UF UNIVERSITY of FLORIDA
IFAS Extension

E X T E N S I O N

Institute of Food and Agricultural Sciences

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Flatwoods Citrus

Vol. 24, No. 1 **January 2021**

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

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January ZOOM Citrus Seminar

You are invited to a Zoom meeting.
When: Wednesday, January 20, 2021, 10:00 AM – 11:00 AM

Register in advance for this meeting:
https://ufl.zoom.us/meeting/register/tJAuce2gqz4jHtHXWKdeZMS9A_uVwVQ8_7p4

After registering, you will receive a confirmation email containing information about joining the meeting.

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

10:00 AM – 11:00 AM
"Title: Citrus disease trends we should heed: Phytophthora, HLB and Leprosis"
Dr. Ozgur Batuman, UF-IFAS
In this talk, I will remind our growers to continue paying attention to other pathogens that can attack already HLB-weakened trees. Phytophthora or leprosis each can substantially reduce productivity of a citrus tree but when they are co-infecting, it can be fatal. Also, some control measures may not be effective anymore due to HLB-induced complications.

February ZOOM Citrus Seminar

Tuesday, February 9, 2021
10:00 AM to 11:00 AM

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

10:00 AM – 11:00 AM
"Title: Problems on flowers, fruit, foliage: Managing PFD, Citrus Black Spot, and Citrus Canker"
Dr. Megan Dewdney, UF-IFAS
I will talk about the most current information we have on how to manage these diseases, the disease outlook for 2021 and basic disease lifecycle refresher information.

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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:

- **2020 #4:** Proper storage of pesticides (10/31/21)
- **2020 #3:** Understanding pesticide labeling (7/31/21)
- **2020 #2:** Avoiding harmful effects of pesticides (4/30/21)
- **2020 #1:** Scouting: The tip of the IPM spear (1/31/21)

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.

There are also CORE CEUs available at Growing Produce
http://www.growingproduce.com/crop-protection/ceu-series/

2020 FLORIDA CITRUS GROWERS' INSTITUTES

- **If you would like to obtain CEUs for Restricted Use Pesticide License or Certified Crop Advisor, Click Here**
- https://citrusagents.ifas.ufl.edu/archived-presentations/2020/ceus2020/
- **Click on a TOPIC to view the VIDEO PRESENTATION**
- **Click on PDF Presentation link to view the POWERPOINT PRESENTATION in PDF format**

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

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

CLIMATE PREDICTION CENTER/NCEP/NWS
and the International Research Institute for Climate and Society
10 December 2020

ENSO Alert System Status: La Niña Advisory

Synopsis: La Niña is likely to continue through the Northern Hemisphere winter 2020-21 (~95% chance during January-March), with a potential transition during the spring 2021 (~50% chance of Neutral during April-June).

La Niña persisted during November, as indicated by well below-average sea surface temperatures (SSTs) extending from the Date Line to the eastern Pacific Ocean (Fig. 1). Most of the weekly indices fluctuated through the month, with the westernmost Niño regions Niño-4 and Niño-3.4 ending up around -1.0ºC (Fig. 2). The negative equatorial subsurface temperature anomalies (averaged from 180°-100°W) weakened slightly last month (Fig. 3), but continued to reflect below-average temperatures from the surface to 200m depth in the eastern Pacific Ocean (Fig. 4). The atmospheric circulation over the tropical Pacific Ocean remained consistent with La Niña. Over the western and central tropical Pacific Ocean, low-level wind anomalies were easterly and upper-level wind anomalies were westerly. Tropical convection continued to be suppressed from the western Pacific to the Date Line (Fig. 5). Also, both the Southern Oscillation and Equatorial Southern Oscillation indices were positive. Overall, the coupled ocean-atmosphere system indicates the continuation of La Niña.

A majority of the models in the IRI/CPC plume predict La Niña (Niño-3.4 index less than -0.5°C) to persist through the Northern Hemisphere winter 2020-21 and to weaken through the spring (Fig. 6). Supported by the latest forecasts from several models, the forecaster consensus is for a moderate strength La Niña (Niño-3.4 index values between -1.0ºC and -1.5ºC) during the peak November-January season. In summary, La Niña is likely to continue through the Northern Hemisphere winter 2020-21 (~95% chance for January-March), with a potential transition during the spring 2021 (~50% chance of Neutral during Apr-Jun; click CPC/IRI consensus forecast for the chances in each 3-month period).

La Niña is anticipated to affect climate across the United States during the upcoming months. The 3-month seasonal temperature and precipitation outlooks will be updated on Thursday December 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 14 January 2021. 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

https://crec.ifas.ufl.edu/flower-bud-induction/flower-bud-induction-2020/

Dr. Tripti Vashisth, Horticulturist

Citrus Research & Education Center, Lake Alfred, FL

Flower Bud Induction Advisory #3, 12/22/2020

Season Forecast: This is going to be a La Niña winter which means Florida will experience temperatures warmer than normal and rainfall lower than normal. We are in for a warm and dry winter weather!

Under these conditions, enough hours below 68° F are likely to accumulate to induce an economic level of flower buds but intermediate warm periods during the winter can lead to multiple flower cohorts and a very prolonged bloom. On the positive side if dry weather prevails during the bloom period there could potentially be lower incidence of postbloom fruit drop

Current Condition: Currently, citrus producing regions of Central and North Florida (Umatilla) have accumulated above 650 inductive hours (IH), which is sufficient for flower bud induction in many cases, especially if the early cultivars have been harvested. At this point, most of the growers have decided to pick Hamlins due to extensive fruit drop, before all the fruit rains down! Therefore, a warm spell of a few days in Central and North Florida can initiate the differentiation of flower buds resulting in the first wave of flowering to occur early (second half of February). Fortunately, next 10-14 days are predicted to be lower than 78°F and low rainfall is expected therefore, major flower bud differentiation is unlikely to happen in the next couple of weeks. If these weather conditions continue, it is expected to see a major single flowering wave in early-mid March. Under current weather conditions (if they remain as predicted), no additional flowering management strategy is recommend. However, we need to closely monitor weather predictions as this season is supposed to be La Niña, it is expected to have warm temperatures. Prolonged warm temperatures after sufficient flower bud induction can accelerate bud differentiation and since it is recommended to keep irrigating throughout the fall, these conditions can be conducive for flowering (may shorten time required for flower formation).

In Southwest and Indian River regions currently, approximately 450 IH have been accumulated, the flower bud induction is low-moderate. It is predicted that this region will accumulate additional 100-200 IH in the next 14 days. Therefore, flower bud induction will be in the moderate category, a warm spell (temperatures above 80°F) of 7-10 days at that time can then initiate differentiation, leading to bloom. For these regions, the major concern is the possibility of an early warm spell with sufficient soil moisture that can initiate the differentiation of easily induced flower buds resulting in some flowering to occur early, therefore extending the bloom period in the spring. Pre-HLB, under healthy conditions, imposing drought stress on the trees would have been a good strategy to minimize flower bud initiation this early under warm conditions however, for HLB-affected trees it is strongly recommended to NOT induce drought stress.

Overall, prevalent cold weather for the next 2-3 weeks will be favorable to result in synchronized and concise bloom in March. However, the trees are now very vulnerable to growth stimulation by a warm period. Based on weather predictions, if you are concerned about early flowering in your region, DO NOT apply drought stress; however, a gibberellic acid (GA) application can be applied to prevent some early flowering. Though, the GA application should be done before differentiation begins.

Flowering related management considerations for HLB-affected trees:

- DO NOT drought stress HLB-affected trees even though drought stress promotes flower induction and suppress vegetative growth, you should not risk current crop due to additional drought stress. Drought stress can exacerbate fruit drop. Daily, lower volume irrigations to minimize fall drought stress is suggested, especially when the weather is warm,
- Flowering enhancing fertilizer to increase the number of flowers are NOT suggested for severely HLB-affected trees as they are less likely to benefit because of two reasons: (1) HLB-affected trees have more dead wood therefore, there are fewer buds available to become flowers, interestingly a good branch on severe HLB trees has same flowering potential as mild HLB trees. So additional flowering promoting fertilizer is not needed. (2) High twig dieback and low fruitlet retention is the main concern with severe HLB trees in regards to fruit set. Only 2% of the total flowers turn into harvestable crop therefore, pushing tree to flower more is not advisable as that is likely to waste trees' energy and resources in extra flowers.
- GA sprays can be used to suppress early spring flowering but the timing of application is critical for GA to be effective. GA should be applied before warm temperatures (that is before differentiation begins).

GA and HLB: Previous research on HLB-affected trees in 2017-2018 (a La Niña winter) has shown that when GA applied monthly in fall, early flowering was suppressed. Therefore, if you have a weak crop load and are forecasted to have warm spells, GA application can be considered to suppress off season flowering. DO NOT spray GA after first of January to manage flowering. GA sprays will reduce the total number of flower buds, however, the current literature shows that reduction in the number of buds in HLB trees with use of GA does not affect final yield.

1/4/2021

Flower Bud Induction Advisory #4

Season Forecast: This is going to be a La Niña winter which means Florida will experience temperatures warmer than normal and rainfall lower than normal. We are in for a warm and dry winter weather! Under these conditions, enough hours below 68°F are likely to accumulate to induce an economic level of flower buds but intermediate warm periods during the winter can lead to multiple flower cohorts and a very prolonged bloom. On the positive side if dry weather prevails during the bloom period there could potentially be lower incidence of postbloom fruit drop.

Current Condition: Even though this year is predicted to be La Niña, that is warmer than average temperatures are expected, so far we have received decent amount of cold weather and the next 10 days are also expected to be less than 75°F for most of the citrus producing region.

Currently, all citrus producing regions of Central and North Florida (Umatilla) have accumulated above 800 inductive hours (IH) and Southwest and Indian River regions have accumulated about 650 IH, the flower bud induction is moderate-high in all cases, which is sufficient for flower bud induction in most cases, both early and late varieties. Therefore, a warm spell (temperatures above 80°F) of 7-10 days can initiate the differentiation of flower buds resulting in the first wave of flowering to occur early (second half of February). Fortunately, next 10-14 days are predicted to be lower than 78°F although some rainfall is expected but overall major flower bud differentiation is unlikely to happen in the next couple of weeks. Even if we receive some rainfall, cool temperatures will not be conducive for bud differentiation. If these weather conditions continue, it is expected to see a major single flowering wave in early-mid March. Under current predicted weather conditions, no additional flowering management strategy is recommend. However, we need to closely monitor weather predictions as this season is supposed to be La Niña, it is expected to have warm temperatures. Prolonged warm temperatures after sufficient flower bud induction can accelerate bud differentiation and since it is recommended to keep irrigating throughout the fall, these conditions can be conducive for flowering (may shorten time required for flower formation).

Flowering related management considerations for HLB-affected trees: DO NOT drought stress HLB-affected trees even though drought stress promotes flower induction and suppress vegetative growth, you should not risk current crop due to additional drought stress. Drought stress can exacerbate fruit drop. Daily, lower volume irrigations to minimize fall drought stress is suggested, especially when the weather is warm.

Flowering enhancing fertilizer to increase the number of flowers is NOT suggested for severely HLB-affected trees as they are less likely to benefit because of two reasons: (1) HLB-affected trees have more dead wood therefore, there are fewer buds available to become flowers, interestingly a good branch on severe HLB trees has the same flowering potential as mild HLB trees. So additional flowering promoting fertilizer is not needed. (2) High twig dieback and low fruitlet retention is the main concern with severe HLB trees in regards to fruit set. Only 2% of the total flowers turn into harvestable crop therefore, pushing tree to flower more is not advisable as that is likely to waste trees' energy and resources in extra flowers.

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Suggestions for Upcoming Season

This is a good time to start thinking about next year's crop and management strategy to improve fruit set, growth and development. This season is predicted to be La Niña, that is warmer than average temperature and lower than average rainfall.

Recent research on HLB has shown:

HLB trees have poor water uptake due to reduced feeder root density.

Small fruit are more likely to drop than large fruit.

With increasing symptoms of HLB, fruit size decreases significantly.

Fruit drop is directly related to HLB symptoms, where small fruit are more likely to drop.

Fruit size starts to differ within first couple of months of fruit set. Fruit size is affected by water availability.

Fruit set and retention is poor in HLB symptomatic trees.

Historically, February-April are driest months in Florida. Coincidentally this is the period when flowering, fruit set, and fruit growth occurs. Water deficiency has been reported to increase with HLB symptoms during this period.

Therefore, it is highly recommended to irrigate the trees during time of flowering and fruit set, March-May before rains start. **Frequent irrigation with small amount of water is recommended, emphasis is on frequency of irrigation and NOT increasing the total amount of water applied.**

Another scenario is where growers have reported good bloom but low yields. Low yield can be due to:

1. Poor fruit set-in this case you will see good flowering but low number of fruit on the tree and not much fruit drop.
2. Fruit drop- during fruit development or preharvest

In both cases GA application can be done. To improve fruit set, GA can be applied once 80% of bloom has occurred and petal fall has started to happen. In order to reduce fruit drop, GA and HLB research on Valencia has shown that when GA is applied monthly from September to January, fruit drop can be reduced. This work is done on Valencia, however, in the case of Hamlin, it is speculated that GA sprayed before color break has happened can be beneficial in minimizing fruit drop. *GA sprays on mature fruit can delay color break, this can be problematic especially for fresh fruit varieties.*

Bottom line- For improving fruit set and growth, a good irrigation strategy is the key. In addition, the adoption of GA use is beneficial, however, timing of application is the essence for efficacy of plant growth regulators. Contact Tripti Vashisth (tvashisth@ufl.edu) if you have more questions.

FACTORS AFFECTING CITRUS FRUIT PRODUCTION AND QUALITY

Citrus fruit production and quality are influenced by many factors including climatic conditions and production practices.

In subtropical climates, the temperature usually falls below 70 °F for several months during winter. This period of cool temperatures causes growth to cease and citrus trees to become dormant for about 3 months. The cool temperatures during this dormant period promote floral induction. When warm spring temperatures, among other things, stimulate the resumption of vegetative growth, induced buds grow and produce flowers. In tropical climates, there is no period of cold temperature to induce dormancy. However, with periods of less than ample soil moisture (drought stress), flushes of bloom and vegetative growth normally follow these drought periods.

It is well documented that vegetative and reproductive (fruit) growth compete for available resources, such as carbohydrates (sugars) and mineral nutrients. Flushes of heavy vegetative growth will reduce the resources available to developing fruit, resulting in fruit with lower total soluble solids (TSS). A period of dormancy, during which there is little or no vegetative growth, reduces this competition for resources and results in fruit with increased TSS. The competition for resources between vegetative and reproductive growth is one of the reasons that citrus fruit grown in tropical climates tend to have lower TSS than those grown in subtropical climates.

CLIMATE

Within fairly broad parameters of adequate soil and reasonably good cultural and crop protection practices, climate is the most important component of the climate-soil-culture complex causing differences in fruit quality among commercial citrus production areas.

There is considerable diversity among citrus cultivars in their response to climate, especially as regards to market quality of the fruit. For example, 'Navel' orange develops its best eating and eye-appeal qualities in a Mediterranean type climate with cool, wet winters and hot, dry summers. In wet, tropical regions, 'Navel' fruit tends to be large, with poorly colored rinds, and low TSS and acid in the juice. Unlike 'Navel', grapefruit cultivars develop optimum internal quality in warm climates with little winter chilling. 'Valencia' orange is adapted to a broad range of climates, producing excellent to acceptable fruit quality in most of the world's important citrus regions.

Some, but not all of these climate-induced differences can be overcome with cultural practices. For example, there is no known cultural practice that allows California (a Mediterranean climate) to produce low-acid, thin-peel grapefruit similar to the world's top quality grapefruit grown in Florida (a humid subtropical climate).

Worldwide climate has a significant effect on citrus yield, growth, fruit quality, and economic returns. In growing regions where the average temperatures remain high all year (tropical climates), fruit peel chlorophyll does not degrade and oranges and tangerines remain green, whereas in cool-winter subtropical climates oranges and tangerines develop more intense orange peel color and greater eye-appeal at maturity.

In lowland tropical areas, due to high respiration rates at warm temperatures, fruit mature quickly and do not have sufficient time to accumulate high TSS and acidity declines rapidly so that the soluble solids/acid ratio increases sharply and the fruit quickly become insipid and dry. TSS in fruit accumulate most slowly in cool coastal areas. Maximum levels of TSS are usually attained in the mid-tropics and in humid subtropical regions with warm winters. Total acid (TA) levels are generally greatest in semiarid or arid subtropical and coastal climates and decline more slowly as fruit mature compared with other climates. Decrease in TA is primarily a function of temperature (heat unit accumulation) and the rapid respiration of organic acids at those higher temperatures.

GROWTH REGULATORS

Application of plant growth regulators (PGRs) can provide significant economic advantages to citrus growers when used in appropriate situations. Depending on cultivar 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.

Gibberellic acid (GA) is recommended for 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 self-incompatible mandarin hybrids. Application of GA to citrus fruit approaching maturity enhances peel firmness and delays peel senescence.

Application of GA in the fall often increases juice extraction from sweet oranges. It is likely that GA enhances juice extraction efficiency because increased peel firmness provides better mechanical support for fruit within extraction cups.

Applied in winter during floral induction to cultivars that routinely flower heavily but set poor crops such as ‘Navel’, ‘Ambersweet’, and ‘Ortanique’, GA reduces flowering and often results in increased fruit set. A combination of GA and 2,4-D has been used in many fresh fruit growing regions to enhance peel strength and extend the harvest seasons for grapefruit and sweet oranges.

Naphthalene acetic acid (NAA) is used to thin fruit when excessive set occurs. Thinning heavily cropping trees with NAA increases fruit size. The greatest thinning response to NAA has been shown to occur when applications are made when the average fruit diameter is about 1/2 inch, which typically occurs 6 to 8 weeks post bloom. Thinning of ‘Murcott’ and ‘Sunburst’ tangerines with NAA was found to increase fruit size, average fruit weight, and percent packout through improved fruit appearance.

CULTIVAR/ROOTSTOCK

The most important determinant of fruit production and quality under the grower’s control is cultivar selection. Under comparable conditions, ‘Hamlin’ orange always has poorer juice color and lower TSS than ‘Midsweet’ or ‘Valencia’ orange. On the other hand, ‘Hamlin’ produces higher, more consistent yields per acre than any other sweet orange cultivar. Worldwide, ‘Valencia’ produces premium quality fruit with excellent internal quality, high sugars, superior flavor, and deep orange juice color at maturity.

Besides cultivar, many of the horticultural characteristics of cultivars are influenced by the rootstock, including tree vigor and size, and fruit yield, size, maturity date, and quality. One of the best-known examples is the small fruit size of ‘Valencia’ budded on ‘Cleopatra’ mandarin (Cleo) rootstock. Cleo is well suited for use with ‘Temple’ orange, tangerines and tangerine hybrids. Sweet orange and grapefruit cultivars on Cleo generally produce small fruit and are not precocious, thus it is not commonly used for these varieties.

Low yield associated with Cleo rootstock is the result of poor fruit set and size, and fruit splitting. Scions on Cleo are most productive on heavier soils.

Larger fruit with thicker, rougher peel, and lower concentrations of TSS and acid in the juice are generally associated with cultivars budded on fast-growing vigorous rootstocks such as rough lemon, 'Volkamer' lemon, *Citrus macrophylla*, and 'Rangpur'. However, these rootstocks impart high vigor to the scion and induce high yield. Tangerine fruit from trees grown on vigorous rootstocks tend to be puffy, hold poorly on the tree, and have high incidence of granulation.

Cultivars on slower-growing rootstocks generally do not produce vigorous vegetative growth, but tend to produce small to medium size fruit with smooth peel texture and good quality fruit with high TSS and acid content in the juice. This latter group of rootstocks includes trifoliate orange and some of its hybrids (citranges and citrumelos). Sweet oranges budded on 'Carrizo' citrange have been among the most profitable combinations over the long term in Florida. Planted on the right soils, trees on 'Swingle' citrumelo are very productive at high-density plantings.

IRRIGATION AND NUTRITION

Although citrus trees develop largely in response to their genetic endowment and the climate, good production practices can have favorable influences on fruit production and quality. Cultural practices that attempt to cope with climatic or weather problems include irrigation and nutrition. Irrigation is of particular importance during the spring, which coincides with the critical stages of leaf expansion, bloom, fruit set, and fruit enlargement.

Proper irrigation increases fruit size and weight, juice content and soluble solids/acid ratio. Soluble solids per acre may increase due to yield increase. However, soluble solids per box and acid contents are reduced. Through its tendency to stimulate vegetative growth, irrigation in the dry fall and winter may reduce soluble solids in the fruit. Decline in total acid levels can also be aggravated by excessive irrigation.

Citrus trees require a good water management system and a balanced nutrition program formulated to provide specific needs for maintenance and for expected yield and fruit quality performance. Adequately watered and nourished trees grow stronger, have better tolerance to pests and stresses, yield more consistently, and produce good quality fruit. On the other hand, excessive or deficient levels of water or fertilizer will result in low fruit yield and oversize fruit with poor quality and diluted soluble solids content.

The most important nutrients influencing fruit quality are nitrogen, phosphorus, and potassium. However, when any other nutrient is deficient or in excess, fruit yield and quality are negatively altered. Nitrogen (N) increases juice content, TSS per box and per acre, and acid content. However, excessive N can induce excess vigor and promote a vegetative rather than a flowering tree and can result in lower yields with lower TSS per acre. In contrast, low N levels promote extensive flowering but fruit set and yields are poor.

Phosphorus reduces acid content, which increases soluble solids/acid ratio. Potassium (K) increases fruit production, fruit size, green fruit and peel thickness. Foliar spray of potassium nitrate or monopotassium phosphate in the spring often increases fruit size of tangerine and grapefruit, and fruit size and total pound solids of 'Valencia' orange. Foliar application (6-8 weeks before bloom) of urea can increase flowering and fruit set.

SUNLIGHT AND PRUNING

Even though citrus trees can tolerate shade and still flower and fruit, maximum flowering occurs when trees are grown in full sun and light penetration through the canopy is maximized. Therefore, pruning, including topping and hedging, to avoid crowding is extremely important for optimum flowering. The amount of fruit that is set has a very significant effect on fruit quality. There is a positive correlation between the number of fruit per tree and fruit quality. When the number of fruit per tree is low, the peel texture, shape of fruit, and often fruit color are poor. Quality of individual fruit varies significantly, even on the same tree. Heavily shaded fruit borne on the interior of the canopy have less TSS than fruit on the exterior of the canopy. Insufficient light contributes to reduced TSS concentration of interior fruit nourished by heavily shaded leaves.

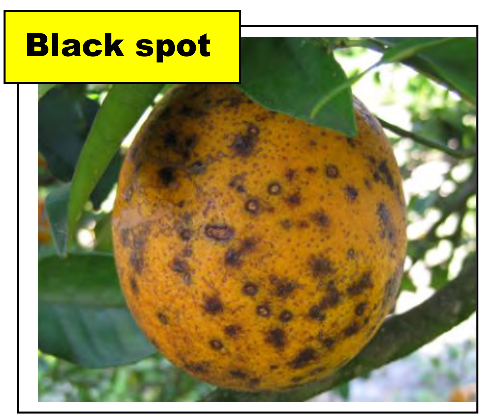
It is well established that shoots with fruit do not flower the following year. A heavy fruit crop tends to deplete carbohydrates and results in a small crop and increased vegetative growth the following year. Pruning after a heavy crop additionally stimulates vegetative growth and reduces fruit yield the following year. Pruning after a light crop and before an expected heavy crop can increase fruit size and help reduce alternate bearing. Pruning or topping and hedging usually increase fruit size and packout of fresh-market fruit by reducing crop load, thus increasing net cash returns to growers.

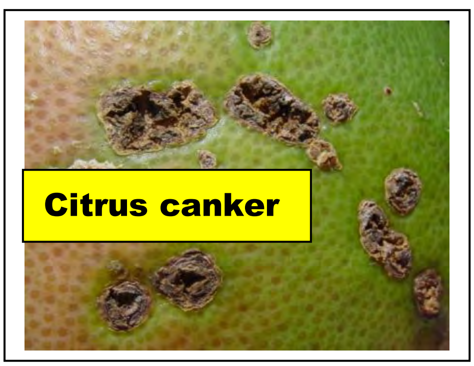
CONCLUSION

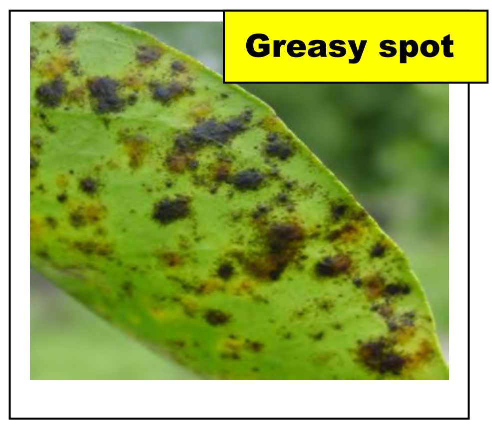
The improvement in citrus fruit production and quality that a grower can achieve through choice of scion/rootstock combinations, good irrigation management, balanced nutrition, and proper pruning may easily be overwhelmed by pests, diseases, and other injuries. Excessive leaf loss will noticeably reduce flowering the following spring and subsequent fruit production. The primary causes of leaf loss are freeze, tropical storm injury, salt and water stress problems including drought stress and flooding injuries, mites, greasy spot, herbicides and pesticide toxicities. Excessive leaf loss in the fall and in early winter is the worst thing that can happen to citrus trees. It will reduce accumulation of carbohydrates affecting flowering, fruit set, and fruit yield. Therefore, good practices in citrus groves should be adapted to minimize negative plant physiological stresses, improve tree health and performance, and enhance citrus trees to produce high yield of good fruit quality.

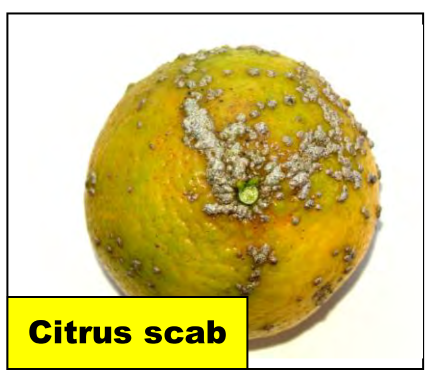
Fungicide effectiveness

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 for more than 10 years. 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, reducing ACP infestation and thus HLB infection of the all-important spring flush. Pyrethroids (Danitol, Baythroid or Mustang) and organophosphates (dimethoate, chlorpyrifos,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 offers alternative products for different months, depending on which pests are of major concern at the time. Neonicotinoids like imidacloprid, thiamethoxam or clothianidin have not been included as spray options due to their importance for controlling ACP in young trees. Superscripts after the pesticide name are now in sequential order to facilitate use and correspond to superscripts after pests controlled. 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 ↔ **Growing Season**

Months	Nov-Dec	Jan	Feb-Mar	Apr	May - June	July - Aug	Sep-Oct
Products *** Labeled for bloom**	OP[1] (e.g. Imidan, Dimethoate, chlorpyrifos)	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 Rustmite Leafminer Scales	ACP	ACP Rustmite Leafminer

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

AERIAL APPLICATION OF PESTICIDES

Aerial application of pesticides can be done using various types of fixed wing aircraft or helicopters. The selection of aircraft depends on the size of the application area, application window, budgets and terrain. The objective is to use aircraft that apply the insecticide in the safest and most efficient manner.

Fixed wing aircraft are used when there are large, continuous areas that may be sprayed with the minimum number of turns. Helicopters are useful for treating discrete or isolated patches of host material. Fixed wing treatment is less costly than by helicopter. Monitoring of the spray operation will be done by project team members from both the ground and the air. Airborne observers will be using small twin-engine aircraft or helicopters. These personnel relay on-site information back to the project team leaders and the pilots to ensure that the spray is carried out as planned.

Weather Monitoring

The weather is the most crucial factor in determining if a spray will occur on a particular day. Successful control of pests requires at least 1 hour without precipitation to allow the insecticide to adequately dry and stick to foliage and pest.

Wind speed is also a critical factor to the actual delivery of the spray from aircraft. The morning is usually the most calm period of the day; however, spraying can be done with some wind. Application is halted when sustained wind speeds exceed 6 miles/hr to prevent unnecessary drift of the pesticide. Specific weather conditions are required to allow the delivery of the insecticide at the desired concentration. Because of the uncertainty of weather, planned aerial spraying for any particular day may be cancelled at the last minute.

Determining the Aircraft Flight Paths

Aircraft apply insecticides in a series of parallel swaths over a spray zone. Well before spraying actually occurs, the route and pattern taken by the spray aircraft will be determined to ensure that the shortest time is spent over the spray zones. Optimal patterns will be designed to minimize the number of times the aircraft has to turn. Each turn wastes time in re-orienting the aircraft as it lines up for its run through the zone.

Safety considerations also play a large role in determining the aircraft's flight pattern.

Identifying the Spray Boundaries

Spray aircraft use sophisticated Global Positioning System-based navigational aids to pin-point their precise location. The GPS system also provides a record of the exact time and location the aircraft were over the spray area and also records the precise moment when the spray equipment was on or off.

Monitoring the Spray Pattern

Even though spray equipment onboard the aircraft are calibrated well before the time of spraying, ground monitoring of spray pattern and deposits are done to ensure that the pesticide was delivered to the target foliage at the desired concentration and distribution. Deposit monitoring is also done to insure that the application does not drift beyond the spray boundaries. Even application is critical to the performance of most pesticides. Uneven application results in under-dosing and poor control of the target pest in some areas and over-dosing and wasted pesticide in other areas.

Some pesticide labels say the pesticide can be applied by either fixed-wing aircraft or by helicopters. The main advantage of aerial spraying is that it can be carried out quickly and at times when ground equipment cannot operate. The main disadvantage is the increased possibility of pesticide drift onto neighboring areas and decreased spray coverage. Even when properly calibrated and operated, aircraft sprayers are often not as thorough in applying material as ground rigs, especially to the lower surfaces of the leaves and to the lower portions of the trees.

Aerial applications should not be used for small acreages or in residential areas, and should be done only by properly trained individuals who hold a valid pesticide applicator's certificate and have licenses.

COLD HARDINESS AND COLD PROTECTION

Two major environmental factors in Florida citrus that regulate cold hardiness are temperature and water.

At 55^0 F, citrus plant growth slows. As temperatures remain below 55^0 F, citrus trees will continue to acquire acclimation to these cooler temperatures. This process is reversible during warm winter periods, and de-acclimation (loss of acclimation) can occur. The greatest amount of citrus acclimation occurs during consistently cool fall and winters. Once de-acclimation occurs citrus trees will generally not re-acclimate to the same level prior to the onset of de-acclimation.

Irrigation and fall/winter rainfall can have a pronounced effect on the citrus acclimation process. Drought induced stress has been shown to increase the tolerance of citrus trees to freezing temperatures when compared to well watered or over watered citrus trees in Florida. However, excessively drought stressed trees are more susceptible to freeze damage.

Critical Temperatures for Florida Citrus

It is very important to know the critical temperature at which freezing temperatures can damage citrus. Minimum temperature indicating thermometers are a wise investment for any grower concerned with freeze/frost protection. Thermometers should be installed in the coldest grove locations. They should be placed at a height of 42 inches (4.5 ft) on a stand, sheltered at the top and facing north. In citrus trees, there can be a great deal of variation in the minimum temperature at which plant damage will occur.

The reference temperature and duration for the initiation of the freezing process in round oranges is 28^0 F for four hours. Tangerines and fruit with smaller mass would receive freeze damage after shorter durations, while grapefruit would require longer durations.

Minimum temperatures of 26^0 F will damage fully mature, harden-off leaves that have not received any acclimation. Minimum temperatures of 30^0 F can significantly damage unhardened new flush leaves. Leaves that have received extensive acclimation have been shown to survive temperatures as low as 20^0 F in Florida.

Protecting citrus trees from cold damage

Cultural practices can have a major influence on the cold hardiness of citrus trees. A clean, hard-packed soil surface intercepts and stores more solar radiation during the day and releases more heat at night than a surface covered with vegetation or a newly tilled area. Irrigation should be applied minimally during the fall and winter. Reducing irrigation results in an increase in the cold tolerance of citrus trees and enhances tree stress resulting in an increase in the formation of flower buds. Excessive application of nutrients should be avoided late in the fall especially with young citrus trees. Heavy hedging or topping during the winter can reduce citrus cold hardiness by reducing canopy integrity that would trap heat released by the soil. This should be avoided.

Water from micro sprinkler irrigation protects young trees by transferring heat to the tree and the environment. The heat provided is from two sources, sensible heat and the latent heat of fusion. Most irrigation water comes out of the ground at 68° to 72°F, depending on the depth of the well. The major source of heat from irrigation is provided when the water in the liquid form changes to ice (latent heat of fusion).

As long as water is constantly changing to ice, the temperature of the ice-water mixture will remain at 32°F. The higher the rate of water application to a given area, the greater is the amount of heat energy that is applied. When expecting a freeze, turn on the water early before the air temperature reaches 32^0F. Remember that in cold pockets, the ground surface can be colder than the air temperature reading in a thermometer shelter. Once irrigation has begun, the system must run for the duration of the time plant temperatures are below the critical temperature. Growers are recommended to use the information at the FAWN website (**http://fawn.ifas.ufl.edu**) to determine when it would be safe to turn off or on their micro-sprinkler irrigation system. For more details, go to http://edis.ifas.ufl.edu/HS179, http://edis.ifas.ufl.edu/CH182, http://edis.ifas.ufl.edu/CH054

In bedded groves to provide additional cold protection, water should also be pumped high in the ditches the day before and during the time of freezing weather.

United States Department of Agriculture
National Agricultural Statistics Service

CITRUS

NOVEMBER FORECAST
MATURITY TEST RESULTS AND FRUIT SIZE

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November 10, 2020

Florida All Orange Production 57.0 Million Boxes
Florida Non-Valencia Orange Production 23.0 Million Boxes
Florida Valencia Orange Production 34.0 Million Boxes
Florida All Grapefruit Production 4.50 Million Boxes
Florida All Tangerine and Tangelo Production 1.10 Million Boxes

FORECAST DATES –	2020-2021 SEASON
December 10, 2020	April 9, 2021
January 12, 2021	May 12, 2021
February 9, 2021	June 10, 2021
March 9, 2021	July 12, 2021

Citrus Production by Type – States and United States

Crop and State	Production [1]			Forecasted Production [1 2]
	2017-2018	2018-2019	2019-2020	2020-2021
	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)
Non-Valencia Oranges [3]				
Florida	**18,950**	**30,400**	**29,650**	**23,000**
California	35,900	42,000	44,300	42,000
Texas	1,530	2,210	1,150	1,300
United States	56,380	74,610	75,100	66,300
Valencia Oranges				
Florida	**26,100**	**41,450**	**37,650**	**34,000**
California	8,300	10,200	9,000	8,500
Texas	350	290	190	200
United States	34,750	51,940	46,840	42,700
All Oranges				
Florida	**45,050**	**71,850**	**67,300**	**57,000**
California	44,200	52,200	53,300	50,500
Texas	1,880	2,500	1,340	1,500
United States	91,130	126,550	121,940	109,000
Grapefruit				
Florida-All	**3,880**	**4,510**	**4,850**	**4,500**
Red	**3,180**	**3,740**	**4,060**	**3,800**
White	**700**	**770**	**790**	**700**
California [4]	3,800	4,200	3,800	3,800
Texas	4,800	6,100	4,400	4,900
United States	12,480	14,810	13,050	13,200
Lemons				
Arizona	1,000	1,350	1,800	1,300
California	21,200	23,700	25,700	22,000
United States	22,200	25,050	27,500	23,300
Tangerines and Tangelos				
Florida	**750**	**990**	**1,020**	**1,100**
California [5]	19,200	26,500	22,000	23,000
United States	19,950	27,490	23,020	24,100

[1] Net pounds per box: oranges in California-80, Florida-90, Texas-85; grapefruit in California and Texas-80, Florida-85; lemons-80; tangerines and mandarins in California-80, Florida-95.
[2] Estimates carried forward from October
[3] Early non-Valencia (including Navel) and midseason non-Valencia varieties in Florida; Navel and miscellaneous varieties in California; Early and mid-season varieties in Texas.
[4] Includes pummelos in California.

All Oranges 57.0 Million Boxes

The 2020-2021 Florida all orange forecast released today by the USDA Agricultural Statistics Board is carried forward from October at 57.0 million boxes, down 15 percent from last season's final production. The total includes 23.0 million boxes of non-Valencia oranges (early, midseason, and Navel varieties) and 34.0 million boxes of Valencia oranges. The Navel orange forecast, at 700 thousand boxes, accounts for 3 percent of the non-Valencia total. The estimated number of bearing trees for all oranges is 50.1 million.

All Grapefruit 4.50 Million Boxes

The forecast of all grapefruit production is carried forward at 4.50 million boxes, 7 percent less than last season's utilization of 4.85 million boxes. The total is comprised of 3.80 million boxes of red grapefruit and 700 thousand boxes of white grapefruit.

Tangerines and Tangelos Total 1.10 Million Boxes

The forecast for tangerine and tangelos is carried forward at 1.10 million boxes, 8 percent more than last season's utilization of 1.02 million boxes. This forecast number includes all certified tangerine and tangelo varieties

Weather and Field Conditions

Daily temperatures during October were average or above for this time of year, with highs mostly in the mid to high 80s. Rainfall amounts varied across the citrus producing region, ranging from one and a half inches in the Northern citrus growing area, to over eight inches in the Indian River District. Some Southern and Central area locations had several days of heavy rains causing localized flooding in citrus groves. According to the October 29, 2020 U.S. Drought Monitor, the entire citrus growing region remained drought free. Grove activities included mowing, herbiciding, fertilizing, nutritional spraying, dead tree removal, new tree planting, and general grove maintenance.

Crop Progress

The crop season in October began with harvesting of Navel and Hamlin oranges, red grapefruit, and Fallglo and Early Pride tangerines. Harvested fruit was primarily for the fresh market. By the end of October, two processing plants were open for eliminations and sixteen packinghouses were shipping fruit. According to the Citrus Administrative Committee Utilization Report, dated November 1, 2020, just over 1 percent of early and midseason oranges, 15 percent of Navels, 7 percent of all grapefruit, and 10 percent of tangerines and tangelos have been certified.

Estimates of Production by Marketing Districts

Production forecasts for Florida oranges and grapefruit were divided among marketing districts for this report. Comparisons are shown to the previous season in the table below. Marketing District II is the legally defined Indian River District along the East Coast. Marketing District III (Gulf) includes the counties of Charlotte, Collier, Glades, Hendry, and Lee. Marketing District I (Florida SunRidge) includes all other citrus-producing counties.

Citrus Production and Prorated Forecast, by Marketing District – 2019-2020 and 2020-2021

[Based on tree populations. The possible differences between growing areas, concerning average fruit size, loss from droppage, and harvest patterns can alter the prorated estimates]

Marketing District	Oranges				Seedless Grapefruit			
	Non-Valencia		Valencia		Red		White	
	2019-2020	2020-2021	2019-2020	2020-2021	2019-2020	2020-2021	2019-2020	2020-2021
	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)
Indian River	896	600	2,104	1,450	3,140	2,850	726	600
Gulf	7,040	5,800	11,068	8,700	575	500	14	50
Florida SunRidge........	21,714	16,600	24,478	23,850	345	450	50	50
Florida Total	29,650	23,000	37,650	34,000	4,060	3,800	790	700

Flatwoods Citrus

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Racial-Ethnic Background

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

Gender

__Female

__Male