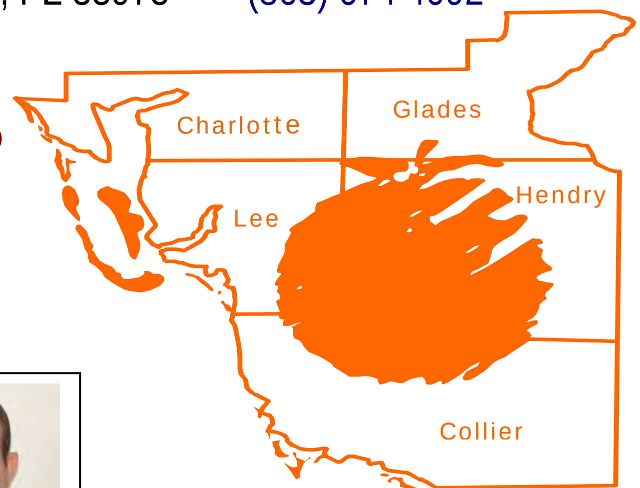
UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION
Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 25, No. 3 **March 2022**

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

Table of Contents

Wednesday March 23, 2022 in-person and Zoom citrus seminar

10:00 AM – 11:30 AM

Pre-registration is required. No registration fee and lunch is free Thanks to **Ricky Bass with Custom Ag Formulations, Inc.**

Please do 1 or 2, not both

1. To reserve an in-person seat and have lunch, send an e-mail to Dr. Mongi Zekri at maz@ufl.edu
2. To attend via Zoom, click on this link: https://ufl.zoom.us/meeting/register/tJMud-mvrjIoH9WeOttUBGgr2wosYUVTJn76
   After registering, you will receive a confirmation email containing information about joining the meeting.

10:00 AM – 10:45 AM (Dr. Ute Albrecht)

Title: **Citrus root structures and rootstock propagation methods**

Summary: Recently, there has been some concern regarding the inferiority of roots in field-grown citrus trees and the possible association with the rootstock propagation method. This seminar will present an overview of the results from three years of field trials comparing seed-, cuttings-, and tissue culture propagated rootstocks grafted with Valencia. Detailed information on root structures from the nursery to the field will be provided and excavated root systems will be available for hands-on examination. The possible factors influencing root structures will be discussed.

10:45 AM – 10: 55 AM - Break

10:55 AM – 11:30 AM (Dr. Ute Albrecht and Leigh Archer)

Title: **Trunk injection for delivery of HLB therapies**

Summary: This presentation will provide information on the basic principles of trunk injection to deliver HLB therapies. Results from ongoing injection studies documenting the effects on tree health, pathogen reduction, fruit quality, and yield will be presented, and possible implications will be discussed.

11:45 AM - Lunch

Location: Immokalee IFAS Center

Speakers: **Dr. Ute Albrecht**, Assistant Professor, and **Leigh Archer**, PhD candidate, UF/IFAS SW Florida Research & Education Center, Immokalee

Coordinator: Dr. Mongi Zekri, Multi-County Citrus Extension Agent, UF-IFAS

1.5 CEUs for pesticide license renewal

1.5 CEUs for certified crop advisors

UF | UNIVERSITY of FLORIDA

April 2022 Citrus Seminar **in-person and via Zoom**

Pre-registration is required. No registration fee and lunch is free Thanks to **Sarah Markle with Valent**

Please do 1 **or** 2, not both

1. To reserve an in-person seat and have lunch, send an e-mail to Dr. Mongi Zekri at maz@ufl.edu
2. To attend via Zoom, click on this link: https://ufl.zoom.us/meeting/register/tJwsd-GsrD0jHdRBdwfQ7UOOhJRiHZt24lZT
   After registering, you will receive a confirmation email containing information about joining the Zoom meeting.

Date & Time: Wednesday, April 20, 2022, 11:00 AM – 12:00 Noon
Title: **Improving 'yield-safety' in citrus weed management**
Speaker: **Dr. Ramdas Kanissery**, Assistant Professor, UF/IFAS Southwest Research & Education Center, Immokalee

Managing weeds in citrus involves several strategies including the most widely utilized chemical weed control. Several factors like efficacy on target weeds, cost-effectiveness, and most importantly, their impact on tree health and productivity must be considered before selecting a specific management approach.
Dr. Kanissery will discuss strategies that help growers adopt a weed control program to successfully manage the weeds while minimizing their impact on citrus trees and yield.

Coordinator: Dr. Mongi Zekri, Multi-County Citrus Extension Agent, UF-IFAS

1 CEU for pesticide license renewal
1 CEU for certified crop advisors

UF | UNIVERSITY of FLORIDA

CEUs for pesticide license renewal

Earn CEU Credits NOW online through Southeast AgNet & Citrus Industry magazine

http://citrusindustry.net/ceu/

The following series of articles and quizzes are available with their expiration dates noted:

- 2022 #1: **Increasing Pesticide Effectiveness With Adjuvants** **(1/31/23)**
- 2021 #4: **Protecting People From Pesticide Exposure** **(10/31/22)**
- 2021 #3: **Before You Spray** **(7/31/22)**
- 2021 #2: **When a Pesticide Doesn't Work** **(4/30/22)**

Each article grants one General Standards (Core) CEU when submitted and approved toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license.

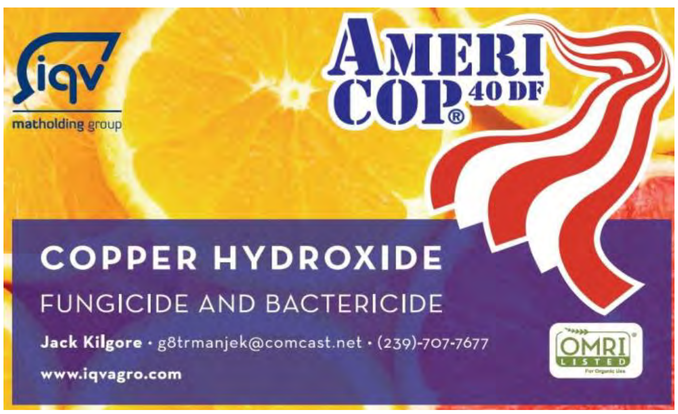
FYI, there are also CORE CEU available at Growing Produce
http://www.growingproduce.com/crop-protection/ceu-series/

http://www.growingproduce.com/crop-protection/ceu-series/

Online Pesticide CEUs
https://pested.ifas.ufl.edu/ceu/

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

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



iqv
matholding group
AMERI COP® 40 DF
COPPER HYDROXIDE
FUNGICIDE AND BACTERICIDE
Jack Kilgore • g8trmanjek@comcast.net • (239)-707-7677
www.iqvagro.com
OMRI LISTED

NOT ALL LIQUID COPPERS ARE CREATED EQUAL
Badge® SC
Fungicide/Bactericide
BART HOOPINGARNER
941.737.7444
BHOOPINGARNER@GOWANCO.COM
Badge®SC is a registered trademark of Isagro USA, Inc.
Always read and follow label directions.
Gowan USA
GOWANCO.COM

Timac AGRO
USA
THINK DIFFERENT...FARM BETTER
CHARLES MCCARTNEY
SOUTHEAST BUSINESS UNIT DIRECTOR
CMCCARTNEY@TIMACUSA.COM
941-219-9063
WWW.US.TIMACAGRO.COM

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

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

10 February 2022

ENSO Alert System Status: La Niña Advisory

Synopsis: La Niña is likely to continue into the Northern Hemisphere spring (77% chance during March-May 2022) and then transition to ENSO-neutral (56% chance during May-July 2022). Below-average sea surface temperatures (SSTs) weakened during January 2022, though anomalies stayed negative across most of the east-central and eastern equatorial Pacific Ocean [Fig. 1]. Most of the weekly ENSO indices remained between -0.5°C and -1.0°C in the last week, except for the Niño-4 index, which was -0.2°C [Fig. 2]. In contrast, subsurface temperatures (averaged between 180°-100°W and 0-300m depth) trended to near average during the month [Fig. 3]. This large change in recent weeks reflected the eastward progression of a downwelling Kelvin wave, as indicated by the extension of above-average subsurface temperatures across much of the Pacific [Fig. 4]. Below-average subsurface temperatures were confined to the eastern Pacific Ocean at the end of the month. For the monthly mean, low-level equatorial winds were near average across much of the Pacific, while upper-level westerly wind anomalies remained over the east-central Pacific Ocean. Below-average convection strengthened near and west of the Date Line, while convection was near average over Indonesia [Fig. 5]. Overall, the coupled ocean-atmosphere system reflected a weakening La Niña. The IRI/CPC plume average for the Niño-3.4 SST index continues to forecast a transition to ENSO-neutral during the Northern Hemisphere spring [Fig. 6]. Because the easterly trade winds have recently been strengthening and are predicted to continue in the near term, the forecaster consensus favors those models suggesting a slower decay of La Niña through the spring. However, ENSO-neutral is still anticipated to return by the Northern Hemisphere summer, although the chance does not exceed 57% during June-August 2022, reflecting the uncertainty associated with the spring predictability barrier. In summary, La Niña is likely to continue into the Northern Hemisphere spring (77% chance during March-May 2022) and then transition to ENSO-neutral (56% chance during May-July; click CPC/IRI consensus forecast for the chances in each 3-month period).

La Niña is anticipated to affect temperature and precipitation across the United States during the upcoming months (the 3-month seasonal temperature and precipitation outlooks will be updated on Thurs. Feb. 17th).

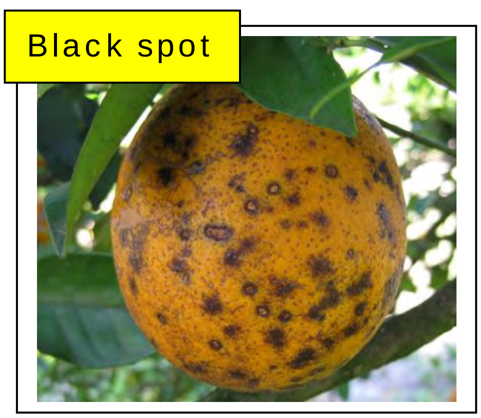
This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Additional perspectives and analysis are also available in an ENSO blog. A probabilistic strength forecast is available here. The next ENSO Diagnostics Discussion is scheduled for 10 March 2022.

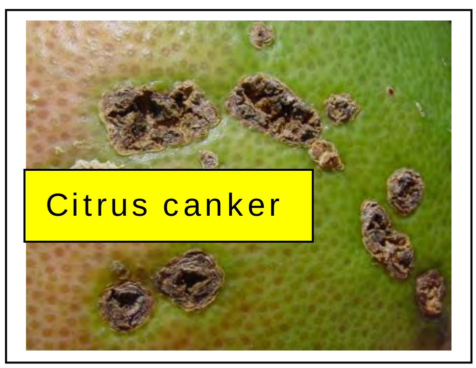
To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

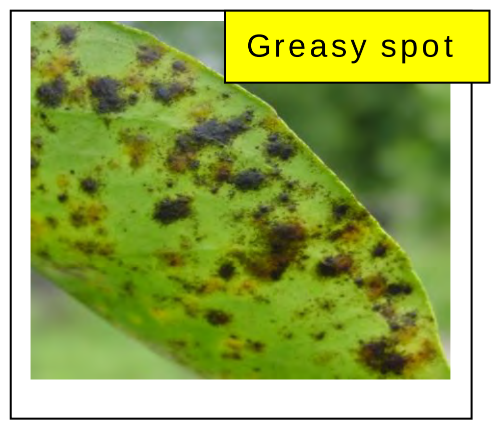
Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service

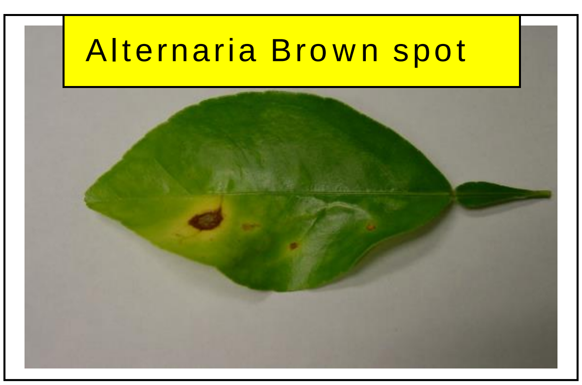
Fungicide effectiveness

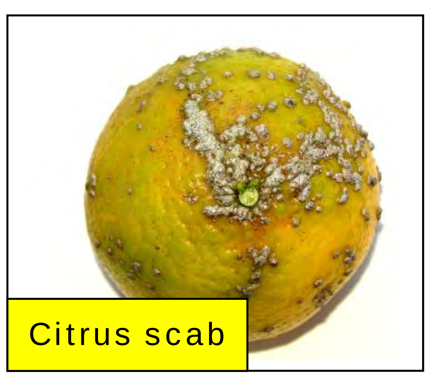
Products	Canker	Greasy Spot	Alternaria	Scab	Melanose	Black spot	PFD
Copper	**Good**	**Good**	**Good**	Moderate	**Good**	Moderate	Weak
Oil	None	**Good**	None	None	None	None	None
Ferbam	None	Weak	Moderate	Moderate	Weak	Weak	Weak
Enable 2F		**Good**		**Good**		**Good**	
Headline	None	**Good**	**Good**	**Good**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











Citrus Spray Programs

Dr. Jawwad Qureshi and Dr. Phil Stansly, UF IFAS- Immokalee

Asian citrus psyllid (ACP) control has been the main objective of Florida citrus growers due to its role in the spread of huanglongbing (HLB) since 2005. While some may question the value of controlling ACP in trees with high HLB incidence, replicated field studies have shown the economic benefit of maintaining young flush pathogen free. Good ACP control starts with effective dormant sprays that will control ACP when populations are low, reduce its infestation and thus HLB infection of the all-important spring flush. Pyrethroids (e.g., Danitol, Baythroid or Mustang) and organophosphates (e.g., dimethoate or Imidan) provide great winter season control of ACP. Best not to use pyrethroids or OPs again during the year except for border sprays which will reduce the need for whole block applications. Follow up with bloom sprays of labeled products to clean up stragglers. Subsequent whole block sprays should target ACP as well as other pests like rust mites and leafminers that may be problematic.

The table below provides some examples of products for different months, depending on which pests are of major concern at the time. Neonicotinoids have not been included as spray option due to their importance for controlling ACP in young trees through soil application. Make choices based on: (1) effectiveness against ACP and other pests that may be problematic, (2) avoiding repetition of any insecticide mode of action in the interest of resistance management, and (3) rebuilding and maintaining an effective natural enemy complex in the grove. Confining the broad-spectrum insecticides (pyrethroids and organo-phosphates) to the winter season and border sprays during growing season will help conserve these products as well as populations of beneficial insects and mites.

Spray Options for Citrus Pest Management

Dormant Season (Nov-Dec to Feb-Mar) **Growing Season** (Feb-Mar to Sep-Oct)

Months	Nov-Dec	Jan	Feb-Mar	Apr	May - June	July - Aug	Sep-Oct
Products * Labeled for bloom	OP [1] (e.g. Imidan , Dimethoate)	Pyrethroid [2] (Mustang Danitol Baythroid)	*Sivanto [3] *Movento [4] *Portal [5] *Micromite [6] Intrepid [7] Exirel [8]	Portal [5] Micromite [6] Exirel [8] Apta [9] Sivanto [3] Oil [13]	Movento [4] Delegate [11] Abamectin [12] Knack [14] Exirel [8] Apta [9] Sivanto [3] Oil [13] MinectoPro [10]	Sivanto [3] Apta [9] OP [1] MinectoPro [10] Oil [13]	Movento [4] Delegate [11] Apta [9] Sivanto [3] Oil [13]
Pests	ACP Weevils	ACP Weevils	ACP Mites Leafminer Weevils Scales Aphids	ACP Mites Leafminer Weevils Aphids	ACP Rust mite Leafminer Scales	ACP	ACP Rustmite Leafminer

ACP+++ [1,2,3,4,8,9,10] ACP++ [5,11] ACP+ [6,12,13] Leafminer [6,7,8,10,11,12,13] Rustmite [4,6,12,13]
Scales [4,12,13] Aphids [3,4] Mealybugs [3,4] (+++ excellent, ++ good, + fair)

FOLIAR FEEDING OF CITRUS TREES

Foliar fertilizer application is certainly not a new concept to the citrus industry. For over five decades, foliar fertilization of citrus has been recommended to correct zinc, manganese, boron, copper, and magnesium deficiencies. It is now common knowledge in agriculture that properly nourished crops may tolerate insect pests and diseases. Traditionally citrus growers try to achieve optimum nutrition through direct soil management. Currently with the introduction of citrus greening in Florida, many growers and production managers consider foliar fertilization a key factor to stimulate the natural defense mechanisms of their trees, to induce pest and disease tolerance, and to improve fruit yield and fruit quality.

In Florida, foliar nutrition programs are becoming very common and extensively used to deliver all of the essential nutrient elements to citrus trees. Furthermore, economic and environmental considerations require the utilization of more efficient methods for nutrient applications. Foliar application of fertilizers is more efficient than traditional soil application because of better, faster nutrient uptake and reduced losses. Although field research has shown that supplemental foliar feeding can increase yield by 10-25% compared with conventional soil fertilization, foliar fertilization should not be considered a substitute for a sound soil-fertility program.

Foliar fertilizer application is highly efficient because the materials are targeted to areas where they can be directly absorbed into the plant. However, nutrients foliarly applied prior to a rainfall are subject to being washed off the leaves and onto the soil. Foliar fertilizer application also provides a more timely and immediate method for delivery of specific nutrients at critical stages of plant growth. Foliar nutrition programs are therefore valuable supplements to soil applications. As indicated previously, foliar feeding is not intended to replace soil-applied fertilization of the macronutrients (nitrogen, potassium, and phosphorus). Foliar applications of macronutrients can however be alternatively applied in sufficient quantities to influence both yield and fruit quality. Citrus trees can have a large part of the annual nitrogen requirements met through foliar applications. Foliar applications of other macronutrients (calcium, magnesium, and sulfur) and micronutrients (zinc, manganese, copper, boron, and molybdenum) have proven to be an excellent means for satisfying citrus tree requirements.

Because fertilizer applications to the soil can be subjected to undesirable processes such as leaching, runoff, and being tied up in the soil in unavailable forms, foliar applications of nutrients have been designed to be an integral component of overall tree nutrition programs. It is used in other situations to help trees through short, but critical periods of nutrient demand, such as vegetative growth, bud differentiation, fruit set and fruit growth. Foliar application of nutrients is of great importance when the root system is unable to keep up with crop demand or when the soil has a history of problems that inhibit normal nutrient uptake. Foliar nutrition is proven to be useful under prolonged periods of wet conditions, droughty conditions, calcareous soil, cold weather or any other condition that decreases the tree's ability to take up nutrients when there is a demand. Foliar feeding may be effectively utilized when a nutritional deficiency is diagnosed. Foliar application is absolutely the quickest method of getting the most nutrients into plants. However, if the deficiency can be observed on the tree, the crop has already lost some potential yield.

While foliar feeding has many advantages, it can burn leaves at certain rates under certain environmental conditions. It is important, therefore, to foliar feed within some established guidelines. There are a number of plant, soil, and environmental conditions that can increase the chances of causing foliar burn to foliar fertilizer application. For example, a tree under stress is generally more susceptible to damage. Stressful conditions include drying winds, disease infection, and unfavorable soil conditions. The environmental conditions at the time of application are also important factors. Applications when the weather is hot (above 80^0F) should be avoided. This means that during warm seasons, applications should be made in the morning or evening when the temperature is right, wind is minimal, and the stomates on citrus leaves are open, allowing leaves to efficiently exchange water and air.

Nutrient absorption is increased when spray coverage reaches the undersides of the leaves where the stomates are located. Favorable results from foliar feeding are most likely to occur when the total leaf area is large. Foliar applications of micronutrients with the exception of iron are more effective and efficient when the spring, summer, and fall new flush leaves are about fully expanded. Additionally, applications should be at least two-week apart to give the tree sufficient time to metabolize the nutrients and deal with the added osmotic stress. To be efficient and to avoid crop damage, dilute solutions of nutrient formulations are recommended. Highly concentrated sprays, especially those including salt-based fertilizers, have the potential to cause leaf burn and/or drop.

Another important factor when applying nutrients foliarly is to ensure that the pH of the spray solution is in the proper range (between 5.5 and 6.5). This is particularly important in areas where water quality is poor. In order to enhance uptake and thus the effectiveness of any foliar application, nitrogen should be added to the solution. Urea may be the most suitable nitrogen source for foliar applications due to its low salt index and high solubility in comparison with other nitrogen sources. Urea has been shown to stimulate absorption of other nutrients by increasing the permeability of leaf tissue. However, the urea utilized in foliar sprays should be low in biuret content (0.2% or less) to avoid leaf burn. Other sources of nitrogen can be obtained from ammonium polyphosphates, ammoniated ortho-phosphates, potassium nitrate, calcium nitrate, and ammonium thiosulfate. These sources, when utilized at low rates of foliar application, are excellent supplemental nitrogen carriers with minimal foliage burn side-effects. Triazone nitrogen has been shown to significantly reduce leaf burn and enhance foliar absorbed nitrogen compared with urea, nitrate, and ammonium nitrogen sources.

The use of a combination of poly and ortho-phosphates has been shown to lessen leaf burn and aid in leaf phosphate absorption. Phosphites have also been found useful, safe, and not phytotoxic as foliar sprays on citrus trees. Potassium polyphosphates, potassium hydroxide, potassium nitrate and potassium thiosulfate sources combine both low salt index and high solubility characteristics. Foliar application of calcium, magnesium, sulfur, zinc, manganese, copper, boron and molybdenum can be highly effective to satisfy nutrient requirements. However, there can be difficulties associated with leaf tissue absorption and translocation of calcium, magnesium, boron and molybdenum. Choosing the correct fertilizer sources for these nutrients can be critical.

Be careful about possible chemical interactions among foliar fertilizers. Some materials are incompatible and should not be mixed together. They may create precipitates that tie up and make some nutrients unavailable and/or clog spray nozzles. Many product labels warn of such incompatibilities. If there is no specific packaging information, small quantities of the materials should be mixed with water in a jar and shaken. If there is no precipitate, there should be no problem. Foliar fertilization can sometimes be combined with pesticide application. However, timing conflicts and material incompatibilities can sometimes make combining such sprays unwise. Be sure to read all product labels and do the jar's test if uncertain.

Foliar applications of low biuret urea at 12-14 gallons or at 53-60 lbs (24-28 lbs N) per acre or phosphite (PO_3) at 3 pints (60% P) to 2 quarts (26% P) per acre in late December-early January (6 to 8 weeks before bloom) have been demonstrated to increase flowering, fruit set, and fruit production. Postbloom foliar applications of potassium nitrate or mono-potassium phosphate at 8 lbs K_2O per acre have also been found to increase yield and fruit size. Foliar spray applications of 3-5 lbs/acre of magnesium, manganese, zinc, and copper, and 0.25-0.50 lb/acre of boron and molybdenum are also recommended on each of the 3 major flushes of citrus trees to prevent nutrient deficiencies, cope with HLB, and improve production. Sulfate forms are less expensive and nitrate forms appear to facilitate the uptake of micronutrients.

Conclusion. Today, foliar feeding is playing an important role in Florida citrus production. It is rapidly gaining ground as a nutritional supplement to soil-applied fertilizers to improve yield and fruit quality, particularly in the face of HLB (citrus greening). Foliar nutrition is also a very important and effective way of addressing diagnosed problems with specific deficiencies observed within the grove and a best management strategy for supplying micronutrients with the exception of iron. The concept that foliar sprays should be applied only after the appearance of a deficiency is unsound since reductions in yield and quality usually precede the appearance of visual symptoms. Foliar sprays of nutrients should be used with the objective of maintaining citrus trees health at an optimal level. However, foliar fertilization should be considered a supplement, not a substitute for a sound soil-fertility program.

Citrus tree performance under soil-applied fertilizer program supplemented with foliar nutrition.

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.

https://edis.ifas.ufl.edu/pdffiles/HS/HS131000.pdf

Plant Growth Regulators

Tripti Vashisth, Chris Oswalt, Mongi Zekri, Fernando Alferez, and Jamie D. Burrow

There are five classic groups of Plant growth regulators (PGRs): auxins, gibberellins, cytokinins, abscisic acid, and ethylene. In addition to the five classic PGRs, other groups of biochemicals are now also recognized as PGRs. They include jasmonates, salicylic acid, strigolactones, and brassinosteroids. Each group of PGRs has unique attributes and is involved in a number of different physiological processes. It is very important to keep in mind that PGRs do not work in isolation. Plant response and efficacy of materials often depend on several factors, such as the concentrations of the materials, levels of other plant hormones, plant health, nutritional and water status, time of year, and climate. For example, the influence of gibberellins on citrus flowering, fruit set, seedlessness, color development, and preharvest fruit drop varies with many of these factors.

Auxins

Auxins were among the first plant hormones identified. Auxins are known to be involved in plant-cell elongation, apical dominance, inhibition of lateral bud growth, promotion of rooting, suppression of abscission, inhibition of flowering, and seed dormancy. A well-known auxin is indole acetic acid (IAA), which is produced in actively growing shoot tips and developing fruit.

Synthetic auxin analogs like 2, 4-dichlorophenoxyacetic acid (2, 4-D) and naphthalene acetic acid (NAA) are extensively used in fruit crop production. 2, 4-D is commonly used in agriculture as an herbicide. It is also used to control preharvest fruit drop and to increase fruit size, particularly in oranges, grapefruit, mandarin, and mandarin hybrids. The efficiency of 2, 4-D in reducing preharvest fruit drop increases when used with oil sprays. The timing of 2, 4-D application to reduce preharvest fruit drop should be carefully assessed to minimize undesirable effects on flowering and harvest timing. NAA is used to inhibit the undesirable growth of suckers on tree trunks. As discussed earlier, NAA can inhibit lateral branching; therefore, its application to trunks keeps lateral buds in a dormant state. NAA can also promote fruit abscission and can therefore be used to thin excessive fruit and increase size of the remaining fruit. Environmental conditions can greatly influence uptake and activity of NAA. High temperatures and delayed drying of spray solution due to high humidity both contribute to greater thinning action. Best results are likely to occur when applied between 75°F and 85°F. Because uptake continues for several hours after the spray dries, heavy rain within six hours of application may significantly reduce NAA action.

Gibberellins

Gibberellins, abbreviated as GA for Gibberellic Acid, have many effects on plants but primarily stimulate elongation growth. Spraying a plant with GA will usually cause the plant to grow larger than normal. GA also influences plant developmental processes like seed germination, dormancy, flowering, fruit set, and leaf and fruit senescence. In citrus, GA is often used to delay fruit senescence. GA delays changes in rind color, and application will result in fruit with green rinds and delayed coloring. This will have a negative effect when selling fruit early in the season for the fresh-fruit market. However, this effect is desirable for late-harvested fruit because it results in fruit that are paler in color than the deeper-colored fruit from untreated trees. GA also affects flowering in citrus. GA application can reduce the number of flowers and therefore fruit yield. It is important to carefully assess timing of GA applications to avoid yield losses. Depending on the application time, GA can reduce preharvest fruit drop and improve fruit set in some citrus varieties.

Cytokinins

Cytokinins derived their name from cytokinesis (cell division) because of their role in stimulating plant cells to divide. In addition to being involved in cell division, cytokinins were shown to have important effects on many physiological and developmental processes, including activity of apical meristems, shoot growth, inhibition of apical dominance, leaf growth, breaking of bud dormancy, and xylem and phloem development. Cytokinins also play an important role in the interaction of plants with both biotic and abiotic factors, including plant pathogens, drought and salinity, and mineral nutrition.

Abscisic Acid

Despite its name, abscisic acid (ABA) does not initiate abscission (drop). ABA is synthesized in the chloroplast of the leaves, especially when plants are under stress, and diffuses in all directions through the vascular bundles. ABA promotes dormancy, inhibits bud growth, and promotes senescence. It also plays a major role in abiotic stress tolerance. During water stress, ABA levels increase in leaves, which leads to the closing of stomata, thereby reducing water loss due to transpiration. ABA is costly to synthesize; therefore, its use in agriculture is limited.

Ethylene

Ethylene, a gaseous hormone, is well known for its role in promoting fruit ripening. In addition, it plays a major role in leaf, flower, and fruit abscission. Ethylene also affects cell growth, shape, expansion, and differentiation. Plants under biotic or abiotic stresses produce high levels of ethylene, which triggers an array of responses. For example, when leaves are damaged or infected with pathogens, high levels of ethylene are produced to promote abscission of those leaves. In citrus, ethylene is commonly used in postharvest to degreen oranges, tangerines, lemons, and grapefruit, making them more attractive to consumers. Ethylene treatment of mature but poorly colored fruit enhances the peel color and increases the marketability of fruit.

New Classes of Plant Hormones

<u>Brassinosteroids</u>

Brasssinosteroids (BR) play a pivotal role in a wide range of developmental processes in plants, such as cell division, cell differentiation, cell expansion, germination, leaf abscission, and stress response. Because of their involvement in many different physiological processes, application of BRs might be of interest in crop production. Successful use of BR in agriculture depends on the production of cost-effective, stable synthetic analogs of BR.

<u>Strigolactones</u>

This group of plant hormones is known for inhibiting shoot growth and branching and stimulating root-hair growth. Strigolactones also promote a symbiotic interaction with mycorrhizal fungi and facilitate phosphate uptake from the soil.

<u>Jasmonates</u>

This group of plant hormones is involved in plant defense responses. Herbivory, wounding, and pathogen attacks trigger the production of these hormones, which results in the regulation of plant-defense-related genes to fight the infection.

Salicylic Acid

Salicylic acid (SA) plays a role in plant growth and development processes, photosynthesis, and transpiration. SA is well known for mediating plants' defense response against pathogens. Their role in increasing plant resistance to pathogens is inducing the production of pathogenesis related proteins. It is involved in the systemic acquired resistance (SAR) response, in which a pathogenic attack on one part of the plant induces resistance in the affected area as well as in other parts of the plant.

General Consideration for Use of PGRs in Citrus Groves in Florida

Because PGRs function by directly influencing plant metabolism, plant response can vary considerably, depending on the variety and plant stress level. Therefore, it is recommended that growers become familiar with PGR effects before application. Preliminary trials in a small field plot should be conducted before using on a large acreage of trees. Most PGRs work best when used with an adjuvant (surfactant, sticker, or spreader). PGRs are regulated as pesticides and therefore, label instructions need to be followed—the label is the law. Table 2 summarizes some of the PGRs that are known to be effective in Florida citrus production.

Things to consider when applying PGRs are:

- Concentration of active ingredient
- Spray volume
- Method of application
- Time of day
- Season
- Compatibility with other chemicals in the tank mix
- Type of adjuvant
- Weather condition (humid, dry, sunny, cloudy, windy)
- Tree health (canopy density)

Use of PGRs for Huanglongbing Affected Trees

Huanglongbing (HLB) affected trees often suffer from extensive preharvest fruit drop. Due to the ability of PGRs such as 2, 4-D and GA to reduce preharvest fruit drop, they were considered as good candidates to mitigate the extensive fruit drop associated with HLB. Results from field trials with HLB-affected trees suggest that PGRs are inconsistent in their effects. Therefore, it is suggested not to use PGRs to alleviate HLB-associated preharvest fruit drop.

If excessive flowering, prolonged flowering, or off-season flowering is identified as a problem in HLB-affected trees, GA applications in the fall (September–January) can be made at 10–20 g a.i., 100–120 gallons per acre without negatively affecting yield. Fall GA applications reduce flowering in the following season. However, GA can also cause delay in color break of the existing crop; therefore, for early-season varieties of sweet orange, mandarins, and grapefruit, applying GA after the fruit is harvested would be ideal. GA applications in ‘Valencia’ during fall may improve fruit size of the existing crop as well as next season’s crop due to reduced flowering. Do not apply GA later than January, because late applications can suppress flowering significantly, resulting in low yields.

Table 2. Plant growth regulator sprays—Florida citrus. Growth regulators may cause serious problems if misused. Excessive rates, improper timing, and fluctuating environmental conditions can result in phytotoxicity, crop loss, or erratic results. Under certain environmental conditions, 2, 4-D may drift onto susceptible crops in surrounding areas. Observe wind speed restrictions and follow all label directions and precautions.

Variety	Response	Time of Application	Growth Regulator and Formulation	Product Rate or Volume per Acre
Orange, Temple, and Grapefruit	Preharvest fruit drop	November–December. Do not apply during periods of leaf flush.	2, 4-D Dichlorophenoxyacetic acid (Citrus Fix, Isopropyl ester of 2,4-D 3.36 lb/gal)	3.2 oz
Navel orange	Reduction of summer-fall drop	6–8 weeks after bloom or August–September for fall drop. Do not make late application when fruit is to be harvested early. Do not apply during periods of leaf flush.	2, 4-D Dichlorophenoxyacetic acid (Citrus Fix, Isopropyl ester of 2,4-D 3.36 lb/gal)	2.4 oz
Tangerine and Murcott	Fruit thinning; activity is temperature dependent. Severe overthinning may result from applications made to trees of low vigor or under stress conditions.	Mid-May	Naphthaleneacetic acid, NAA (K-Salt Fruit Fix 200, 6.25%)	24–120 oz (100–500 ppm)
Grapefruit	Delay of rind aging process and peel color development at maturity; combine with 2, 4-D for fruit drop control.	August–November. Late sprays can result in re-greening.	Gibberellic acid, GA_3 (ProGibb 4%, ProGibb 40%, ProGibb LV Plus)[2]	16–48 gram a.i.[3]
Tangerine hybrids				20–40 gram a.i.
Navel oranges				16–48 gram a.i.
All round orange				20–60 gram a.i.
Navel oranges Ambersweet orange Sweet orange	Improvement of fruit set and yield; can result in small size and leaf drop.	December–late January	Gibberellic acid, GA_3 (ProGibb 4%, ProGibb 40%, ProGibb LV Plus)[2]	15–25 gram a.i.
Tangerines Mandarins Grapefruit		Full bloom		8–30 gram a.i.
Processing oranges (late varieties)	To increase juice extraction yield	Color break	Gibberellic acid, GA_3 (ProGibb 4%, ProGibb 40%, ProGibb LV Plus)[2]	20 gram a.i.

[1]Rates are based on application of 500 gal. per acre to mature trees. The effects of applications at lower volumes (concentrate sprays) are unknown.
[2]Do not use in spray solutions above pH 8.
[3]Active ingredient; follow the label for variety-specific rates and conversion to fluid ounce per acre.

For more information, go to: https://edis.ifas.ufl.edu/pdf/HS/HS1310/HS1310-Dwbnfn90f9.pdf

The 31st Annual Farm Safety Day

Friday, 6 May 2022
Saturday, 7 May 2022

AN IMPORTANT MESSAGE TO EMPLOYERS

Safe and competent equipment operators are important to you as an employer. Accidents, which cause damage, injury or death to employees, equipment and crops, are costly. We believe all types of accidents can be reduced with proper employee training. Our training has been designed to help your employees perform better, operate safely to prevent accidents, fulfill necessary training requirements and build pride in themselves and their farm company.

Certificates

The 2022 Southwest Florida Farm Safety Day is almost here. Farm Safety Day is an educational event designed to emphasize the importance of farm/equipment safety. Each participant is presented with a certificate of attendance and **the employer will be provided with a certificate of training that can be placed into the employee's file**.

Registration Info

The deadline for registration is Friday, April 22, 2022. It is the employer's responsibility to assure that the employee is present at 7:30 AM on Friday, May 6 **or** on Saturday, May 7 at the Immokalee IFAS Center, 2685 State Rd. 29 North, Immokalee, FL 34142 to receive their nametag. Upon arrival each participant will check in at the registration table and receive a packet containing their nametag, instructions (in both English and Spanish) session handouts, an evaluation form, rodeo cap and pencil. They will be directed to their respective course sessions.

Please give us the names of those who will be attending our 31st Farm Safety Day on Friday, 6 May or Saturday, 7 May 2022 (please select the date). The cost is $25.00 per person, which will include educational sessions, handouts, pencils, refreshments, lunch, door prizes, and a cap.

Make checks payable to: University of Florida

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

Deadline is Friday, April 22, 2022

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.

31^{st} ANNUAL SAFETY DAY

Friday, 6 May 2022
Saturday, 7 May 2022

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 2022 FARM SAFETY DAY
REGISTRATION FORM

Please give us the names of those who will be attending our 30th Farm Safety Day on Friday, 6 May or Saturday, 7 May 2022 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:
University of Florida

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

Deadline is Friday, April 22, 2022

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
		.	.			.	.
		.	.			.	.
		.	.			.	.
		.	.			.	.
		.	.			.	.
		.	.			.	.
		.	.			.	.
		.	.			.	.

***Please Note: It is very important that we know the date (**Friday, 6 May or Saturday, 7 May 2022**) 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.

*Sending hard copies of this **Flatwoods Citrus newsletter** by regular mail will stop this year. You will receive your copy only through e-mail or through* ***https://citrusagents.ifas.ufl.edu/newsletters/***

☐ If you did not receive the ***Flatwoods Citrus*** newsletter and would like to be on our e-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
or E-mail: maz@ufl.edu

Subscriber's Name:______________________________________

Company:____

Phone:________________________

E-mail:____

Racial-Ethnic Background

__American Indian or native Alaskan
__Asian American
__Hispanic
__White, non-Hispanic
__Black, non-Hispanic

Gender

__Female
__Male