



CITRUS BLACK SPOT MANAGEMENT

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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 like Valencia

Symptoms Occur on Maturing Fruit

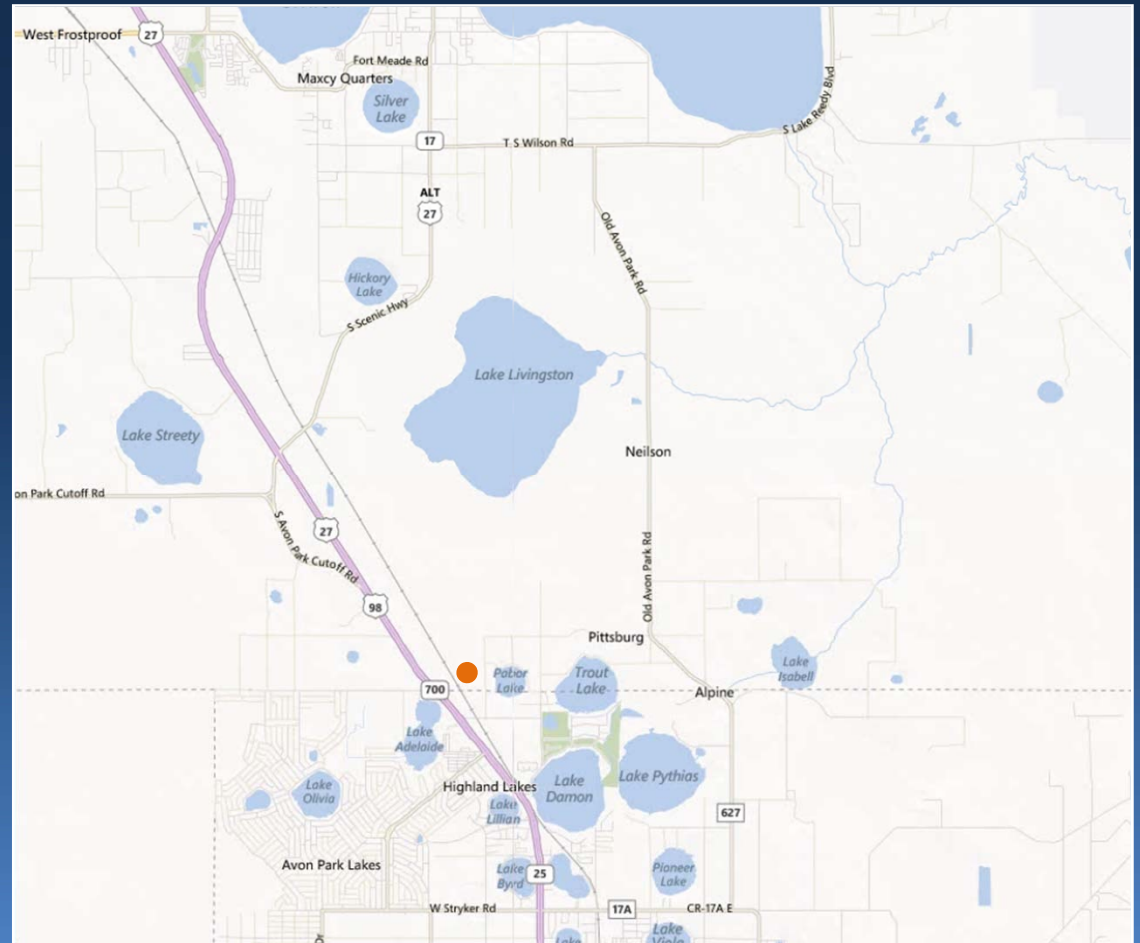
- Unusual to see hard spot more than 2 months before maturity
- Exposure to sunlight increases lesion number
 - Warm temps also increase disease
- Symptoms generally occur on the 'sunny side of trees'
- Symptoms that can occur on green fruit
 - Cracked spot
 - False melanose

Symptoms Observed This Season



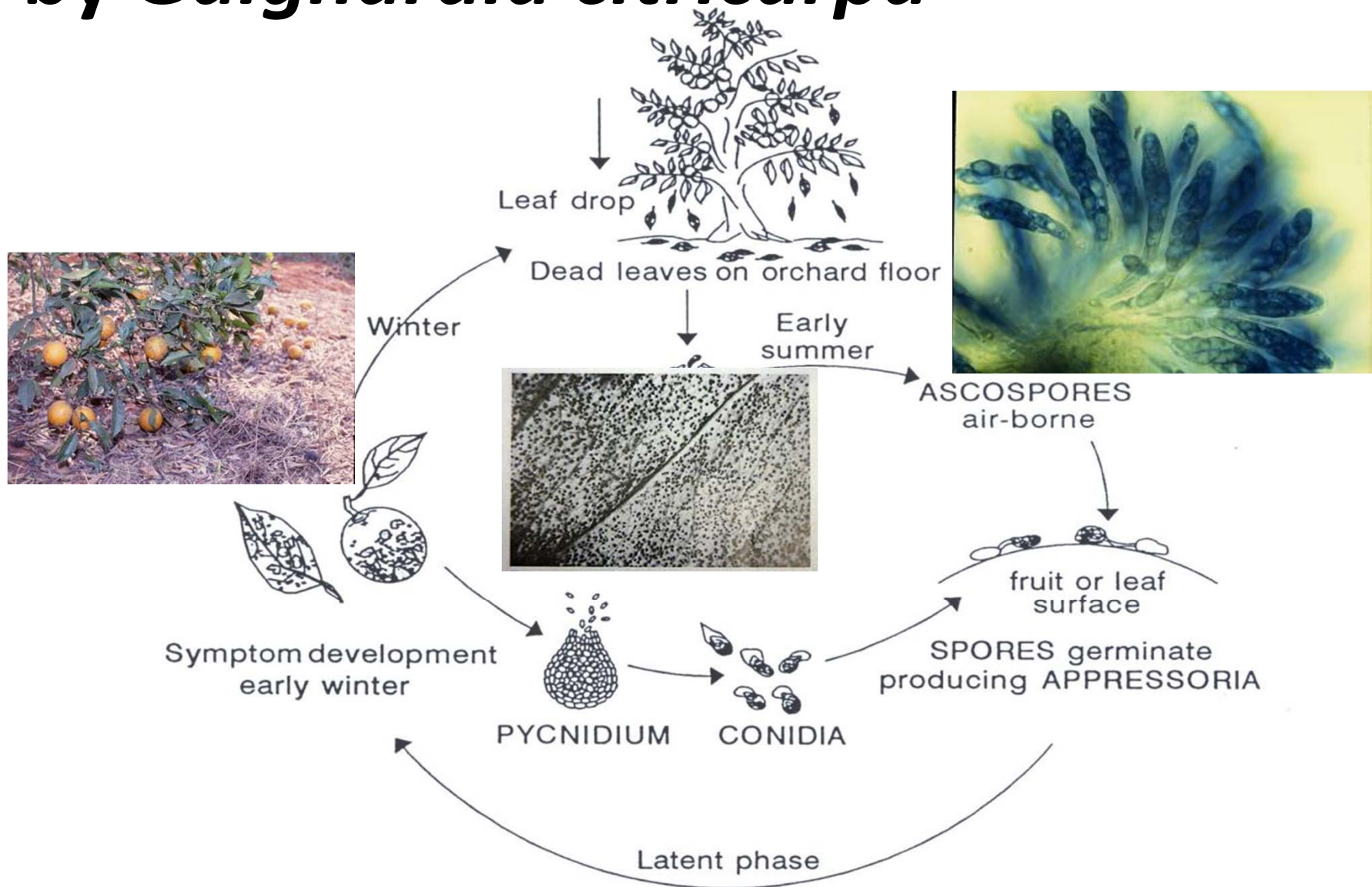
New Geographical Location

- South Polk County
- Observed symptoms: few lesions on 1 fruit
- Likely further undetected infected trees



Bing maps

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

Leaves Are Nearly Symptomless

- On oranges, if chemical control used, symptoms extremely 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



Plant Debris Movement

- Needs to be minimized to reduce spread
 - Tarping is necessary
 - Have seen tarping machine prototypes built
- All vehicles and equipment
 - Canker decontamination materials (quat) will work
- Fruit loads if possible as well
 - Dr. Reza Ehsani can commercialize machine developed for mechanical harvesting
 - Noticing greater twig breakage during harvest recently



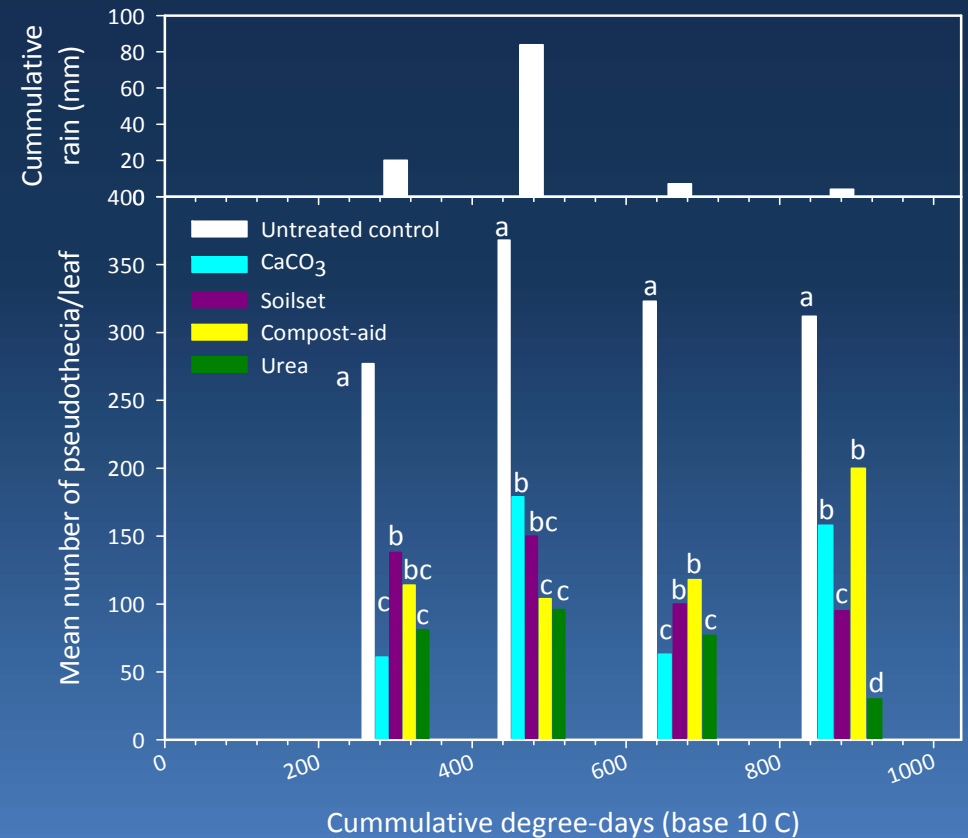
Tree Health

- Declining trees are more symptomatic
 - More susceptible to disease
- Declining trees should be removed
 - Cause of decline unimportant
- Anything that can maintain tree health good practice
 - Nutritional
 - Pest and disease control



Cultural Controls

- Leaf litter management
- 5% urea best treatment in small plots
- Hope for large trials this spring
 - Cooperator last year was not able to participate



Cultural Controls

- Mulching in Brazil shown to reduce disease
 - Can we grow enough mulch in alleys to get nearly 8-12 inches deep?
- Dead wood removal
 - Dead twigs source of inoculum like melanose
 - Man power too expensive?
- Regular irrigation in dry periods
 - To keep leaves on trees
 - Try to reduce wetting of leaf litter

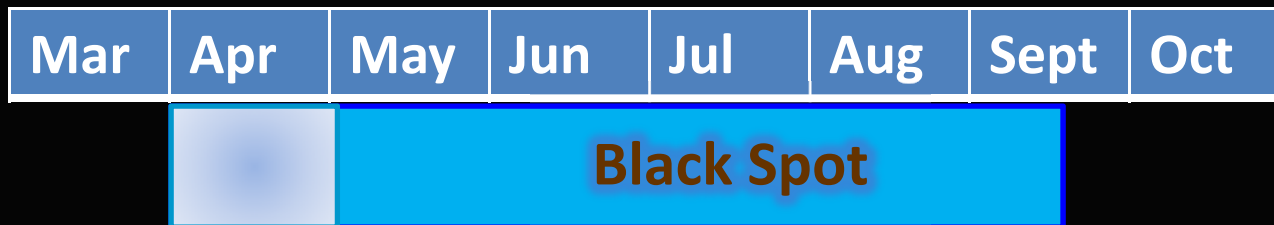
Harvest Early

- Since disease promotes fruit drop
- Prioritize highly symptomatic blocks
- Symptomatic fruit falls early but still suitable for juice
- Symptoms near top of fruit more likely to promote drop



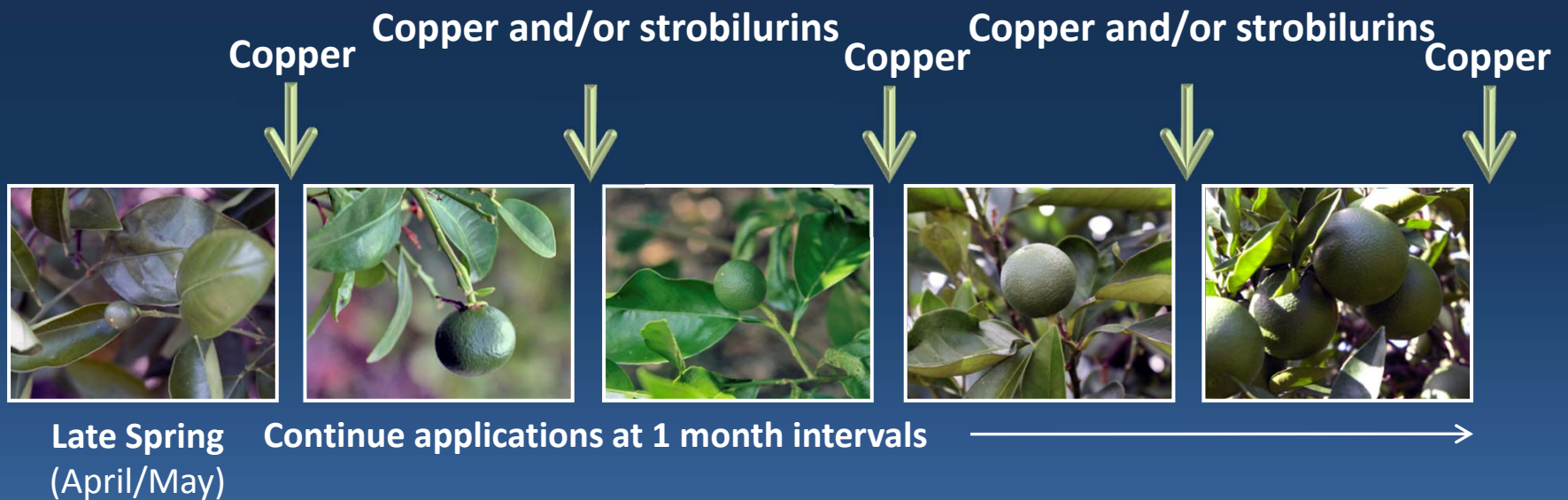
Black Spot Chemical Control

- Fruit is susceptible for 5-6 months post-petal fall
- Control products
 - Copper - All formulations
 - Strobilurin fungicides (Abound, Gem, Headline)
 - Reserved for hot weather



Black Spot Application Timing

Fruit is susceptible for at least 5-6 months post-petal fall
Ascospores present from March to September



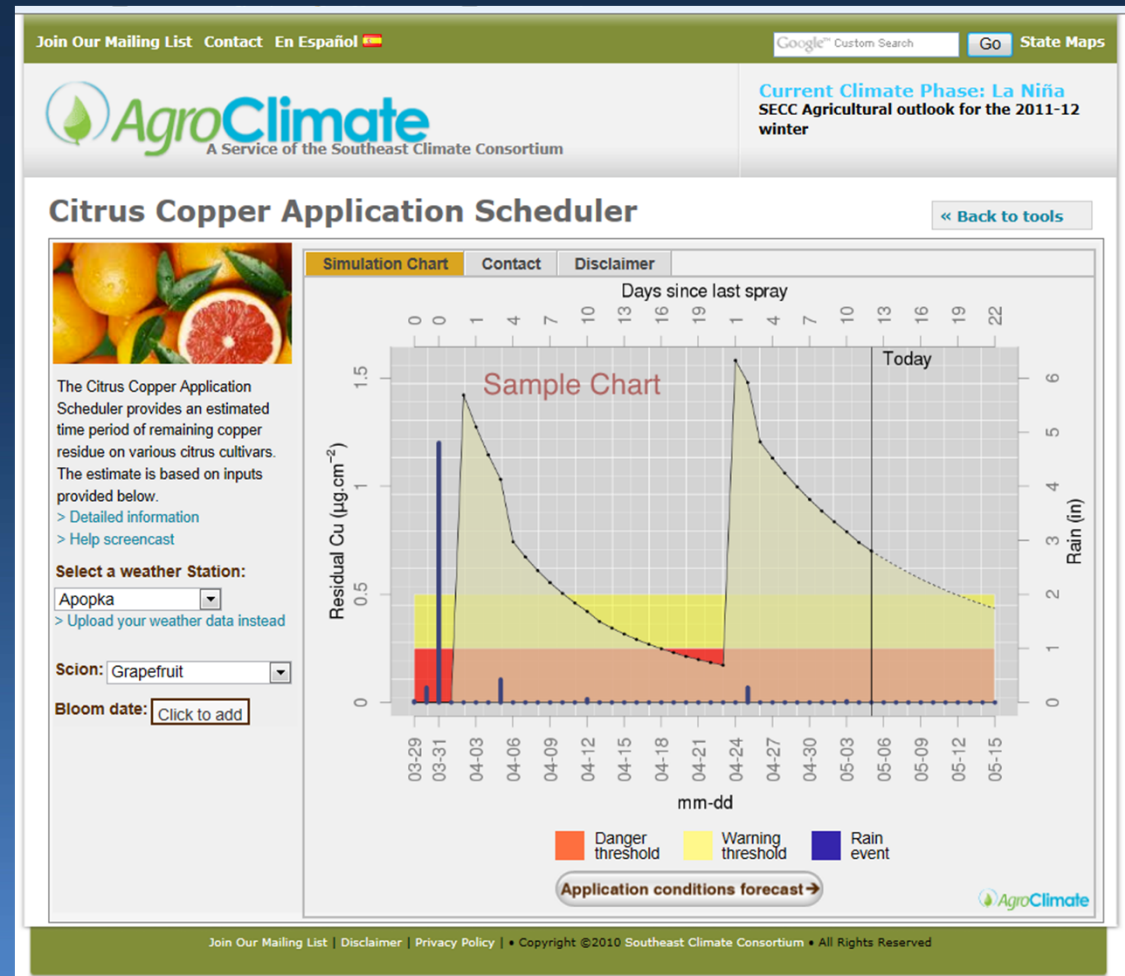
Timing is critical!
A 7-14 day delay can ruin your season

Spray Intervals

- Reports from Brazil that if using strobilurins can treat every 5-6 weeks
 - Not found publication to support
 - Be cautious
- Copper needs shorter interval
 - 3-4 weeks
 - Can evaluate residue levels with Copper model

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



Optimized Schedule for Early Season

- For copper applications
- Traditional 21-day application schedule with early, average and late peak bloom scenarios

Event	Early bloom	Ave. bloom	Late bloom
Bloom	10-Mar	20-Mar	30-Mar
1 st spray	31-Mar	10-Apr	20-Apr
2 nd spray	21-Apr	1-May	11-May
3 rd spray	12-May	22-May	1-Jun
4 th spray	2-Jun	12-Jun	22-Jun
5 th spray	23-Jun	3-Jul	13-Jul
6 th spray	14-Jul	24-Jul	--

For All Diseases Control By Copper

- Longer season is needed for black spot but double disease control
 - Canker
 - Melanose
 - Greasy Spot
- Strobilurin applications also control
 - Melanose
 - Greasy Spot

What Blocks to Treat

- Recommendations from Australia, Brazil and South Africa
 - Treat all blocks with the disease!
 - With no treatment, disease will become more severe
- Leaves not symptomatic but reported susceptible for 10 months post formation
 - More leaf infections, more inoculum next year

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

Questions?