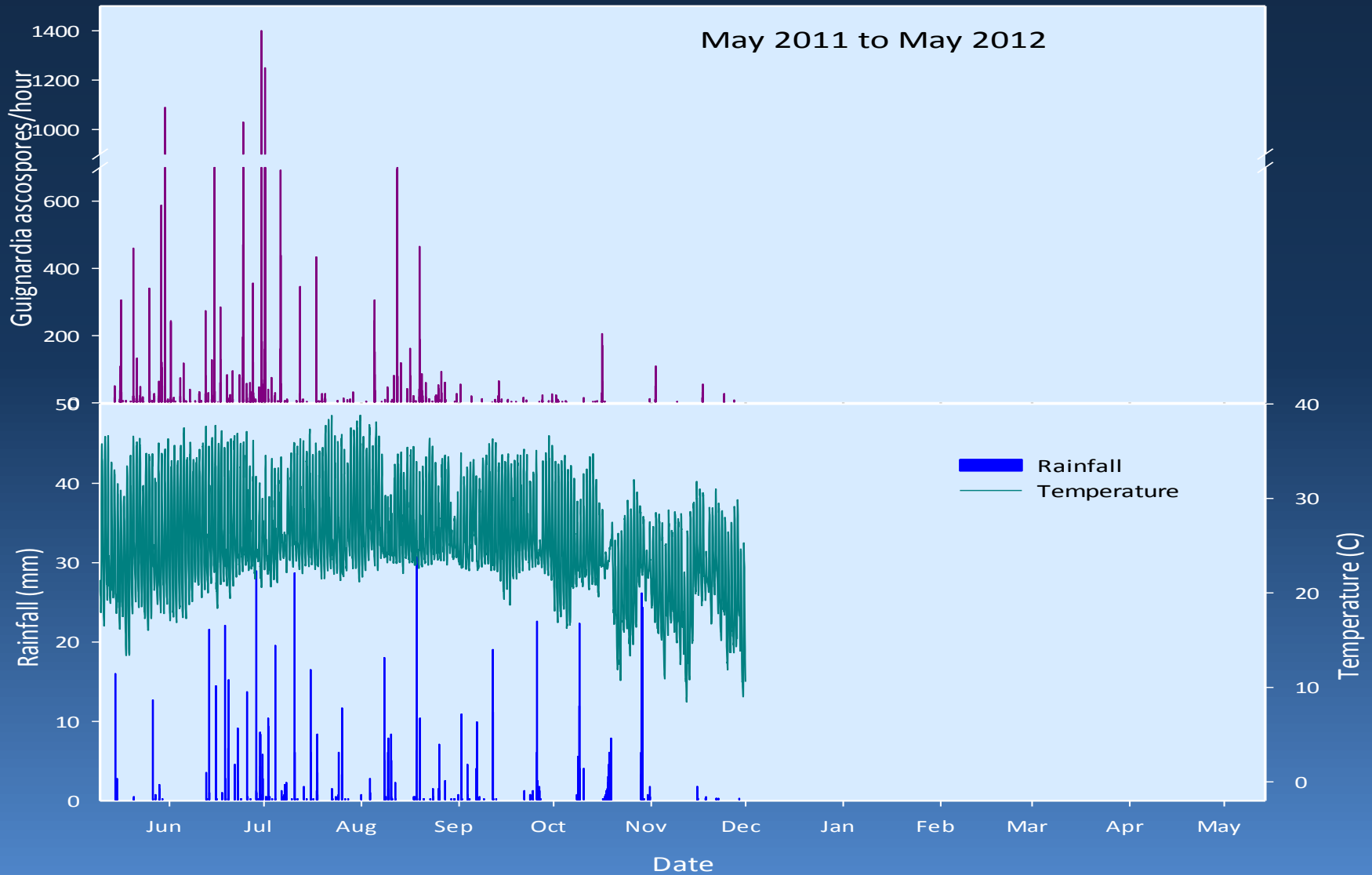
- Two spore traps at 4 sites
- Burkard collects hourly data on slides
- Second spore trap collects daily spores in tubes
- Weather station
 - Rainfall
 - Temperature
 - Leaf wetness
 - Solar radiation
 - Wind speed



Ascospore Ejections Immokalee



Ascospore Ejections Immokalee



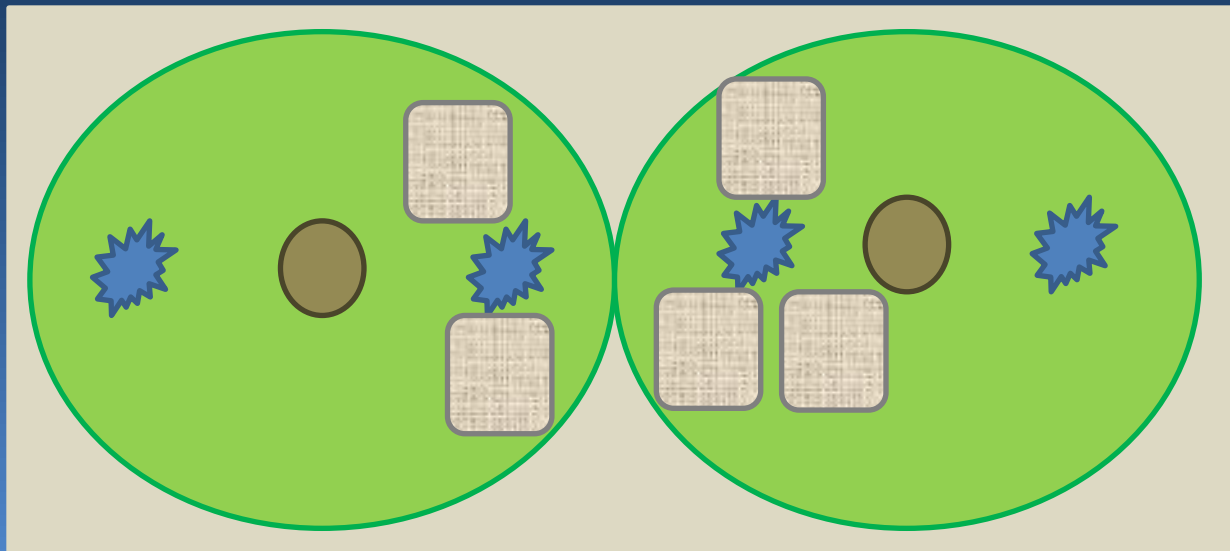
Summary

- Greater numbers of ascospores in 2011 than 2010
 - Likely weather related
 - Ascospore ejections correlated to temperature
- Rain more frequent and heavier in 2011
 - Allows for more fungal structures to form and mature?
 - Role of irrigation?
- Release more steady in 2011
 - Larger jumps in cumulative ascospores in 2010
- 2012 ascospores trapped in 2nd week of January

LEAF LITTER

Leaf Litter Reduction

- 5 sets of 5 screens (0.25 m²) in 0.25 mile (400 m) row
- 5 treatments: Urea, CaCO₃, Soilset, Compost-aid and untreated control

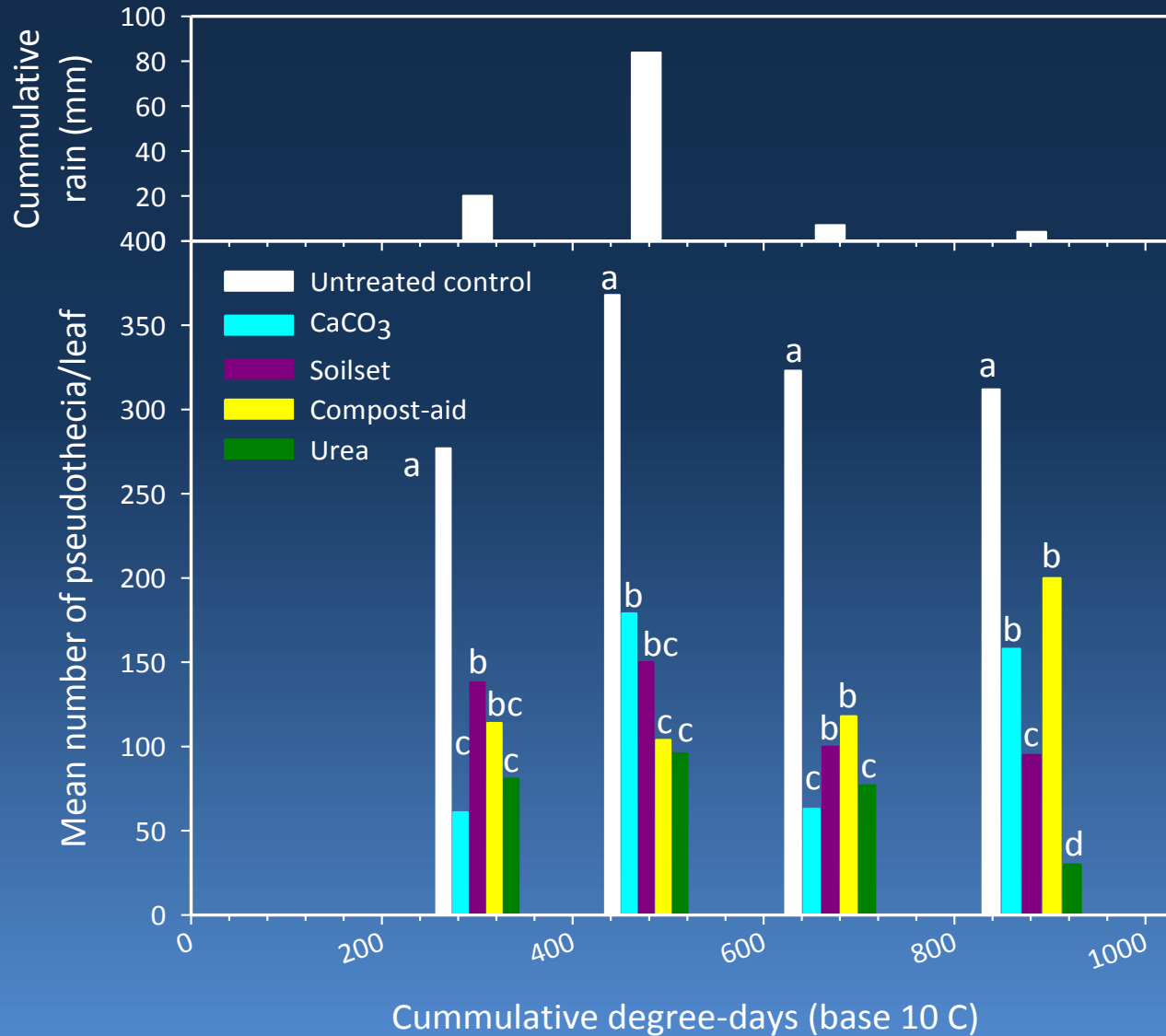


Leaf Litter Reduction

- Sampled leaves every 2 weeks
- Examined under for fungal structures



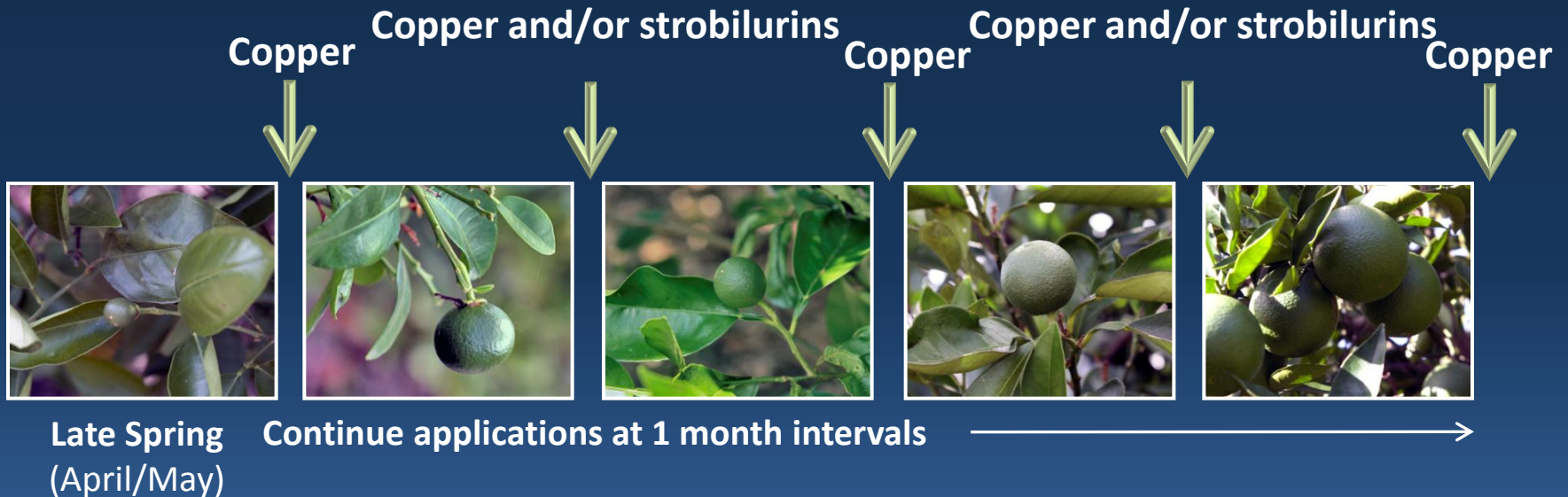
Experiment – February to April 2011



FURTHER MANAGEMENT

Black Spot Application Timing

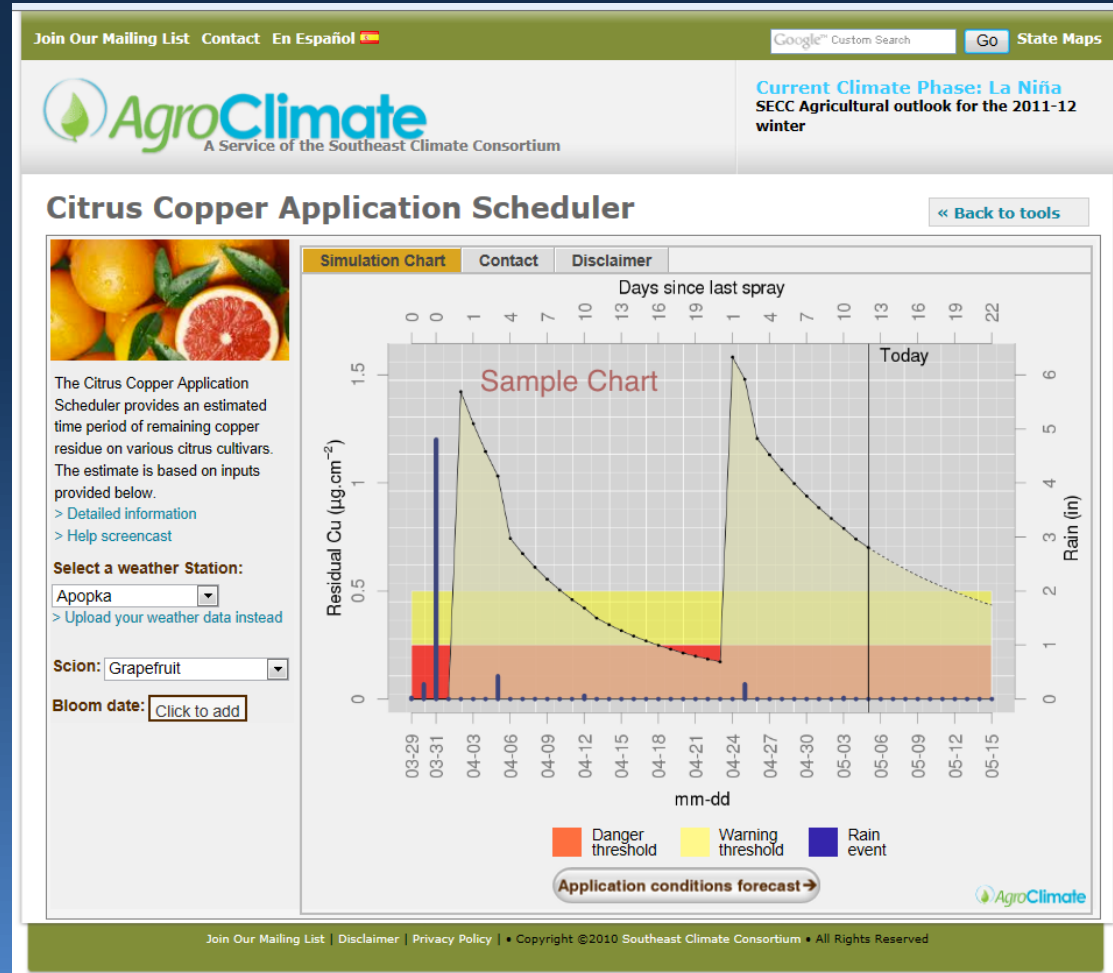
Fruit is susceptible for 5-6 months post-petal fall



Use strobilurins when concerned about copper phytotoxicity

Citrus Copper Application Scheduler (Agroclimate.org)

- Improve copper spray timing over 21-day schedule
- Reduce environmental impact of copper sprays
- Avoid unnecessary copper applications
- Reduce costs
- Warn when residue levels are unexpectedly low



Greater Management Efforts

- No easy fixes or solutions
- Will require an integrated approach
 - Leaf litter management
 - Fungicide applications
 - Use tools to aid application timing
 - Removal of declining trees
- Will not be able to rely on one management method

Cultural Controls

- Avoid moving trash via equipment from one location to another
 - Tarping will need to continue
 - As fresh leaves decompose can produce ascospores
- Increase air flow in trees to reduce leaf wetness
 - Pathogen requires 24-48 hours of wetness to infect
- When replanting, avoid cultivars with significant off-season bloom
 - Remove trees with off-season bloom
- Maintain good tree health
 - Trees that are in poor health become more severely infected

Cultural Controls cont.

- Harvest infected blocks as soon as possible
 - More fruit will be lost as symptoms become severe
- Use clean nursery trees for planting
- Consider mulching in addition to leaf litter management
- Prune out dead wood
 - Source of spores
- Wind breaks to slow ascospore movement
 - Will cause greater wetting periods and potentially greater infection

Acknowledgements



Brandon McCauley and
Jiahuai Hu



Sachindra Mondal
and Jenna Lastinger