

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

# Flatwoods Citrus



**Vol. 20, No. 10**

**October 2017**

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



## *Table of Contents*

Upcoming Events	2
Flatwoods Citrus Newsletter Sponsors – Thank you!	3-6
El Niño/Southern Oscillation (Enso) Diagnostic Discussion	7
Hurricane Irma	8
Flooding Injury and Importance of Drainage	9-11
Resetting In Citrus Groves	12-15
Phytophthora	16-17
Brown Rot Management	18-19
<b>Flatwoods Citrus Newsletter Evaluation Form</b>	20

# IMPORTANT EVENTS

## Seminar

Title: Nutrient Management of Citrus Trees

Location: Southwest Florida Research and Education Center, Immokalee

Date & time: Wednesday, 25 October 2017, 10:00 AM – 12:00 Noon

Speakers: Kelly Morgan, Bill Easterwood, Mongi Zekri, and Eric Waldo

Program Coordinator: Mongi Zekri, UF-IFAS

Program Sponsor: Eric Waldo with Yara

2 CEUs for certified crop advisors (CCAs)

**Pre-registration is required.** No registration fee and lunch is free Thanks to Eric Waldo with YARA. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: [maz@ufl.edu](mailto:maz@ufl.edu)

### Agenda

----10:00 AM – 10:30 AM

“**Nutrition of Citrus Trees-Basic Guidelines**” by **Dr. Mongi Zekri**

----10:30 AM – 11:00 AM

“**Nutrient and Irrigation Strategies for Citrus after a Hurricane**” by **Dr. Kelly Morgan**

**11:00 AM – 11:10 AM Break**

----11:10 AM – 11:40 AM

“**Balanced Nutrition to Reduce Plant Stress and Rebuild Roots in Citrus**” by **Dr. Bill Easterwood**

----11:40 AM – 12:00 Noon

“**Tools and Strategies for Growing or Re-Building a Healthy Citrus Tree**” by **Eric Waldo**

## Citrus Health Management Areas (CHMAs)



Title: Citrus Health Management Area (CHMA)

Location: Southwest Florida Research and Education Center, Immokalee

Date & time: Tuesday, 14 November 2017, 10:00 AM – 12:00 Noon

Speakers: Dr. Phil Stansly and others

Program Coordinators: Ron Hamel, GCGA and Mongi Zekri, UF-IFAS

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  
and the International Research Institute for Climate and Society  
14 September 2017**

**ENSO Alert System Status: [La Niña Watch](#)**

**Synopsis: There is an increasing chance (~55-60%) of La Niña during the Northern Hemisphere fall and winter 2017-18.**

Over the last month, equatorial sea surface temperatures (SSTs) were near-to-below average across the central and eastern Pacific Ocean. ENSO-neutral conditions were apparent in the weekly fluctuation of Niño-3.4 SST index values between  $-0.1^{\circ}\text{C}$  and  $-0.6^{\circ}\text{C}$ . While temperature anomalies were variable at the surface, they became increasingly negative in the sub-surface ocean, due to the shoaling of the thermocline across the east-central and eastern Pacific. Though remaining mostly north of the equator, convection was suppressed over the western and central Pacific Ocean and slightly enhanced near Indonesia. The low-level trade winds were stronger than average over a small region of the far western tropical Pacific Ocean, and upper-level winds were anomalously easterly over a small area of the east-central Pacific. Overall, the ocean and atmosphere system remains consistent with ENSO-neutral.

A majority of the models in the IRI/CPC suite of Niño-3.4 predictions favor ENSO-neutral through the Northern Hemisphere 2017-18 winter. However, the most recent predictions from the NCEP Climate Forecast System (CFSv2) and the North American Multi-Model Ensemble (NMME) indicate the formation of La Niña as soon as the Northern Hemisphere fall 2017. Forecasters favor these predictions in part because of the recent cooling of surface and sub-surface temperature anomalies, and also because of the higher degree of forecast skill at this time of year. In summary, there is an increasing chance (~55-60%) of La Niña during the Northern Hemisphere fall and 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 12 October 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](mailto:ncep.list.enso-update@noaa.gov).

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

**Hurricane Irma** was very devastating to Florida in general and to SW Florida in particular. Commercial citrus groves suffered 40-80% fruit drop and 5-30% uprooted trees.



### **Tree rehabilitation**

1. Resetting trees to an upright position should be accomplished as soon as possible.
2. Topped trees should be pruned back to sound wood.
3. Painting exposed trunks and branches with white latex paint helps prevent sunburn.

### **Irrigation:**

Check operation of the irrigation system as rehabilitation is a long process and maintaining tree water supply is critical.

### **Fertilizer:**

1. Plant nutrients should be applied when new growth begins.
2. Topped trees will require less fertilizer due to reduced root system and tree canopy.
3. Reduce N fertilizer proportionally to canopy and/or to leaf loss.
4. The following year, trees may require more-than-normal rates to re-establish canopy.
5. Micronutrients should be applied in nutritional sprays to the leaves and soil applied as well.

### **Weeds:**

Resume row middles mowing and herbicide applications on a normal schedule.

### **Pests:**

A rigorous effective pest management program should be adopted.



**Pruning and resetting a tree to an upright position.**



# Flooding Injury and Importance of Drainage

Almost all citrus trees grown in the Indian River and Southwest Florida production areas are located on high water tables and poorly drained soils. Water management on these soils is difficult and expensive. During heavy rains in the summer, excess water must be removed from the root zone while periods of limited rainfall require irrigation. On these soils, drainage is as important as or sometimes even more important than irrigation. 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.

Roots, like the rest of the tree, require oxygen for respiration and growth. Well-aerated soils in Florida typically contain around 20-21% oxygen. When flooding occurs, the soil oxygen is replaced by water. This condition causes tremendous changes in the types of organisms present in the soil and in the soil chemistry.

Flooding injury is highly probable if the root zone is saturated for 3 or more days during the summer when soil temperatures (86-95°F) are relatively high (Figure 1). Flooding during the cooler December-March period can be tolerated for several weeks at low soil temperatures (< 60° F). The rate of oxygen loss from the soil is much greater at higher than at lower temperatures. The potential for damage to roots is less obvious, but equally serious, when the water table is just below the surface. Flooding stress is much less when water is moving than when water is stagnant. The use of observation wells is an easy and a quick method for evaluating water-saturated zones in sites subject to chronic flooding injury (See “Water Table Measurement and Monitoring in Citrus Groves”, Citrus Industry magazine, May 2015 issue).



Figure 1. Flooded citrus grove after a heavy summer rain event.

Short-term estimates of flooding stress can be obtained by digging into the soil and smelling soil and root samples. Sour odors indicate an oxygen deficient environment. The presence of hydrogen sulfide (a disagreeable rotten egg odor) and sloughing roots indicate that feeder roots are dying. In flooded conditions, root death is not exclusively associated with oxygen deficiency. Anaerobic bacteria (the kind that can grow only in the absence of oxygen) develop rapidly in flooded soils and contribute to the destruction of citrus roots. Toxic sulfides and nitrites formed by anaerobic sulfate- and nitrate-reducing bacteria are found in poorly drained groves. Sulfate-reducing bacteria require both energy and sulfates to change sulfates to sulfides. The best sources of energy have been found to be certain organic acids contained in citrus roots, grass roots, and buried pieces of palmetto. Thus, citrus roots can contribute to their own destruction by being an energy source for these bacteria.

Symptoms of flooding injury may occur within a few days or weeks, but usually show up after the water table has dropped and the soil dries. Leaf wilting appears since the damaged roots cannot take up enough water to meet tree demand. This wilting is followed by leaf drop and twig dieback. Chlorosis patterns may develop and tree death may occur. Trees subjected to chronic flooding damage are stunted with sparse canopies and dull colored small leaves. Trees produce low yields of small fruit. New flushes of growth will have small, pale leaves due to poor nitrogen uptake by restricted root systems. Usually, the entire grove is not affected, but most likely smaller more defined areas will exhibit the symptoms. Striking differences in tree condition can appear within short distances associated with only slight changes in rooting depths. Water damage may also be recognized by a marked absence of feeder roots and root bark that is soft and sloughs easily.

With acute water damage, foliage wilts and sudden heavy leaf drop follows (Figure 2). Trees may totally defoliate and actually die. More frequently, partial defoliation is followed by some recovery. However, affected trees remain in a state of decline and are susceptible to drought when the dry season arrives because of the shallow, restricted, root systems. Moreover, waterlogged soil conditions, besides debilitating the tree, are conducive to the proliferation of soil-borne fungi such as *Phytophthora* root and foot rot. These organisms cause extensive tree death especially in poorly drained soils.



Figure 2. Flooding damage causing severe leaf wilt.

Water damage may usually be distinguished from other types of decline by a study of the history of soil water conditions in the affected areas. Areas showing water damage are usually localized and do not increase in size progressively as do areas of spreading decline. Foot or root rot symptoms include a pronounced chlorosis of the leaf veins caused by root damage and girdling of the trunk. Lesions also appear on the trunk usually near the soil level (foot rot) or roots die and slough-off (root rot). Flood damage does not produce lesions. Trees with blight or citrus tristeza virus are usually randomly distributed within the grove and diagnostic tests are available to distinguish them from water-damaged trees.

Citrus trees respond physiologically to flooding long before morphological symptoms or yield reductions appear. Photosynthesis and transpiration decrease within 24 hours of flooding and remain low as flooding persists. Water uptake is also reduced. These effects eventually translate to decreased shoot growth and yields.

It is both difficult and costly to improve drainage in existing groves, so drainage problems should be eliminated when the grove area is prepared for planting by including a system of ditches, beds, and/or tiling. Growers should not depend on the slight and often unpredictable differences in rootstock tolerance to waterlogging to enable trees to perform satisfactorily in soil-saturated conditions. Trees, irrespective of scion and rootstock cultivars, should be planted using the best drainage conditions possible.

Do not disk a grove when trees were injured by flooding. Irrigation amounts should be reduced, but frequencies should be increased to adequately provide water to the depleted, shallow root systems. Soil and root conditions should be evaluated after the flooding has subsided. Potential for fungal invasion should be determined through soil sampling and propagule counts. If there is a *Phytophthora* problem, the use of certain fungicides can improve the situation.

Both surface and subsoil drainage is necessary for citrus trees grown in flatwoods areas to obtain adequate root systems. Drainage systems consist of canals, retention/detention areas, open ditches, subsurface drains, beds, water furrows, swales, and the pumps required to move the drainage water. These systems require continued good maintenance to minimize the chances of root damage from prolonged exposure to waterlogged soils following high intensity rains. Rutting in the water furrows that prevents water from efficiently moving into ditches is often a precursor to waterlogging and root damage.

Water furrows and drainage ditches should be kept free of obstruction through a good maintenance program including chemical weed control. Drainage systems should generally be designed to allow water table drawdown of 4 to 6 inches per day, which should be adequate to prevent root damage. Good drainage allows air to move into the soil and prevents oxygen-deprived conditions. Tree recovery from temporary flooding is more likely to occur with good drainage structure maintenance conditions.

Recent research work has shown that citrus greening (HLB-) infected trees are much more affected by extremes in soil moisture than trees without HLB. This stress intolerance was found to be due to a significant loss of fibrous roots. This finding makes attention to good drainage even more important because flooding could cause additional damage to root systems already weakened by HLB.

Additional information on drainage systems for citrus can be found at:  
<http://edis.ifas.ufl.edu/ch165>

# 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.**



# 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 cm<sup>3</sup> 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 <sup>2</sup>	Mature Trees Rate/Acre <sup>1</sup>
Aliette WDG	33	5 lb
Phostrol	33	4.5 pints
ProPhyt	33	4 pints
copper fungicide	M1	Use label rate.

<sup>1</sup>Lower rates may be used on smaller trees. Do not use less than minimum label rate.

<sup>2</sup>Mode 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>**

# FLATWOODS CITRUS NEWSLETTER EVALUATION FORM

Please take a moment to rate the quality and usefulness of the information presented in the Flatwoods Citrus newsletter. Please send back the form to:

**Dr. Mongi Zekri**  
**University of Florida, IFAS**  
**Hendry County Extension Office**  
**P.O. Box 68**  
**LaBelle, FL 33975**

or **Fax to 863 674 4636** or E-mail to [maz@ufl.edu](mailto:maz@ufl.edu) Thank you for your input!!!

Please circle or **bold** your answer

- |   |   |                                    |    |              |
|---|---|------------------------------------|----|--------------|
| 1 | Was the information up to date and accurate?                    | Yes                                | No | Uncertain    |
| 2 | Was the information delivered on time to be useful?             | Yes                                | No | Uncertain    |
| 3 | Was the information relevant to your situation?                 | Yes                                | No | Uncertain    |
| 4 | Was the information easy to understand?                         | Yes                                | No | Uncertain    |
| 5 | Have you had an opportunity to use the information?             | Yes                                | No | Uncertain    |
| 6 | Have you shared the information with someone else?              | Yes                                | No | Uncertain    |
| 7 | Overall, how do you feel about the Flatwoods Citrus Newsletter? |                                    |    |              |
|   | Satisfied   | Neither Satisfied Nor Dissatisfied |    | Dissatisfied |

8 Do you have any suggestions that might improve the newsletter?

(Please write in any comments)

9. How many years have you been using the Extension Service? \_\_\_\_\_ Years
10. What is your employment status?
- |                          |                         |                        |
|--------------------------|-------------------------|------------------------|
| _____ Grower             | _____ Chemical Industry | _____ Service Provider |
| _____ Production Manager | _____ Regulator         | _____ University       |
| _____ Consultant         | _____ Association       | Other _____            |

We appreciate your reactions and the time you have given us. Thank you, and please contact us when we may be of service to you.

# Flatwoods Citrus

If you did not receive the *Flatwoods Citrus* newsletter and would like to be on our mailing list, please check this box and complete the information requested below.

If you wish to be removed from our mailing list, please check this box and complete the information requested below.

Please send: Dr. Mongi Zekri  
Multi-County Citrus Agent  
Hendry County Extension Office  
P.O. Box 68  
LaBelle, FL 33975

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Subscriber's Name: \_\_\_\_\_

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E-mail: \_\_\_\_\_

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## *Racial-Ethnic Background*

\_\_ American Indian or native Alaskan

\_\_ Asian American

\_\_ Hispanic

\_\_ White, non-Hispanic

\_\_ Black, non-Hispanic

## *Gender*

\_\_ Female

\_\_ Male