

Citrus 101:



Everything you wanted to know about
citrus, but didn't want to ask!

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A Guide to Citrus Diseases

Greasy Spot

(*Mycosphaerella citri*)



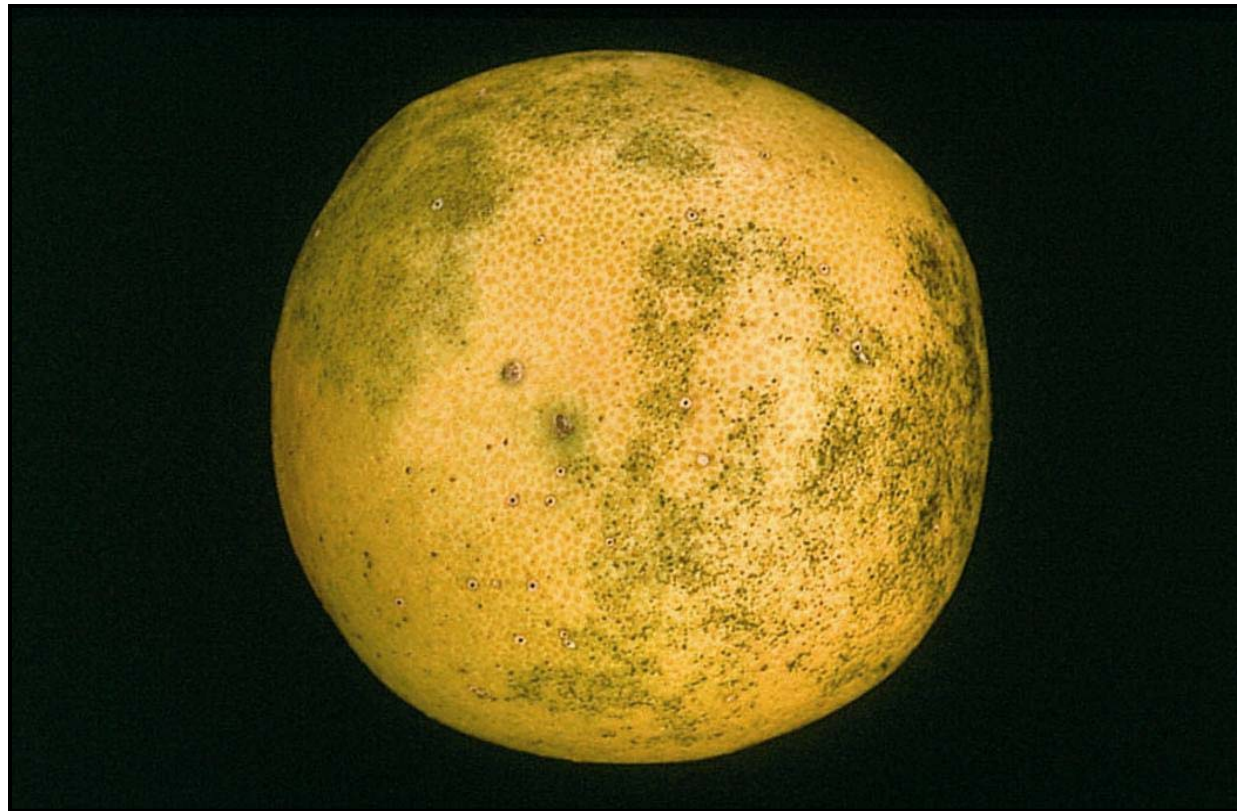
Greasy Spot



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

Greasy Spot Rind Blotch

(*Mycosphaerella citri*)

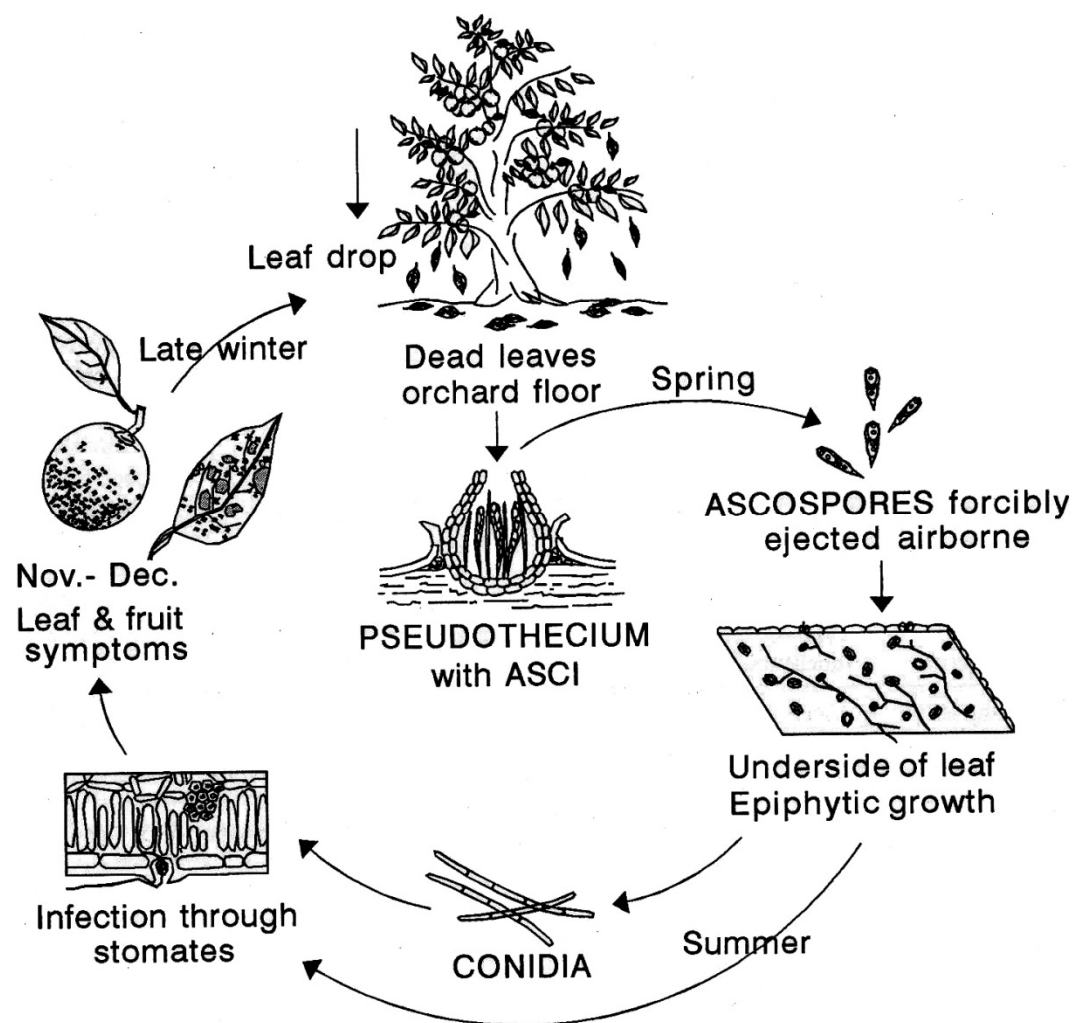


Greasy Spot Rind Blotch

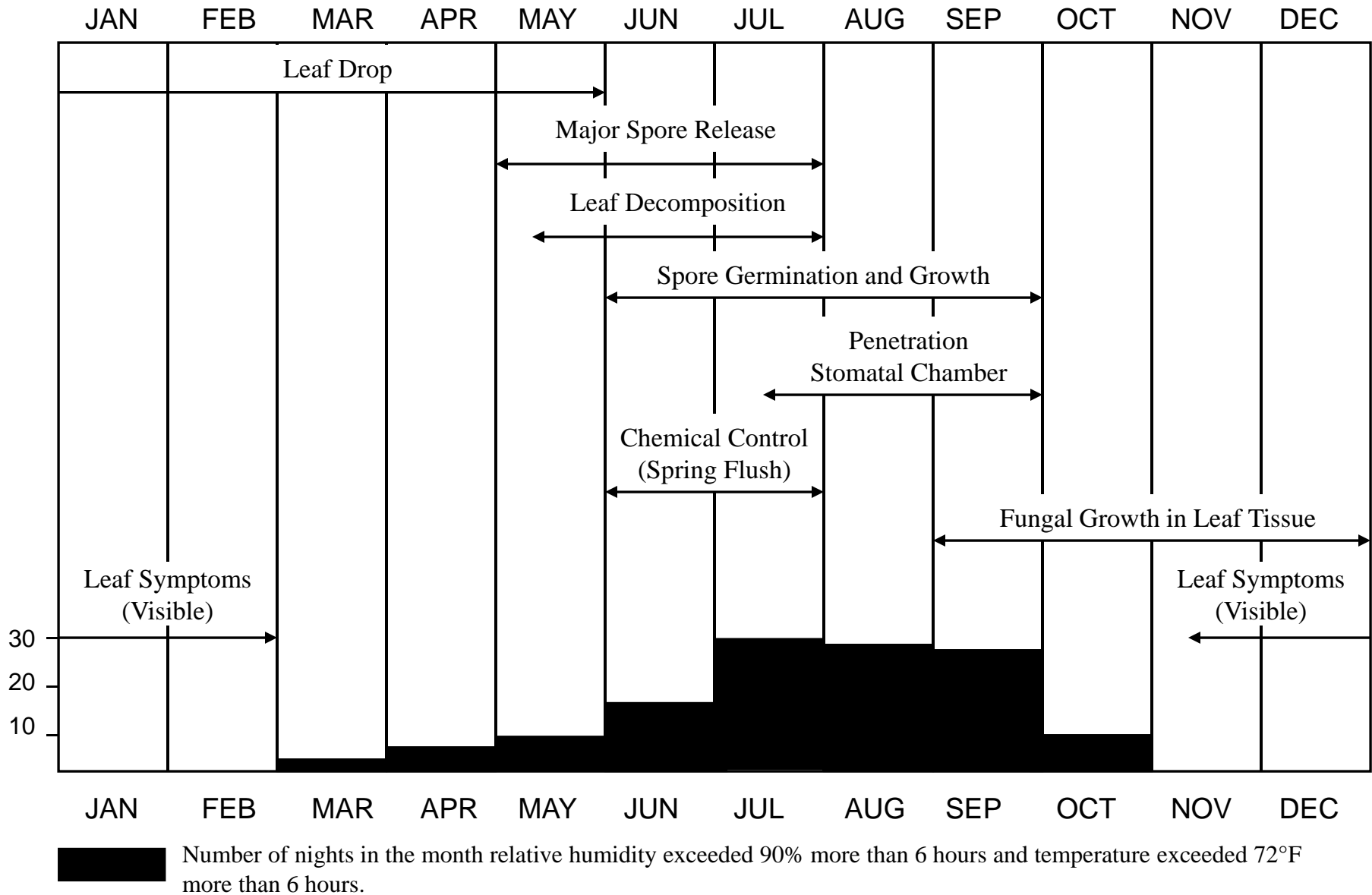
- Pinpoint black specks between oil glands with infection on grapefruit
- Specks coalesce, gives rise to symptom called pink pitting or greasy spot rind blotch
- Living cells adjacent to the specks often retain green color longer than normal



Life Cycle of Greasy Spot



GREASY SPOT



Greasy spot seasonal development on Florida citrus.

Greasy Spot Management

Recommended Chemical Control for Greasy Spot

Pesticide	Rate/Acre
Petroleum Oil 97+% (FC 435-66, FC 455-88 or FC 470)	Use label rates. Do not apply when temperatures exceed 94°F.
Copper fungicide	Use label rate.
Copper fungicide + Petroleum Oil 97+% (FC 435-66, FC 455-88 or FC 470)	Use label rate of each. Do not apply when temperatures exceed 94°F.

Citrus Scab

(*Elsinoe fawcetti*)



Foliage Symptoms



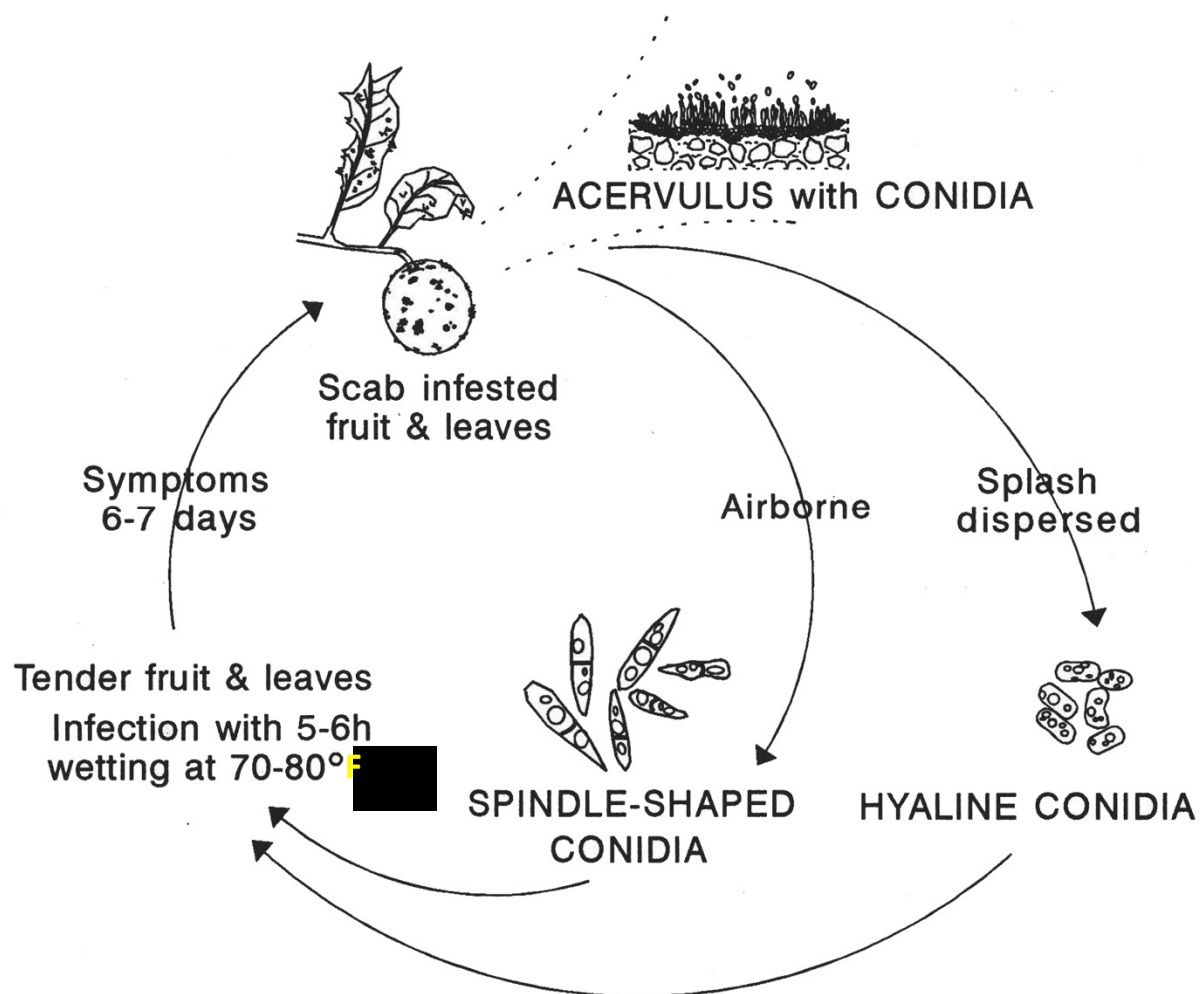
Fruit Symptoms

Citrus Scab

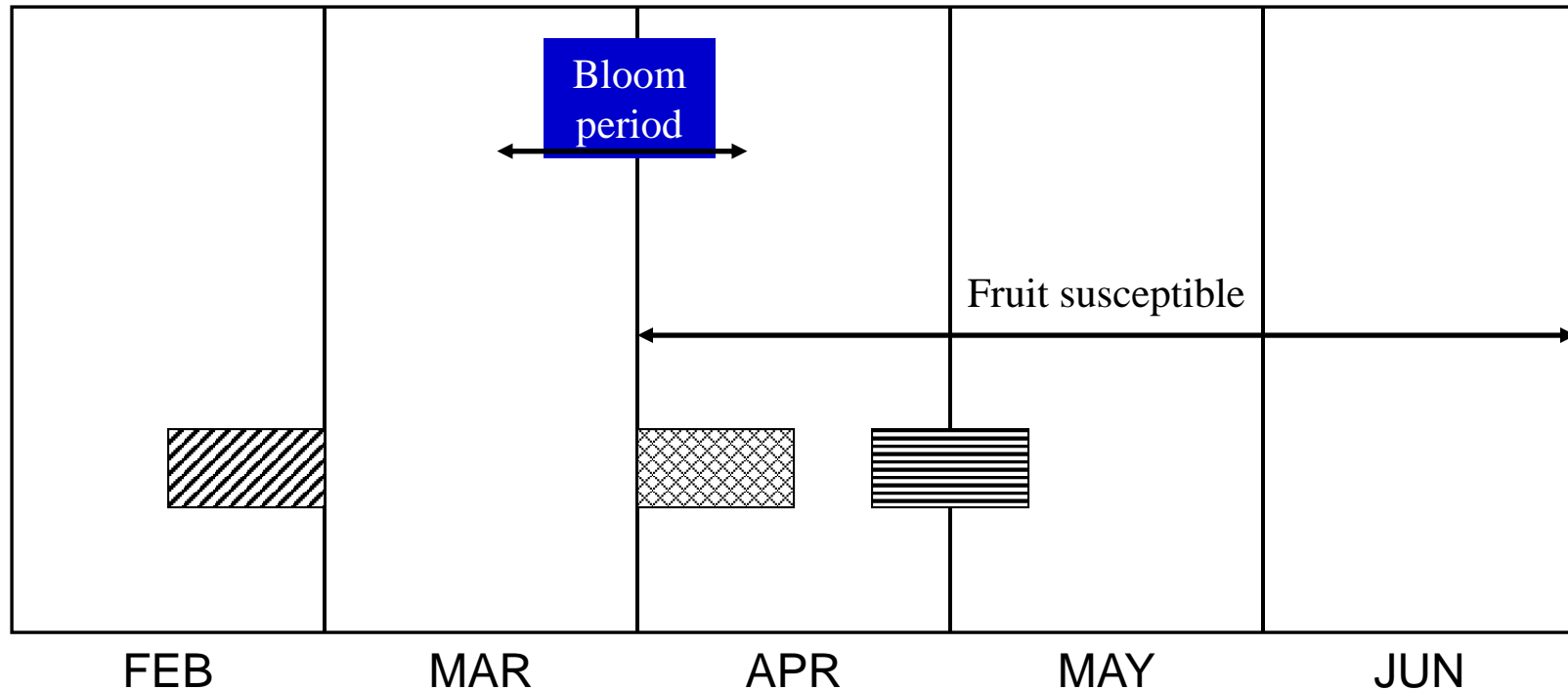
- Small, somewhat circular, elevated spots on leaves and fruit
- Infection becomes wart-like structures, covered with a corky pale tissue
- Pustules may group together
- Can be severe on Temples, lemons, Murcotts, Minneola, grapefruit



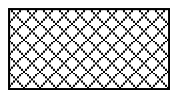
Life Cycle of Citrus Scab



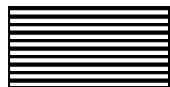
SCAB



Delayed dormant application. This treatment is required only on groves with a history of severe scab problem.



Two-thirds petal fall application. This is the only treatment necessary with light infestation. This treatment is also needed in conjunction with delayed dormant spray on groves with severe scab problem.



Melanose spray. Treatment at this time for melanose also reduces scab infection.

Recommended timing of fungicide applications to control sour orange scab on Florida citrus.

Citrus Scab Management

Recommended Chemical Control for Scab

Pesticide	Rate/Acre
Copper fungicide	Use label rate.

Melanose

(*Diaporthe citri*)



Melanose on Fruit



- Lesions are small, raised, superficial dots, pustules and irregularly shaped spots ranging from brick red to black
- Feels 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

Melanose

(*Diaporthe citri*)



Melanose on Leaves



- First appears on young leaves as minute, dark circular depressions with yellow margins
- Later become raised, brown in color
- Young infected leaves become distorted
- Difficult and not economical to try to control on foliage

Star Melanose

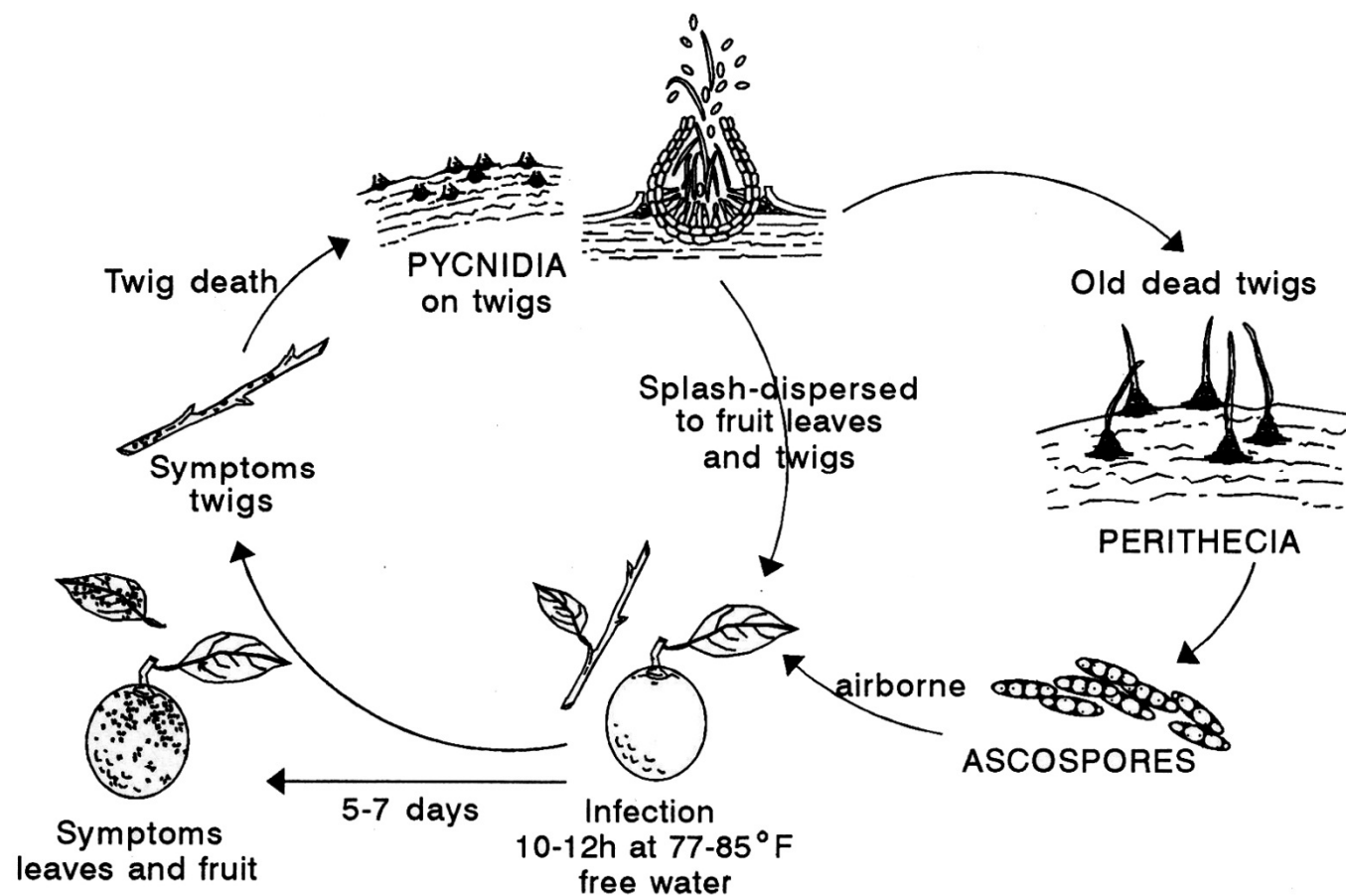


Star Melanose

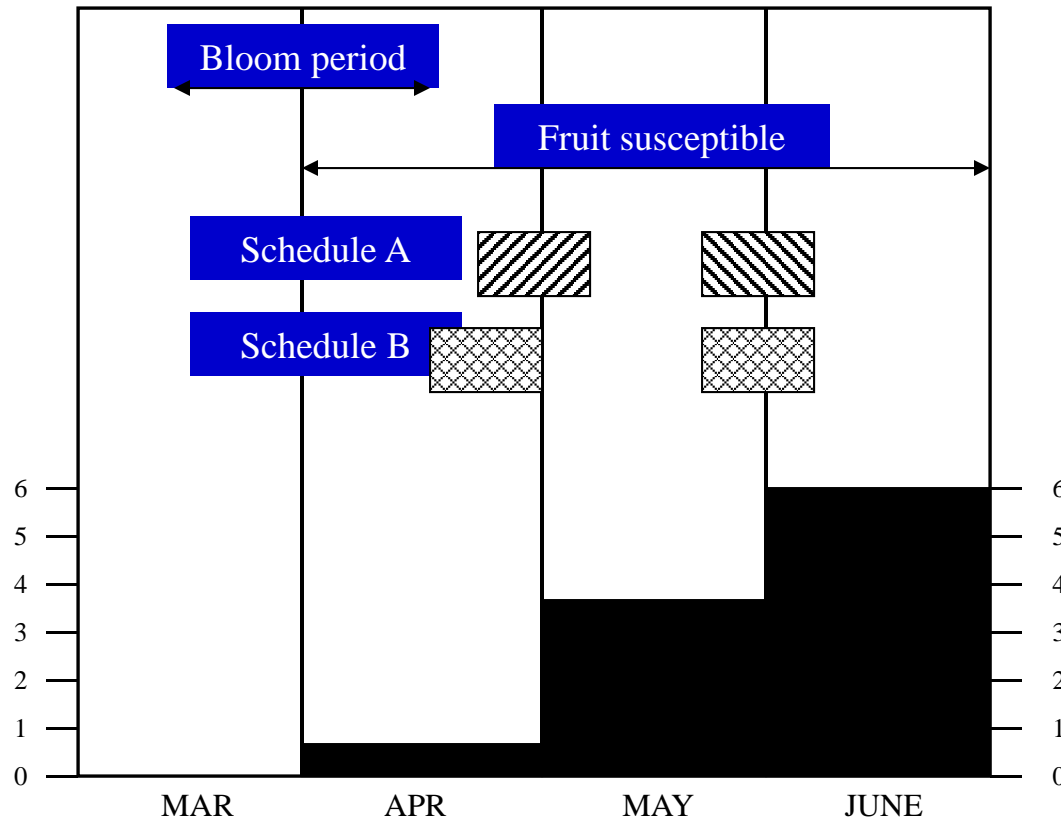




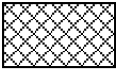

- Occurs when copper is applied late during hot, dry weather and is due to copper damage to leaves
- Has no relationship to melanose
- Copper causes the developing tissue to become more corky and darker than normal and shape of the lesion often resembles a star

Life Cycle of Melanose



MELANOSE



- Schedule A  Single fungicide application required under most conditions.  Second application required in years of extended or delayed bloom.
- Schedule B  Two applications per year to minimize infection in groves with history of severe melanose problem.
-  Average number of days per month favorable for melanose infection.

Melanose development and recommended timing of fungicide applications.

Melanose Management

Recommended Chemical Control for Melanose

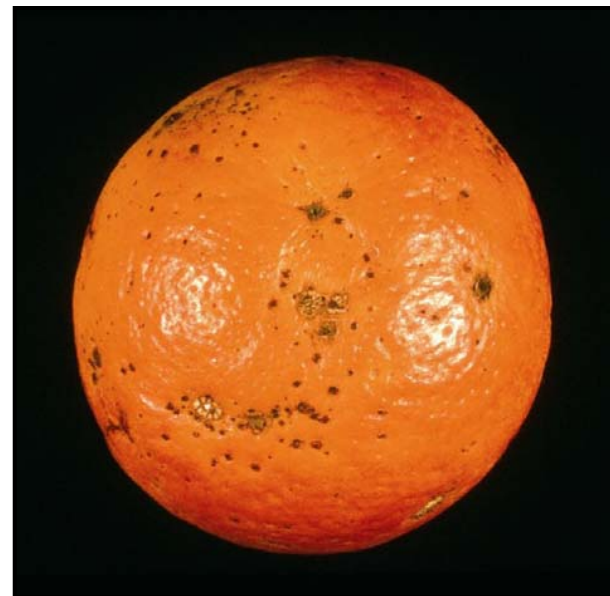
Pesticide	Rate/Acre
Copper fungicide	Use label rate.

Alternaria Brown Spot

(*Alternaria alternata*)



Foliage Symptoms



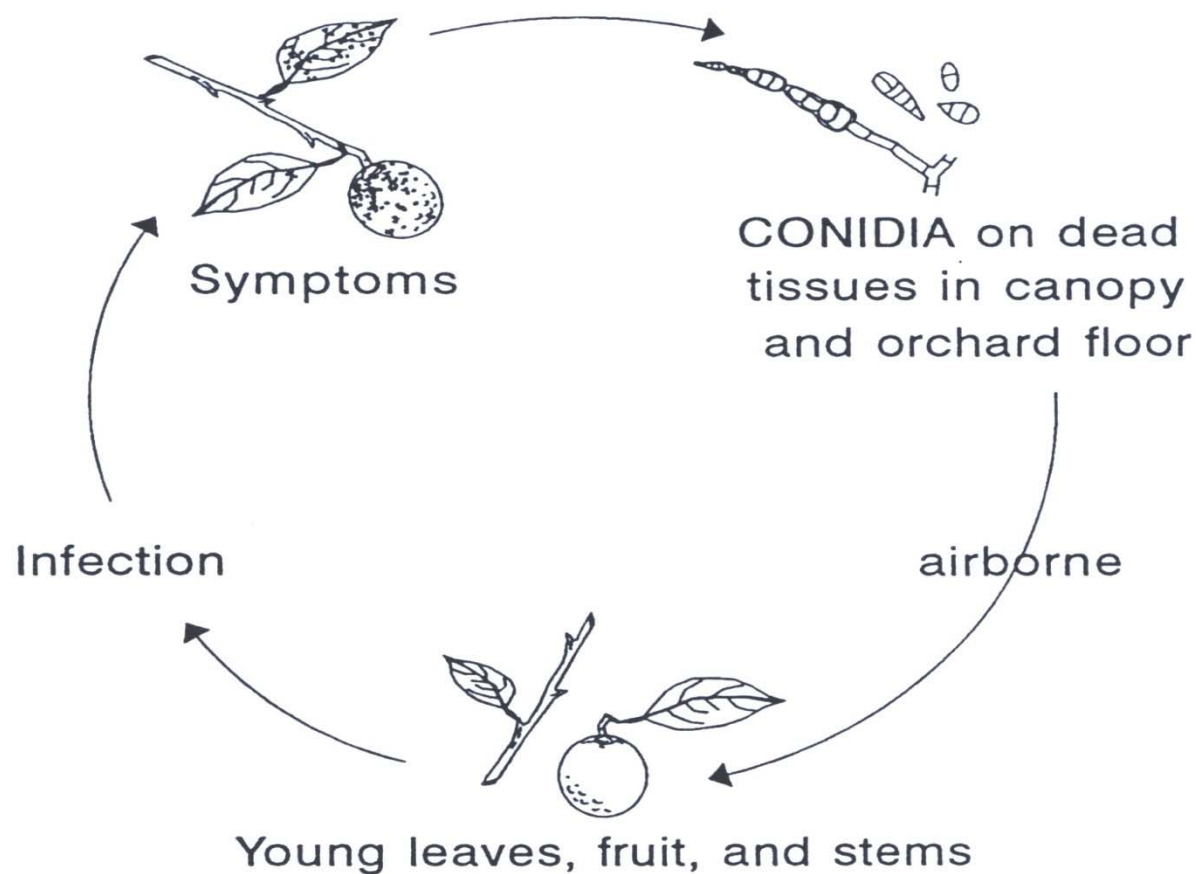
Fruit Symptoms

Alternaria Brown Spot

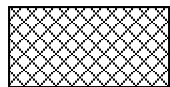
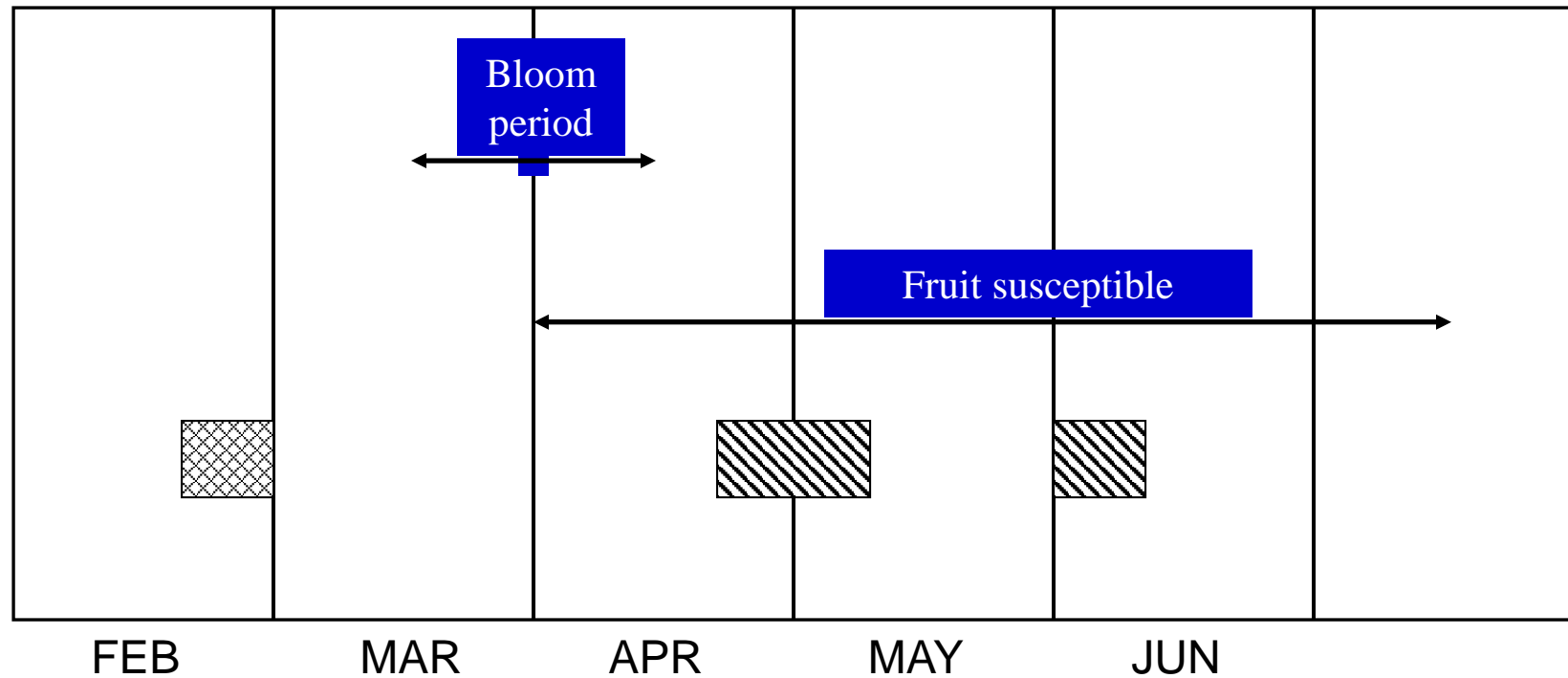


- The fungus attack fruit, leaves and young shoots of susceptible varieties
- First appears as small, slightly depressed black spots which can cause young fruit and leaves to fall
- Fruit usually immune to infection after reaching 3-4 months of age
- Infects Dancy, Minneola, Murcotts and other varieties

Life Cycle of Alternaria Brown Spot



ALTERNARIA BROWN SPOT



Delayed dormant application of defoliation. This treatment could be delayed until immediately after first signs of infection on the new growth if it is possible to spray on short notice. This application will not be necessary in those years when weather during the critical period of shoot development is too dry for infection.



Two copper sprays are required.

Recommended timing of fungicide applications to control Alternaria brown spot on Florida citrus.

Alternaria Brown Spot Management

Recommended Chemical Control for Alternaria
Brown Spot

Pesticide	Rate/Acre
Copper fungicide	Use label rate.

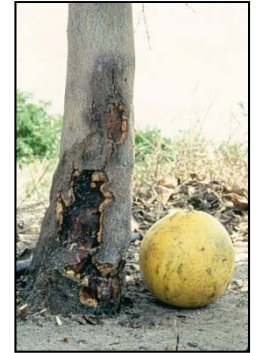
Foot Rot

(*Phytophthora nicotianae*)



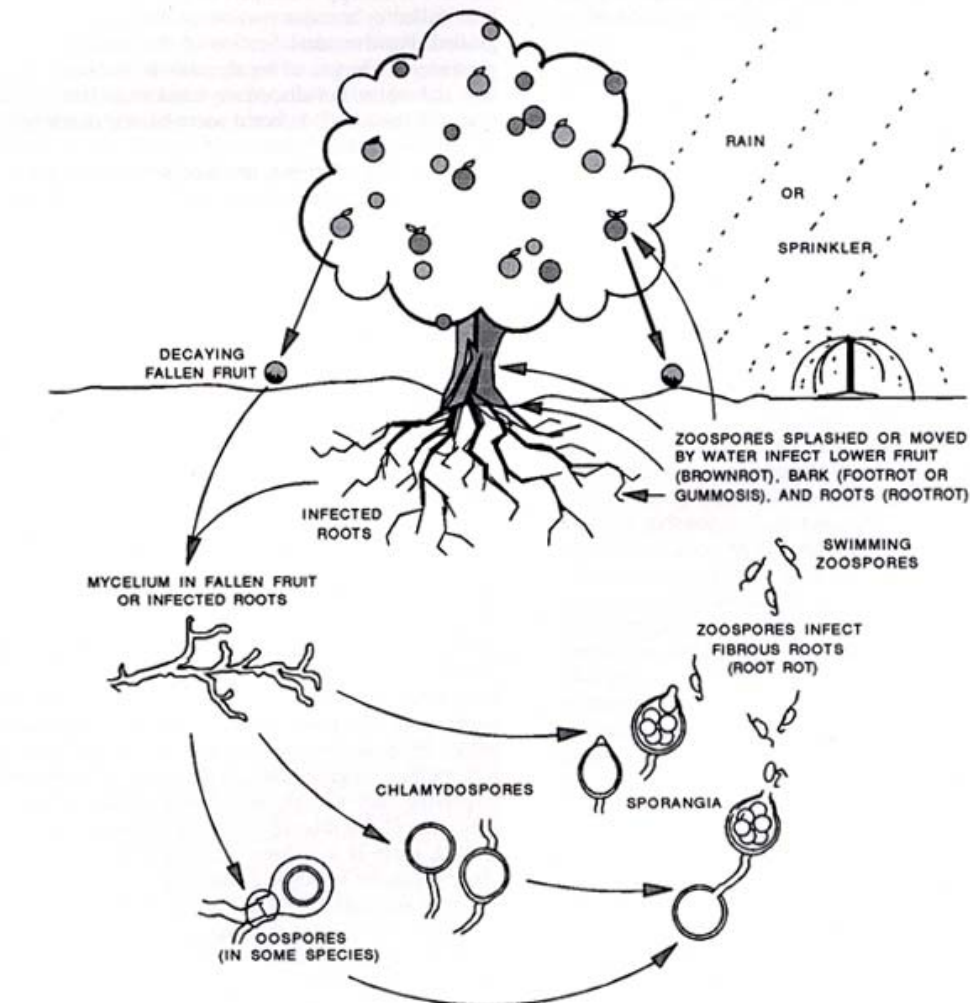
Foot Rot

(*Phytophthora nicotianae*)



- 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

Life Cycle of Foot Rot



Disease cycles of *Phytophthora* diseases affecting the roots, bark, and fruit of citrus trees.

Foot Rot and Root Rot Management

Recommended Chemical Control for Foot Rot and Root Rot

Pesticide	Rate/Acre	Method of Application	Comments
Copper-Wettable Powder	0.5 lb (metallic) Cu gal water	Trunk paint	Protectant
Copper-Count-N	1 qt in 3 qt water	Trunk paint	Protectant. Do not apply to green bark; may cause gumming.

Brown Rot on Fruit

(*Phytophthora* species)



Brown Rot on Fruit



- Infected fruit exhibit a light brown, leathery decay
- Has a characteristic pungent, rancid odor
- Fruit may become infected via soil contact, splash dispersal with soil particles or fruit-to-fruit spread by windblown rain
- Infected fruit fall from tree
- Greater problem in late summer (Aug.-Sept.) if conditions are wet
- Early varieties more susceptible than late maturing varieties

Brown Rot on Fruit

Management

Recommended Chemical Control for Brown Rot on Fruit

Pesticide	Rate/Acre
Copper fungicide	Use label rate.

Citrus Canker

(*Xanthomonas citri* subsp. *citri*)



Citrus Canker

(*Xanthomonas citri* subsp. *citri*)



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

Citrus Greening

Huanglongbing (HLB)



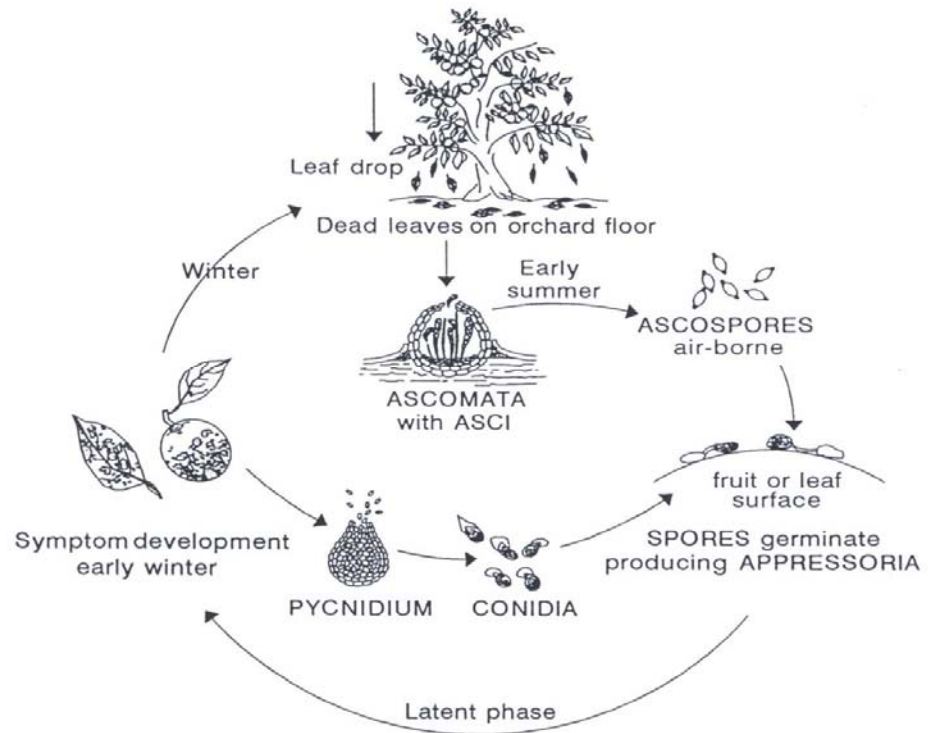
Greening has
been found
statewide.

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

Life Cycle of Citrus Black Spot

- Primary inoculum is from leaf litter
- Spores are ejected when leaf litter is wet
- Spores move with wind current



Citrus Black Spot-Fruit Symptoms

- Symptomatic fruit is not acceptable in 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



These photos are from an article by
Stephen H. Futch¹ and L. W. Timmer²
University of Florida, IFAS, Citrus REC
Lake Alfred, Florida

Available as EDIS document number CH159 or as
Horticultural Sciences Fact Sheet HS-798.

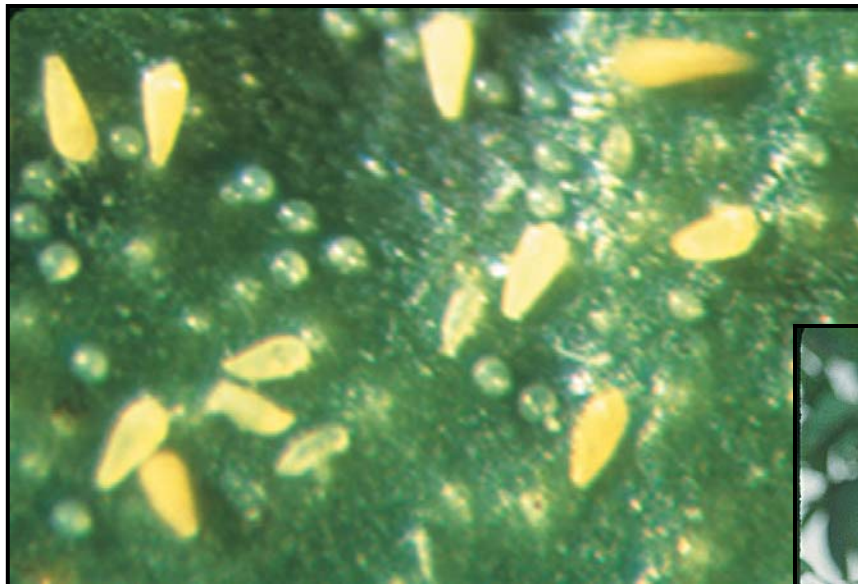
¹Multi-County Citrus Agent

²Professor Emeritus, Plant Pathologist

Citrus Mites

Citrus Rust Mite

(*Phyllocoptiruta oleivora*)



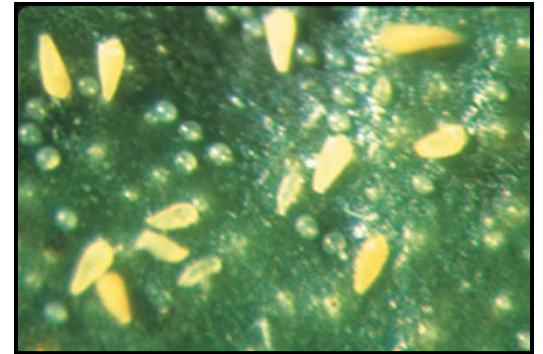
Citrus rust mite and eggs

Sun spot resulting from
where citrus rust mite
avoids feeding on most sun
exposed portion of the fruit

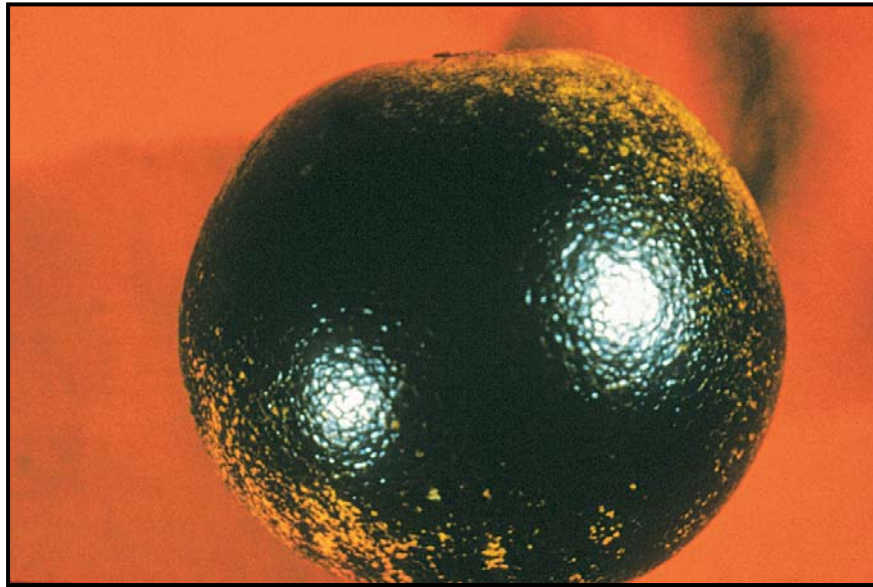


Citrus Rust Mites

- Damages epidermal cells of leaves and fruit using piercing-sucking mouthparts.
- Elongated, wedge-shaped body.
- Magnification is required.
- Color ranges from light yellow to straw.
- Peak populations usually occur during June and July.

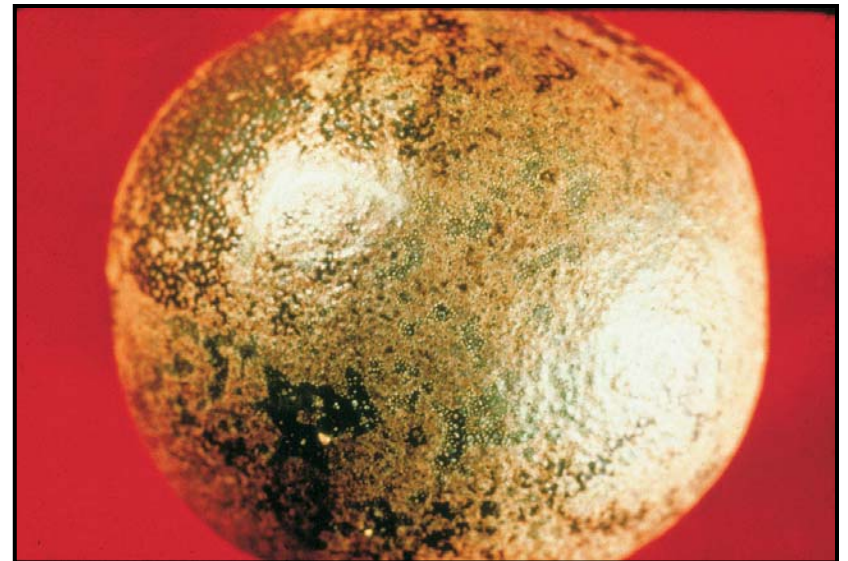


Citrus Rust Mite Damage to Fruit



Sharkskin
(spring injury)

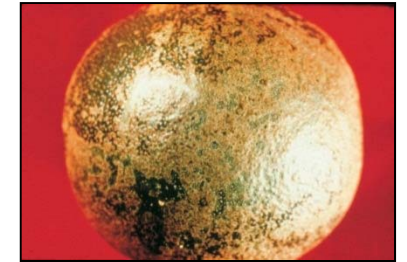
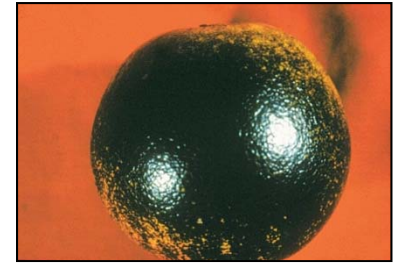
Bronzing
(summer or fall injury)

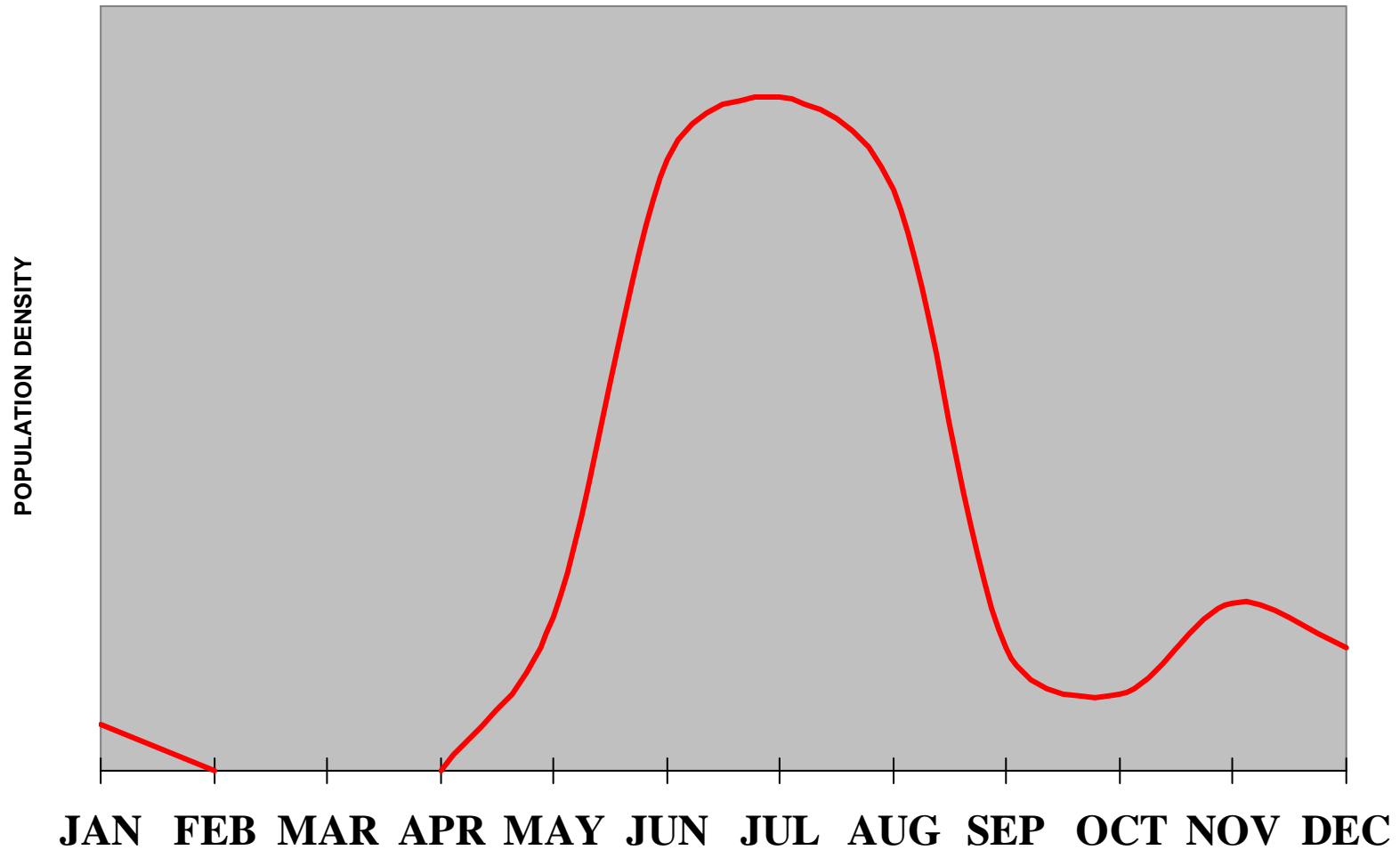


Citrus Rust Mite

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.”





Citrus rust mite curve showing population density by month for a typical year.

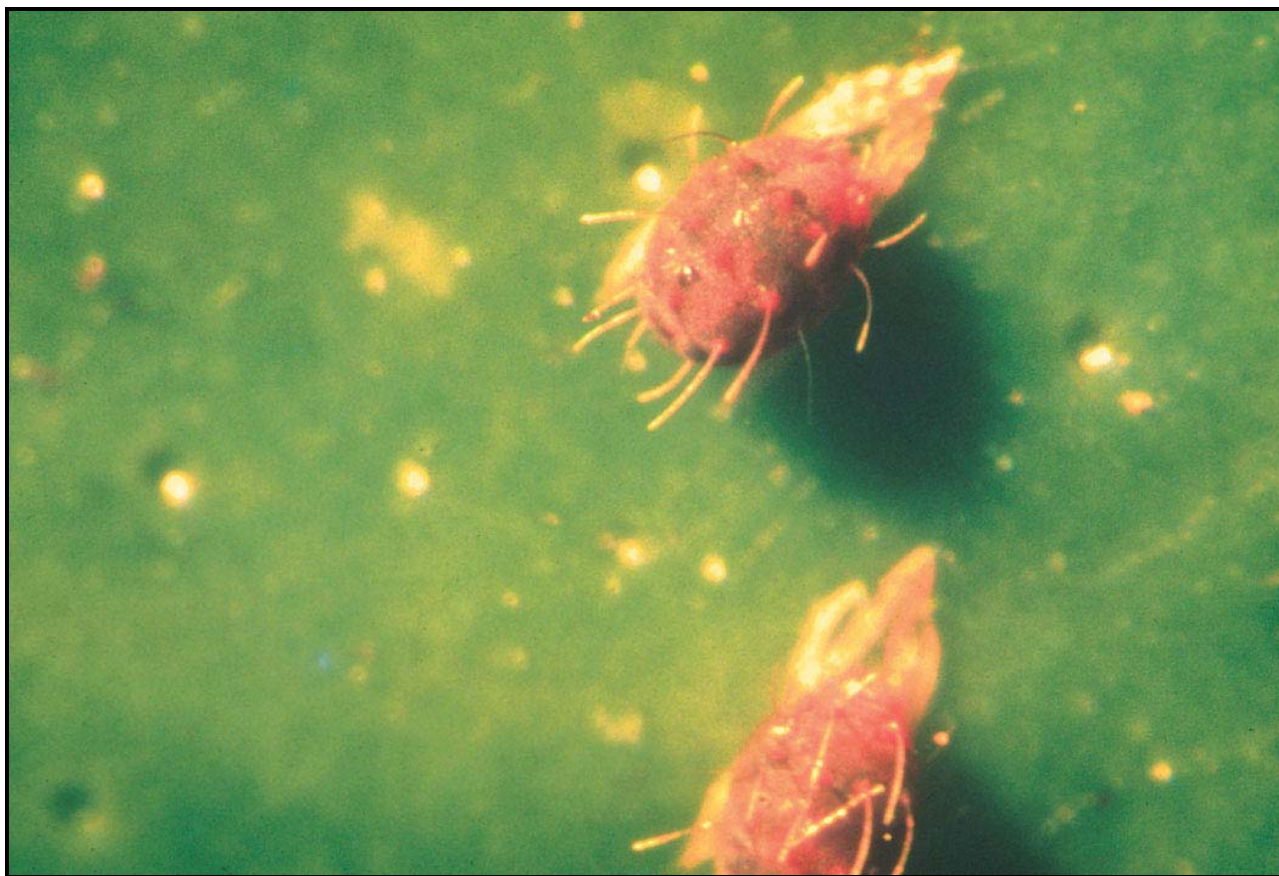
Citrus Rust Mite on Fruit Management

Recommended Chemical Controls for Citrus Rust Mite

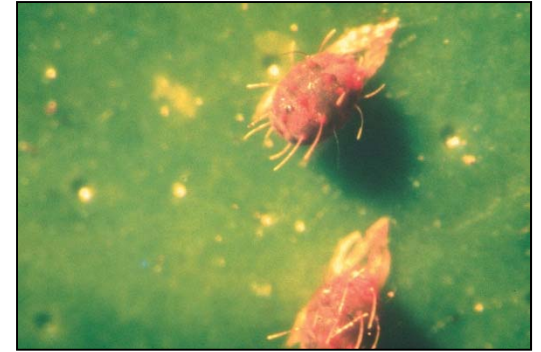
Pesticide	Comments	Other Pests Controlled
Petroleum Oil 97+% (FC 435-66, FC 455-88 or FC 470)	Does not control citrus snow scale. Do not apply if trees are wilting or in a near wilt state. Do not apply within 3 weeks of sulfur. Some early maturing specialty fruit varieties may experience degreening problems with fall applied petroleum oil. Can be tank-mixed with any recommended mite material except where prohibited under the comment section. Do not apply when temperatures exceed 94°F.	Scale, whitefly, spider mites, greasy spot, sooty mold.

Citrus Red Mite

(*Panonychus citri*) (McGregor)

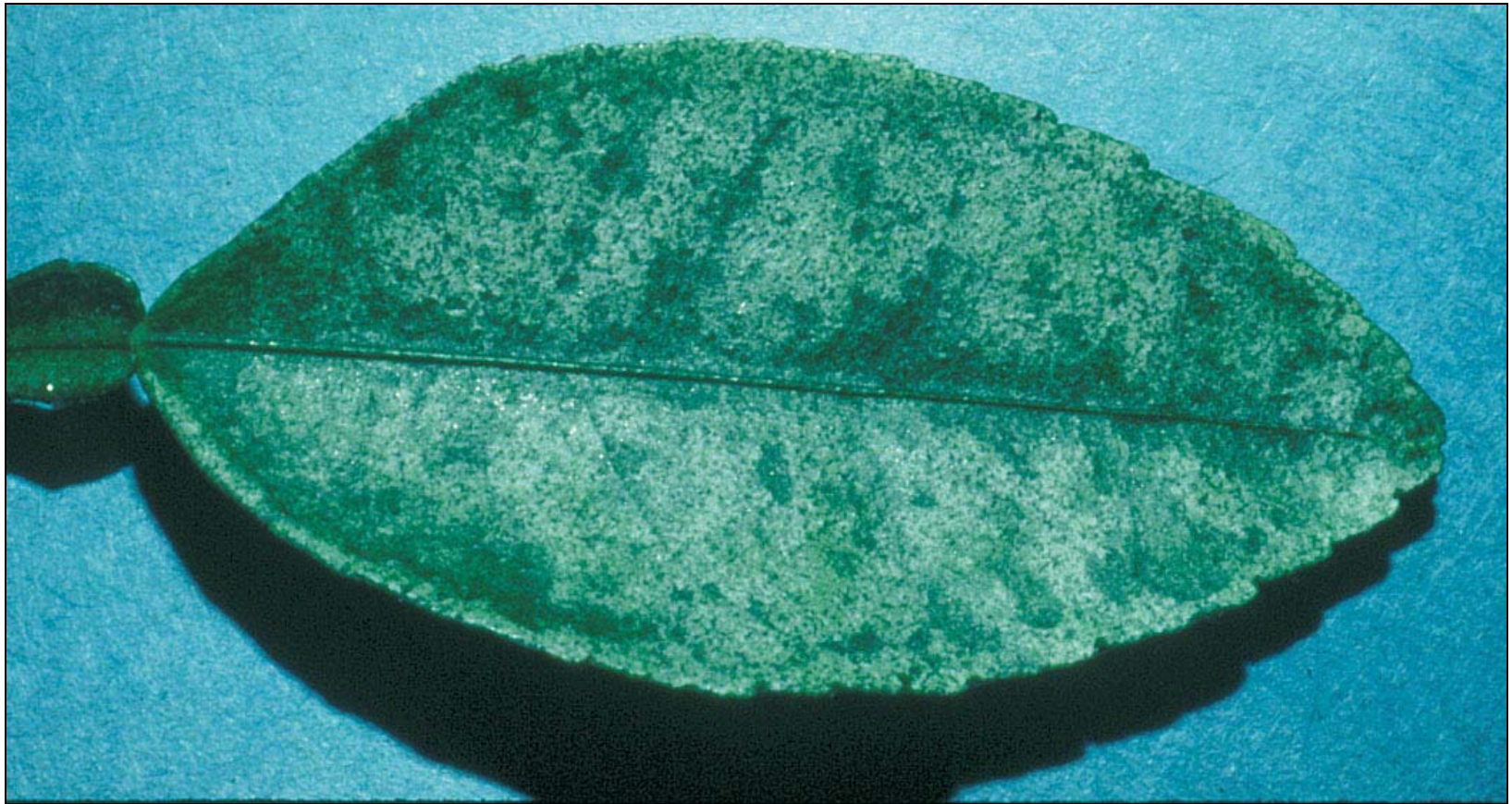


Citrus Red Mite

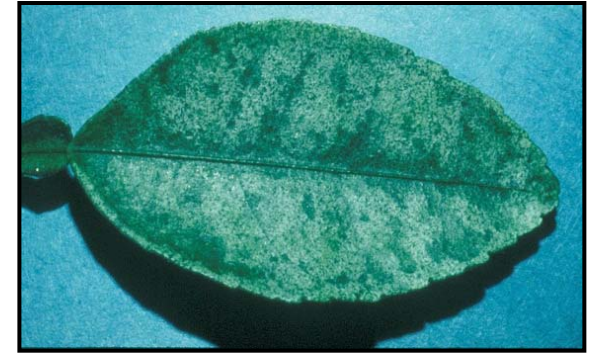


- Deep red to reddish purple in color
- About 0.5 mm long, white setae (hairs) arising from dorsal body surface
- Adult male has long legs, tapering abdomen and is smaller than the female
- Round, red eggs have a vertical stalk projecting upward with webbing often between the stalk and leaf surface

Citrus Red Mite Damaged Leaf



Citrus Red Mite Damaged Leaf



- Feed on leaves, green twigs and fruit using piercing-sucking mouthparts
- Visible injury is characterized by light colored, scratched (etched) areas which giving upper leaf surface a silvery appearance
- Mite feeding and environmental stress can lead to mesophyll collapse and leaf abscission
- Fruit damage by citrus red mite is rarely seen

Texas Citrus Mite

(*Eutetranychus banksi*) (McGregor)



Texas Citrus Mite



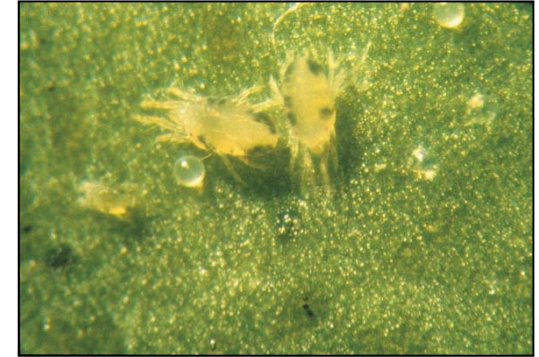
- About 0.5 mm long with males more slender than females
- Tan to brownish green with dark green to black spots on upper side of body
- Adults and nymphal mites have eight legs and the larval stage has only six legs
- Prefers the upper leaf surface with eggs primarily along midrib and lateral veins
- Highest number in spring when humidity conditions are low

Six-Spotted Mite

Eotetranychus sexmaculatus (Riley)



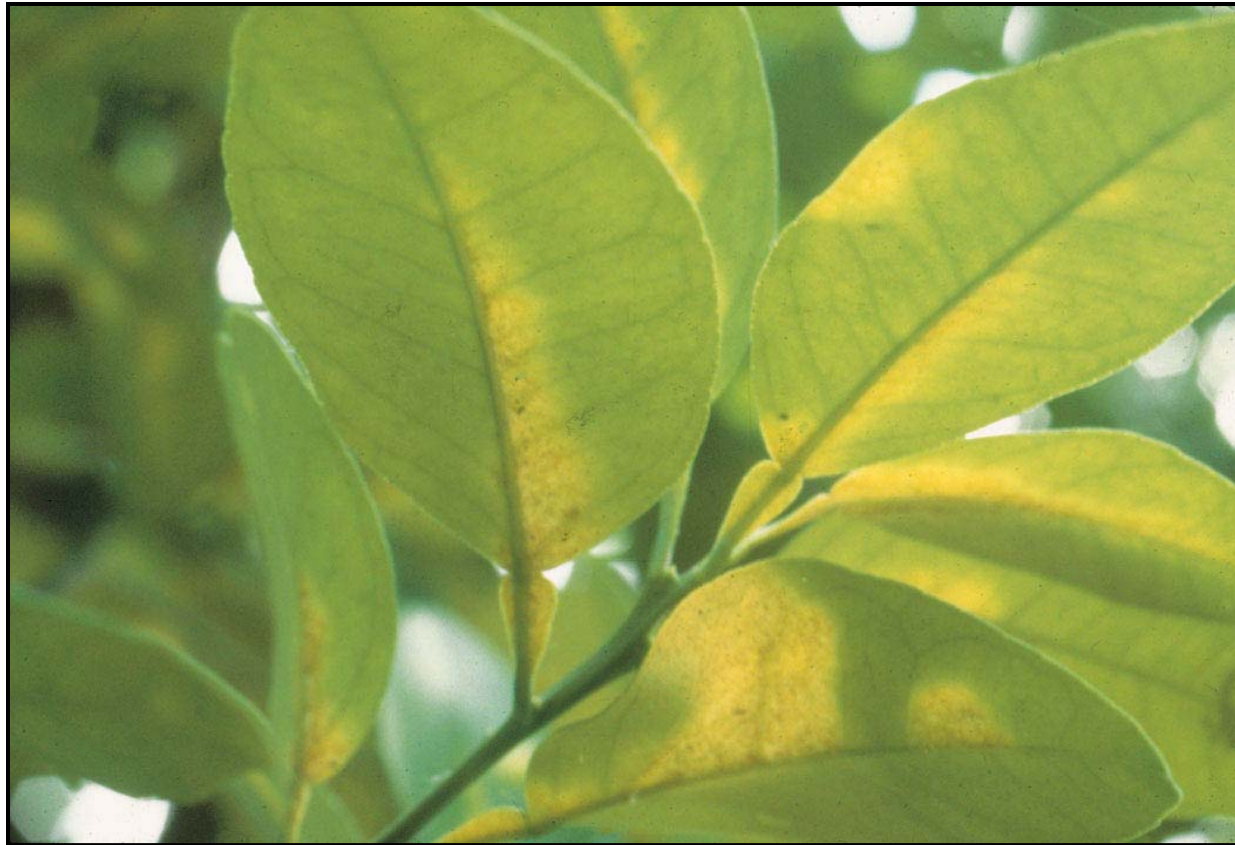
Six-Spotted Mite



- Pale yellow, oval, 0.35 mm long, with one to three pairs of dark spots on the upper surface of the body
- Long setae are visible on the dorsal surface of the mite
- Found mostly along the petiole, midrib, or lateral veins on the lower leaf surface usually in dense colonies covered with webbing
- Eggs are round and light yellow, with a short stalk or mask extending vertically

Six-Spotted Mite

Damage to Leaf Surface



Six-Spotted Mite

Damage to Leaf Surface



- Highest population commonly found in early spring
- Prefer the underside of the leaf, producing extensive webbing
- Usually damage is first observed on lower canopy leaves between March and May
- Feeding causes discoloration of leaf surface in response to cell damage which collapses inward causing the leaf to bulge upward
- Extensive feeding can induce defoliation

Six-Spotted Mite

Recommended Chemical Control

Pesticide	Comments	Other Pests Controlled
Petroleum Oil 97+% (FC 435-66, FC 455-88 or FC 470)	Does not control citrus snow scale. Do not apply if trees are wilting or in a near wilt state. Do not apply within 3 weeks of sulfur. Some early maturing specialty fruit varieties may experience degreening problems with fall applied petroleum oil. Can be tank mixed with any recommended mite material except where prohibited under the comment section. Do not apply when temperatures exceed 94°F.	Citrus rust mite, whitefly, sooty mold
Follow label rate		

These photos are from an article by
S. H. Futch¹, C. C. Childers² and C. W. McCoy²
University of Florida,
Citrus REC, Lake Alfred, Florida

Available as EDIS document number CH179 or
Horticultural Sciences Fact Sheet HS-806.

¹Multi-County Citrus Agent

²Professor of Entomology

A Guide to Scale Insect Identification

Citrus Snow Scale

Unaspis citri (Comstock)



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
- Primarily attack the trunk and large limbs, but can be found on leaves, twigs, and fruit

Florida Red Scale

Chrysomphalus aonidum (L.)

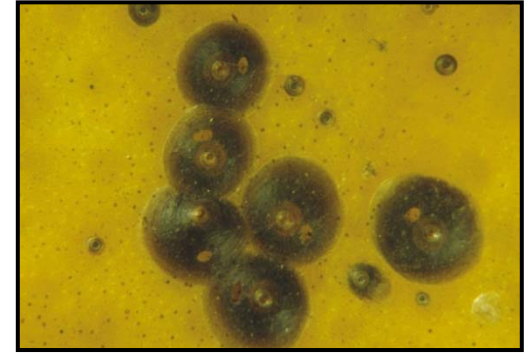


Florida red scale; larger scales contain parasite emergence holes

Florida red scale on fruit



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
- Under biological control



Caribbean Black Scale

Saissetia neglecta DeLotto



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

Scale Insects

Recommended Chemical Controls

Pesticide	Comments	Other Pests Controlled
Malathion 5 EC	Glover and yellow scale. Does not control chaff or black scale.	Plant bugs, crickets
Petroleum Oil 97+% (FC 435-66, FC 455-88 or FC 470)	Does not control citrus snow scale. Do not apply if trees are wilting or in a near wilt state. Do not apply within 3 weeks of sulfur. Some early maturing specialty fruit varieties may experience degreening problems with fall applied petroleum oil. Can be tank mixed with any recommended mite material except where prohibited under the comment section. Do not apply when temperatures exceed 94°F.	Citrus rust mites, whitefly, greasy spot, sooty mold
Sevin 80 S Sevin 4 F Sevin XLR	May increase citrus red mite and Texas citrus mite populations. Do not exceed 20 lb a.i./acre/year for all uses.	Adult root weevils, orangedog, crickets, katydids, grasshoppers

These photos are from an article by
S. H. Futch¹, C. W. McCoy² and C. C. Childers²
University of Florida
Citrus REC, Lake Alfred, Florida

Available as EDIS document number CH195 or
as Horticultural Sciences Fact Sheet HS-817.

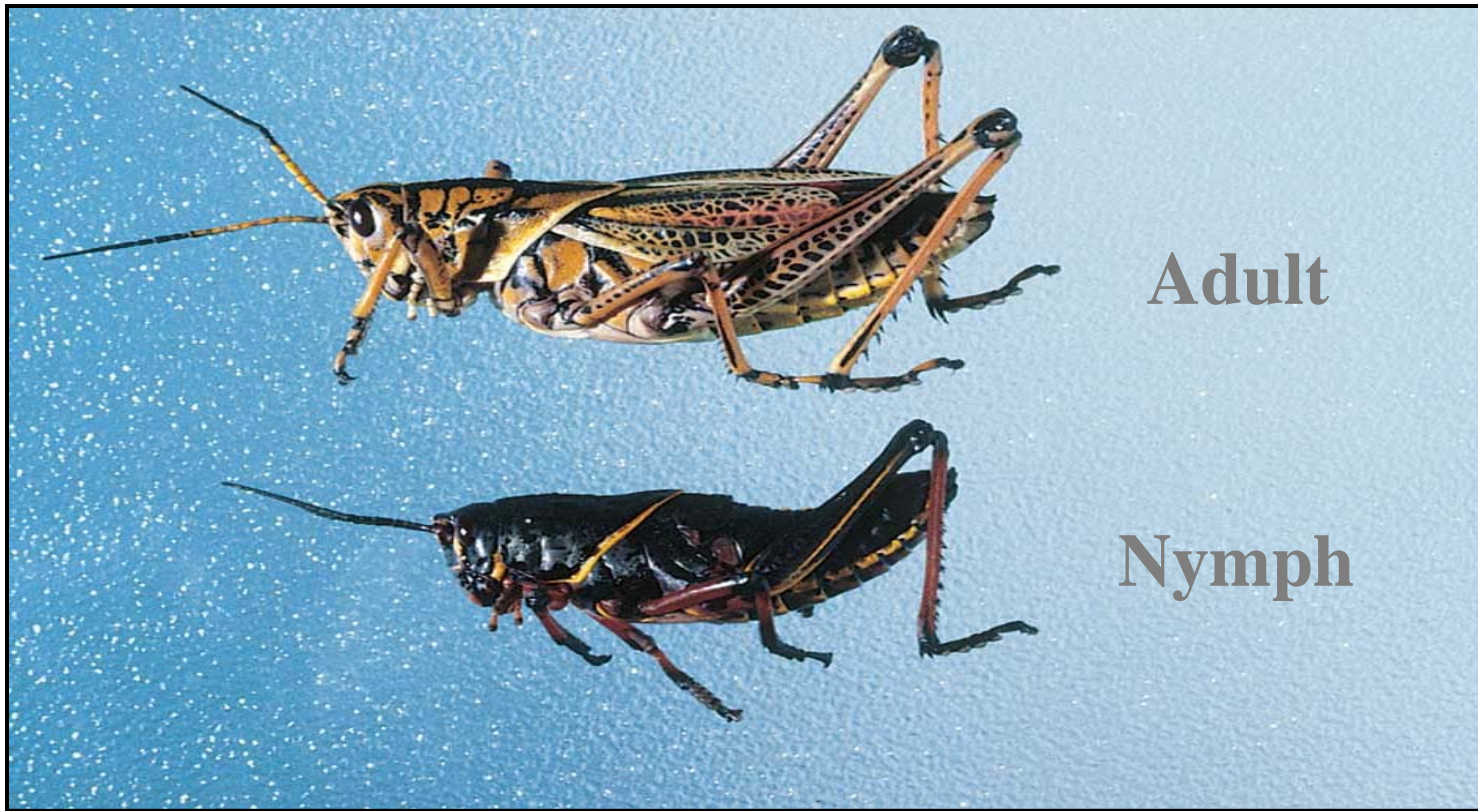
¹Multi-County Citrus Agent

²Professor of Entomology

Identification of Insect Pests

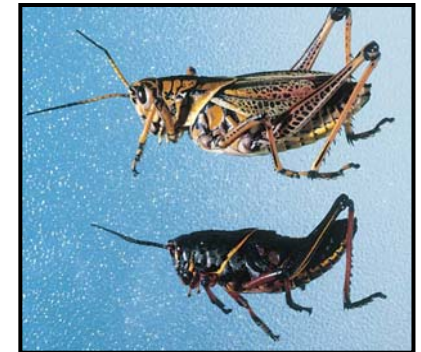
Eastern Lubber Grasshopper

Romalea microptera (Beauy)



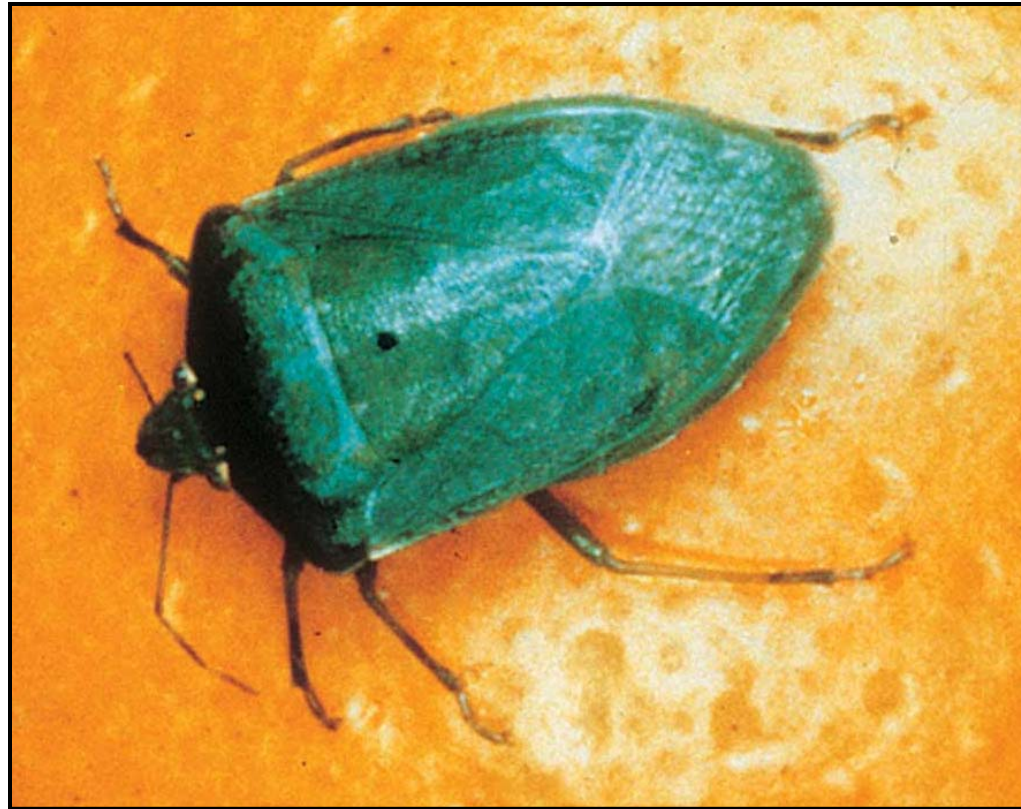
Eastern Lubber Grasshopper

- Native grasshopper
- Adult is brilliant yellow with red and black markings, approximately 2 inches long
- Nymphs are solid black
- Female lays eggs in soil in generally wet areas or in woodland areas
- Can defoliate young citrus trees



Southern Green Stinkbug

Nezara viridula (L.)



Southern Green Stinkbug

- Bright green with broadly oval, shield-shaped body
- Approximately 1 inch long
- Damage to fruit is by piercing-sucking mouthparts
- When peel is damaged, a discolored and dry area often appears in the flesh below the damaged area



Orangedog

Papilio cresphones (Cramer)



Swallowtail butterfly

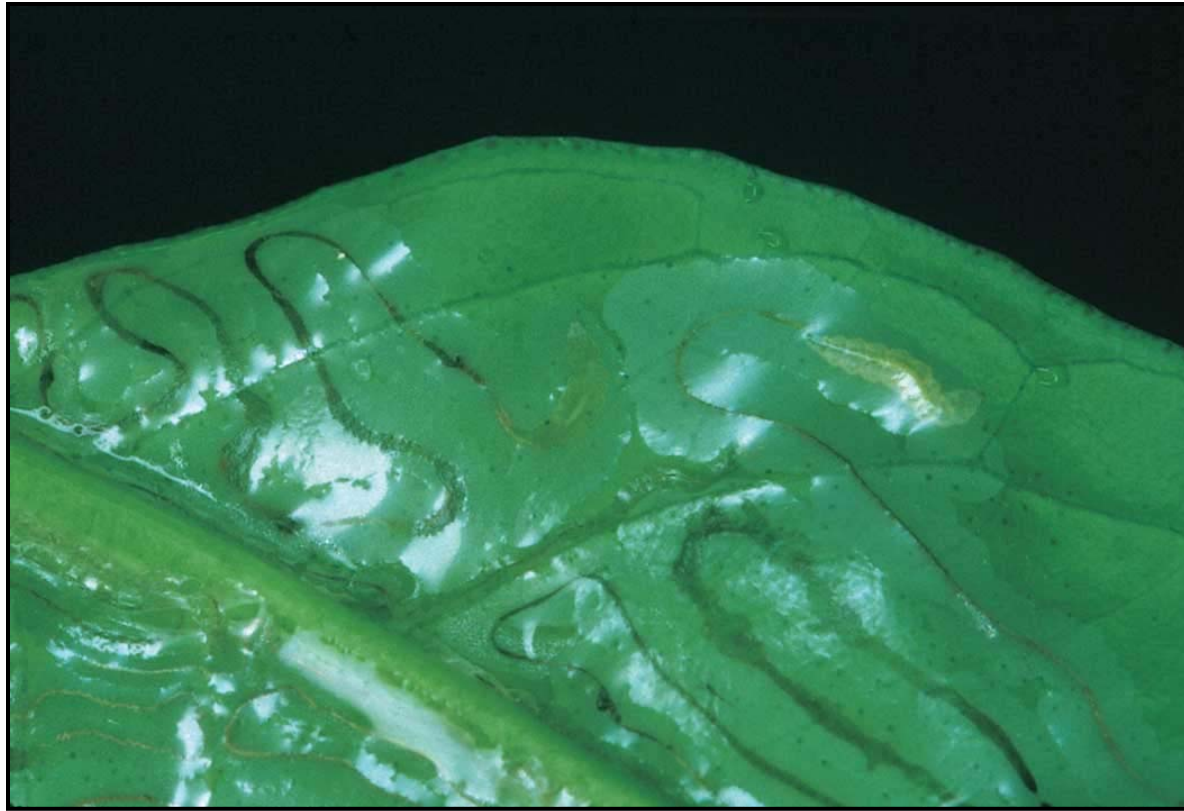
Orangedog



- Larval stage feed on young foliage causing extensive damage and defoliation
- Larval stage is brown and white caterpillar that 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 1/4-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

These photos are from an article by
S. H. Futch¹, C. W. McCoy² and C. C. Childers²
University of Florida
Citrus REC, Lake Alfred, Florida

Available as EDIS document number HS142 or
as Horticultural Sciences Fact Sheet HS-893.

¹Multi-County Citrus Agent

²Professor of Entomology

Identification of Soft-Bodied Insects (Homoptera)

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



Aphids

- Produce live young asexually allowing for rapid population increases
- Infest newly expanding citrus terminals, sucking sap from the growing leaves and stems
- Does not produce significant damage to mature trees but can damage young trees
- Honeydew is excreted by aphids stimulating the growth of sooty mold that may reduce photosynthesis
- Under biological control by ladybeetles, hoverflies, and lacewings
- Populations usually decline under high summer temperatures and during periods that lack new flushes

Brown Citrus Aphid

Toxoptera citricida (Kirkaldy)



Aphid Damaged Twig



Brown Citrus Aphid



- The most abundant aphid in Florida citrus and a vector of citrus tristeza virus (CTV)
- Feeds only on citrus and related species
- Large colonies form on new flushes where they deposit large amounts of honeydew that stimulates the growth of sooty mold
- Growing terminals may be stunted by high populations
- Glossy black appearance with dark body fluid when squeezed

Spirea or Green Citrus Aphid

Aphis spiraeicola (Patch)



Spirea or Green Citrus Aphid

- Spirea aphid is quite small and matches the color of new flushes of citrus leaves
- Can feed on a wide host range including citrus
- A weak vector of CTV
- Its feeding causes permanent damage to growing citrus terminals
- Injury is characterized by shortening of internodes, cupping and twisting of leaves



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

Citrus Whitefly

Dialeurodes citri (Ashmead)

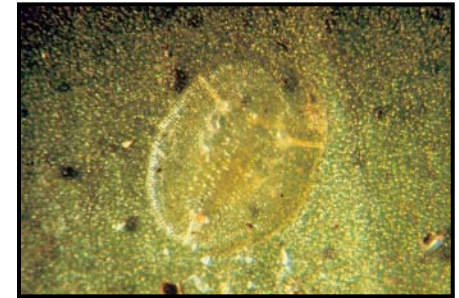


Citrus Whitefly Nymph



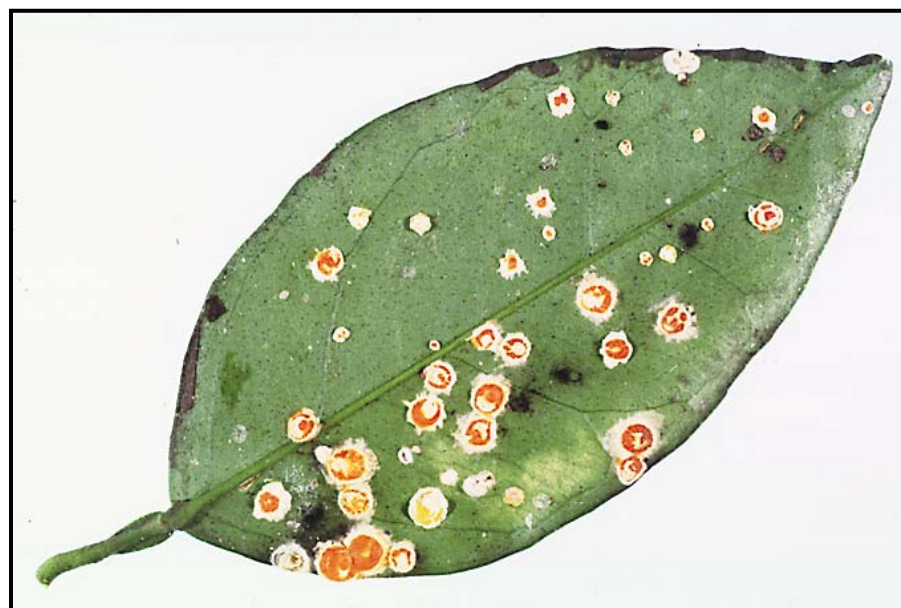
Citrus Whitefly

- Adults are about 1-2 mm long, moth-like with males smaller than females.
- Wings are covered with a white waxy powder, abdomen is yellow
- Eggs laid primarily on the underside of the leaf, yellow in color and on stalks
- Populations increase on spring and summer leaf flushes
- Whiteflies produce honeydew which supports the growth of sooty mold
- Attacked by fungal pathogens and various wasps



Aschersonia Fungi

- Infects whitefly nymphs, producing a red or yellow raised growth in and over the nymphs
- As the fungi ages, the colors will fade
- Friendly fungi



Citrus Mealybug

Planococcus citri (Risso)



Citrus Mealybug

Planococcus citri (Risso)



- White with a segmented body which is covered by a powdery wax covering
- Underneath the covering is a yellowish, oval soft body
- Wax covering will increase with age.
- Adult female is approximately 3 mm in length and will produce 300-600 eggs
- Nymphs are light yellow to cream
- Common in the spring and early summer and are found in sheltered location within the citrus tree
- Produce large amounts of honeydew

These photos are from an article by

S. H. Futch¹, C. W. McCoy², J. P. Michaud² and
C. W. Childers²

University of Florida
Citrus REC, Lake Alfred, Florida

Available as EDIS document number HS133 or
as Horticultural Sciences Fact Sheet HS-870.

¹Multi-County Citrus Agent

²Professor of Entomology

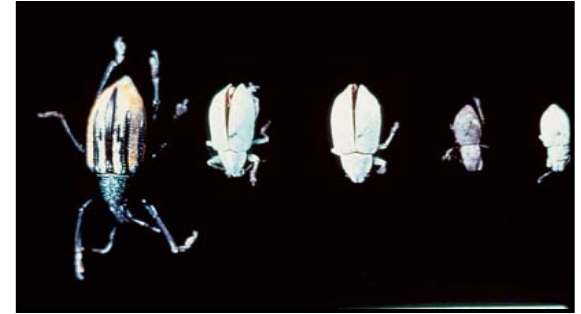
A Guide to Soil Insect Pests Identification

Citrus Root Weevils



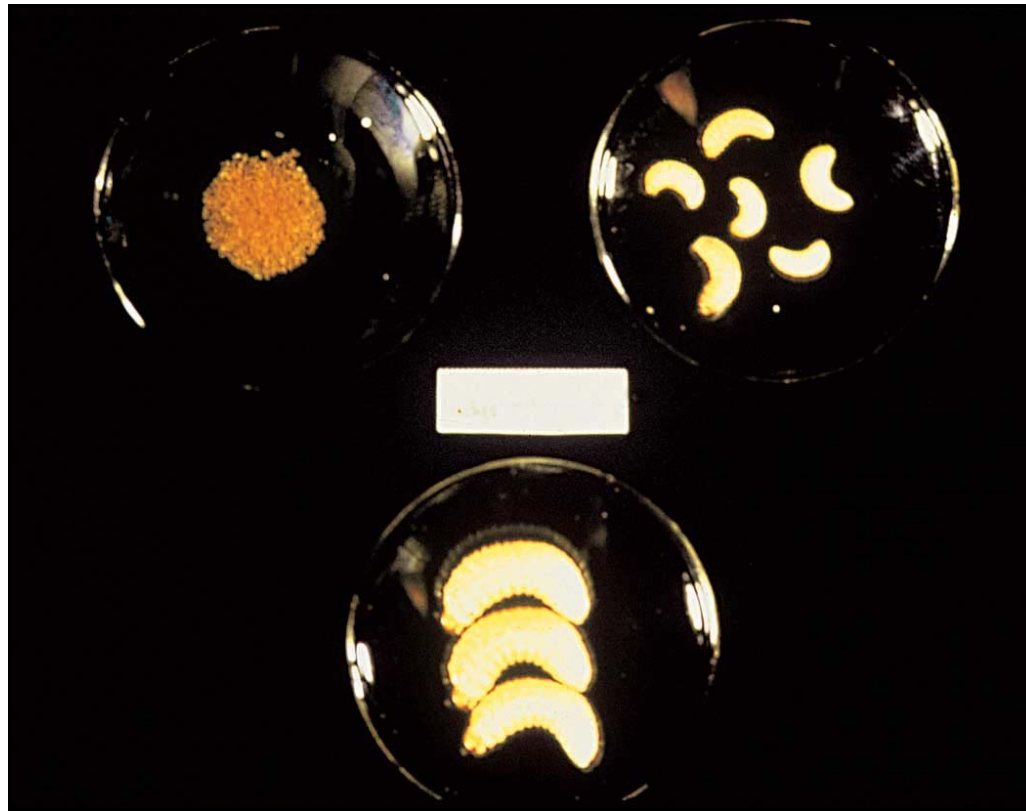
Weevils are, left to right: Diaprepes, southern citrus root weevil, northern citrus root weevil, Fuller rose beetle and little leaf notcher

Citrus Root Weevils



- Most common species from left to right:
 - Diaprepes, *Diaprepes abbreviatus* (L.)
 - Southern citrus root weevil, *Pachnaeus litus* (Germar)
 - Northern citrus root weevil, *Pachnaeus opalus* (Olivier)
 - Fuller rose beetle, *Asynonychus godmani* (Crotch)
 - Little leaf notcher, *Artipus floridanus* (Horn)

Weevil Larva with Neonates



Weevil Larva and Neonates

- All weevils have similar life cycle
- The immature stages are egg, larva and pupa
- After hatching, the larvae enter the soil to feed on roots
- The adults weevils emerge from the soil, feed on foliage



Diaprepes Larvae Feeding



Root system damaged by Diaprepes larvae feeding

Diaprepes Larvae Feeding

Root System Damage



- Large larvae cause damage by channeling the outer root bark tissue including the cambium layer, or by girdling a root, thereby causing root death
- Feeding damage by older larvae may be seen on major lateral roots and in crown region when tree is removed from the soil

Diaprepes Adult Feeding Damaged Leaves



Diaprepes Adult Feeding

Damaged Leaves



- Adults feed on the margins of newly emerged leaves, producing a notched margin to the leaf
- Notching patterns will vary with species and can be confused with grasshopper injury
- Adults are semi-nocturnal; they can be found in the early morning or late afternoon on the outer foliage
- When disturbed, they fall from the branch to the ground and fake death

Subterranean Termite

Reticulitermes flavipes (Kollar)



Subterranean Termite

- Usually do not feed on living plants and can be found on dead and decaying woody plant material
- Subterranean termites are 0.20 inch in length, white to yellow in color
- They are similar to ants in appearance



Termite Damage to Tree



Termite Damage to Tree

- When food supply becomes limited, termites may feed on bark of the live tree trunk in a ring between the soil line and crown roots, causing girdling and possible tree death
- Feeding may advance above the soil line
- If termites are found, check other areas as a possible host site



Red Imported Fire Ant

Solenopsis invicta (Fabricius)



Red Imported Fire Ant

- Fire ants are reddish-brown to black in color and 0.13-0.25 inch long
- Fire ant colonies may contain upwards of 250,000 individuals in mound measuring 3-12 inches high and up to 3 feet in diameter



Fire Ant Damage



Fire ant damage
to young citrus
tree

Fire Ant Damage to Young Citrus Tree



- Ants may feed on bark and tender new flush
- Once feeding occurs on the bark, the tree can be girdled or wound opened, which allow pathogens to enter the tree with possible tree death to follow

These photos are from an article by
S. H. Futch¹, C. W. McCoy² and H. N. Nigg²
University of Florida
Citrus REC,, Lake Alfred, Florida

Available as EDIS document number HS130 or
as Horticultural Sciences Fact Sheet HS-868.

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A Guide to Citrus Nutritional Deficiencies and Toxicities

Nitrogen Deficiency



Normal

Nitrogen Deficiency

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

Nitrogen Deficiency



Aging, senescing leaves

Nitrogen Deficiency on Aging, Senescing Leaves

- Nitrogen deficiency is associated with senescing foliage, which can develop a yellow-bronze appearance prior to leaf abscission



Yellow Vein Chlorosis

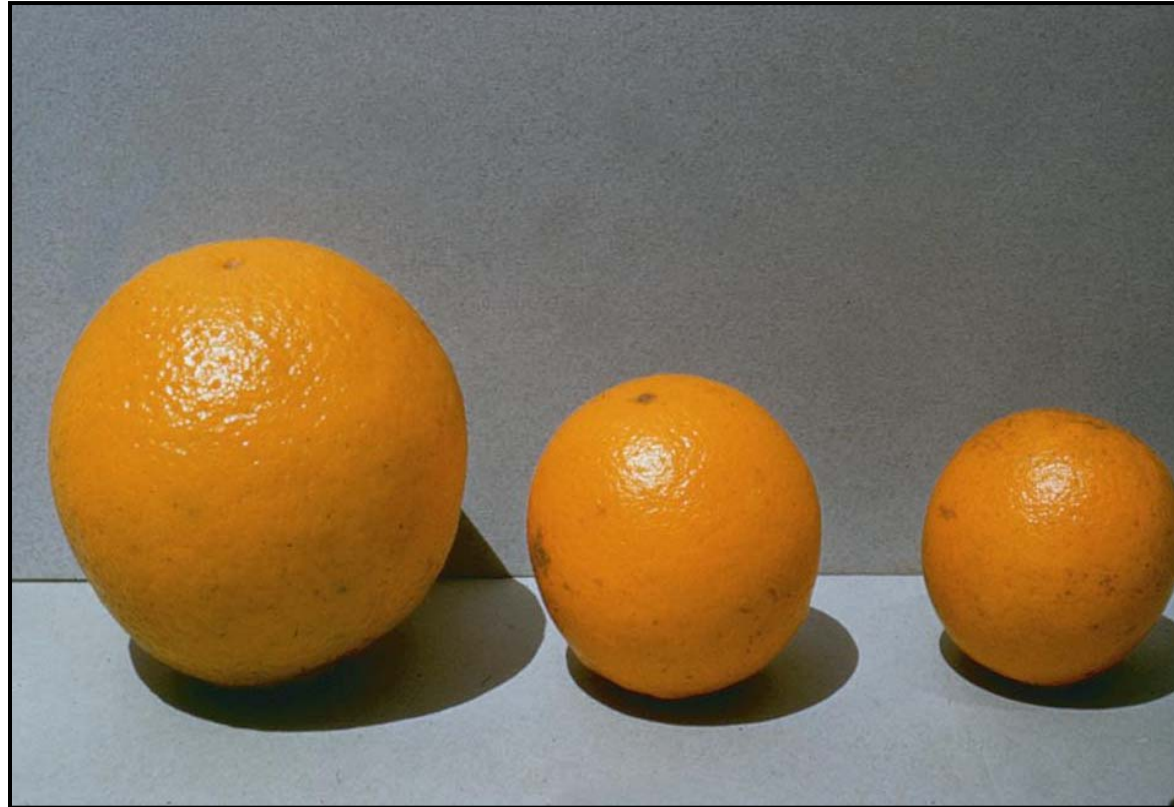


Yellow Vein Chlorosis



- 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

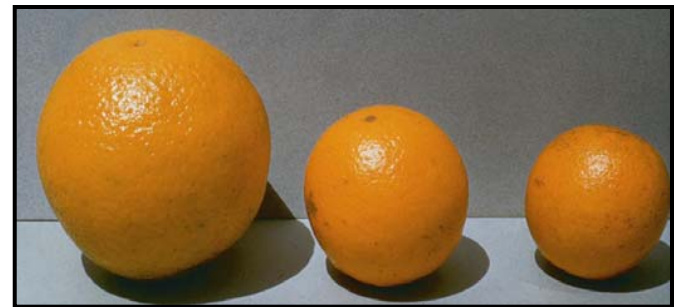
Potassium Deficiency



3 levels of potassium deficiency with
the smallest fruit being the most
deficient

Potassium Deficiency

- Fruit are smaller, have smoother, thinner rinds and may be subject to splitting and/or fruit drop
- Potassium deficiency is likely to occur on calcareous soils due to elemental antagonism
- Easily corrected by soil applications except in areas of extremely high soil pH



Magnesium Deficiency

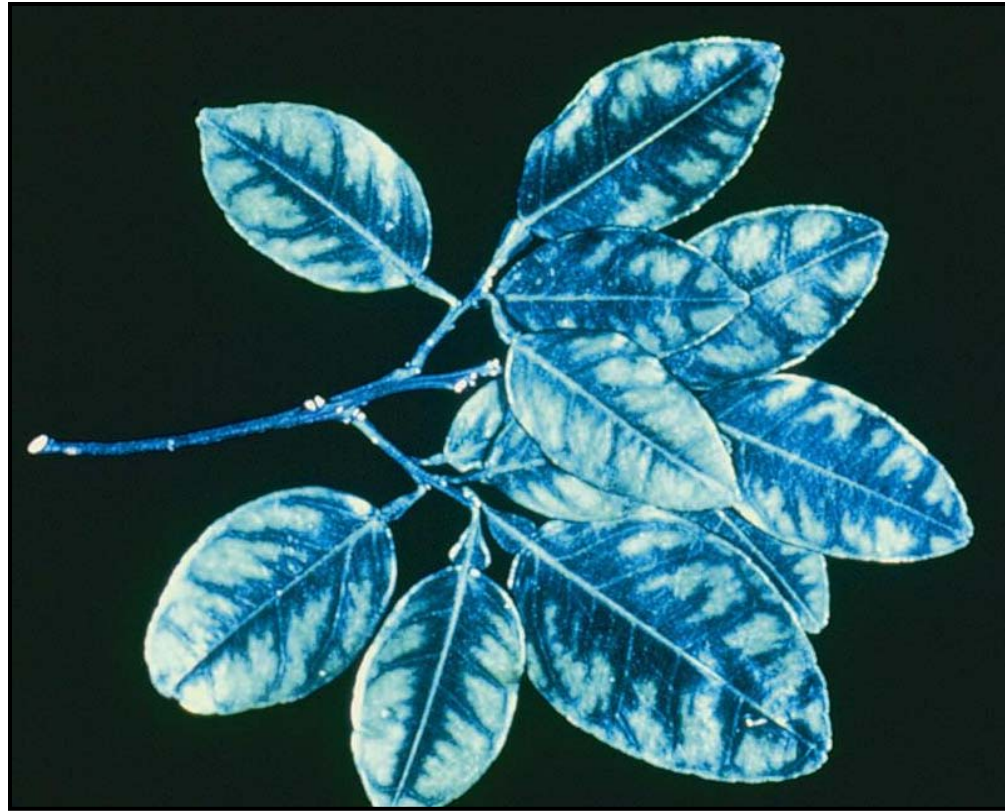


Magnesium Deficiency



- 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



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



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



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

Copper Deficiency (Ammoniation)



Copper Deficiency



- Mild copper deficiency is usually associated with large, dark green leaves on long soft angular shoots
- Twigs can develop blister-like pockets of clear gum at nodes
- As twigs mature, reddish brown eruptions may occur in the outer portion of the wood
- Severely affected twigs commonly die back from the tip with new growth appearing as multiple buds

Copper Deficiency

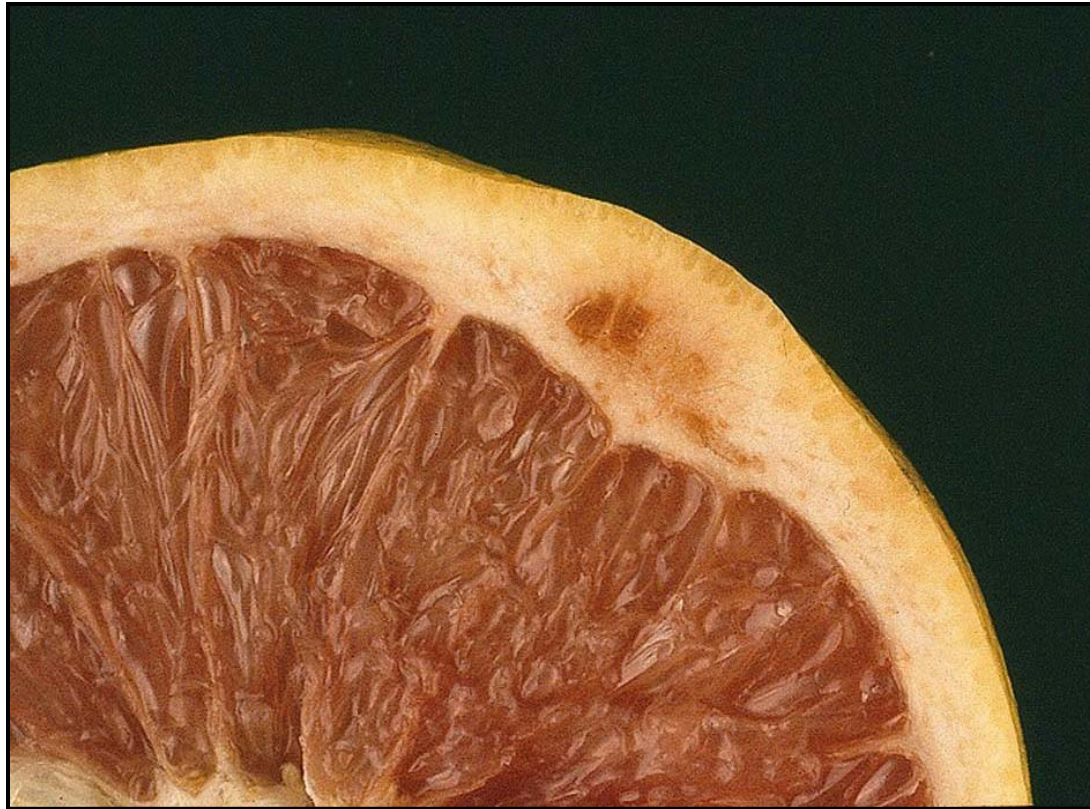


Copper deficiency showing gum pocket at node

Copper Toxicity

- Feeder roots may become darkened, and show restricted growth
- When extractable copper exceeds 100 pounds per acre, trees begin to decline
- High copper levels may be ameliorated by liming to pH 6.5
- Swingle citrumelo is known to be quite susceptible to high soil copper

Boron Deficiency



Boron Deficiency



- Fruit symptoms most indicative of boron deficiency include darkish-colored spots in the white albedo (white portion of the peel) of fruit and sometimes the central core
- Fruit may be somewhat misshapen with lumpy surface
- Slight excess can cause toxicity
- Can be corrected by soil or foliar applications, but not both

Salt Injury



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

These figures are from an article by
Stephen H. Futch¹ and David P. H. Tucker²
University of Florida
Citrus REC, Lake Alfred, Florida

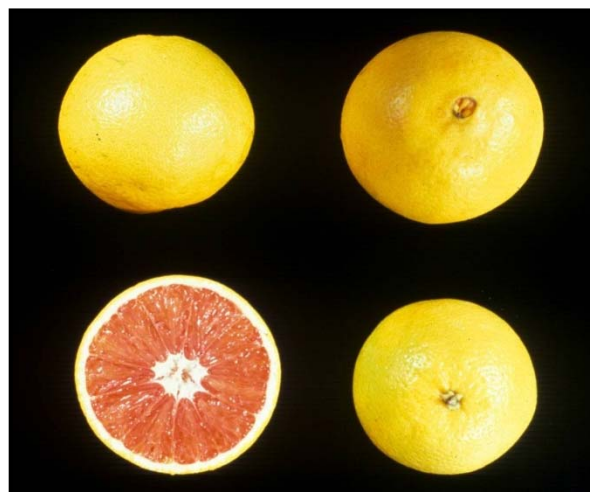
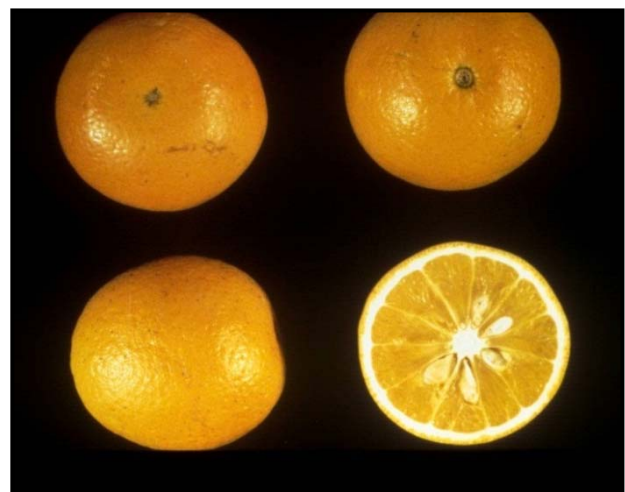
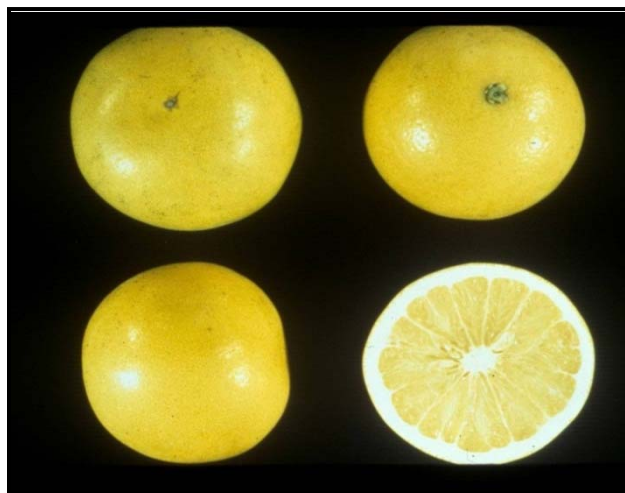
Available as EDIS document number CH142 or
as Horticultural Sciences Fact Sheet HS-797.

¹Multi-County Citrus Agent

²Professor Emeritus, Horticulturist

Identification of Fruit Varieties

Varieties



Citrus Varieties

- Oranges
 - Navel
 - Red Navel
 - Hamlin
 - Pineapple
 - Valencia
- Grapefruit
 - Duncan
 - Marsh
 - Mixed red varieties
- Tangerines & Hybrids
 - Satsuma
 - Fallglo
 - Sunburst
 - Dancy
 - Temple
 - Orlando
 - Minneola
 - Murcott

Naval Orange

- Season: Oct. - Jan.
- Seeds per fruit: seedless
- Average diameter: 3-3.5 inches
- Appearance of secondary fruit (navel)
- Use: fresh



Cara Cara Red Navel Orange

- Season: Oct. - Jan.
- Seeds per fruit: 0-6
- Average diameter: 3-3.5 inches
- Appearance of secondary fruit (navel)
- Use: fresh



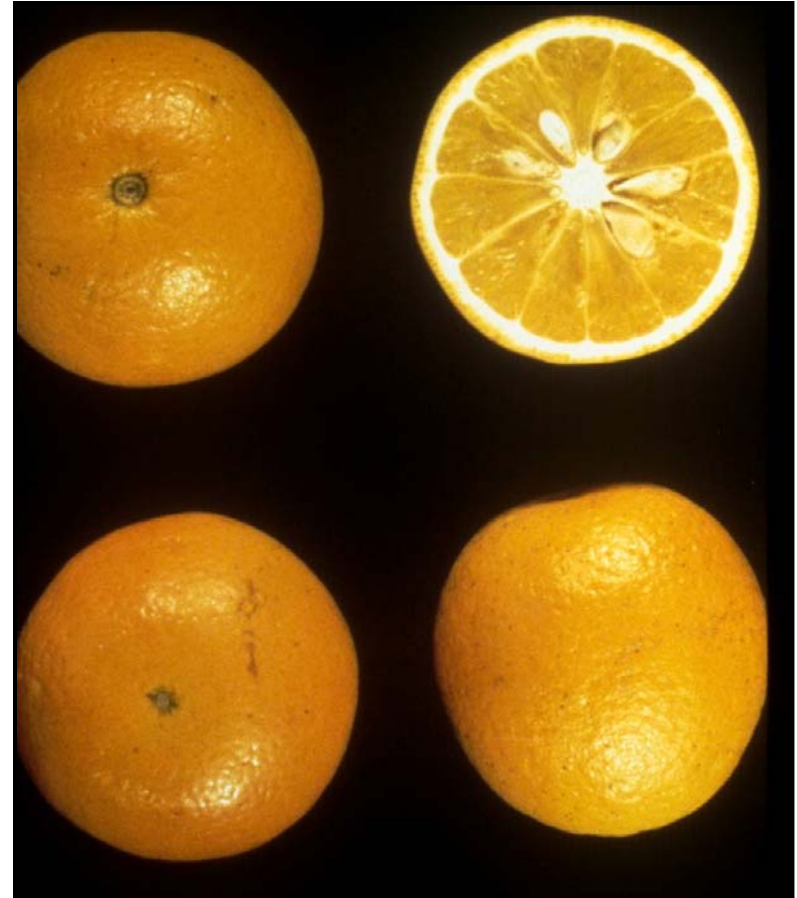
Hamlin Orange

- Season: Oct. - Jan.
- Seeds per fruit: 0-6
- Average diameter: 2.75-3 inches
- Peel texture: somewhat smooth
- Use: fresh and processing



Pineapple Orange

- Season: Dec. - Feb.
- Seeds per fruit: 15-25
- Average diameter: 2.75-3 inches
- Peel texture: somewhat coarse
- Use: fresh and processing



Valencia Orange

- Season: Mar. - June
- Seeds per fruit: 0-6
- Average diameter: 2.75-3 inches
- Peel texture: somewhat coarse
- Use: fresh and processing



Duncan Grapefruit

- Season: Dec. - May
- Seeds per fruit: 30-70
- Average diameter: 3.5-5 inches
- Use: fresh and processing, popular for sectionizing
- Disadvantage: seed number

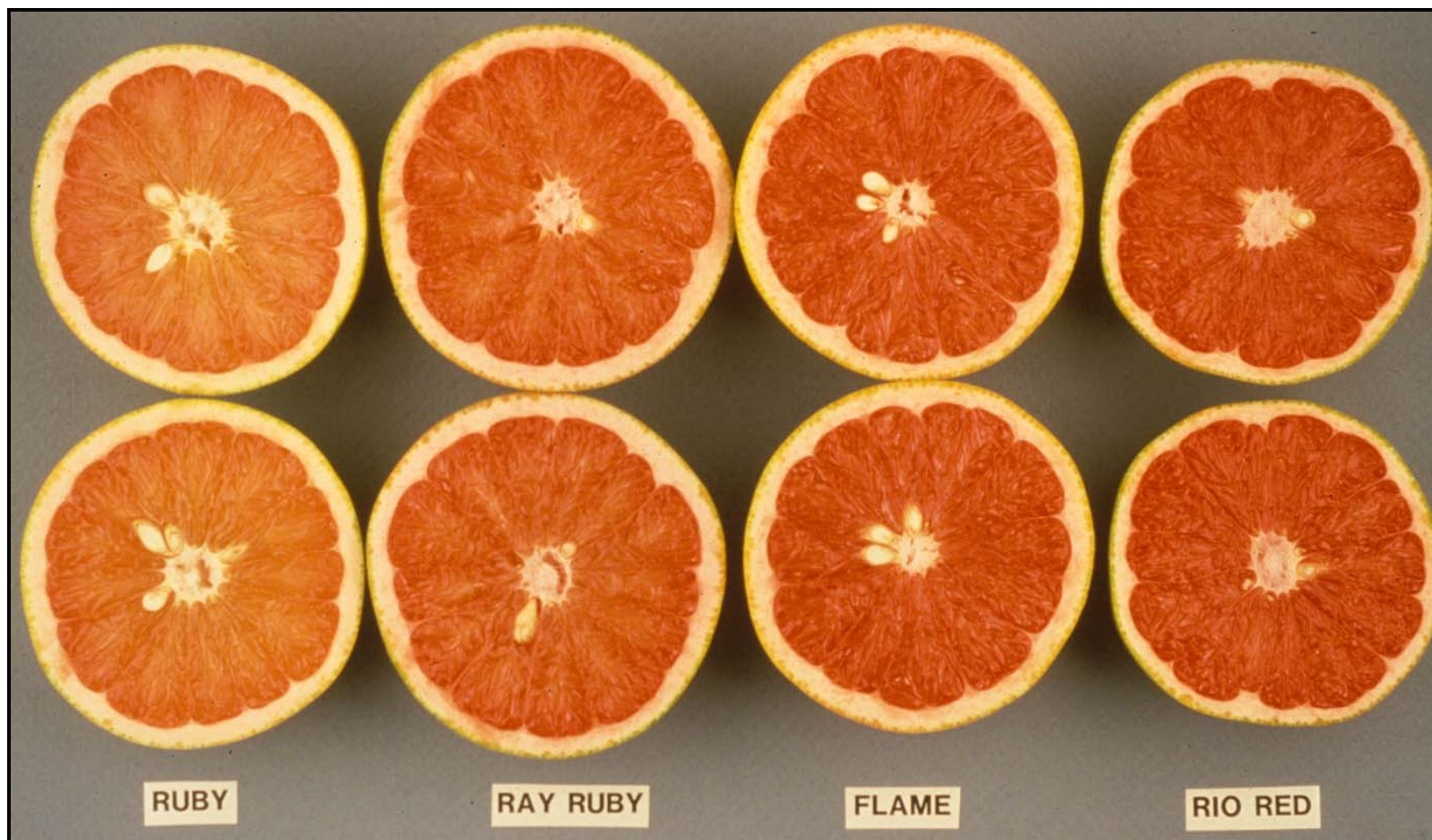


Marsh Grapefruit

- Season: Nov. - May
- Seeds per fruit: 0-6
- Average diameter: 3.5-4.5 inches
- Use: fresh and processing



Citrus Varieties



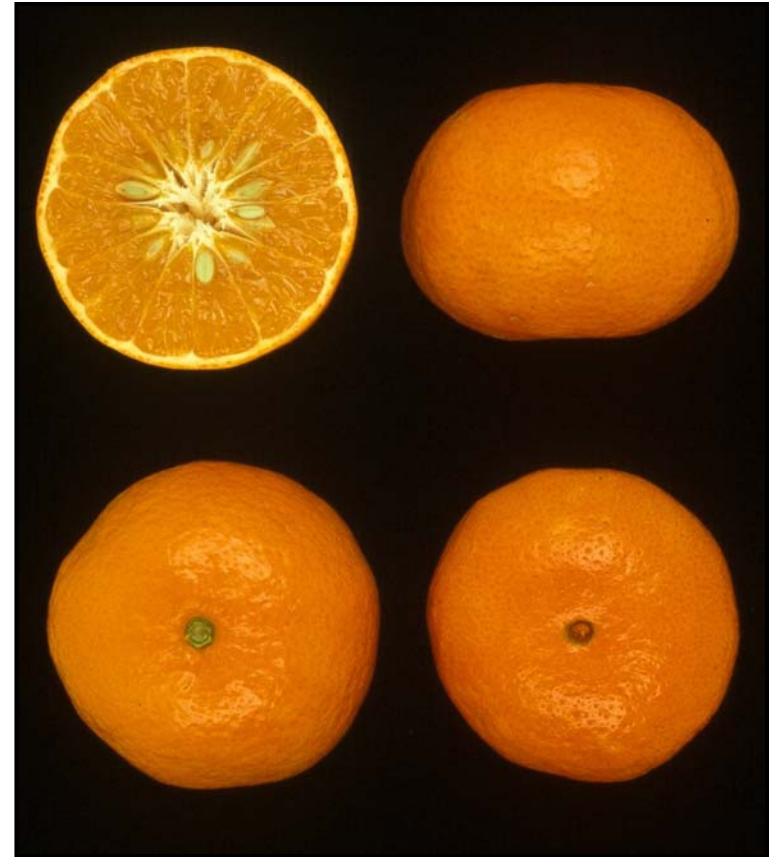
Tangerines and Tangerine Hybrids-Satsuma

- Season: Sept. - Nov.
- Seeds per fruit: 0-6
- Average diameter: 2.25-2.5 inches
- Use: fresh and processing
- The tree is more cold hardy than most citrus varieties
- Fruit quality is dependent on cool fall and winter temperatures.



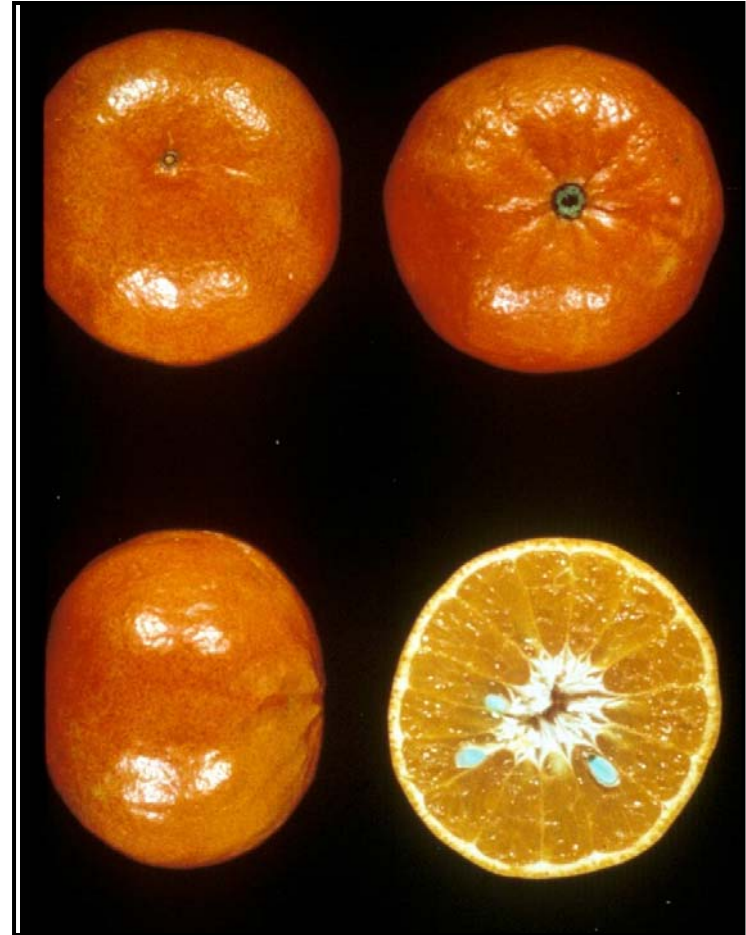
Tangerines and Tangerine Hybrids-Fallglo

- Season: Oct. - Nov.
- Seeds: 20-40
- Size: 2.75-3.25 inch in diameter
- Use: fresh
- Comment: does not store well on tree, does not require cross-pollination



Tangerines and Tangerine Hybrids-Sunburst

- Season: Nov. - Dec.
- Seeds: 1-20
- Size: 2.5-3 inches in diameter
- Use: fresh
- Comments: self-incompatible and must be cross-pollinated, green internal seed color



Tangerines and Tangerine Hybrids-Dancy

- Season: Dec. - Jan.
- Seeds: 6-20
- Size: 2.5-3 inches in diameter
- Use: fresh
- Comments: older tangerine variety, easy to peel



Tangerines and Tangerine Hybrids-Temple

- Season: Jan. - March
- Seeds: 15-20
- Size: 2.75-3 inches in diameter
- Use: fresh or juice
- Comments: more cold tender tangerine hybrids, susceptible to scab, does not require cross-pollination



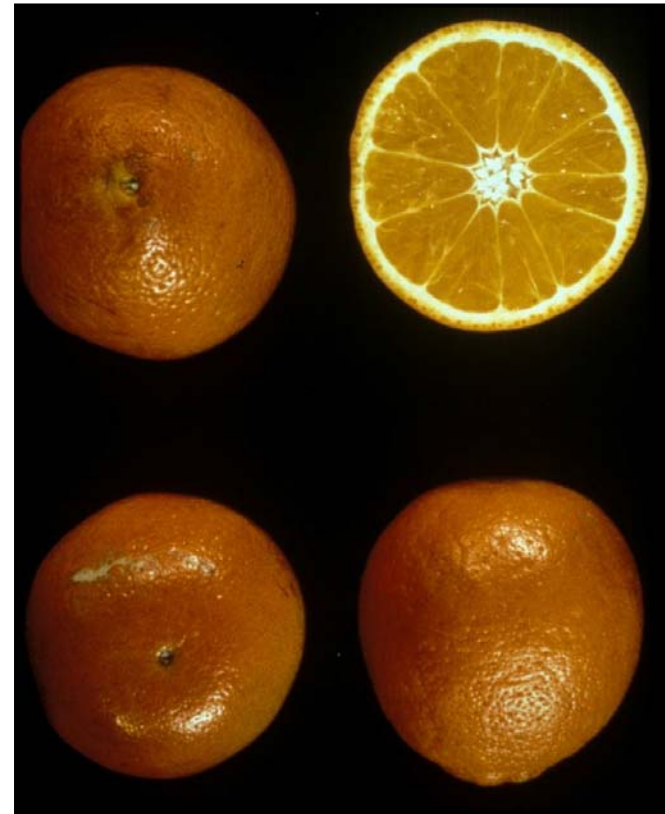
Tangerines and Tangerine Hybrids-Orlando

- Season: Nov. - Jan.
- Seeds: 0-35
- Size: 2.75-3 inches in diameter
- Use: fresh
- Comments: requires cross-pollination, requires higher N levels, susceptible to Alternaria and scab



Tangerines and Tangerine Hybrids-Minneola (Honeybell)

- Season: Dec. - Feb.
- Seeds: 0-12 depending on cross pollination
- Size: 3-3.5 inches in diameter
- Use: fresh
- Comments: requires cross-pollination, susceptible to scab and particularly Alternaria brown spot



Tangerines and Tangerine Hybrids- Murcott (Honey Tangerine)

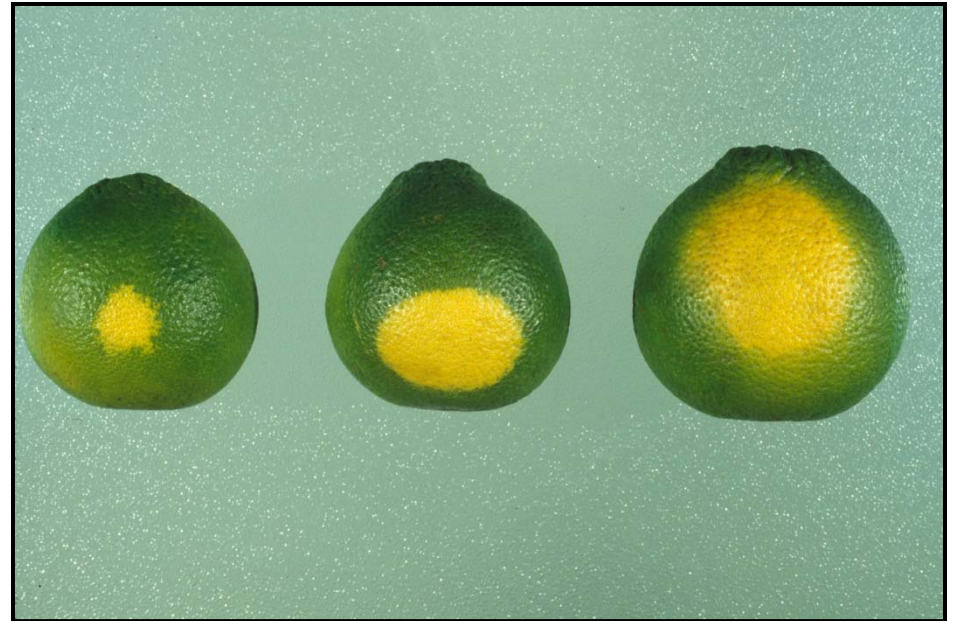
- Season: Jan. - March
- Seeds: 10-20
- Size: 2.75 inches in diameter
- Use: fresh
- Comments: use Cleopatra mandarin as rootstock, susceptible to scab and Alternaria brown spot



Miscellaneous Citrus Problems

Sunburned Fruit

- Exposure to sun can cause damage to some varieties, esp. Murcott, Ambersweet



Sunburned Leaves

- When the underside of the leaf is exposed to direct sun light, it can be damaged
- Brown gum spots are irregular in shape and have a hard, smooth, raised surface



Lichens

- Lichens may occur on the trunk, branches, and twigs of the tree
- Usually on old or neglected trees
- Does not harm the tree
- Color varies, but gray-green is the most common



Chimera

- A genetic mutation that occurs on a twig, branch, or fruit
- Can differ in color, texture or shape
- Generally, mutations are of inferior quality



Bird/Thorn Puncture

- May have single to multiple puncture sites that vary in depth and size
- In severe cases, the fruit may fall from the tree before reaching maturity



Glyphosate Injury

Roundup and other brands

- Results from the material being absorbed and translocated by the green tissue
- New growth after application will appear as small, narrow, strap-shaped leaves
- Multiple bud growth may also appear



Fertilization of Citrus

Suggested Fertilization Schedule

Tree Age	Lbs N/ tree/yr	Lbs Fertilizer/tree/yr			Applications/yr
		6-6-6	8-8-8	10-10-10	
1	0.15-0.30	2.5-5.0	1.8-3.8		6
2	0.30-0.60	5.0-10.0	3.8-7.5		5
3	0.45-0.90	8.0-15.0	5.6-11.3		4
4	0.80-1.0	13.0-17.0	10.0-12.5	8.5-12.5	3
5+	1.1-1.4	18.0-23.0	13.8-17.5	11.0-14.0	3

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

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

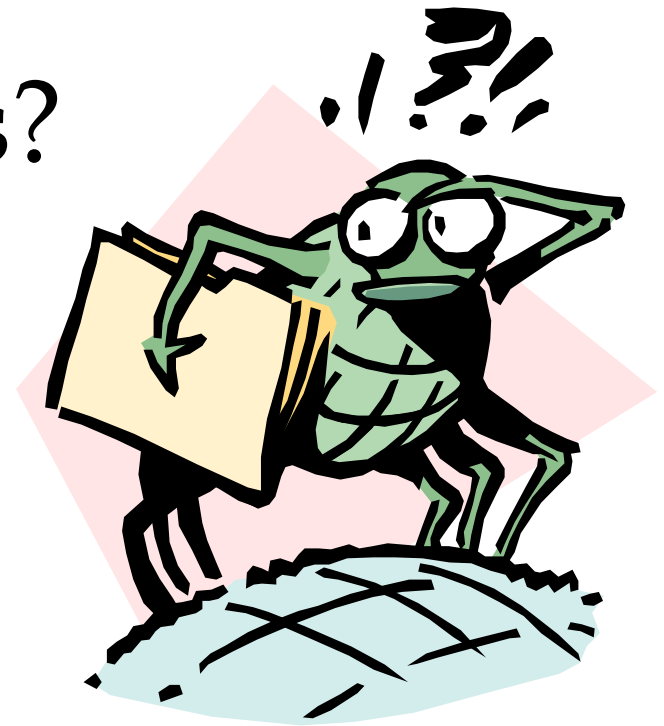
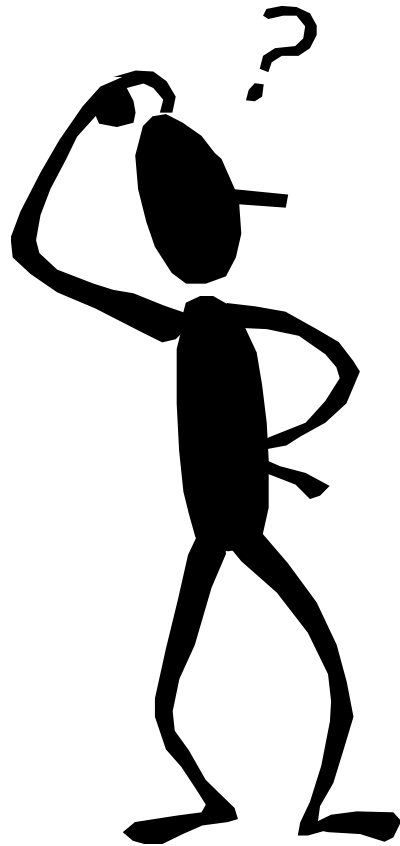
How to Apply Fertilizer

- 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?



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