The Basics of Black Spot Management

Megan M. Dewdney
Associate Professor of Plant Pathology and Extension Specialist
University of Florida, IFAS
Citrus Research and Education Center
How could black spot affect me?

- Caused by fungus *Phyllosticta citricarpa*
- Citrus black spot can cause up to 60% yield loss (fruit drop) in severe situations with little management
- More commonly, fruit drop levels of 10-20% in a minimally managed block
  - Still a significant number of fruit
- Producing fresh fruit?
  - Export restrictions to certain regions; particularly EU
- Quarantine disease leading to requirements like tarping
- Increased costs due to additional fungicide applications
Is black spot still spreading?

- CHRP program and FDACS continue scouting program each year as fruit ripen
  - New blocks identified each year so far
- Present in 5 southwestern counties
  - Glades County was most recent county with quarantine zones
- Mostly in commercial groves
  - First residential find in 2019 (Lee County)
  - Appears to have been present in location for more than a year
  - Apparently, a subsequent find was made in relatively close by
Irma will haunt us for a while

- Irma likely moved black spot to new areas
  - Difficult to determine how far may have moved
  - May not see spread for up to five years post-storm
    - 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 CHRP multipest survey if concerned that disease in grove

- This is in addition to spread that would have occurred anyway
Where black spot was found before Irma 2017

- First found in 2010
  - Late in harvest season and many blocks had been picked
- Restricted to 3 counties but primarily in Collier and Hendry
- Small incursions into Lee
Current locations in Southwest Florida

- Present in 5 southwestern counties
  - Recent spread mainly in Charlotte and Glades
- Mostly in commercial groves
  - First residential find in 2019
Not in a survey area but concerned

- Learn to recognize symptoms and scout
  - Train grove workers to keep an eye out for unusual things
  - CREC extension program can train staff on request
    • Contact Jamie Burrow: 863-956-8648; jdyates@ufl.edu

- Contact CHRP and arrange for a multi-pest survey on property
  - CHRP contact number: 863-298-3000
Black spot symptoms
How to scout for CBS

- Wait for color break or about 1 month before harvest
- Visit multiple locations in grove
  - Disease tends to be initially found in clusters
    - Multiple trees in a small area with asymptomatic trees surrounding
  - Particular areas of interest: along roads or near staging areas for equipment or fruit trucks
- Declining trees tend to have more disease
- Sunny sides of trees tend to express symptoms first
Potential scouting pattern

Three to four rows
Sample trees
Black spot fungicide program

- Currently recommended products in the 2021-2022 Florida Citrus Production Guide

- 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!
Black spot fungicide timing

- All citrus is vulnerable, but late hanging sweet oranges are the most susceptible varieties in Florida
- Goal is to maintain coverage on fruit
- Minimum once a month applications for best control
- Start May if dry in April
  - Otherwise start applications in April

<table>
<thead>
<tr>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All citrus</td>
<td></td>
</tr>
</tbody>
</table>
Fungicide trial for CBS in 2019-2020 season

- Collaborative effort with Ozgur Batuman, SWFREC
- Trial undertaken in 20+ year-old ‘Valencia’ grove with known infection
- Trees were evaluated for citrus black spot symptoms on fruit before trial
  - March 12 and 13\textsuperscript{th}, 2019
  - 25 fruit per tree
- Tried to use initial rating to make disease levels in treatments as equivalent as possible
Trial details cont.

- Application dates of fungicides
  - May 16 and 17\textsuperscript{th}, June 3 and 4\textsuperscript{th}, June 24 and 25\textsuperscript{th}, July 15\textsuperscript{th}, August 19\textsuperscript{th}, and September 10, 2019
  - Applied with handgun
- Trial evaluated March 9\textsuperscript{th}, 2020
  - 50 fruit per tree
- Will be collecting data for another trial mid-March
Pre-treatment levels of Citrus Black Spot

Pre-treatment rating of black spot
<table>
<thead>
<tr>
<th>Treatment (FRAC code)</th>
<th>Rate/acre</th>
<th>Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miravis (7)</td>
<td>14.9 fl. oz.</td>
<td>Pydiflumetofen</td>
</tr>
<tr>
<td>Miravis Top (7+3)</td>
<td>15.0 fl. oz.</td>
<td>Pydiflumetofen and difenoconazole</td>
</tr>
<tr>
<td>Enable (3)</td>
<td>8 fl. oz.</td>
<td>Fenbuconazole</td>
</tr>
<tr>
<td>Amistar Top (11+3) rotated with Kocide 3000 (M 01)</td>
<td>15.4 fl. oz. or 3.5 lbs</td>
<td>Azoxystrobin and difenoconazole or copper hydroxide (30% metallic)</td>
</tr>
<tr>
<td>Luna Sensation (11+7)</td>
<td>4 fl. oz.</td>
<td>Trifloxystrobin and fluopyram</td>
</tr>
<tr>
<td>Luna Experience (7+3)</td>
<td>8 fl. oz.</td>
<td>Fluopyram and tebuconazole</td>
</tr>
</tbody>
</table>
## Treatment list cont.

<table>
<thead>
<tr>
<th>Treatment (FRAC code)</th>
<th>Rate/acre</th>
<th>Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph-D (19) rotated with Kocide 3000 (M 01)</td>
<td>6.2 oz. or 3.5 lbs</td>
<td>Polyoxin D zinc salt or copper hydroxide (30% metallic)</td>
</tr>
<tr>
<td>Priaxor (11+7)</td>
<td>11 fl. oz.</td>
<td>Pyraclostrobin and fluxapyroxad</td>
</tr>
<tr>
<td>Headline (11) rotated with Kocide 3000 (M 01)</td>
<td>15.0 fl. oz. or 3.5 lbs</td>
<td>Pyraclostrobin or copper hydroxide (30% metallic)</td>
</tr>
<tr>
<td>Untreated control (UTC)</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Post-treatment CBS level

![Bar chart showing the rating of black spot after various treatments.](chart)

- **Miravis Top** and **Luna** have the highest rating, followed by **UTC**.
- **Amistar**, **Enable**, **Top and Kocide**, and **Kocide** follow with medium ratings.
- **Priaxor and Kocide**, **Ph-D**, **Luna Sensation**, and **Miravis** have the lowest ratings.

The chart indicates the effectiveness of different treatments in reducing the rating of black spot.
Dropped fruit with CBS

% Dropped fruit with black spot symptoms

% Dropped fruit with symptoms

Treatment

- Miravis Top
- Ph-D and Kocide
- UTC
- Enable
- Miravis Luna
- Experience Luna
- Sensation
- Amistar Top and Kocide
- Priaxor Headline and Kocide
Trial purpose

- Does skirting trees improve the outcome of fungicide programs?

- Does applying fungicide treatments earlier or later than current recommendations improve disease outcomes?
Treatment list

- Skirting done on June 4, 2019
  - Fungicides applied with and without skirting

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard CBS fungicide program</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Abound (15.0 fl oz)</td>
<td>Kocide 3000 (2.5 lb)</td>
<td>Kocide 3000</td>
<td>Pristine (18.5 oz)</td>
<td>Kocide 3000</td>
<td>Abound</td>
<td>--</td>
</tr>
<tr>
<td><strong>Early CBS fungicide program</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable (8 fl oz)</td>
<td>Abound</td>
<td>Kocide 3000</td>
<td>Kocide 3000</td>
<td>Pristine</td>
<td>Kocide 3000</td>
<td>Abound</td>
<td>--</td>
</tr>
<tr>
<td><strong>Late CBS fungicide program</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Abound</td>
<td>Kocide 3000</td>
<td>Kocide 3000</td>
<td>Pristine</td>
<td>Kocide 3000</td>
<td>Abound</td>
<td>Enable</td>
</tr>
<tr>
<td><strong>Untreated control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Disease presence per tree

No significant difference
Disease severity

For the 2019-2020 season, there was no significant difference in disease severity between the No skirting and Skirting treatments. For the 2020-2021 season, there were significant differences in disease severity between the Fungicide treatments, with the Control and Late treatments showing the highest and lowest disease severity, respectively.
What we learned

- Does skirting trees improve the outcome of fungicide programs?
  - Skirting does not appear to improve fungicide programs
  - There are other good disease management reasons to skirt

- Does applying fungicide treatments earlier or later than current recommendations improve disease outcomes?
  - Fungicide treatments in April or October did not appear to improve disease management
  - With higher disease pressure fungicide use beneficial
What we learned

- Later start to trial in 2020 because of COVID but weather very dry
  - The wetter summer did appear to affect how much disease was present in 2021
  - Data in 2021 collected 3 weeks later than in 2020
  - Many more severe symptoms like virulent spot in 2021
- Disease has increased in grove over time
Management summary

- Determine if black spot is in your area or grove
  - Are your groves near a transport corridor or processing/packing facility?
  - Check quarantine information on [www.fdacs.gov](http://www.fdacs.gov) for most recent areas
  - Scout on your own or contact CHRP for multi-pest survey

- Fungicide program
  - Recommend a multiple mode of action program for resistance management
    - Use copper in the program as an alternation
Management summary cont.

- Manage your leaf litter to enhance effect of fungicide program
  - Could use Soil-set or composting
  - Particularly where disease is severe; less need if only a few trees
- Remove as much dead wood as possible and destroy it on site
  - Conidia are formed in dead twigs
- Practice vehicle and equipment decontamination when leaving affected sites
- If you reduce or eliminate CBS management program, disease will return
Acknowledgments

- Tracey Hobbs
- Etelvina Aguilar
- André Bueno Gama
- Diane Bright
- Monty Myers
- Alec Pica
- Samantha Gebben
- Keanu Thomas
- George Ugartemendia

- Martha Silva
- Kseniya Chumachenko
- Juan Balderas
- Ana Redondo
- Kellee Britt
- Salih Yilmaz
- Sanju Kunwar
- Nico Tezna

Funding sources:

Any Questions?