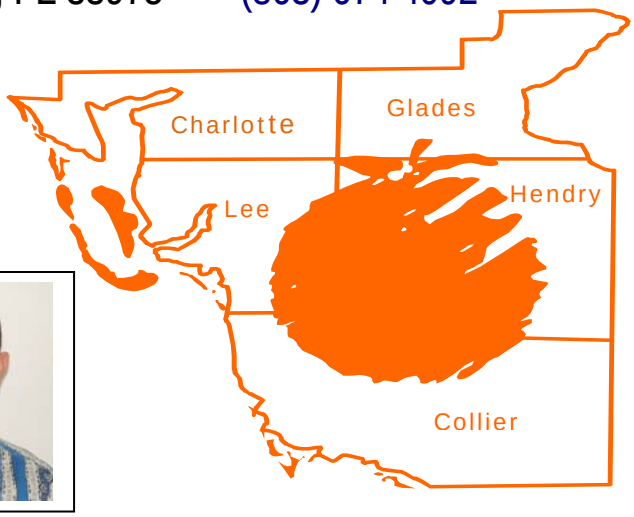
UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

Hendry County Extension, P.O. Box 68, LaBelle, FL 33975 (863) 674 4092

Flatwoods Citrus



Vol. 19, No. 2 **February 2016**

Dr. Mongi Zekri
Multi-County Citrus Agent, SW Florida

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Previous issues of the Flatwoods Citrus newsletter can be found at:
http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm
http://irrec.ifas.ufl.edu/flcitrus/

Excess water from frequent heavy rainfall is heaven for the development and buildup of fungal diseases. In groves with a previous history of *Phytophthora*, most HLB-infected trees develop root rot when grown in flatwoods situations with high or fluctuating water tables and fine-textured soils. Citrus black spot (CBS) quarantine areas are expending. With the substantial rain this winter, heavy fungal spore buildup of postbloom fruit drop (PFD) from off-season blooms is a major problem. Trees grown for the fresh fruit market may be devastated by citrus scab, Alternaria brown spot, and melanose if not protected. Citrus scab affects grapefruit, Temples, Murcotts, tangelos, and some other tangerine hybrids. Alternaria brown spot affects Minneola tangelos, Dancy tangerines, Murcotts, and less frequently Orlando tangelos, Novas, Lees, and Sunburst. Grapefruit is very susceptible to melanose but all citrus may be damaged by the disease if recently killed twigs and wood are present.
To get prepared, you need to attend this seminar program:

All You Need to Know About Scouting and Managing Citrus Fungal Diseases

Date: Thursday, **February 11**, 2016
Time: **10:00 AM – 12:10 PM**
Location: Immokalee IFAS Center
Program Sponsor: Cody Hoffman with Syngenta
Program Coordinator: Mongi Zekri, UF-IFAS

1. 10:00 AM – 10:30 AM, Alternaria brown rot and citrus scab symptoms and management, Dr. Megan Dewdney
2. 10:30 AM – 11:00 AM, Melanose and greasy spot symptoms and management, Dr. Megan Dewdney

11:00 AM – 11:10 AM Break

3. 11:10 AM – 11:40 AM, The copper model and postbloom fruit drop, Dr. Megan Dewdney
4. 11:40 AM – 12:10 PM, Citrus black spot and Phytophthora management, Dr. Katherine Hendricks

2 CEUs for Certified Crop Advisors (CCAs)
2 CEUs for Pesticide License Renewal
12:15 PM, Sponsored Lunch

Pre-registration is required. No registration fee and lunch is free Thanks to Cody Hoffman with Syngenta**.** To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

Mark your calendar and plan to attend

Best Management Practices for Citrus Nutrition

Date: March 16, 2016
Time: 10 AM – 12:00 Noon
Location: Immokalee IFAS Center
Coordinator: Dr. Mongi Zekri
Speakers: Dr. Kelly Morgan & Others
Pre-registration is required. No registration fee and lunch is free**.** To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

2016 ANNUAL FLORIDA CITRUS GROWERS' INSTITUTE

Date & Time: Tuesday, 5 April 2016, 8:00 AM – 3:35 PM
Location: Avon Park Campus of South Florida Community College
Coordinators: Citrus Extension Agents, UF-IFAS
Agenda and information on registration will be available next month.

Certified Crop Adviser Educational Seminar and CEU Session

Date: Wednesday, April 13, 2016
Time: 7:30 a.m. – 6:30 p.m.
On-site program at the UF/IFAS Citrus Research and Education Center, Lake Alfred. Refreshments and lunch will be provided.
Available by videoconference at UF/IFAS Research and Education Centers in:

- Gulf Coast REC in Balm
- Southwest Florida REC in Immokalee
- Indian River REC in Fort Pierce
- University of Florida Main Campus in Gainesville
- Lake County Extension Center in Tavares

Registration: $100 including lunch, refreshments, and hard copies of the PowerPoint presentations.
Agenda and information on registration will be available next month and will be sent to CCA licensee holders by mail.

Special Thanks to sponsors of the "Flatwoods Citrus" newsletter for their generous contribution and support. If you would like to be among them, please contact me at 863 674 4092 or maz@ufl.edu

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

CLIMATE PREDICTION CENTER/NCEP/NWS
and the International Research Institute for Climate and Society
14 January 2016

ENSO Alert System Status: El Niño Advisory

Synopsis: A strong El Niño is expected to gradually weaken through spring 2016, and to transition to ENSO-neutral during late spring or early summer.

A strong El Niño continued during December, with well above-average sea surface temperatures (SSTs) across the central and eastern equatorial Pacific Ocean (Fig. 1). All weekly Niño indices decreased slightly from the previous month (Fig. 2). The subsurface temperatures in the central and eastern Pacific, while still well above average, weakened (Fig. 3) due to an upwelling equatorial oceanic Kelvin wave (Fig. 4). Significant low-level westerly wind anomalies and upper-level easterly wind anomalies continued over much of the tropical Pacific. During the last week, another westerly wind burst occurred in the east-central Pacific. The traditional and equatorial Southern Oscillation Index (SOI) values remained strongly negative. Also, convection remained strong over the central and east-central tropical Pacific, and suppressed over Indonesia (Fig. 5). Collectively, these atmospheric and oceanic anomalies reflect the continuation of a strong El Niño episode.

Most models indicate that a strong El Niño will weaken with a transition to ENSO-neutral during the late spring or early summer (Fig. 6). The forecasters are in agreement with the model consensus, though the exact timing of the transition is difficult to predict. A strong El Niño is expected to gradually weaken through spring 2016, and to transition to ENSO-neutral during late spring or early summer (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

El Niño has already produced significant global impacts and is expected to affect temperature and precipitation patterns across the United States during the upcoming months (the 3-month seasonal outlook will be updated on Thursday January 21st). The seasonal outlooks for January – March indicate an increased likelihood of above-median precipitation across the southern tier of the United States, and below-median precipitation over the northern tier of the United States. Above-average temperatures are favored in the West and northern half of the country with below-average temperatures favored in the southern Plains and along the Gulf Coast.

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts are also updated monthly in the Forecast Forum of CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 11 February 2016. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service
College Park, MD 20740

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

NEWS RELEASE

February 1, 2016

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South Florida Water Management District
Office: (561) 682-2800 or Cellular: (561) 389-3386

www.sfwmd.gov/news
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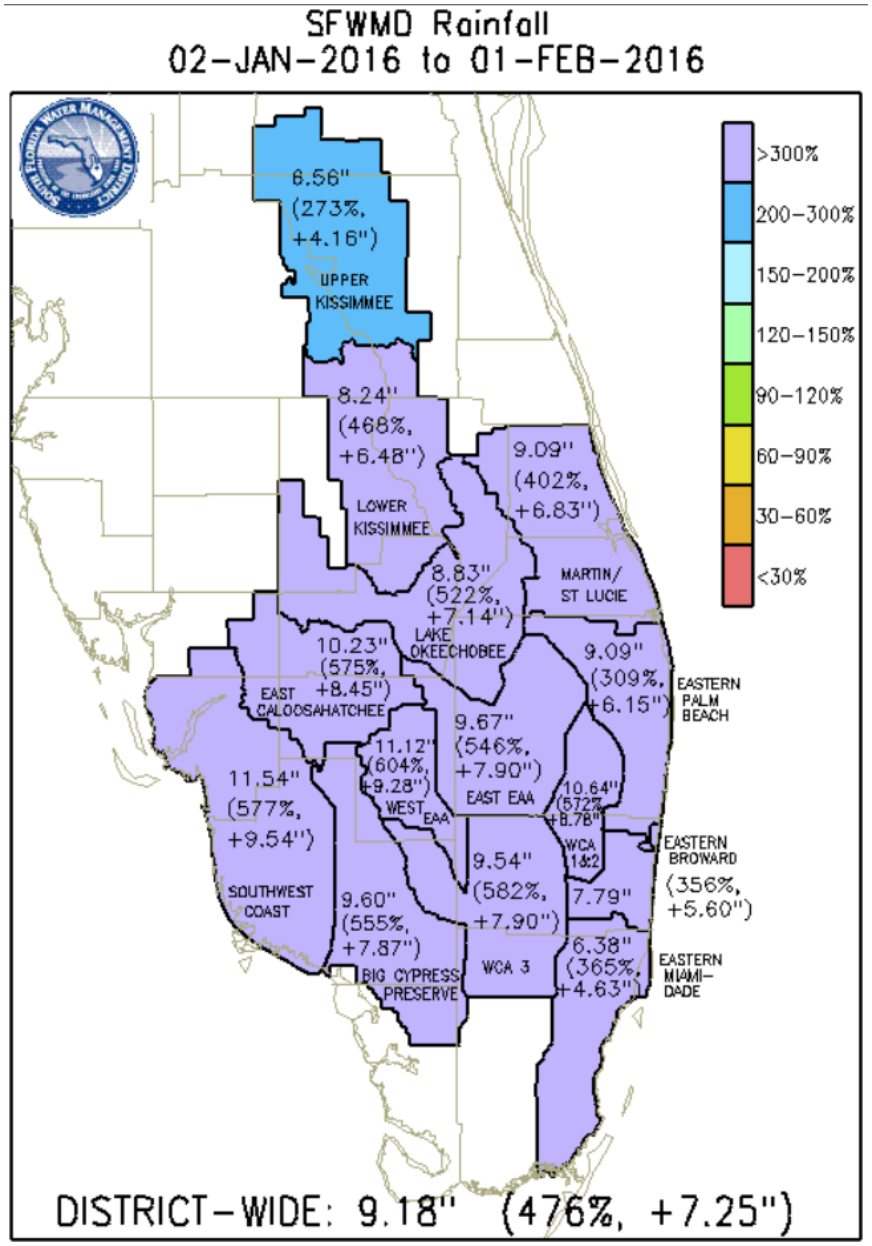
South Florida Records Wettest January Since 1932

January was also the wettest of any dry season month since March 1970



West Palm Beach, FL — Widespread January rainfall set a record with 476 percent of average for the dry season month across the South Florida Water Management District (SFWMD), District meteorologists reported today.

A total of 9.18 inches of rain fell District-wide in January, representing 7.25 inches above average. Rainfall statistics included:

- January was the wettest January since record keeping began in 1932.
- January 27 was the wettest dry-season day in 25 years.
- January 22 through 28 was the single wettest week District-wide since Tropical Storm Isaac in August 2012.
- November through January, the first half of the dry season, was the wettest for this period since record keeping began in 1932.

All basins in the SFWMD's 16-county region received significantly above-average rainfall for the month. Nearly all basins received more than 300 percent of average rainfall. Above-average rainfall is expected to continue for the next week.

Dry Season Forecast

Among the National Weather Service forecast highlights for the 2015-2016 South Florida dry season:

- Above-normal rainfall
- Above-normal storminess/severe weather
- Below-normal temperatures and below-normal freeze of at least one this dry season
- Average of 5-10 more days with measurable precipitation

South Florida's Dry Season
• *November – May*
• *About 18 inches of rain is the average*
• *May and October are important transition months*
• *March, April and May have the highest evaporation rates and lowest rainfall*

More information is available at:

- SFWMD Weather/Rainfall Data
- U.S. Drought Monitor Florida
- Climate Prediction Center Precipitation Forecast

# # #

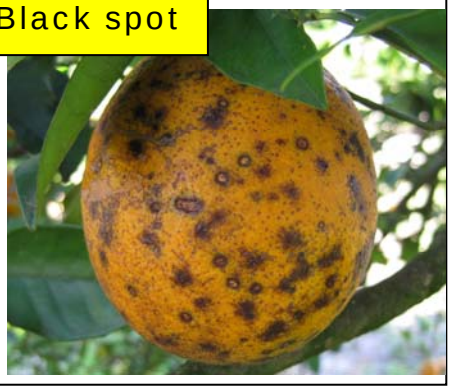
The South Florida Water Management District is a regional governmental agency that manages the water resources in the southern part of the state. It is the oldest and largest of the state's five water management districts.

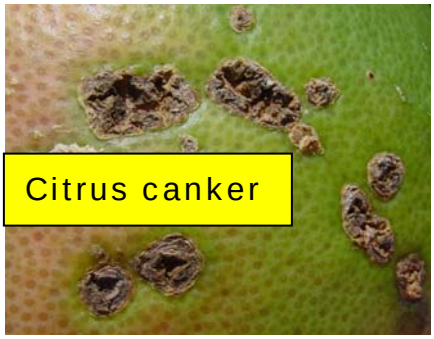
Our Mission is to manage and protect water resources of the region by balancing and improving flood control, water supply, water quality and natural systems.

Fungicide effectiveness

Products	Canker	Greasy Spot	Alternaria	Scab	Melanose	Black spot	PFD
Copper	**Good**	**Good**	**Good**	Moderate	**Good**	Moderate	**Weak**
Oil	None	**Good**	None	None	None	None	None
Ferbam	None	Weak	Moderate	Moderate	Weak	Weak	Weak
Enable 2F		**Good**		**Good**		**Good**	
Headline	None	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Abound	None	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Gem	None	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Pristine	None	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Quadris Top	None	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**

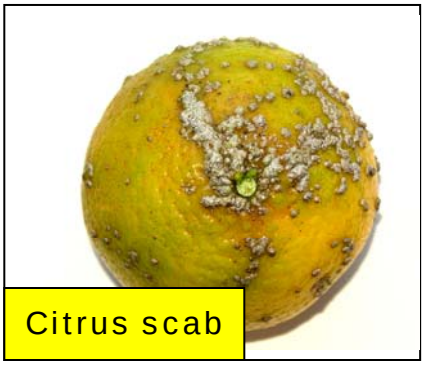
Black spot



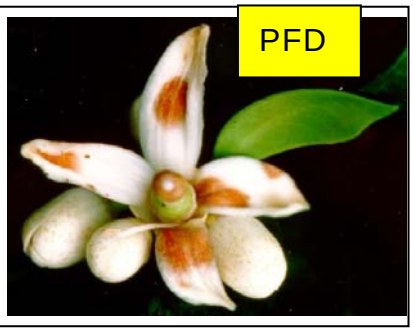


Greasy spot

Alternaria Brown spot



PFD



POSTBLOOM FRUIT DROP (PFD) has been most severe on Navel and Valencia oranges.

Most spores of this fungus are produced directly on the surface of infected petals. Spores are splash-dispersed by rain to healthy flowers where they infect within 24 hours and produce symptoms in 4-5 days. The fungus survives between bloom periods as resistant structures on the surface of leaves, buttons, and twigs.
Groves with persistent calyxes (buttons) from the previous year should be closely examined once the bloom begins. Groves with a history of PFD should be checked twice weekly during the bloom period. Ground and aerial applications are effective for control of PFD. The removal of declining trees, where off-season blooms may provide a site for fungal spore buildup should reduce disease severity.
Of the products recommended for control of PFD, Abound, Gem, and Headline are effective but do not have a long residual effect. Ferbam is less effective and should not be used alone, but it can be combined with low rates of other products to maximize protection and reduce the risk of resistance development. No resistance has been detected to date. Neither Abound, Gem, nor Headline should be used alone more than once per season, but can be used more than once if combined with Ferbam.
For more information go to:
http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Postbloom%20Fruit%20Drop.pdf

Recommended Chemical Controls

READ THE LABEL.
Rates for pesticides in Table 1 are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment, including handguns, mix the per-acre rate for mature trees in 125 gallons of water. Calibrate and arrange nozzles to deliver thorough distribution and treat as many acres as this volume of spray allows.

Table 1. Recommended Chemical Controls for Postbloom Fruit Drop

Pesticide	FRAC MOA[2]	Mature Trees Rate/Acre[1]
Abound[3]	11	12.0-15.5 fl oz. Do not apply more than 92.3 fl oz/acre/season for all uses.
Abound[3] + Ferbam	11, M3	12.0 fl oz + 5 lb. Maximum 3 ferbam applications a year and do not apply more than 6 lb ai/acre in a single application.
Gem 500 SC[3]	11	1.9-3.8 fl oz. Do not apply more than 15.2 fl oz/acre/season for all uses. Do not apply within 7 days of harvest.
Gem[3] + Ferbam	11, M3	1.9 fl oz + 5 lb. Maximum 3 applications a year and do not apply more than 6 lb ai/acre in a single application.
Headline SC[3]	11	12-15 fl oz. Do not apply more than 54 fl oz/acre/season for all uses.
Headline[3] + Ferbam	11, M3	12fl oz + 5 lb. Maximum 3 applications a year and do not apply more than 6 lb ai/acre in a single application.

[1]Lower rates can be used on smaller trees. Do not use less than the minimum label rate.
[2]Mode of action class for citrus pesticides according to the Fungicide Resistance Action Committee (FRAC). [3]Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides.

CITRUS BLACK SPOT fungal disease causes fruit blemishes and fruit drop especially on sweet oranges.

Lemons are the most susceptible, but sweet oranges, especially mid to late maturing types such as Valencia, are highly susceptible to this disease. Hamlin sweet oranges and tangerine/mandarin types are moderately susceptible. Grapefruit is thought to be moderately susceptible and symptoms have been seen in Florida.

Black spot fruit symptoms are wide ranging and have many different names. Hard spot is the most diagnostic symptom of black spot. Lesions are nearly circular, depressed, with gray necrotic tissue at the middle, and a brick-red to black margin that can be cracked around the edges. Significant fruit drop is a common symptom in heavily infected groves.

Airborne ascospores produced in decomposing leaf litter on the grove floor are the source of the primary inoculum for black spot. They are blown into the canopy by wind. These spores germinate and directly infect the leaves and fruit. Major ascospore release usually occurs from April to early September, with favorable infection conditions from May through September. Fruit remains susceptible most of the growing season. Monthly fungicide applications of copper and/or strobilurins (Abound, Gem, or Headline) will be needed from early May to mid-September to control black spot. If there is substantial rain in April, starting fungicide applications in April is advised. Since only four strobilurin fungicides can be used in a season for any purpose, it is recommended for fresh fruit to reserve strobilurin fungicides for times when phytotoxicity from copper applications is a concern (temperatures >90°F). For processing fruit, strobilurins can be used earlier in the season, and applications for greasy spot and melanose can be combined. It is recommended that strobilurin fungicides not be applied in two consecutive sprays to manage pathogen resistance. Currently, we do not have any other rotational fungicides for resistance management.

In addition to chemical control measures, practices to accelerate leaf litter decomposition beneath the trees to reduce the ascospore inoculum may be beneficial. Enhancing leaf litter degradation should commence in mid-March. There are three methods that have reduced the ascospore inoculum of *Mycosphaerella citri*, the fungus that causes greasy spot. The first is to increase the microsprinkler irrigations to at least 5 times a week for approximately a ½ hour per irrigation period for 1.5 months. The leaf litter decomposition will be greater compared to that with the traditional irrigation frequency. A drawback is that leaf litter reduction will be confined to the areas where the

microsprinklers reach. A second method is to apply urea (187 lb/treated acre) or ammonium sulfate (561 lb/acre) to the leaf litter. The final method is to apply dolomitic lime or calcium carbonate (2226 lb/treated acre) to the leaf litter. The decay rate is greater for litter treated with lime and inoculum production is reduced. All treatments worked equally well with *M. citri* and there is no indication that one method is better than another. Lime or irrigation methods should not be used in conjunction with the high N treatments, since they have opposite methods of action.

Care must be exercised in handling and moving citrus fruit, leaves, twigs and debris from citrus black spot (CBS) Quarantined Areas, since the disease may be easily and unwittingly spread to other citrus trees, nurseries or groves. There are many rules and regulations that **Growers, Harvesters, Haulers, Processing, Packing Facilities and Haulers have to be aware of with relation to the black spot disease in Florida. For more information, go to: http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Citrus%20Black%20Spot.pdf**

READ THE LABEL.

See Table 1.

Rates for pesticides are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment, including handguns, mix the per-acre rate for mature trees in 250 gallons of water. Calibrate and arrange nozzles to deliver thorough distribution and treat as many acres as this volume of spray allows.

Table 1.
Recommended Chemical Controls for Citrus Black Spot

Pesticide	**FRAC MOA[2]**	**Mature Trees Rate/Acre[1]**
copper fungicide	M1	Use label rate.
Abound[3]	11	9.0-15.5 fl oz. Do not apply more than 92.3 fl oz/acre/season for all uses. Best applied with petroleum oil.
Gem 500 SC[3]	11	1.9-3.8 fl oz. Do not apply more than 15.2 fl oz/acre/season for all uses. Best applied with petroleum oil. Do not apply within 7 days of harvest.
Headline SC[3]	11	12-15 fl oz. Do not apply more than 54 fl oz/acre/season for all uses. Best applied with petroleum oil.
[1]Lower rates can be used on smaller trees. Do not use less than minimum label rate.		
[2]Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC). Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2015 Florida Citrus Pest Management Guide for more details.		
[3]Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides.		

ALTERNARIA BROWN SPOT

Alternaria fungal disease can cause severe leaf and fruit drop particularly in Minneola (Honeybell) and Orlando tangelos, Dancy tangerine, and Murcott (Honey tangerine). Alternaria must be controlled on these cultivars to obtain high yields of good quality fruit. The spores of this disease are air borne, but require moisture for germination and infection. Leaf tissue is susceptible until it is fully expanded and fruit is susceptible for about 3 months after bloom. When new groves of the above cultivars are planted, only disease-free nursery stock should be used. Trees should be spaced more widely than oranges to promote rapid drying of the canopy. It is best to locate susceptible varieties in high areas where air drainage and ventilation are good so that leaves dry more rapidly. Irrigation, fertilization, hedging, topping, and skirting should be carefully monitored so that excessive vegetative growth is minimized. Copper fungicides, Abound, Gem, Ferbam, Headline, Pristine, Quadris Top are the materials registered for the control of this disease. The first spray should be applied when the spring flush leaves are ¼-1/2 expanded. In severe cases, another spray should be applied when the leaves are near full expansion to reduce the infection on the fruit. Another spray should be scheduled shortly after petal fall. Abound, Ferbam, Gem, Headline, Pristine, or Quadris Top may be the best choice for one or both applications especially if the grove has problems with both scab and Alternaria. From April through June, spray applications may be needed as often as every 10 days or as infrequently as once a month depending on the frequency and amount of rainfall and the rate of infection in the grove. Copper fungicides can be used from April through May, but can produce fruit blemishes if applied during hot weather. Therefore, Abound, Gem, Ferbam, Headline, Pristine or Quadris Top may be substituted for copper in June or July applications. Abound, Gem, Headline, Pristine, and Quadris Top are strobilurin fungicides and Alternaria has the potential to develop resistance to these products. Strobilurin should not be used for Alternaria control more than 3 times in a season and never more than 2 applications in a row. Gem is not highly effective for control of Alternaria. Trilogy and Ferbam are less effective for Alternaria control than copper, Abound or Headline.

For more information, go to: http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Alternaria.pdf

CITRUS SCAB

This fungal disease affects grapefruit, Temple orange, Murcott, tangelos, and some other tangerine hybrids. If leaves from the previous season are heavily infected by citrus scab, 3 applications should be scheduled to control this disease. The first spray should be applied at about ¼ expansion of the spring flush leaves, the second at petal fall and the third about 3 weeks later. Fruit becomes resistant to scab about 2 months after petal fall. Ferbam, Enable, Abound, Gem, or Headline are good choices for the first application because they are able to kill the fungus in old lesions and thus reduce the inoculum and protect the foliage. Whichever of these products was not used in the first spray may then be used in the petal fall spray. Copper fungicides, Abound, Gem, or Headline are good choices for the third spray since they will protect fruit from early melanose as well as from scab. On tangelos and Murcott, Alternaria brown spot and scab occur together. Under this circumstance, either copper fungicides, Abound, Gem, or Headline should be selected for the 3 sprays. Copper products are less effective for scab and should not be selected where scab pressure is high. Ferbam is less effective against Alternaria. If used more than once a year, resistance of the scab fungus to Abound, Gem, or Headline may develop.

For more information, go to:
http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Scab.pdf

•Spring flush
Abound, Gem, Headline,
Ferbam, Enable

•Petal fall
Abound, Gem, Headline,
Ferbam

•3 weeks later
Cu fungicides, Abound,
Gem, Headline

•Do not use Abound, Gem, or Headline more than once.

DO NOT APPLY ABOUND, GEM, or HEADLINE IN NURSERIES.

IMPORTANCE OF SPRAYER CALIBRATION

Sprayers must be checked to ensure all nozzles are applying pesticides uniformly and at the correct rate. Make sure your equipment is working properly and calibrated to ensure the correct amount of pesticide is delivered to the target area.

Pesticide application, greater than the label rate, is illegal and can result in needless risk to groundwater, increased production costs, and crop damage. Under-application might be costly by not properly controlling the target pest. Although you can sometimes repeat the application, doing so is time-consuming, costs more, increases the risk of applying too much and increases the risk in pesticide resistance.

Regular sprayer calibration includes measuring the output of each nozzle to ensure all nozzles are functioning properly. Specific calibration guides are available from a number of sources. Sprayer calibration should be done every time a different pesticide is applied or at least once each season.

The rate of application depends partly on the particle or droplet size, texture, and other properties of the pesticide being applied. Use only water during the test if the pesticide is a liquid. Contact the manufacturer to get reliable information regarding carrier material to perform the tests if the pesticide is a dust, granule, or fumigant, or a liquid diluted with a liquid other than water.

Follow calibration and mixing instructions carefully. Mixing, loading, and calibration methods must also conform to the speed of the application machinery. Moving too fast or too slow changes the rate of application.

Minimizing spray drift

Spray drift, movement of a pesticide through air during or after application to a site other than the intended site of application is a challenging issue facing pesticide applicators. Complete elimination of spray drift is impossible. However, drift can be minimized by following these control measures:

1. Read and follow the pesticide label.
2. Select low or nonvolatile pesticides.
3. Use spray additives following label guidelines.
4. Use large orifice sizes for spray nozzles.
5. Avoid high sprayer pressures, which create finer droplets.
6. Use drift reduction nozzles.
7. Use wide-angle nozzles, lower spray boom heights, and keep spray boom stable.
8. Do not spray when wind speeds exceed 10 mph and when wind direction is directed toward sensitive vegetation.
9. Use a shielded spray boom when wind conditions exceed preferred conditions.
10. Avoid spraying on extremely hot and dry days, especially if sensitive vegetation is nearby.
11. Keep good records and evaluate the results.

IMPORTANCE OF FERTILIZER SPREADER CALIBRATION AND MAINTENANCE

Properly calibrated and maintained equipment ensures a more uniform distribution of nutrients. This, combined with other conservation practices, reduces production costs, soil surface runoff, and nutrient movement to nearby surface waters. Spreaders that have not been properly maintained and calibrated will have problems delivering accurate rates and evenly distributed fertilizer amounts to the grown crop.

Calibration

Calibration is the process used to help ensure that the equipment applies proper rates of the selected product. Proper calibration is the key to successful fertilizer use efficiency. Failure to calibrate equipment can result in ineffective applications. Applying too much is costly, unlawful and may cause crop injury. Applying too little can result in poor crop growth and production. It is important to calibrate equipment on a regular basis to compensate for variations. The equipment will become worn or damaged with use and result in inaccurate output and spread pattern.

Two items must be considered when calibrating a spreader. The first is the distribution pattern of the spreader. The second is the product application rate, which is the amount of product applied per acre. There are many factors that affect the distribution pattern of a rotary spreader and some of them relate directly to the product. For this reason, it is recommended that the spreader be calibrated separately for every product to be applied. Spreader calibration should be checked more often when the spreader is used frequently.

Product & application

Choose a product according to the need of the crop. Before applying the product, read the spreader manual. The spreader manual will usually indicate proper settings for various application rates. However, calibration still needs to be performed to ensure the settings are accurate and to compensate for wear and variations in equipment. Be sure that the proper procedures and application rates are followed. Check the ‘spread pattern’ and amount being applied. The physical properties of dry fertilizer can vary widely. Since larger particles are thrown further than small particles, a product of uniform size should be used to achieve a consistent application pattern. It is essential to maintain a constant speed when using a rotary spreader to obtain uniform and accurate distribution.

Maintenance and Cleaning

Proper care and maintenance will help retain precise applications and prolong the life of spreaders. Manufacturer’s directions on cleaning and lubricating should be followed. With the shutter or gate wide open, remove all granules from the spreader at the end of each application. Then, the spreader should be thoroughly washed and allowed to dry. Hot water may help break lose fertilizer which is caked on. Finally, lubricate the spreader according to instructions. Spreaders should be stored in a clean, dry place out of direct sunlight.

FOLIAR FEEDING

Foliar feeding is not intended to completely replace soil-applied fertilization of the macronutrients (nitrogen, potassium, and phosphorous). However, macronutrients can be foliarly applied in sufficient quantities to influence both fruit yield and quality. Citrus trees can have a large part of the nitrogen, potassium, and phosphorous requirements met through foliar applications.

Foliar applications of other plant nutrients (calcium, magnesium, and sulfur) and micronutrients (zinc, manganese, copper, boron, and molybdenum) have proven to be an excellent means for supplying the plants' requirements. Soil application of manganese, zinc, boron, and molybdenum is not as economical and not as effective as foliar application to supply those nutrients to citrus trees. Applications made to the soil can be subject to leaching, volatilization, and/or being tied up by soil particles in unavailable forms to plants.

Foliar feeding should be used as an integral part of the annual nutritional program. It can be used in other situations to help plants through short, but critical periods of nutrient demand, such as fruit set and bud differentiation. Foliar nutrition may also prove to be useful at times of soil or environmentally induced nutritional shortages. Foliar application of nutrients is of significant importance when the root system is unable to keep up with crop demand or when the soil has a history of problems that inhibit normal growth.

Foliar feeding is proven to be useful under prolonged spells of wet soil conditions, dry soil conditions, calcareous soil, cold weather, or any other condition that decreases the tree's ability to take up nutrients when there is a demand. Foliar feeding may be utilized effectively when a nutritional deficiency is diagnosed. A foliar application is the quickest method of getting the most nutrients into plants. However, if the deficiency can be seen, the crop might have already lost some potential yield.

Several Florida citrus growers and production managers are using foliar nutritional sprays, mainly micronutrients, to slow down tree decline and maintain adequate fruit productivity of citrus greening-infected trees. Supplemental, balanced foliar nutrition has positive effects on plant diseases by inducing naturally occurring plant resistance mechanisms. It is always important to maintain the balance between nutrients because having one nutrient significantly out of balance can be as bad as a deficiency.

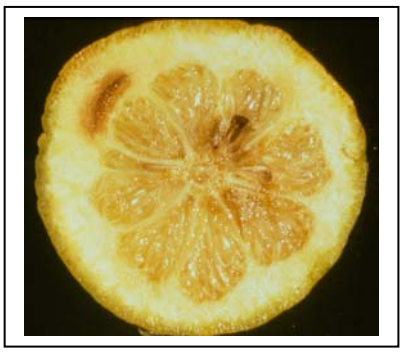
While foliar feeding has many advantages, it can burn plants at certain rates under certain environmental conditions. It is important, therefore, to foliar feed within the established guidelines. There are a number of conditions that can increase the chances of causing foliar burn. A plant under stress is more susceptible to damage. Stressful conditions include drying winds, disease infestations, and poor soil conditions. The environmental conditions at the time of application are also important factors. Applications when the weather is warm (above 80^0F) should be avoided. This means that during warm seasons, applications should be made in the morning or evening. Additionally, applications should not be at less than two-week intervals to give the plant sufficient time to metabolize the nutrients and deal with the added osmotic stress.

Another important factor when applying nutrient foliarly is to ensure that the pH of the material is in the proper range. The pH range of the spray solution should be between 6 and 7. This is significant in areas where water quality is poor.

Boron (B)

Boron is particularly necessary where active cell division is taking place. Boron plays an important role in flowering, pollen-tube growth, fruiting processes, nitrogen (N) metabolism, and hormone activity. Florida sandy soils are low in B, and a deficiency of this element in citrus occasionally occurs under field conditions. The deficiency may be aggravated by severe drought conditions, heavy lime applications, or irrigation with alkaline water. Boron is very mobile in the soil profile of sandy soils and readily leaches by rainfall or excess irrigation.

Boron deficiency is known as "hard fruit" because the fruit is hard and dry due to lumps in the rind caused by gum impregnation. The chief fruit symptoms include premature shedding of young fruits. Such fruit have brownish discoloration in the white portion of the rind (albedo), described as gum pockets or impregnations of the tissue with gum and unusually thick albedo. Older fruit are undersized, lumpy, misshaped with an unusually thick albedo containing gum deposits. Seed fails to develop and gum deposits are common around the axis of the fruit.



The first visual symptoms of B deficiency are generally the death of the terminal growing point of the main stem. Further symptoms are a slight thickening of the leaves, a tendency for the leaves to curl downward at right angles to the midrib, and sometimes chlorosis.

Young leaves show small water soaked spots or flecks becoming translucent as the leaves mature. Associated with this is a premature shedding of leaves starting in the tops of the trees and soon leaving the tops almost completely defoliated. Fruit symptoms appear to be the most constant and reliable tool for diagnostic purposes.

To treat citrus affected with B deficiency, B compounds can be applied either foliarly or in the fertilizer. As a maintenance program, apply B in the fertilizer at an annual rate equivalent to 1/300 of the N rate. In Florida, foliar spray applications have been found much safer and more efficient than soil application. Soil applications frequently fail to give satisfactory results during dry falls and springs and may result in toxicity problems if made during the summer rainy season. Boron solubility in the soil is reduced at soil pHs below 5 and above 7. Foliar spray may be applied during the dormant period through post bloom, but preferably during early flower development. Treating at this growth stage is important because boron does not move very readily from other parts of the tree to the buds. Applying boron at this time will assist in flower initiation and pollen production, satisfy the needs for pollen tube growth, and enhance fruit set. For maintenance spray application, 0.25 lb/acre of B may be used. Boron levels in the leaf tissue should not drop below 40 ppm or exceed 120 ppm (dry wt basis). Where deficiency symptoms are present, double the amount suggested. Use care not to apply more than the recommended amount because it is easy to go from deficiency to excess.

Flatwoods Citrus

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