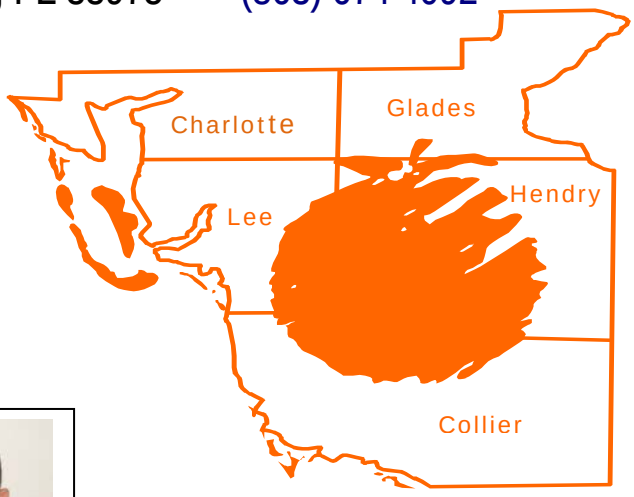
UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

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

# Flatwoods Citrus




**Vol. 21, No. 3** **March 2018**

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

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## Purpose of the Institute

Citrus Greening or Huanglongbing (HLB) continues to impact all citrus production areas of Florida. The 2018 Florida Citrus Growers' Institute is an opportunity for Florida citrus growers to come together to learn about effective management of HLB and other challenging diseases affecting the industry. Topics this year include citrus pathology, horticultural management of HLB, Asian citrus psyllid management, and the use of bactericides.

## Continuing Education Units

Continuing Education Units (CEU's) will be offered for holders of restricted use pesticide licenses (RUP) and certified crop advisors (CCA). CEU's have been granted in the following categories: private applicator, agricultural tree crop and demonstration & research for RUP holders. CEU's have been requested for CCA's in the appropriate CEU categories.

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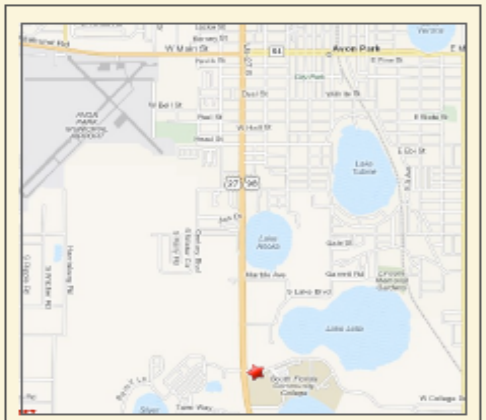

## Directions

The South Florida State College is located at 600 West College Drive in Avon Park.

From the South: Take U.S. Hwy. 27/98 north towards Avon Park, turn east onto W. College Drive and follow the signs to the Theatre.

From the North: Take U.S. Hwy. 27/98 south to Avon Park, continue south to W. College Drive, turn east onto W. College Drive and follow the signs to the Theatre.

From the East: Take U.S. Hwy. 98 north to where U.S. Hwy. 27/98 merge south of Sebring. Proceed on U.S. Hwy. 27/98 north towards Avon Park, turn east onto W. College Drive and follow the signs to the Theatre.

From the West: Take S.R. 64 east to Avon Park, turn south on U.S. Highway 27/98 to W. College Drive, turn east onto W. College Drive and follow the signs to the Theatre.

South Florida State College
Alan Jay Wildstein
Center for the Performing Arts
600 W. College Drive
Avon Park, FL

# Florida Citrus Growers' Institute


Conducted by

University of Florida, IFAS Extension
Citrus Research and Development Foundation

South Florida State College
Alan Jay Wildstein
Center for Performing Arts
Avon Park, Florida

April 3, 2018

# 2018 Florida Citrus Growers' Institute

## Program Agenda
**Tuesday, April 3, 2018**

8:00 AM - Registration

8:30 AM - **Welcome and Introductions**
*Ms. Laurie Hurner*, CES, Sebring, FL

8:46 AM - **Review of CRDF Programs** - *Dr. Lisa Weaver*, CRDF

### Citrus Pathology
*Moderator: Mr. Chris Oswalt*, CES, Bartow, FL

9:06 AM - **Citrus Compliance Agreements** - *Ms Callie Walker*, FDACS/DPI

9:16 AM - **Citrus Canker Control & Citrus Black Spot Update** - *Dr. Megan Dewdney*, UF/IFAS CREC

9:46 AM - **Update on Bactericide Effectiveness in the Battle Against HLB** - *Dr. Robert Shatters*, USDA/ARS

10:16 AM - **Break**

### Horticultural Management and Economics
*Moderator: Dr. Steve Futch*, CES, UF/IFAS CREC

10:30 AM - **Net Present Value of New Citrus Plantings** - *Dr. Ariel Singerman*, UF/IFAS CREC

11:00 AM - **Alternatives to Rootstock Propagation by Seed - What can we Expect?** - *Dr. Ute Albrecht*, UF/IFAS SWFREC

11:30 AM - **Citrus Under Protective Screen Update with Post Hurricane Observations** - *Dr. Arnold Schumann*, UF/IFAS CREC

12:00 PM - **Lunch**

1:00 PM - **Effective Citrus Weed Management - Challenges and Opportunities** - *Dr. Ramdas Kanissery*, UF/IFAS SWFREC

### Psyllid Management
*Moderator: Dr. Mongi Zekri*, CES, LaBelle, FL

1:30 PM - **Insecticide Mode of Action Rotation for Psyllid Control in Florida** - *Dr. Lukasz Stelinski*, UF/IFAS CREC

2:00 PM - **Imidicaplorid Alternatives for Growing Young Citrus Trees** - *Dr. Phil Stansly*, UF/IFAS SWFREC

2:30 PM - **Tamarixia Release Results** - *Dr. Robin Stuart*, FDACS/DPI

3:00 PM - **Adjourn**

**CES:** County Extension Service

**CRDF:** Citrus Research and Development Foundation

**CREC:** Citrus Research & Education Center, Lake Alfred, FL

**FDACS/DPI:** Florida Department of Agriculture & Consumer Services/ Division of Plant Industry, Gainesville, FL

**SWFREC:** Southwest Florida Research & Education Center, Immokalee, FL

**UF/IFAS:** University of Florida, Institute of Food and Agricultural Sciences

**USDA/ARS:** United States Department of Agriculture/Agricultural Research Service, Ft. Pierce, FL



**Florida Citrus Growers' Institute**
April 3, 2018

**Preregistration is required**

Name:_____

Company:_____

Address:_____

City/State/Zip:_____

Phone:_____ Email:_____

Please send registration by March 30, 2018 to:
Gail Crawford, Polk County Extension Service, P.O. Box 9005, Drawer HS03, Bartow, FL 33831
By phone: 863-519-1042, Fax: 863-534-0001, email: dorothyc@ufl.edu or
online at: https://2018citrusinstitute.eventbrite.com

# *TWENTY SEVENTH ANNUAL SAFETY DAY*

**Friday, 4 May 2018**
**Saturday, 5 May 2018**

**Location: University of Florida, IFAS, SWFREC**
**2685 State Rd. 29 North**
**Immokalee, FL 34142**

## SCHEDULE:

| | |
|---|---|
| 7:30-8:10 | Check In, Coffee, Juice, Refreshments, Door Prizes |
| 8:10-9:00 | Session 1 (Begin sessions) |
| 9:00-9:10 | Break (change session, door prizes) |
| 9:10-10:00 | Session 2 |
| 10:00-10:10 | Break (change session, door prizes) |
| 10:10-11:00 | Session 3 |
| 11:00-11:10 | Break (change session, door prizes) |
| 11:10-12:00 | Session 4 |
| 12:00-1:30 | Lunch and Adjourn |

# The 2018 FARM SAFETY DAY
## REGISTRATION FORM

Please give us the names of those who will be attending our 27th Farm Safety Day on **Friday, 4 May or Saturday, 5 May 2018** at the Immokalee IFAS Center, 2685 State Rd. 29 North, Immokalee, FL 34142. The cost is **$25.00** per person, which will include educational sessions, handouts, refreshments, lunch, and a cap.

**Make checks payable to:**
Citrus Advisory Committee

**Mail registration and checks to:**
University of Florida, IFAS, SWFREC
Attention: Barbara Hyman
2685 State Rd. 29 North
Immokalee, FL 34142

**Or fax registration to:** 239 658 3403
**Deadline is Friday, April 13, 2018**

Company Name:
Administrative Contact Person:
E-mail address:
Mailing Address:
Telephone: _____ Fax:_____ County:_____

Please list the employees who will be attending our safety training and please check their language preference*****. If there is not enough space to fill in all attendants, please attach an additional sheet with the necessary information.

| Name | Friday or Saturday | English | Spanish | Name | Friday or Saturday | English | Spanish |
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***Please Note: It is very important that we know the date (Friday, 4 May or Saturday, 5 May 2018) and the language capabilities for each attendee.**
**Next to each attendee's name please mark in which language they are more fluent.**
If there are any questions, please contact **Barbara Hyman (hymanb@ufl.edu) at 239 658 3400.**

**Don't wait. The number of trainings offered and attendance at each training is LIMITED. Don't wait. For each day, class size is limited to the first 80 Spanish-speaking and 20 English-speaking people.**

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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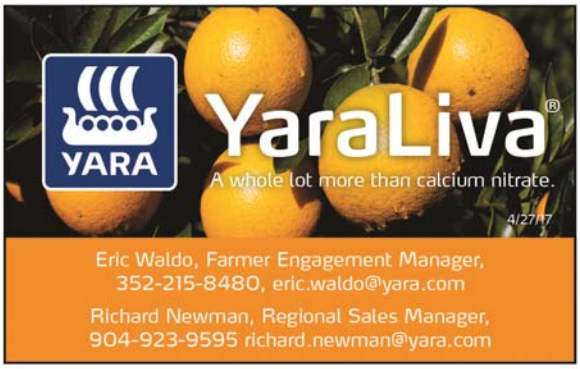


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*Arysta LifeScience*

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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

**EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION**

**issued by**

**CLIMATE PREDICTION CENTER/NCEP/NWS**
**and the International Research Institute for Climate and Society**
**8 February 2018**

**ENSO Alert System Status: La Niña Advisory**

**Synopsis: A transition from La Niña to ENSO-neutral is most likely during the Northern Hemisphere spring (~55% chance of ENSO-neutral during the March-May season).**

During January 2018, La Niña was evident in the pattern of below-average sea surface temperatures (SSTs) across the central and eastern equatorial Pacific Ocean. The latest weekly index values were close to -1.0°C in the Niño-1+2, Niño-3, and Niño-3.4 regions, while the western-most Niño-4 region was -0.5°C. While negative anomalies were maintained near the surface, the sub-surface temperatures in the eastern Pacific Ocean returned to near average during the last month. This was due to the eastward propagation of above-average temperatures in association with a downwelling equatorial oceanic Kelvin wave, which undercut the below-average temperatures near the surface. The atmospheric conditions over the tropical Pacific Ocean also reflected La Niña, with suppressed convection near and east of the International Date Line and enhanced convection around Indonesia. Also, the low-level trade winds remained stronger than average over the western and central Pacific, while upper-level winds were anomalously westerly. Overall, the ocean and atmosphere system remained consistent with La Niña.

Most models in the IRI/CPC plume predict La Niña will decay and return to ENSO-Neutral during the Northern Hemisphere spring 2018. The forecast consensus also favors a transition during the spring with a continuation of ENSO-neutral conditions thereafter. In summary, a transition from La Niña to ENSO-neutral is most likely during the Northern Hemisphere spring (~55% chance of ENSO-neutral during the March-May season) (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

La Niña is anticipated to continue affecting temperature and precipitation across the United States during the next few months (the 3-month seasonal temperature and precipitation outlooks will be updated on Thursday February 15th). The outlooks generally favor above-average temperatures and below-median precipitation across the southern tier of the United States, and below-average temperatures and above-median precipitation across the northern tier of the United States.

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 8 March 2018. 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

# PLANT GROWTH REGULATORS (PGRs)

Plant growth regulator sprays can provide significant economic advantages to citrus growers when used in appropriate situations. Many citrus growers routinely use PGRs to enhance crop profitability. Depending on variety and timing, PGRs may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, and reduce preharvest fruit drop. Excessive rates, improper timings, untested surfactants or tank mixes, and inappropriate environmental conditions can result in phytotoxicity, erratic results, and/or greatly reduced cropping. Growers are urged to become familiar with PGRs through application to small plots before treating significant acreage. To avoid drift onto susceptible crops in surrounding areas, products containing 2,4-D (2,4-Dichlorophenoxyacetic acid) have stringent requirements for application conditions. READ THE LABEL. Consult with your County Extension Office.

Since PGRs function by directly influencing plant metabolism, plant response can vary considerably with concentration, making sprayer calibration and accurate material measurement especially important. Studies show that variability in spray deposition increases as spray volume is reduced below 250 gallons/acre in mature citrus groves. At lower water rates, canopy closest to the sprayer manifold tends to retain much more material than other plant surfaces. Because material concentration is especially important in PGR use, water volumes below 125 gallons/acre are not generally recommended.

Unlike most agrichemicals applied to crop, efficacy of PGRs depends on entry of materials into plant tissues. Uptake is influenced by a number of factors: amount of PGR applied, concentration of PGR, presence of surfactants, solution pH, environmental conditions during and after application, foliage condition, and plant stress level. Application of PGRs is recommended only on healthy citrus blocks. Even when properly applied, some PGRs may cause leaf curling, especially when sprayed on young leaves.

**GIBBERELLIC ACID ($GA_3$)** is recommended to be used on citrus hybrids that are weakly parthenocarpic and without sufficient cross-pollination to improve fruit set. Applied from full bloom to two-third petal fall, GA can effectively set and produce an excellent crop of seedless Robinson, Nova, Orlando, Minneola, or other self-incompatible mandarin hybrids. Use Gibeerellic acid ($GA_3$, 4.0% liquid concentrate) at the rate of 10-20 oz/acre. Products marketed include: Pro-Gibb, GibGro, and Gibbex. Because material concentration is important in plant growth regulators, water volumes below 125 gallons/acre are not recommended. Do not use in water above pH 7.5 because uptake will be reduced. Care should also be exercised in not exceeding the recommended GA dosage or concentration because it can cause severe leaf drop.
READ THE LABEL

# Chemical thinning of tangerines with NAA to increase fruit size and reduce branch breakage and alternate bearing

NAA (naphthalene acetic acid) encourages greater physiological-drop (usually in May for Florida citrus). Sunburst and Murcott are especially likely to benefit from judicious use of NAA. READ THE LABEL

**NAA rate**

Since concentration is so important, growth regulator treatments are usually expressed on a concentration basis (part per million or ppm) rather than ounces per acre. Rates of 250-500 ppm NAA have been most effective in thinning citrus varieties. For mature groves of large trees, 125-150 gallons per acre is probably adequate and lower volumes should be used for smaller trees by turning off some sprayer nozzles. Growers uncomfortable with calculations on a ppm basis can use the ounces of NAA/125 gallons, at appropriate ppm, as a rate per acre when applying at 125 gallons/acre. All NAA applications should include a surfactant at 0.05% and should not be tank mixed with other materials, unless you confirm that it is compatible with NAA.

**For most healthy, unstressed groves, NAA should be applied at 120 ounces Fruit Fix 200 (or similar product, NOT Citrus Fix, which is 2,4-D rather than NAA plus 6.5 ounces of surfactant per 100 gallons, at 125 gallons per acre. Murcott should receive a lower rate 60-96 oz NAA/100 gallons.**
READ THE LABEL

**Timing**

**NAA should be applied near the beginning of physiological drop, when most fruitlets are about 1/2 inch in diameter,** which typically occurs 6 to 8 weeks postbloom**. Rain within six hours of treatment, drought stress, or very hot or cool conditions may affect response.**

Environmental conditions can greatly influence uptake and activity of NAA. Higher temperatures and delayed drying of spray solution both contribute to greater thinning action. Best results are likely to occur when applied between 75° and 85° F. Higher temperatures may cause excessive thinning. Since uptake continues for several hours after the spray dries, heavy rain within six hours of application may significantly reduce NAA action.

# PLANT GROWTH REGULATORS FOR CITRUS IN CALIFORNIA

The plant growth regulators 2,4-dichlorophenoxyacetic acid (2,4-D), gibberellic acid ($GA_3$) are registered for preharvest use on California citrus crops. 2,4-D is used mainly to delay and reduce unwanted fruit abscission (fruit drop), $GA_3$ is used mainly to delay senescence (overripening).

In order to be effective, plant growth regulators must be absorbed by plant tissue. Good spray coverage is essential and climatic conditions that favor absorption are therefore desirable.

Both 2,4-D and $GA_3$ seem to be compatible with urea, potassium foliar sprays, zinc and manganese micronutrient sprays, and neutral copper sprays, but the timing of growth regulator applications may not coincide with the best time for nutrient sprays.

**2,4-dichlorophenoxyacetic acid (2,4-D)**. 2,4-D is used to control preharvest fruit drop, increase fruit size (oranges, grapefruit, mandarin, and mandarin hybrids), and to control leaf and fruit drop following an oil spray. When you use 2,4-D to reduce drop of mature fruit, apply the compound before (preferably *shortly* before) fruit drop becomes a problem, but far enough ahead of flowering to minimize undesirable effects that 2,4-D would otherwise have on the spring cycle of growth. For navel oranges, October through December sprays are common. October, however, may be too early to effectively reduce fruit drop if conditions favor it (e.g., warm winter, protracted harvest). January sprays may be somewhat risky, especially when environmental factors favor an earlier-than-usual spring flush of growth.

For mature grapefruit and 'Valencia' orange trees, 2,4-D can be applied to control drop of mature fruit or as a dual-purpose spray (to control mature fruit drop and to improve fruit size for the next year's crop). Fruit-sizing sprays require excellent coverage. In general, 'Valencia' orange is more responsive than grapefruit to fruit-sizing sprays. For mandarin and mandarin hybrids, 2,4-D fruit sizing sprays are applied 21 to 35 days after 75% petal fall.

**Gibberellic acid ($GA_3$)**. The purpose of applying $GA_3$ to citrus trees in California is to delay fruit senescence. Make applications while the fruit are still physiologically young, but are approaching maturity. $GA_3$ can have a negative effect on flowering and thus on production for the following year, especially if it is applied much later than specified on the current label or in these guidelines. It delays changes in rind color, an effect that can be considered either desirable or undesirable. For example, if you apply $GA_3$ to navel orange trees while the fruit still have green rinds, delayed coloring will have a negative effect on your ability to harvest and market the fruit early in the season. In contrast, this effect is desirable for late-harvested fruit because it delays rind senescence, which results in fruit that are paler in color than the deeper-colored fruit from untreated trees. $GA_3$ applications amplify the re-greening of "Valencia" oranges. This is considered undesirable and can be minimized if you apply the compound no later than the date specified on the label or in these guidelines. $GA_3$ application may result in leaf drop, which can be severe, especially when it is applied to navel orange trees that are under heat or water stress. When this happens, the tree may also suffer twig dieback. By including 2,4-D in the $GA_3$ spray, you may be able to reduce this kind of damage.

**C. J. Lovatt, Botany and Plant Sciences, UC Riverside**
**C. W. Coggins, Jr., Botany and Plant Sciences, UC Riverside**

# PLANT GROWTH REGULATORS IN FLORIDA

By Davies, Ismail, Stover, and Wheaton, UF-IFAS

Plant growth regulator (PGR) sprays can provide significant economic advantages to citrus growers when used in appropriate situations. Many citrus growers routinely use PGRs to enhance crop profitability. Depending on variety and timing, PGRs may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, reduce preharvest fruit drop, or reduce hand-suckering by controlling trunk sprout growth in young citrus trees. Excessive rates, improper timings, untested surfactants or tank mixes and inappropriate environmental conditions can result in phytotoxicity, erratic results and/or greatly reduced cropping. Growers are urged to become familiar with PGRs through application to small plots before treating significant acreage. To avoid drift onto susceptible crops in surrounding areas, products containing 2,4-D (2,4-Dichlorophenoxyacetic acid) have stringent requirements for application conditions.

**Importance of material concentration and spray volume**

Most registered pesticides are effective over a fairly broad concentration range with little likelihood of phytotoxicity. Since PGRs function by directly influencing plant metabolism, plant response can vary considerably with concentration, making sprayer calibration and accurate material measurement especially important. Studies show that variability in spray deposition increases as spray volume is reduced below 250 gallons/acre in mature citrus groves. At lower water rates, canopy surfaces closest to the sprayer manifold tend to retain much more material than other plant surfaces. Because material concentration is especially important in PGR use, water volumes below 250 gallons/acre are not recommended.

**PGR uptake**

Unlike most agrichemicals applied to crop plants, efficacy of PGRs depends on entry of materials into plant tissues. Uptake is influenced by a number of factors: amount of PGR applied, concentration of PGR, presence of surfactants, after application, and plant stress level.

**Effect of surfactants and tank mixes**

Surfactants and other spray adjuvants can affect uptake in several ways. Surfactants and oils spread spray materials over leaf surfaces, and increase uptake by enhancing the total area contacted by spray solution. Many surfactants, urea, ammonium salts and oils can also directly enhance uptake by helping materials penetrate the plant cuticle. Organosilicone surfactants and some oils can result in very rapid uptake by carrying material through plant pores known as stomates. Surfactants can significantly enhance entry of PGRs into plant tissues, however, most PGR studies in citrus were conducted without surfactants or with less effective surfactants than many currently available. Use of untested surfactants may significantly enhance uptake, resulting in excessive plant response and/or phytotoxicity. Tank mixing with other spray materials may influence PGR uptake through surfactants or oils in material formulation or may bind PGR molecules rendering them ineffective.

**Importance of weather conditions**

Studies with other crops have shown that weather conditions greatly influence PGR uptake. Uptake generally increases with both temperature and duration of spray drying. Application at night or in early morning often enhances uptake because greater drying time more than compensates for somewhat lower temperature.

Dew following application is likely to enhance PGR uptake by prolonging drying. Considerable uptake often occurs after spray has dried, therefore, rain within a few hours of application may significantly reduce PGR effectiveness. Many PGRs degrade rapidly in sunlight. Growers should consider the likely influence of environmental factors in timing PGR sprays. It is illegal to apply 2,4-D when wind speed is above 10 miles/hour and distance to susceptible crops downwind is specified at lower wind speeds.

**Influence of plant stress**

Trees under significant drought, cold, or pest stress may respond excessively to PGR treatments. Therefore, application of PGRs is recommended only to healthy citrus trees.

**Leaf curling**

Even when properly applied, some PGRs may cause leaf curling, especially when sprayed on young leaves.

## Recommended Chemical Controls

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 Plant Growth Regulators.

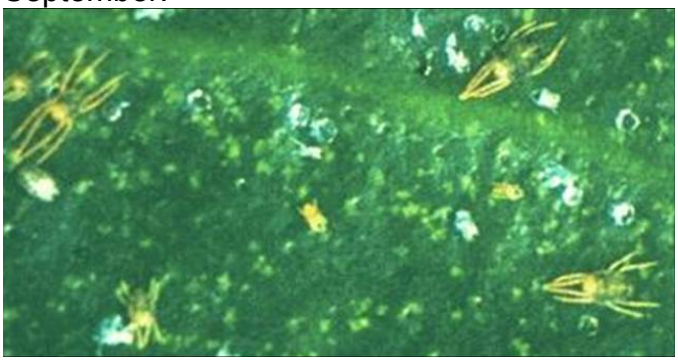
| Growth Regulator | Rate/Acre[1] | Variety and Activity | Time of Application/Cautions |
|---|---|---|---|
| Fruit Fix K-Salt **200** (Naphthaleneacetic acid, NAA, 200 g/gal liquid formulation) | 8-20 pt. Use lower rates on Murcotts. | Tangerines, Murcotts, & Tangelos. Fruit thinning to increase fruit size and reduce alternate bearing. | May/June drop, typically mid-May. Activity is temperature dependent. Severe overthinning may result from applications made to trees of low vigor and/or under stress conditions. Heavy rain within several hours of application may reduce activity. |
| [1]Rates are based on application in 250 gallons per acre to mature trees. Proportional reduction in water and material rates is desirable for smaller trees. Application of Pro-Gibb at full rate to juice oranges in 125-150 gallons per acre to mature trees has been effective. The effects of applications in concentrate sprays are unknown. | | | |
| [2]Greater uptake at lower spray solution pH. Do not use in water above pH 8. | | | |

**Table 1.** Recommended Plant Growth Regulators.

| Growth Regulator | Rate/Acre[1] | Variety and Activity | Time of Application/Cautions |
|---|---|---|---|
| Citrus Fix (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.36 lb/gal) | 3.2 oz | Orange, Temple and grapefruit. Reduction of preharvest drop. | Nov-Dec. Do not apply during periods of leaf flush. Observe restrictions to avoid drift. |
| Citrus Fix (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.36 lb/gal) | 2.4 oz | Navel orange. Reduction of summer and fall drop. | 6-8 wks after bloom for summer drop or Aug-Sept for fall drop. Do not apply fall spray when fruit is to be harvested early. Do not apply during periods of leaf flush. Observe restrictions to avoid drift. |
| Pro-Gibb (Gibberellic acid, $GA_3$, 4.0% liquid concentrate)[2] | 20 oz | Seedless grapefruit. Delay of rind aging process and peel color development. Combine with Citrus Fix for fruit drop control. | Nov-Dec. Greater response prior to colorbreak but early harvest is disrupted by delayed coloring and irregular green spotting may develop. Surfactants increase activity but may cause fruit marking, so use is not recommended. Application within 6 weeks of copper or oil may increase rind marking. Application in Dec may reduce subsequent crop and regreen fruit. |
| Pro-Gibb (Gibberellic acid, $GA_3$, 4.0% liquid concentrate)[2] | 10-20 oz | Tangelo. Improvement of fruit set. Can result in small fruit size from excessive cropping and/or leaf drop. | Full bloom. Surfactants not recommended. |
| Pro-Gibb (Gibberellic acid, $GA_3$, 4.0% liquid concentrate)[2] | 20 oz | Minneola tangelo. Delay of stem rind deterioration. | Apply 2 weeks before aniticipated colorbreak. Application after or during coloring may cause rind staining or blotchy color development. |
| Pro-Gibb (Gibberellic acid, GA3, 4.0% liquid concentrate)2 | 18 oz | Oranges for processing. Delay of rind aging process and peel color development. Delays decline in peel firmness and increases juice extraction weight during processing. | Apply at or near colorbreak. Application may delay bloom the following year. Do not apply after December 1. |
| Tre-Hold (Naphthaleneacetic acid, NAA, 1.0% liquid concentrate) | Apply undiluted to trunk only as thorough spray or light brush application. | Nonbearing citrus. Inhibition of trunk sprout growth. | Prior to sprout growth. Caution-may inhibit sprouting desired for tree recovery following freeze. Excessive heavy application may result in tree damage. Do not apply after Sept 1. |

# Spider Mites

The Texas citrus mite is the predominant species in most citrus groves throughout the state. The citrus red mite is usually second in abundance, but in some nursery operations it is the predominant species. The Texas citrus and citrus red mites occur on citrus throughout the year and usually are most abundant in groves during the dry season. They are found most commonly on the upper leaf surface of recently mature flush, and all stages of the mites orient along the mid-vein. As populations increase, they move to leaf margins and fruit. Spider mites feed primarily on mature leaves and differ from rust mites by feeding beneath the epidermal layer of cells. They are capable of removing cellular contents, causing cell destruction and reducing photosynthesis. Mesophyll collapse and leaf drop can result when trees are stressed by high spider mite infestations in combination with sustained dry, windy conditions that may occur in the late fall, winter or early spring months. When populations of Texas citrus mite or citrus red mites are high, they will also feed on developing fruit. Spider mites prefer dry weather and low relative humidities in the range of 30 to 60% and generally do not pose a sustained problem in the higher humidity conditions that occur between June and September.



Populations of Texas citrus and citrus red mites aggregate among leaves within and between citrus trees.

Spider mites are suppressed to low densities by several species of predacious mites, insects, and entomopathogens in some groves. However, when populations averaging 5 to 10 motile spider mites per leaf develop between September and May, it would be reasonable to apply a miticide, especially if the trees are stressed. However, infestations comprised predominantly of adults, particularly males, are in decline and would not require control. Adult mites are recognized by their large size relative to immatures and females distinguished by their round shape and shorter legs compared to males.

Need for controlling spider mites is based on temperature and humidity conditions, spider mite population levels, tree vigor, and time of the year. Petroleum oil provides some ovicidal activity against spider mite eggs. None of the other miticides provide ovicidal activity, and their residual activity must be sufficiently long-lasting to kill subsequently emerging larvae.

Application of Miticides

Selection of a miticide should be based on the target pests to be controlled, avoiding risks of phytotoxicity, products that will be tank mixed, the time of year, treatment to harvest interval, and prior use of a product. All miticides except petroleum oil should be used only once a year to minimize resistance development. For example, dicofol can be effectively used for spider mite or rust mite control during the supplemental early spring or postbloom intervals. The product is most effective when applied at ONE of these times. Conversely, Comite would be recommended in the fall or supplemental late fall intervals. Vendex is effective in one of the following four periods: supplemental spring, postbloom, fall, or supplemental fall periods. Petroleum oil spray applications can be effectively applied during the postbloom, summer, or fall intervals. Sulfur is included since it has a short treatment to harvest interval and provides a highly effective means of cleaning up rust mite infestations prior to harvest when needed. Use of sulfur should be minimized given its toxic effects on several beneficial arthropods.

## Recommended Chemical Controls

READ THE LABEL.
TO MINIMIZE RISK OF RESISTANCE, DO NOT APPLY A SPECIFIC MITICIDE MORE THAN ONCE PER ACRE PER SEASON OTHER THAN PETROLEUM OIL.

### Control Thresholds and Appropriate Sample Sizes for 10 Acres

| If the control threshold is: | Sample size (Sample trees should be uniformly scattered across a 10-acre block. Do not sample adjacent trees.) |
|---|---|
| 5 mites/leaf | Examine 4 leaves/tree from 6 trees/area from 4 areas/10 acres = 96 leaves on 24 trees/10 acres |
| 8 mites/leaf | Examine 4 leaves/tree from 6 trees/area from 3 areas/10 acres = 72 leaves on 18 trees/10 acres |
| 10 mites/leaf | Examine 4 leaves/tree from 5 trees/area from 2 areas/10 acres = 40 leaves on 10 trees/10 acres |
| 15 mites/leaf | Examine 4 leaves/tree from 4 trees/area from 2 areas/10 acres = 32 leaves on 8 trees/10 acres |

**TABLE 2.** Citrus Miticide Selection*

| Supplemental (early Spring) | Post Bloom | Summer | Fall | Supplemental Fall |
|---|---|---|---|---|
| -- | -- | Agri-mek + oil | -- | -- |
| Apta | Apta | -- | Apta | Apta |
| -- | -- | -- | Comite | Comite |
| Envidor | Envidor | Envidor | Envidor | Envidor |
| -- | Petroleum oil | Petroleum oil | Petroleum oil | -- |
| -- | -- | -- | Sulfur | Sulfur |
| -- | -- | Micromite | Micromite | -- |
| -- | -- | -- | Nexter | Nexter |
| Movento | Movento | Movento | -- | -- |
| Vendex | Vendex | -- | Vendex | Vendex |

*Except for petroleum oil, do not use the same miticide chemistry more than once a year.

**TABLE 3.** Recommended Chemical Controls for Mites

| Pesticide | IRAC MOA[1] | Mature Trees Rate/Acre[2] | Comments | Pests Controlled |
|---|---|---|---|---|
| Agri-Mek 0.15 EC + Petroleum Oil 97+% (FC 435-66, FC 455-88 or 470 oil) | 6 | 5 to 10 fl oz + min of 3 gal | Restricted use pesticide. Do not apply any petroleum oil products when temperatures exceed 94°F. Do not apply Agri-mek or any other abamectin containing product within 30 days of last treatment. Do not apply more than 40 fl oz/A of Agri-mek or any other abamectin containing product in any growing season. Do not make more than 3 applications of Agri-mek or any other abamectin containing product in any growing season. | Rust mites<br>Broad mites<br>Citrus leafminer |
| Apta | 21A | 14 to 27 fl oz | Do not apply by air. Do not apply more than 27 oz/acre per growing season. Do not make more than 2 applications per year. Allow at least 14 days between applications. | Asian citrus psyllid |
| Comite 6.55 EC | 12C | 3 pt | Leaf distortion and/or fruit spotting may occur when used in the spring or if tank mixed with oil or applied within 2 weeks prior to or following an oil application. Do not use in spray solution above pH 10. | Rust mites<br>Spider mites |
| Envidor 2 SC | 23 | 13 to 20 oz | Limit to one application per season. Use 20 oz rate if tank mixing with oil. Tank mixing with oil results in reduced residual activity. | Rust mites<br>Spider mites |
| Micromite 80WGS | 15 | 6.25 oz | Restricted use pesticide. See restriction on the label. | Rust mites<br>Root weevils<br>Citrus leafminer |
| Movento 240 SC + Petroleum Oil 97+% (FC 435-66, FC 455-88 or 470 oil) | 23 | 10 fl oz/A + 3% V/V | Limit of 20 fl oz of product (0.32 lb ai) per acre per season. Do not apply within 10 days prior to bloom, during bloom, or until petal fall is complete. Movento has a smilar mode of action as Envidor; do not make back-to-back applications of these two products. | Asian citrus psyllid nymphs<br>Some scale insects |
| Movento MPC + Petroleum Oil 97+% (FC 435-66, FC 455-88 or 470 oil) | 23 | 16 fl oz/A + 3% v/v | Limit of 32 fl oz of product (0.32 lb ai) per acre per season. Do not apply within 10 days prior to bloom, during bloom, or until petal fall is complete. Movento has a similar mode of action as Envidor; do not make back-to-back applications of these two products. | Asian citrus psyllid nymphs<br>Some scale insects |
| Nexter 75 WP | 21 | 6.6 oz | Tank mixing with oil or copper results in reduced residual activity. | Spider mites<br>False spider mites<br>Rust mites |
| Petroleum Oil 97+% (FC 435-66, FC 455-88 or 470 oil) | NR[3] | 2% v/v | Do not apply when temperatures exceed 94°F. 470 weight oil has not been evaluated for effects on fruit coloring or ripening. These oils are more likely to be phytotoxic than lighter oils. | Rust mites<br>Scales<br>Whiteflies<br>Spider mites<br>Greasy spot<br>Sooty mold |
| Sulfur | NR[3] | | Limit to one application per season where supplemental rust mite control is needed between main sprays. Do not combine with oil or apply within 3 weeks of oil as fruit burn may result. May cause eye irritation to applicators and fruit harvesters. | Rust mites<br>Broad mites (Kumulus, Thiolux and Microthiol only) |
| Kumulus 80 DF | | 15 lb | | |
| Microthiol 80 DF | | 15 lb | | |
| Thiolux 80 DF | | 15 lb | | |
| Wettable powder or dust | | 50 lb | | |
| Vendex 50 WP | 12B | 2 lb | Restricted use pesticide. Tank mixing with oil or copper results in reduced residual activity. Do not apply at rates greater than 20 oz/500 gal to fruit less than one inch in diameter within 10 days of an oil spray. | Rust mites<br>Spider mites |

[1] Mode of action class for citrus pesticides from the Insecticide Resistance Action Committee (IRAC) mode of action classification V7.3 (2014). Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2017-18 Florida Citrus Production Guide for more details.

[2] Lower rates may be used on smaller trees. Do not use less than minimum label rate.

[3] No resistance potential exists for these products.

**For more information and details, go to:**

# Rust Mites, Spider Mites, and Other Phytophagous Mites[1]

http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/Rust%20Mites.pdf

# Flatwoods Citrus

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Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975

---

Subscriber's Name:_____

Company:_____

Address:_____

City:_____State:_____Zip:_____

Phone:_____

Fax:_____

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