Citrus 101
Everything you wanted to know about citrus but didn’t want to ask!

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Citrus Diseases
Greasy Spot (*Mycosphaerella citri*)
Greasy spot

- Swelling on lower leaf surface.
- Yellow mottle appears at the corresponding point on upper surface.
- Swollen tissue starts to collapse, turns brown and eventually black in color.
- Infection causes premature leaf drop which occurs mostly in winter and early spring.
Scab

- Small, somewhat circular, elevated spots on leaves and fruit.
- Infection becomes wart-like structures, covered with a corky pale tissue.
- Pustules may group together.
- Can be severe on Temples, lemons, Murcotts, Minneola, grapefruit.
<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Rate/Acre</th>
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</thead>
<tbody>
<tr>
<td>Copper fungicide</td>
<td>Use label rate.</td>
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</table>
Melanose on fruit

- Lesions are small, raised, superficial dots, pustules and irregularly shaped spots ranging from brick red to black.
- They feel like sandpaper when touched.
- Pustules are larger on grapefruit than other varieties.
- Fruit becomes resistant to infection at about 12 weeks after petal fall.
- Spores develop on twigs that have recently died.
Alternaria brown spot

- The fungus attack fruit, leaves and young shoots of susceptible varieties.
- First appears as small, slightly depressed black spots which can cause young fruit and leaves to fall.
- Fruit usually immune to infection after reaching 3-4 months of age.
- Infects Dancy, Minneola, Murcotts and other varieties.
Foot rot

- Lesions on tree trunk usually on the bark at or just above the budunion on susceptible scions.
- Lesions first appear as a drop of gum on the surface of the bark.
- Brown, discolored, necrotic, slippery areas will be found under the bark.
- Lesions can eventually girdle the entire tree trunk.
- Can occur when bark is damaged with tools as this allows easy entry of the disease into the tree.
- Planting at proper height in soil minimizes problem.
Citrus Canker (Xanthomonas axonopodis)
Citrus Canker
Citrus canker

- Lesions are produced on young fruit and leaves of citrus.
- Bacteria are produced under moist conditions and dispersed by windblown rains.
- Bacteria enters leaf stomates or wounds on leaves, twigs or fruit.
- No chemical control.
- Can use copper to suppress disease.
Canker Suppression

- Remove infected plant material (i.e. infected fruit and/or leaves).
- Spray with copper at 21-day intervals from after bloom until late summer.
  - Grapefruit and Hamlin oranges require more sprays than Valencia
- More frequent flushes the greater the problem in infected areas.
Canker Suppression

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Citrus Greening

Greening has been found Statewide.
Citrus Black Spot

• Caused by one fungal pathogen with two names
  – *Guignardia citricarpa* (sexual)
  – *Phyllosticta citricarpa* (asexual)

• Affects all citrus varieties
  – Sweet oranges, grapefruit and lemons are highly susceptible

• Fungus spreads in warm wet conditions in the presence of susceptible fruit when inoculum is present
Citrus Black Spot Spread

• Primary inoculum is from leaf litter
• Spores are ejected when leaf litter is wet
• Spores move with wind current
Fruit Symptoms

- Symptomatic fruit is not acceptable in the fresh markets
- Lower fruit often have more symptoms
- Does not cause internal decay
- Symptoms will most likely appear about a month before harvest on sunny side of tree
- Four symptom types: hard spot, cracked spot, false melanose and virulent spot
Sample Submission

- For Citrus Black Spot – contact local FDACS office to collect sample.
- For Citrus Canker – contact FDACS or a local county citrus extension agent to determine if it is citrus canker.
- For HLB / greening – samples can be submitted to either Southern Gardens lab or to Southwest Florida Research & Education Center in Immokalee.
- All samples that are delivered to Extension offices should be placed in plastic bags and disposed in normal trash.
Citrus Mites
Citrus rust mites

- Damages epidermal cells of leaves and fruit using piercing-sucking mouthparts.
- Body is elongated wedge-shaped.
- Magnification is required.
- Color ranges from light yellow to straw.
- Peak populations usually occur during June and July.
Citrus rust mite damage to fruit

- Extensive CRM feeding on fruit surface will result in surface blemishes, lower external grade, reduce fruit size and increase fruit drop.
- When fruit is injured in summer or fall, the injured surface is smooth and dark in color, “bronzing”.
- When fruit is injured in the spring, damage is lighter in color than later damage, “sharkskin”.
Scale Insects
Citrus snow scale

- Adult female is 1.5 – 2.25 mm long.
- Female armor is shaped like an oyster shell, brownish purple to black.
- Immature male scale armor is white with parallel sides and three longitudinal sections, one central and two marginal ridges.
- Adult male is winged and light yellow.
- Citrus snow scale primarily attack the trunk and large limbs, but can be found on leaves, twigs and fruit.
Florida red scale

- Florida red scale has circular armor made up of three concentric rings.
- Dark reddish brown with a conspicuous light brown center.
- Adult male is gnat-like and free flying.
- Florida red scale is under biological control.
Caribbean black scale

- Female is 3-5 mm long and brown to black in color.
- Ridges along outer scale body form an ‘H’.
- Adult males are free flying.
- Crawlers are 0.34 mm long and light brown.
- Found on young fruit, stems, and twigs.
- Scales secrete prolific amounts of honeydew which support the growth of sooty mold.
- Usually under biological control.
Insect Pests
Orangedog

- Larval stage feed on young foliage causing extensive damage and defoliation.
- Larval stage is brown and white caterpillar which resembles bird droppings.
- Approximately 1-2 inches in length.
- Adult stage is the swallowtail butterfly.
Citrus leafminer, *Phyllocnistis citrella* (Stainton)
Citrus leafminer

- Adults are minute moths, with ¼ inch wingspread.
- Females lay eggs in evening or early morning on young foliage.
- Larvae are translucent greenish.
- Upon larva entering the leaf, they begin to feed producing a serpentine larval mine.
- Damage results in leaf distortion, leaf drop and possible stem dieback.
Citrus Leafminer Suppression

• Spray young growth flushes with insecticide.
• Use product that contains imidacloprid
Soft-Bodied Insects
Sooty Mold

• Dense, black fungus that grows on the honeydew secreted by insects like aphids, scales, whiteflies and mealybugs.
• Found on leaves, stem, and fruit.
Aphid Damaged Twig
Asian Citrus Psylla, *Diaphorina citri* (Kuwayama)
Asian Citrus Psylla

- Primary vector of citrus greening disease.
- Adult psylla are sexual and can survive for extended periods of time feeding on mature leaves and forego reproduction until new leaves are available.
- Eggs are laid only on new flushes.
- Juvenile psylla deform flush terminals, causing a distinctive pinching and twisting of leaves.
- Honeydew is waxy and viscous, forming curly white strands producing less sooty mold than aphids.
Nutritional Deficiencies
Nitrogen deficiency

- Deficiency is expressed by light green to yellow foliage over entire tree in absence of any distinctive leaf patterns.

- As deficiency progresses leaves become lighter in color.

- Nitrogen deficiency will limit tree growth and fruit production.

- Excessive nitrogen produces excessive vegetative growth at the expense of fruit production, reducing fruit quality.
Yellow vein chlorosis

- With yellow vein chlorosis, the midribs and lateral veins turn yellow while the rest of the leaf remains a normal green.
- This chlorosis is frequently attributed to girdling of individual branches or tree trunk.
- May also occur with the onset of cooler weather in the fall and winter due to reduced nitrogen uptake by the plant from the soil.
Magnesium deficiency

- First symptom is a yellowish green blotch near the base of the leaf between the midrib and the outer edge.
- The yellow area enlarges until the only green remaining is at the tip and base of the leaf as an inverted V-shaped area on the midrib.
- Dolomite will correct mild foliage symptoms in soils with low to neutral pH.
- Magnesium deficiency occurring in calcareous soils may have to be corrected with foliar sprays.
Manganese deficiency

- Deficiency appears as dark green bands along the midrib and main veins surrounded by light green interveinal areas giving a mottled appearance.
- As severity increases, the light green interveinal areas give way to a yellow-bronze coloration.
- Deficiency occurs on calcareous soils.
- Soil and foliar application may be effective in correction of manganese deficiency.
Zinc deficiency

• Early stages appear as small blotches of yellow between green veins on the leaf.
• With severe deficiency, leaves may become increasingly yellow except for the green veinal areas.
• Under severe conditions, leaves will also be small with narrow pointed tips on terminal growth.
• Foliar fertilizer applications are usually recommended for correcting zinc deficiency.
• Trees with citrus blight also show leaf zinc deficiency.
Iron deficiency

- In mild cases, leaf veins are slightly darker green than interveinal areas with symptoms appearing first on new foliage.
- In severe cases, interveinal areas become increasingly yellow with the entire area eventually becoming ivory in color.
- Usually a greater problem on calcareous soils.
- Trees which have been flood damaged will also show iron deficiency.
Salt injury

- Chloride toxicity, consisting of burned necrotic or dry appearing edges of leaves.
- Many salinity-induced symptoms are similar to drought stress symptoms, including root growth, decreased flowering, smaller leaf size and impaired leaf growth.
- Excessive fertilizer applications, highly saline irrigation water, and storm-driven ocean sprays can all result in salinity-induced phytotoxic symptoms.
Fertilization of Citrus
## Suggested fertilization schedule

<table>
<thead>
<tr>
<th>Tree Age</th>
<th>Lbs N/tree/yr</th>
<th>Lbs Fertilizer/tree/yr</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6-6-6</td>
</tr>
<tr>
<td>1</td>
<td>0.15-0.30</td>
<td>2.5-5.0</td>
</tr>
<tr>
<td>2</td>
<td>0.30-0.60</td>
<td>5.0-10.0</td>
</tr>
<tr>
<td>3</td>
<td>0.45-0.90</td>
<td>8.0-15.0</td>
</tr>
<tr>
<td>4</td>
<td>0.80-1.0</td>
<td>13.0-17.0</td>
</tr>
<tr>
<td>5+</td>
<td>1.1-1.4</td>
<td>18.0-23.0</td>
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Tree age = years planted, with year 1 beginning right after planting.
Do not use a fertilizer with higher than an 8-8-8 analysis on young trees during years 1-3.
When to fertilize

- Young trees
  - Apply at 6-week intervals
  - Fertilizer should be applied beginning in:
    - Late February-early March
    - Ending in late September

- *Remember local fertilizer rules against applying some nutritional materials during summer time period.*
When to fertilize

• Mature trees
  – Apply 3 applications per year
    • Late February-early March
    • Mid May
    • Mid-late September
  – Avoid applications during summer rainy months due to potential leaching

• Remember local fertilizer rules against applying some nutritional materials during summer time period.
How to apply the fertilizer

• Young trees
  – Apply fertilizer uniformly in a 3 foot diameter circle around the tree

• Mature trees
  – As the tree becomes older, increase area covered with fertilizer
    – Fertilize an area twice the diameter of the tree canopy

• Do not apply against the tree trunk
Soil pH

• Adjust soil pH up to approximately 6.0-6.5
  – Materials for pH adjustment include
    • Dolomite
    • High calcium lime

• For high pH soils, > 7.0-7.5
  – Very difficult to reduce soil pH
  – Many micro nutrients may need to be applied to the foliage of the tree
Questions?