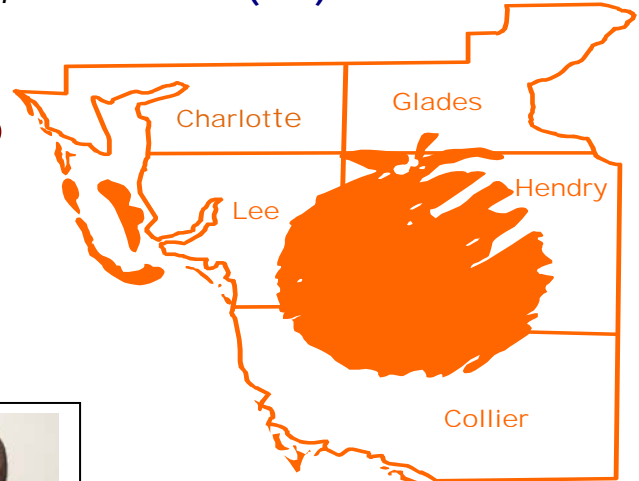


Hendry County Extension, P.O. Box 68, LaBelle, FL 33975 (863) 674 4092

Flatwoods Citrus



Vol. 20, No. 8

August 2017

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



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IMPORTANT EVENTS

Seminar & Field Day – Weed Science

Title: Herbicide Synergy - for better weed management in citrus

- Use of both POST and PRE emergent herbicides, used in conjunction, for enhanced and long-term weed control
- The timing of herbicide application, as a critical factor in weed management strategies
- Proper herbicide mixing strategies
- Show an experiment using pre and post emergent herbicides

Location: Southwest Florida Research and Education Center, Immokalee

Date & time: Wednesday, August 23, 2017, 9:00 AM – 11:00 AM

Speakers: Dr. Ramdas Kanissery and Robert Riefer, UF-IFAS

Coordinator: Mongi Zekri, UF-IFAS

Sponsor: ?

2 CEUs for pesticide license renewal

2 CEUs for certified crop advisors (CCAs)

Pre-registration is required. No registration fee. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at maz@ufl.edu

August 16-17, 2017 at the Lee Civic Center in North Ft. Myers, FL

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<http://citrusexpo.net/registration/>

Wednesday, August 16, 2017

Morning Session (9:30 a.m. – 11:45 a.m.)

2 CEU (Ag Tree Crop)

2 CCA (Crop Management)

9:30 - Gary Cooper, AgNet Media, Inc., Welcome, announcements and introduction

9:40 - Fred Gmitter, UF/IFAS/Citrus Research and Education Center (CREC)

What to plant now: new varieties from University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS)

10:10 - Kim Bowman, USDA/ARS

What to plant now: new varieties from the U.S. Department of Agriculture/Agricultural Research Service (USDA/ARS)

10:40 - Arnold Schumann, UF/IFAS/CREC

Citrus undercover production systems (CUPS): research update

11:10 - Mark Ritenour, UF/IFAS/Indian River Research and Education Center (IRREC)

Production practices and HLB: impacts on fruit marketability

11:40 - Michael Rogers, UF/IFAS/CREC

Session wrap-up

11:45 – Lunch, Served in the trade show. John Deere gun safe drawing (donated by Everglades Equipment Group) for pre-registered growers during lunch.

Afternoon Session (2:00 p.m. – 4:30 p.m.)

2 CEU (Private), 2.5 CCA (Pest management)

2:00 - Gary Cooper, AgNet Media, Inc., Opening announcements

2:05 - Travis Chapin, UF/IFAS/CREC

Food Safety Modernization Act forecast: expectations for the first season under the produce safety rule

2:35 - Phil Stansly, UF/IFAS/Southwest Florida Research and Education Center (SWFREC)

Importance of controlling psyllids in HLB-affected groves

3:05 - Jawwad Qureshi, UF/IFAS/IRREC

Approaches to managing psyllids and reducing costs

3:35 - Lukasz Stelinski, UF/IFAS/CREC

Current status and strategies for mitigating insecticide resistance in Asian citrus psyllid populations

4:05 - Megan Dewdney, UF/IFAS/CREC

Update on managing citrus blackspot, canker and postbloom fruit drop

4:45 p.m. - Florida FFA Fundraiser Raffle, Drawing by U.S. Secretary of Agriculture Sonny Perdue

On the trade show floor

Thursday, August 17, 2017

Morning Session (9:30 a.m. – 12:20 p.m.)

2 CEU (Regulatory)

1 cca (crop management), 1 cca (pest management)

9:30 - Gary Cooper, AgNet Media, Inc., Welcome, announcements and introductions

9:40 - Aaron Himrod, Himrod Citrus Nursery

Florida citrus nursery update

9:55 - Ute Albrecht, UF/IFAS/SWFREC

Establishing new trees: possible impacts of rootstock propagation method on young tree growth

10:20 - Evan Johnson, UF/IFAS/CREC

Citrus root health management

10:45 - Stephanie Slinski, CRDF

CRDF bactericide field trial update

11:00 - Ariel Singerman, UF/IFAS/CREC

Cost of production and the impact of bactericides

11:25 - Tripti Vashisth, UF/IFAS/CREC

A closer look at some potential grower success stories: research perspective

11:45 - Grower Panel Discussion

A closer look at some potential grower success stories

12:15 - Gary Cooper, AgNet Media

Concluding comments

12:20 – Lunch, Served in the trade show. Citrus painting (donated by Kelvin Hair) drawing during lunch.

August 16 GCGA's Annual Citrus Industry Celebration 5:30 PM FGCU Alico Arena



*Cordially invite you to attend
the Citrus and Agricultural Industry
"Celebration"*

Featuring

*Florida Gulf Coast University
President Michael Martin, Ph.D.*

*Florida Department of Agriculture & Consumer Services
Commissioner Adam Putnam*

*United States House of Representatives, 17th District
Representative Tom Rooney*

Keynote Speaker

*United States Secretary of Agriculture
Sonny Perdue*

*Wednesday, August 16th
FGCU Alico Arena
12181 FGCU Lake Parkway East
Fort Myers, Florida 33965*

Business Casual Attire

Reception: 5:30 p.m. (Cash Bar)
Dinner: 7:00 p.m.
\$75.00 Per Person

RSVP by August 9, 2017
(239) 690-0281

Seminar

Breeding citrus for tolerance/resistance to HLB

Date & time: Wednesday, September 20, 2017, 10:00 AM – 12:00 Noon

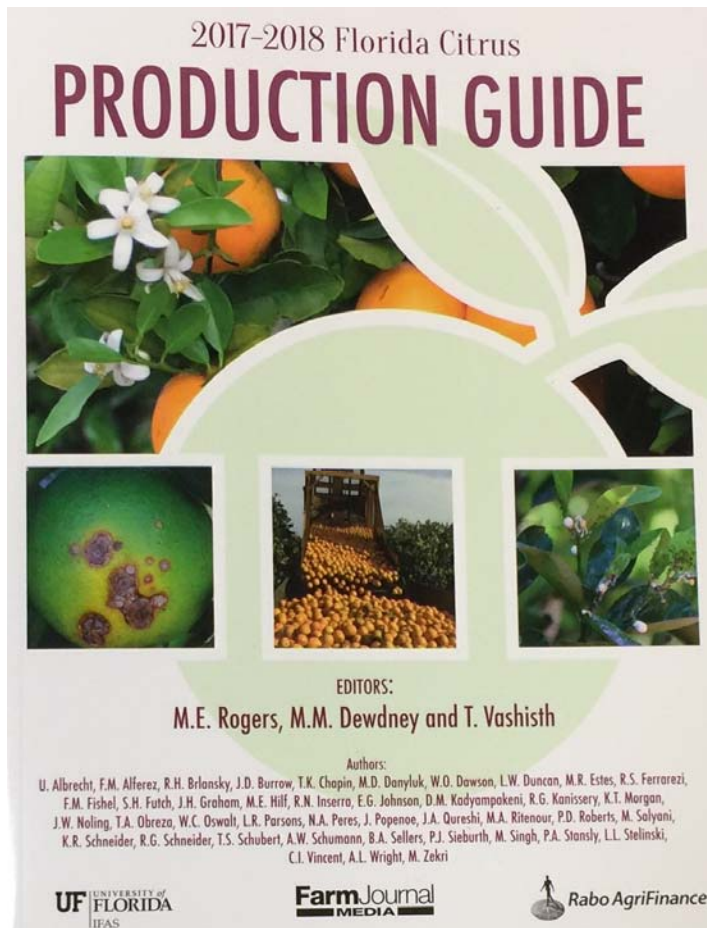
Location: UF-IFAS Southwest Florida Research and Education Center, Immokalee

Speakers: Dr. Jude Grosser and Dr. Fred Gmitter, UF-IFAS

Program Coordinator: Dr. Mongi Zekri, UF-IFAS

Sponsor: ?

University of Florida Will be Celebrating a Century of Citrus Research on November 29, 2017, Lake Alfred CREC



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Scott Houk
Dow AgroSciences
13543 Troia Drive
Estero, FL 33928
Phone: 239-243-6927
SEHouk@dow.com

George Winslow
Gulf Citrus Properties
Agricultural Specialists
Office: 941 575 1505
info@gulfcitrus.com



Jim Faircloth, 402 639 2756
jim.faircloth@syngenta.com

Zach Langford, 407 212 5631
Zach.langford@syngenta.com

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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**

13 July 2017

ENSO Alert System Status: Not Active

Synopsis: ENSO-neutral is favored (~50 to 55% chance) into the Northern Hemisphere winter 2017-18.

During June, ENSO-neutral continued, although equatorial sea surface temperatures (SSTs) remained above average in the central and east-central Pacific Ocean (Fig. 1). The latest weekly Niño index values were near +0.5°C in the Niño-4 and Niño-3.4 regions, and closer to zero in the Niño-3 and Niño-1+2 regions (Fig. 2). The upper-ocean heat content anomaly was above average during June (Fig. 3), reflecting above-average sub-surface temperatures across the central and eastern Pacific (Fig. 4). In the atmosphere, tropical convection was suppressed over the west-central tropical Pacific and enhanced over the Maritime Continent (Fig. 5). The lower-level and upper-level winds were near average over most of the tropical Pacific, and the Southern Oscillation Index (SOI) and Equatorial SOI were slightly negative to near-zero. Overall, the ocean and atmosphere system remains consistent with ENSO-neutral.

Some models predict the onset of El Niño (3-month average Niño-3.4 index at or greater than 0.5°C) during the Northern Hemisphere summer (Fig. 6). However, more than half of the models favor ENSO-neutral through the remainder of 2017. These predictions, along with the near-average atmospheric conditions over the Pacific, lead forecasters to favor ENSO-neutral into the winter (~50 to 55% chance). However, chances for El Niño remain elevated (~35-45%) relative to the long-term average. In summary, ENSO-neutral is favored (~50 to 55% chance) into the Northern Hemisphere winter 2017-18 (click [CPC/IRI consensus forecast](#) for the chance of each outcome for each 3-month period).

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 10 August 2017. 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

RESETTING IN CITRUS GROVES



For maximum efficiency of a production unit or grove, it is essential that every tree space is occupied by a healthy and productive tree. The average annual tree loss across the Florida citrus industry is currently around 6%. However, the extent of tree loss among individual groves can vary from 2 to 12% or more. Prompt replacement of unproductive trees means higher average long-term returns from the grove. If the declining trees remain in the grove, they keep getting weaker and yield less fruit each year and therefore the potential production capacity for the grove keeps declining even though production costs remain the same or even increase. It is very important to remove and replace such trees once it is clear that they are declining and they are no longer economically profitable. However, the reason for the decline should be determined and the condition should be corrected so that the replacement tree does not suffer the same fate.

Resetting should be considered if the tree is affected by an incurable disease such as blight, tristeza, or citrus greening. The resetting program should be conducted regularly rather than being delayed until serious losses in production have occurred. Resets should be planted with the same cultivar already in the block. Usually, it is more economical to keep resetting and not to push the entire block unless the cultivar and/or the tree spacing between rows is an undesirable one. Replanting in a mature grove seems justified only when a minimum of 8 ft between canopy driplines, (not from trunk-to-trunk), is available for canopy development of the new trees.

Replacement of dead, diseased, and declining trees in Florida citrus groves should always be an important part of the total production program. Today, tree replacement is more important than ever since overhead and production costs are dramatically increasing and a full stand of productive trees is essential to maximize production and profits. Freezes, blight, tristeza, Phytophthora, Diaprepes, and other pests and diseases have been particularly troublesome to Florida citrus growers for the last two decades. Citrus canker and greening have been devastating citrus groves since their introduction to Florida. Extensive tree losses coupled with the economic necessity of regular resetting have caused many growers to investigate ways to achieve new efficiencies in reset management.

NOT AN EASY TASK

Caring for young citrus trees is always troublesome because they require far more attention than larger, established trees. Florida's sandy soils, high summer temperatures, possible low winter temperatures, and scattered rainfall patterns complicate young tree care by forcing growers to protect, fertilize, and weed young trees regularly or face extensive losses. Young trees are more sensitive and more attractive to pests than mature trees due to high levels of vegetative growth. Therefore, special care is needed to insure pests are adequately controlled. Resets often present an even greater problem because trees are usually scattered throughout a block of larger trees, where they compete with large, full-grown trees for limited supplies of water, nutrients, and sometimes sunlight. Scattered resets frequently have serious weed problems since removal of the previous tree allows the area to receive more sunlight and provides more favorable conditions for weed growth. Since resets are usually scattered throughout a block of much larger trees, they are often difficult to locate and may be accidentally overlooked, resulting in inadequate care. Researchers, growers, and production managers are continually developing and improving methods of dealing with reset care.

PLANNING THE RESET PROGRAM

Grove managers should include tree removal and resetting as a routine part of the production program and assign special crews to deal specifically with young tree care. Planning ahead is very important because there is often a lag period between the time when replacement trees are ordered and when they are received. The wait time for the most desired rootstock and scion combination may be as great as 1 to 2 years, so replacement tree needs should be anticipated (when possible) and orders placed so they can be obtained when needed.

PURCHASING TREES

High quality reset trees are essential for maximum young tree growth. These young trees will be placed in an intensely competitive situation and may sometimes receive less than ideal care, so there is no room for compromising tree quality. Only healthy and properly sized trees from registered sources should be purchased since the initial cost is only a small fraction of the total cost of bringing such a tree into production.

SITE PREPARATION

The planting site should be well prepared. Weeds should be removed before planting. At a minimum, a non-residual herbicide should be applied to the reset area to get weeds under control before the young tree is planted.

Planting sites should be prepared well in advance of receipt of the trees. Ideally, trees should be planted on the same day they are received. Under no circumstances should trees be allowed to dry out. To minimize root desiccation and damage, they should be kept cool and moist until they are planted.

PLANTING THE TREES

Trees should be removed from the container and inspected for evidence of pot-binding. Make several vertical slashes about one inch deep through the root ball to encourage root branching. These slashes also allow the potting soil and roots to interface more closely with the soil in the planting site. It may be easier to cut some of the roots with pruning shears and pull them so they protrude from the ball.

A common problem with nursery trees is that the potting mixture is often highly organic. Such materials form areas, which are difficult to permeate with water after the young tree is planted in sandy soils and irrigated. The outer third of the organic ball should be removed so that the outer roots are exposed and can extend into the soil in which the tree is planted. Otherwise, the tree may not grow off quickly and satisfactorily.

WEED CONTROL

Keeping weeds under control during the establishment period of the reset is very important. Weeds compete with young citrus trees for water, nutrients, soil applied pesticides, and sunlight and

they must be properly controlled. Weed control around a reset site should be considered at pre-plant, early post-plant, and after the tree is established. Control of weeds prior to planting should be provided. If residual herbicides are used, they should be used at proper rates and at least 30 days in advance of planting so that residues do not impact reset growth. Prior to planting, contact or growth regulating herbicides may be preferred since they do not leave residual effects in the soil.

Weed control during the establishment period or approximately the first year is frequently quite difficult. Hand labor is scarce and expensive. Trunk damage by hoes or other cultivation equipment further compounds the problem. Chemical weed control provides at least a partial solution to the problem during this establishment period. There is now a fairly wide selection of residual herbicides available, which can be used around young trees. These materials should be applied at reduced rates. Be sure to read labels carefully for restrictions on the use of herbicidal materials around young trees.

After the reset has been planted for a year or more, modifications of the weed control program can be considered. Labels of materials under consideration should be checked carefully for restrictions prior to use. Some herbicides require reduced rates around young trees to minimize potential damage to resets planted among older trees. Specially modified herbicide applicators are available which enable the equipment operator to deliver reduced rates or a different herbicide mix around young trees.

To minimize herbicide contact to young trees, many growers apply a wrap or guard around the lower 12 to 16 inches of the tree trunk. When using these wraps be sure to monitor the protective structure for ants or other pests that may damage the tree trunk.

SPROUTING

Resets require periodic sprout removal. The use of tree wraps usually reduces the need for sprout control. Wraps often stay in place for up to 3 years. They should, however, be checked periodically for the presence of ants or fungal diseases. Reduced sprouting may be enough to justify their use. There are no simple answers to the use of wraps. Each situation is different and requires careful horticultural and economic consideration to arrive at the best procedure of maintenance, inspection, and management.

IRRIGATION & DRAINAGE

Young citrus trees require frequent but moderate water application for survival and proper growth. Competition for water is accentuated by nearby older trees or if weeds are allowed to grow close to the young trees. Anything that can be done to discourage competition for available water should be beneficial to the young tree. Irrigation systems should be in place before planting trees. Special modifications to the irrigation pattern by inverting the micro-sprinkler so that the surface wetting area is reduced or by increasing irrigation frequency can be good strategies to supply water for resets. However, the irrigation frequency necessary to sustain a mature grove is rarely adequate for good growth of newly-set trees, and young trees should be checked frequently to be certain they are receiving sufficient water. Drainage is as important as irrigation. Excess water must be removed from the rootzone. The concept of total water management must be practiced. If either system -irrigation or drainage- is not designed, operated, and maintained properly, then the maximum profit potential of a grove cannot be achieved. In Florida, both surface and subsoil drainage is necessary to obtain adequate root systems for the trees.

FERTILIZATION

Reset fertilization requires an extra effort beyond the needs of the bearing grove. Frequent application of water-soluble fertilizers with irrigation water (fertigation) can increase overall fertilizer use efficiency. If the grove is under a fertigation program, there is no need for special care in terms of nutrition for resets. Great care must be taken to ensure that proper rates of fertilizer materials are dispensed to prevent nutritional deficiencies or toxicities. Frequent light applications usually produce best results and lessen the danger of leaching but these practices need to be evaluated for cost

effectiveness. The use of controlled-release fertilizers for resets is a better option than making multiple trips throughout the year to scattered resets throughout large blocks.

PEST CONTROL

Because young trees have more frequent flushing cycles than mature trees, they are more attractive and sensitive to pests. Therefore, special care is needed to keep the citrus psyllid and leafminer under control to reduce their damage to new leaves and to reduce the severity of citrus canker and the spread of citrus greening. Relying solely on foliar contact insecticides for resets is not a good strategy. Soil-applied systemic insecticides (neonicotinoids) which provide 6-8 weeks of control are the most effective tool for managing psyllids and leafminers on resets. Currently, three neonicotinoid products are registered for use in citrus: imidacloprid (Admire, Alias, Couraze, Nuprid), thiamethoxam (Platinum), and clothianidin (Belay). Various generic formulations are also available. Resets should also benefit from foliar contact pesticides and from foliar nutrition used on mature trees.

GROVE PLAT

Since resets are usually scattered throughout a block of much larger trees, they are often difficult to locate and may be accidentally overlooked, resulting in inadequate care. An annually updated grove plat is probably the best method for assessing general grove condition and productivity. Plats can be prepared by hand or with the assistance of a computer. This can help determine the number of trees which will be needed and where they should be placed. Reset plats can be prepared to later help equipment operators locate newly-planted trees for periodic care.

Scattered resets in a citrus grove.



WEED MANAGEMENT IN CITRUS GROVES

Weeds can reduce the growth, health and survival of young trees, or the time to come into bearing and ultimately fruit production. The more competitive the weeds, the more adversely they alter tree physiology, growth, fruit yield and quality. The attainment of early crop production requires controlling the growth of weeds. Weeds alter economic status by competing with trees, particularly young trees, for water, nutrients and even light in the case of climbing vines, which can easily cover trees if left uncontrolled.



Weeds also have various effects on tree performance including reduced efficacy of low volume irrigation systems, and interception of soil-applied pesticides.

Management Methods

Cultural & mechanical

Cultural methods include off-target irrigation and fertilizer applications. Mechanical methods include cultivation in row middles. However, **constant cultivation results in the destruction of citrus fibrous roots, which normally would grow in the undisturbed portion of the soil.**



Mowing is practiced between the tree rows and away from the trees in combination with herbicide applications in the tree row over the major root zone of trees. It is appropriate where a cover crop is desired in bedded groves to prevent soil erosion. Weeds can also be spread by seed and vegetatively during mowing operations, reinfesting tree rows where herbicides have been applied. **Mowing before seedhead formation is necessary to reduce seed dissemination and reinfestation.**

Chemical mowing

Chemical mowing, utilizing Low Rate Technology (LRT) postemergence herbicide spray applications and wiping in combination with mechanical mowing, is used for the suppression of vegetation in row middles. With the high frequency and cost of mechanical mowing required to maintain vegetation control in row middles, chemical mowing and wiping with low rates of glyphosate has increased. Weed management in Middles by chemical applications results in the elimination of tall growing species and establishment of more manageable sod type species such as Bermuda and Bahia grasses.

Chemical

Generally speaking, all weed species listed as susceptible on the herbicide product label will be controlled by that herbicide at the appropriate rate, time of application and stage of growth. Environmental and plant conditions before, during and following the application are also important including moisture in the form of rainfall and/or irrigation.

Poor control can sometimes be expected from postemergence applications to weeds under stress conditions due to poor uptake and translocation of applied herbicides.

Assuming that the appropriate herbicide or herbicide mixtures are selected for the weed species present, failures in the program will usually be due to one of the above factors or to the actual application including calibration and/or equipment design and operation.

Herbicides may be classified as foliar or soil-applied. Foliar applied materials may have systemic or contact activity. Soil applied preemergence herbicides are absorbed through weed root systems, being most

effective during germination and early seedling growth stages. Systemic herbicides are those that are absorbed by either roots or aboveground plant parts and are translocated throughout the plant. Contact herbicides act as desiccants, damaging or killing all plant parts actually sprayed with little if any translocation.

For the control of well-established perennial weeds, a postemergence herbicide with systemic metabolic activity should be used with preemergence soil residual products.

Timing and frequency of application are the keys to good vegetation management.

Increased application frequency of lower rates of soil residual herbicides is more effective in young groves where vegetation presence is greater due to more exposure of the grove floor to sunlight and where a greater herbicide safety factor is required.

Application Technology

Rapid advances in herbicide application technology have resulted in the development of sophisticated equipment. Application equipment is now capable of selective delivery of multiple herbicide products, each directly injected into booms. In a single application, tree rows and row middles may be treated with soil residual and postemergence products with selectivity for tree age, soil type and vegetation species.



Well-maintained, accurately calibrated equipment with good filtration and agitation systems capable of uniform distribution of prescribed spray volumes and droplet size is essential for efficiency, cost-effective vegetation management. Worn nozzle tips result in increased spray delivery rates and distortion of distribution patterns and should be

checked regularly. Improved herbicide boom design to reduce tree skirt contact, spray drift and interference of heavy weed cover with nozzle output will reduce tree damage and fruit drop while improving control of target vegetation. Tree skirt pruning and timing of postemergence applications will also reduce boom and spray contact with low hanging limbs and fruit.



Environmental Considerations

In determining management options, herbicide selection should be based not only on species and stage of vegetation development, but product solubility and leaching potential, soil type and rainfall distribution. Objectives are to reduce weed competition and interference through measured vegetation control/suppression with inputs having reduced potential for leaching through over-irrigation, runoff and erosion, chemical drift, or other off-target impacts. **CAUTION:** Herbicides may move through the soil to groundwater. Several factors influence the rate of this movement. Lower rates applied more frequently combined with sound irrigation management practices will reduce herbicide movement. **The use of bromacil-containing herbicides is prohibited on deep, sandy Ridge-type soils.**

For more information and for the list of herbicides registered for citrus in Florida, go to: <http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/Weeds.pdf>

PHYTOPHTHORA

Foot rot results from infection of the scion near the ground level, producing bark lesions, which extend down to the budunion on resistant rootstocks.



Crown rot results from infection of the bark below the soil line when susceptible rootstocks are used. Root rot occurs when the cortex of fibrous roots is infected, turns soft and appears water-soaked.

Fibrous roots slough their cortex leaving only white thread-like stele.



When managing Phytophthora-induced diseases, consider integration of cultural practices (e.g., disease exclusion through use of Phytophthora-free planting stock, resistant rootstocks, proper irrigation practices) and chemical control methods.

Cultural practices. Field locations not previously planted with citrus are free of citrus-specific *P. nicotianae*. Planting stock should be tested free of Phytophthora in the nursery and inspected for fibrous root rot in the nursery or grove before planting. In groves with a previous history of foot rot, consider use of Swingle citrumelo for replanting. Swingle citrumelo is resistant to foot rot and roots do not support damaging populations once trees are established.

Cleopatra mandarin should be avoided because it is prone to develop foot rot when roots are infected in the nursery or when trees are planted in flatwoods situations with high or fluctuating water tables and fine-textured soils. Trees should be planted with the budunion well-above the soil line and provided with adequate soil drainage. Overwatering, especially of young trees, promotes buildup of populations in the soil and increases risk of foot rot infection. Prolonged wetting of the trunk, especially if tree wraps are used on young trees, should be avoided by using early to midday irrigation schedules. Control of fire ants prevents their nesting under wraps and causing damage to tender bark.

Sampling for *P. nicotianae*. Population densities of the fungus in grove soils should be determined to assist in decisions to treat with fungicides. Soil samples containing fibrous roots should be collected during the spring through fall (March to November) from under-canopy within the tree dripline. Individual small amounts of soil from 20 to 40 locations within a 10-acre area are composited into one resealable plastic bag to retain soil moisture. Samples must be kept cool but

not refrigerated for transport to the analytical laboratory. Currently, populations in excess of 10 to 15 propagules per cm³ soil are considered damaging. The same soil sample could be tested for populations of nematodes, to assess whether they occur at damaging levels.

Chemical control.

Use of fungicides in young groves should be based on rootstock susceptibility, likelihood of *Phytophthora* infestation in the nursery, and history of *Phytophthora* disease problems in the grove. For susceptible rootstocks, such as Cleopatra mandarin and sweet orange, fungicides may be applied to young trees on a preventive basis for foot rot. For other rootstocks, fungicide treatments should commence when foot rot lesions develop. The fungicide program for foot rot should be continued for at least one year for tolerant rootstocks, but may continue beyond for susceptible stocks.



In mature groves, the decision to apply fungicides for root rot control is based on yearly soil sampling to indicate whether damaging populations of *P. nicotianae* occur in successive growing seasons. Time applications to coincide with periods

of susceptible root flushes in late spring and late summer or early fall.

Soil application methods with fungicides should be targeted to under canopy areas of highest fibrous root density. To avoid leaching from the root zone, soil-applied fungicides should not be followed by excessive irrigation.



Recommended Chemical Controls for *Phytophthora* Foot Rot and Root Rot include Aliette, Phostrol, ProPhyt, Ridomil, UltraFlourish, and Copper.

For more details, go to:

<http://www.crec.ifas.ufl.edu/extension/pes/t/PDF/2017/Phytophthora.pdf>

BROWN ROT MANAGEMENT



Management of brown rot, caused by *Phytophthora nicotianae* or *P. palmivora*, is needed on both processing and fresh market fruit. While the disease can affect all citrus types, it is usually most severe on Hamlin and other early maturing sweet orange cultivars.

Phytophthora brown rot is a localized problem usually associated with restricted air and/or water drainage. It commonly appears from mid-August through October following periods of extended high rainfall. It can be confused with fruit drop due to other causes at that time of the year. If caused by *P. nicotianae*, brown rot is limited to the lower third of the canopy because the fungus is splashed onto fruit from the soil. *P. palmivora* produces airborne sporangia and can affect fruit throughout the canopy.

Early season inoculum production and spread of *Phytophthora* spp. are minimized with key modifications in cultural practices. Skirting of the trees reduces the opportunity for soil-borne inoculum to contact fruit in the canopy. The edge of the herbicide strip should be maintained just inside of the dripline of the tree to minimize the exposure of bare soil to direct impact by rain. This will limit rain splash of soil onto the lower canopy. Boom application of herbicides and other operations dislodge low-hanging fruit. Fruit on the ground becomes infected and produces inoculum of *P. palmivora* that can result in brown rot infection in the canopy as early as July while fruit are still green. The beginning stages of the epidemic are very difficult to detect before the fruit are colored and showing typical symptoms. Application of residual herbicides earlier in the summer may reduce the need for post-emergence materials later and minimize fruit drop throughout this early stage of inoculum production from fallen fruit.

Usually a single application of Aliette, Phostrol or ProPhyt before the first signs of brown rot appear in late July is sufficient to protect fruit through most of the normal infection period. No more than 20 lb/acre/year of Aliette should be applied for the control of all Phytophthora diseases. Aliette, Phostrol and ProPhyt are systemic fungicides that protect against postharvest infection and provide 60-90 days control. Copper fungicides are primarily protective but are capable of killing sporangia on the fruit surface and thus reducing inoculum. They may be applied in August before or after brown rot appearance and provide protection for 45-60 days. If the rainy season is prolonged into the fall, a follow-up application of either systemic fungicides at one-half of the label rate, or copper in October may be warranted. With average quality copper products, usually 2-4 lb of metallic copper per acre are needed for control.

Precautions should be taken during harvesting not to include brown rot-affected fruit in the field containers as this could result in rejection at the processing or packing facility.



Recommended Chemical Controls for Brown Rot of Fruit

Pesticide	FRAC MOA ²	Mature Trees Rate/Acre ¹
Aliette WDG	33	5 lb
Phostrol	33	4.5 pints
ProPhyt	33	4 pints
copper fungicide	M1	Use label rate.

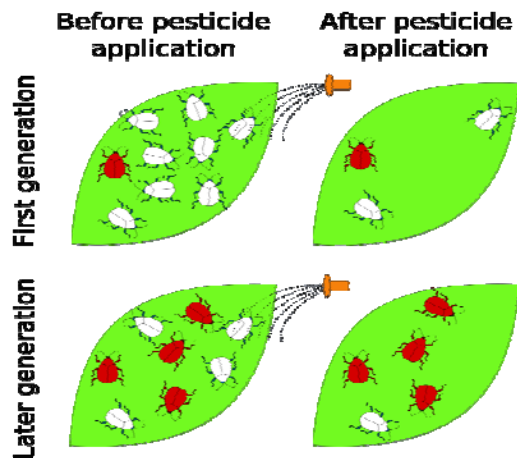
¹Lower rates may be used on smaller trees. Do not use less than minimum label rate.
²Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2013. Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2014 Florida Citrus Pest Management Guide for more details.

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.

For more information, go to Florida Citrus Production Guide: Brown Rot of Fruit at: <http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/Brown%20Rot.pdf>

Pesticide Resistance and Resistance Management

M.E. Rogers and M.M. Dewdney



Populations of animals, fungi, bacteria, and plants possess the ability to respond to sustained changes or stresses in their environment in ways that enable the continued survival of the species. Such environmental stresses include physical factors (e.g., temperature or humidity), biological factors (e.g., predators, parasites, or pathogens) and environmental contaminants. In any population, a small percentage of individuals will be better able to respond to new stresses because of unique traits or characteristics that they possess. Consequently, those individuals will survive, reproduce, and become more common in a population. This phenomenon is commonly referred to as "survival of the fittest."

Many pest species, such as the citrus rust mite, are exceptionally well-equipped to respond to environmental stresses because of their short generation time and large reproductive potential. The use of chemical sprays to control insect, mite, and fungal diseases of citrus creates a potent environmental stress. There are now many examples of pests and pathogens that have responded by developing resistance to one or more pesticides. Pesticide-resistant individuals

are those that have developed the ability to tolerate doses of a toxicant that would be lethal to the majority of individuals. The resistance mechanisms can vary according to pest species and/or the class of chemical to which the pest is exposed. Resistance mechanisms include an increased capacity to detoxify the pesticide once it has entered the pest's body, a decreased sensitivity of the target site that the pesticide acts upon, a decreased penetration of the pesticide through the cuticle, or sequestration of the pesticide within the organism. The main resistance mechanism for pathogens is a change in the target site so that the pathogen is less susceptible or fully resistant. A single resistance mechanism can sometimes provide defense against different classes of chemicals and this is known as *cross-resistance*. When more than one resistance mechanism is expressed in the same individual, this individual is said to show *multiple resistance*. Because the traits for resistance are passed from one generation to the next, continued stress from a pesticide may, over time, create resistance in the majority of individuals in a population. From an operational perspective, this process would be expressed as a gradual decrease and eventual loss of effectiveness of a chemical. Resistance to a particular chemical may be stable or unstable. When resistance is stable, the pest population does not revert to a susceptible state even if the use of that chemical is discontinued. When resistance is unstable and use of the chemical is temporarily discontinued, the population will eventually return to a susceptible state, at which time the chemical in question could again be used to manage that pest. However, in this situation, previously resistant populations may eventually show resistance again. Of the factors that affect the development of resistance—which include the pest's or pathogen's biology, ecology and

genetics—only the operational factors can be manipulated by the grower. The key operational factor that will delay the onset of pesticidal resistance and prolong the effective life of a compound is to assure the survival of some susceptible individuals to dilute the population of resistant individuals. The following operational procedures should be on a grower's checklist to steward sound pesticidal resistance management for acaricides, insecticides, fungicides, and herbicides:

Never rely on a single pesticide class. Integrate chemical control with effective, complementary cultural and biological control practices.

Always use pesticides at recommended rates and strive for thorough coverage. When there is more than one generation of pest, alternate different pesticide classes.

Do not use tank mixtures of products that have the same mode of action.

If control with a pesticide fails, do not re-treat with a chemical that has the same mode of action.

Reports of resistance have been documented for certain acaricides used to control citrus rust mite and fungicides used to combat diseases in Florida.

Resistance to Benlate developed in the greasy spot fungus shortly after the product was introduced about 30 years ago and is still widespread. Benlate resistance also occurs in the scab fungus in isolated situations and is stable.

Resistance has been detected in tangerine groves with *Alternaria* brown spot to strobilurin fungicides (Abound, Gem, and Headline and contained in the mixtures Pristine and Quadris Top) but no resistance has developed to ferbam.

Dicofol resistance in citrus rust mite was detected throughout the citrus industry about 10 years ago, but resistance proved to be unstable and usage of dicofol has continued. Agri-mek tolerance in citrus rust mite is of concern and growers should follow sound resistant

management practices when using this product.

The following tables are provided to aid in the rotation of pesticides with different modes of action within a season or from year to year. There is a separate table for insecticides/acaricides, fungicides, and herbicides. The information in these tables was derived from information produced by the Insecticide Resistance Action Committee (IRAC)

(<http://www.iraconline.org/>), Fungicide Resistance Action Committee (FRAC)

(<http://www.frac.info/>), and the Herbicide Resistance Action Committee (HRAC)

(<http://hracglobal.com/pages/classificationofherbicidesiteofaction.aspx>). Each table lists the number (or letter in the case of herbicides) of the group code for each pesticide class, the group name or general description of that group of pesticides, the common name of pesticides used in citrus production that belong to each group, and examples of trade names of pesticides for each common name listed. When using the table to rotate between using products with different modes of action, choose products with a different group code than previously used in the grove during the current growing season. In the case of insecticides/acaricides, many of these pesticides are broken into subgroups. It is unclear whether cross resistance will occur between these subgroups. When possible, it is recommended to rotate with an entirely different group. (Note: The IRAC and FRAC mode of action systems both use a similar numbering system. There is no cross-resistance potential between the insecticides and fungicides.) Products with broad-based activity such as sulfur, copper, and oil are not included in this list because the development of resistance to them is not likely. For more details, go to:

<http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/Pesticide%20Resistance%20and%20Resistance%20Management.pdf>

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CITRUS LEPROSIS,

NOT HERE YET IN FLORIDA, BUT CLOSE IN MEXICO

Leprosis is one of the most important citrus diseases in Brazil. This problem is caused by the *Citrus leprosis* virus and is transmitted by mites of *Brevipalpus* spp. It also occurs in other South American countries and has been recently identified in Central America. This northbound spread of leprosis is being considered a serious threat to the Florida citrus industry.

Prior to 1925, leprosis had a negative impact on citrus production in Florida. Then about 1926, the incidence of leprosis in Florida drastically declined, with the decline coinciding with the introduction of sulfur as an effective miticide for controlling citrus rust mite. The last time leprosis was reported in Florida was in the mid-1960s.

This disease alone is responsible for approximately \$60 to 100 million per year losses in Brazil. It is quite difficult to work with the citrus leprosis virus, which has hindered much of the progress regarding its accurate detection. Symptoms require field experience and can be confused with those caused by other plant pathogens. On the other hand, laboratory analysis of lesions is time-consuming, requires experience, and is not always very accurate, leading to some false negatives.



Leprosis produces symptoms on leaves, branches and fruit. It causes lesions in the fruit skin, premature drop of leaves and fruits, and twigs dieback, with the possible death of

the tree. The damage to the branches can decrease the plant productivity after some years because the damaged branches prevent the normal flow of plant sap. With effective mite control, it might take two years for a citrus tree with leprosis to fully recover. Citrus leprosis infects all varieties of sweet orange, and has been reported on lemon and mandarin. Tangerines and tangor are also susceptible to the disease. Grapefruit is reported to be tolerant.



Dissemination of the disease occurs only when infected citrus trees and vectors are present. In citrus, the population of the leprosis mite is low and usually occurs in clusters of trees, which should be monitored carefully. When the trees are contaminated with the leprosis virus, the number of diseased trees will increase as the contaminated mites disperse.

Leprosis control is based mainly on the elimination of the sources of inoculum by pruning the affected trees and by using miticides to reduce the vector. Additional control procedures are also recommended, such as:

- Planting of young trees free from leprosis mites and from leprosis virus
- Controlling the leprosis mites host weeds
- Disinfection of equipment, boxes and vehicles
- Use of mite non-host species as windbreak
- Developing and using procedures that favor the increase of the population of natural enemies of the leprosis mite.

Flatwoods Citrus

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__ Asian American

__ Hispanic

__ White, non-Hispanic

__ Black, non-Hispanic

Gender

__ Female

__ Male