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Institute of Food and Agricultural Sciences

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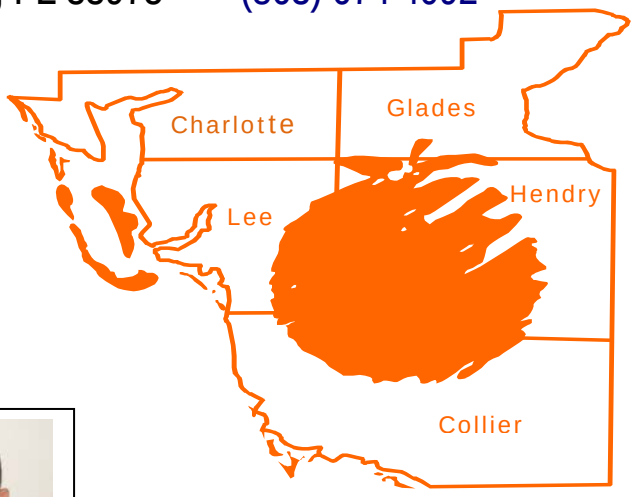
Flatwoods Citrus



Vol. 21, No. 1 **January 2018**

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

Have a Happy Holiday Season and a Productive Healthy New Year!!!

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I M P O R T A N T E V E N T S

Workshop – Starting at 9:00 AM

All You Need to Know About Scouting and Management of Citrus Insect Pests

Date: Wednesday, **January 17, 2018**, Time: 9:00 AM **– 1:00 PM**
Location: Immokalee IFAS Center
Program Coordinator: Mongi Zekri, UF-IFAS
Program Sponsor: Sam Monroe with Nichino

Agenda

----9:00 AM - 10:00 AM

1. Scouting citrus for pests and beneficials

Spider mites, rust mites, weevils, citrus leafminer, psyllid, scale insects, other pests

Dr. Phil Stansly, UF-IFAS

----10:00 AM - 11:00 AM

2. **Chemical and Biological Control of Asian Citrus Psyllid**

Psyllid suppression, Predators, Parasitoid Tamarixia radiata, Effect on Yield

Dr. Jawwad Qureshi, UF-IFAS

11:00 AM – 11:10 AM Break

----11:10 AM - 11:40 AM

3. Scouting and Management of Citrus Rust Mites (CRM)

Scouting methods, new products for CRM control

Barry Kostyk, UF-IFAS

----11:40 AM – 12:00 Noon

4. 2017 Nichino Citrus Product Update

Portal citrus pests controlled, Apta citrus pests controlled, Portal and Apta as part of your pesticide resistance management program

Dr. Scott Croxton, Nichino

3 CEUs for Certified Crop Advisors (CCAs)
3 CEUs for Pesticide License Renewal

Pre-registration is required. No registration fee and lunch is free Thanks to Sam Monroe with Nichino. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

http://www.citrusshow.com/

January 24-25, 2018 • Havert L. Fenn Center, Ft. Pierce Florida

Registration at: https://www.eiseverywhere.com/ereg/index.php?eventid=284198&

Wednesday, January 24, 2018

8:00 – 8:30 am	**Visit the Trade Show – Continental Breakfast**
8:30 – 8:50 am	**Welcome and Opening Remarks** Dr. Ronald Cave, UF/IFAS, IRREC Director Dr. Rhuanito "Johnny" Ferrarezi, UF/IFAS Doug Bournique, Indian River Citrus League Pat Schirad, St. Lucie County Commissioner Mark Satterlee, St. Lucie County Deputy Administrator
Moderator: Dr. Garima Kakkar, UF/IFAS	
8:50 – 9:05 am	**New Scion Performance from USDA-ARS** Dr. Ed Stover, USDA-ARS
9:05 – 9:20 am	**New Rootstock Performance from USDA-ARS** Dr. Kim Bowman, USDA-ARS
9:20 – 9:35 am	**New UF/IFAS Varieties Update** Dr. Fred Gmitter, UF/IFAS
9:35 – 9:50 am	**New UF/IFAS Rootstocks Update** Dr. Jude Grosser, UF/IFAS
9:50 – 10:00 am	**IRREC Millennium Block Trial Results** Dr. Rhuanito "Johnny" Ferrarezi, UF/IFAS

Thursday, January 25, 2018

8:00 – 8:30 am	**Visit the Trade Show – Continental Breakfast**
Moderator: Ed Skvarch, UF/IFAS	
8:30 – 8:50 am	**Integrated Pest Management for Citrus** Dr Jawwad Qureshi, UF/IFAS
8:50 – 9:10 am	**Metalized Reflective Mulch: More Fruit with Less Psyllids** Bob Adair, Florida Research Center
9:10 – 9:30 am	**Capability of Photonic Fence Technology to Detect, Track, and Intercept Flying Psyllids** Dr. Joe Pratt, USDA-ARS; and Arty Makagon, Photonic Sentry, LLC
9:30 – 10:45 am	**Break/Visit the Trade Show**
Moderator: Dr. Kayla Thomason, UF/IFAS	
10:45 – 11:05 am	**Biostimulants: Brazilian Experience using Physiological Management (soil amendments, nutrients, and hormones)** Dr. Camilo Medina, Conplant/GCONCI, Brazil

10:00 – 11:00 am	**Break/Visit the Trade Show**

Moderator: Dr. Stephen Futch, UF/IFAS

11:00 – 11:15 am	**HLB and Bactericide Updates on Valencia Orange** Tom Jerkins, Premier Citrus
11:15 – 11:30 am	**Bactericide Registration Update** Dr. Kent Morgan, AgroSource, Inc.
11:30 – 11:50 am	**Management and Outlook on Post-Bloom Fruit Drop** Dr. Megan Dewdney, UF/IFAS
11:50 – 12:05 pm	**Integrated Pest Management of Foliar Disease in Citrus** Dr. Ozgur Batuman, UF/IFAS
12:05 – 1:30 pm	**Lunch – Visit the Trade Show**

Moderator: Christine Kelly-Begazo, UF/IFAS

1:30 – 2:05 pm	**Weather Events in Florida** Dr. Kevin Rodriguez, NOAA-NWS West Melbourne
2:05 – 2:20 pm	**Hurricane Recovery Update: A Look at Aid, Loan and other programs** Jenny Hoover, USDA Farm Service Agency
2:20 – 2:35 pm	Hurricane Irma: A Predictive Model Estimation of Citrus Black Spot Spread and Areas Impacted Dr. Tim Gottwald, USDA-ARS; and Dr. Weiqi Luo, USDA-ARS
2:35 – 3:30 pm	**Break/Visit the Trade Show**

Moderator: Juanita Popenoe, UF/IFAS

3:30 – 3:50 pm	**Citrus Nursery Inventory Update** Nate and Anna Jameson, Brite Leaf Nursery
3:50 – 4:10 pm	Precision Agriculture Technologies to Improve Citrus Production Dr. Ioannis Ampatzidis, UF/IFAS
4:10 – 4:30 pm	**Encouraging Updates to the Produce Safety Rule and Tools Related to Water Quality** Dr. Mark Ritenour, UF/IFAS
11:05 – 11:40 am	**Rehabilitating Water Damaged Citrus Root Systems** Dr. Evan Johnson, UF/IFAS
11:40 – 12:00 pm	**Biostimulants and Nutrient Utilization: A Case Study in the Indian River District** Scott Gibson, JAKL
12:00 – 1:30 pm	**Lunch/ Visit the Trade Show**

Moderator: TBD

1:30 – 1:50 pm	**Grapefruit Economics Update** Dr. Ariel Singerman, UF/IFAS
1:50 – 2:25 pm	**Lemon Production Potential in Florida** Dr. Glenn C. Wright, University of Arizona
2:25 – 3:10 pm	**Grower Panel: HLB-Infected Citrus Management Considerations after the Storm** Moderator: Frank Giles, Editor, *Florida Grower* magazine
3:10 pm	**Concluding Remarks** Indian River Citrus League

Seminar- Citrus Nutrient Management for trees affected by HLB

Location: Southwest Florida Research & Education Center, Immokalee
Date & time: Thursday, February 8, 2018, 10:00 AM – 12:00 Noon.
Speakers: Dr. Evan Johnson, Dr. Davie Kadyampakeni, Dr. Kelly Morgan, and Eric Waldo
Program Coordinator: Mongi Zekri, UF-IFAS
Program Sponsor: Eric Waldo with Yara

2 CEUs for certified crop advisors (CCAs)
2 CEUs for pesticide license renewal

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

Agenda

----10:00 AM – 10:30 AM
Effect of HLB on citrus root density – by Dr. Evan Johnson

----10:30 AM – 11:00 AM
Effect of reduced root density on citrus water uptake – by Dr. Davie Kadyampakeni

11:00 AM – 11:10 AM Break

----11:10 AM – 11:40 AM
Review of nutrient management studies on citrus tree growth and yield – by Dr. Kelly Morgan

----11:40 AM – 12:00 Noon
Tools and Strategies for Growing or Re-Building a Healthy Citrus Tree – by Eric Waldo

----12:00 Noon: Lunch

Annual Certified Pile Burners Course in SW Florida

Wednesday, 14 February 2018

Pre-registration is required to attend, and class size is limited to the first 50 people.

PRE-REGISTRATION WILL NOT BE ACCEPTED WITHOUT PAYMENT OF THE REGISTRATION FEE.

Registration fee: $50

The $50 fee covers the training sessions, a booklet with all the presentations in color, other handouts, refreshments, and lunch.

Send your registration form and check as soon as possible. This class usually gets full 3-4 weeks before the event.

Location: The Immokalee IFAS Center

The Florida Division of Forestry and University of Florida Cooperative Extension Service will be conducting a Certified Pile Burners Course that will show you how to burn piles ***legally, safely and efficiently***.

Most importantly, it could save a life. If you burn piles regularly, don't put off registering for this training. When the weather is dry, certified pile burners will receive priority for authorization to burn. Also, certified pile burners are allowed to burn up to two hours longer per day and get multiple day authorizations. Don't wait. The number of trainings offered and attendance at each training is LIMITED. This training will be held from 8:00 am till 4:30 pm at the **Southwest Florida Research and Education Center in Immokalee**.

Detailed information including registration was attached in the previous issue or at:

http://www.freshfromflorida.com/content/download/77706/2225014/HendryPileBurnerFeb2018.pdf

http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Education/For-the-Community/Withlacoochee-Training-Center-WTC/Class-Schedule

Special Thanks to sponsors of the "Flatwoods Citrus" newsletter for their generous contribution and support.
If you would like to be among them, please contact me at 863 674 4092 or maz@ufl.edu

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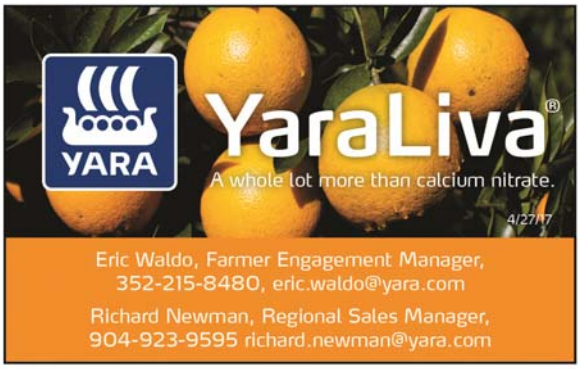

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

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

14 December 2017

ENSO Alert System Status: La Niña Advisory

Synopsis: La Niña is likely (exceeding ~80%) through the Northern Hemisphere winter 2017-18, with a transition to ENSO-neutral most likely during the mid-to-late spring.

La Niña strengthened during the past month, as indicated by an increasingly prominent pattern of below-average sea surface temperatures (SSTs) across the central and eastern equatorial Pacific Ocean. The latest weekly Niño-3.4 index value was -0.8°C, with the easternmost Niño-3 and Niño-1+2 indices at or below -1.0°C during much of the month. Sub-surface temperature anomalies weakened slightly during November, but remained significantly negative due to the anomalously shallow depth of the thermocline across the central and eastern Pacific. The atmospheric circulation over the tropical Pacific Ocean also reflected La Niña, with convection suppressed near the International Date Line and enhanced over Indonesia. The low-level trade winds were stronger than average over the western and central Pacific, with anomalous westerly winds at upper-levels. Overall, the ocean and atmosphere system reflects La Niña.

La Niña is predicted to persist through the Northern Hemisphere winter 2017-18 by nearly all models in the IRI/CPC plume and in the North American Multi-Model Ensemble (NMME). Based on the latest observations and forecast guidance, forecasters favor the peak of a weak-to-moderate La Niña during the winter (3-month Niño-3.4 values between -0.5°C and -1.5°C). In summary, La Niña is likely (exceeding ~80%) through the Northern Hemisphere winter 2017-18, with a transition to ENSO-neutral most likely during the mid-to-late spring (click CPC/IRI consensus forecast for the chance of each outcome for 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 Thursday December 21st). The outlooks generally favor above-average temperatures and below-median precipitation across the southern tier of the United States, and below-average temperatures and above-median precipitation across the northern tier of the United States.

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts are also updated monthly in the Forecast Forum of CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 11 January 2018. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

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

HEDGING, TOPPING, AND SKIRTING CITRUS TREES

The interception and utilization of sunlight should be an important consideration in citrus grove design. The effect of insufficient light is frequently observed in mature citrus groves that are not pruned (hedged, topped) regularly. Shading reduces yield and foliage on the lower parts of the trees. Sunlight not only influences flowering and fruit set but also enhances fruit quality and color development. Increased sunlight penetration within the tree canopy might also allow foliage to dry quicker after a rain shower and could help reduce establishment of fungal pathogens. Therefore, adjustments must be made in tree height and hedging angle to maximize sunlight interception.

Hedging and topping are important cultural grove practices. Severe hedging or topping of citrus trees during the winter can reduce cold hardiness. Trees with exposed internal scaffold wood and new tender growth are susceptible to cold injury.

In general, tree response to hedging and topping depends on several factors including variety, rootstock, tree age, growing conditions, time of pruning, and production practices. No one system or set of rules is adequate for the numerous situations encountered in the field. Growers are encouraged to gain a clear understanding of the principles involved in hedging and topping, and to take advantage of research results as well as consulting knowledgeable colleagues and custom operators for their observations.

Hedging should be started before canopy crowding becomes a problem. Developing a pro-active pruning program should assist managers in removing the right-sized branches. Removal of a significant portion of the tree will result in excessive vegetative growth and a drastic reduction in subsequent yield. Hedging is usually done at an angle, with the boom tilted inward toward the treetops so that the hedged row middles are wider at the top than at the bottom. This angled hedging allows more light to reach the lower skirts of the tree. Hedging angles being commonly used vary from 10 to 15 degrees from vertical.

Topping should be done before trees have become excessively tall and should be an integral part of a tree size maintenance program. Long intervals between toppings increase the cost of the operation due to heavy cutting and more brush disposal. Furthermore, excessively tall trees are more difficult and expensive to harvest and spray. Topping trees will improve fruit quality and increase size. Some common topping heights are 10 to 12 ft at the shoulder and 13 to 14 ft at the peak. As a general rule, topping heights should be two times the row middle width.

After severe hedging or topping, heavy nitrogen applications will produce vigorous vegetative regrowth at the expense of fruit production. Therefore, nitrogen applications should be adjusted to the severity of hedging and/or topping. Reducing or omitting a nitrogen application before and possibly after heavy hedging will reduce both costs and excessive

vegetative regrowth. Light maintenance hedging should not affect fertilizer requirements.

Large crops tend to deplete carbohydrates and results in a reduced fruit yield 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 is recommended because it can help reduce alternate bearing which can be a significant problem in Valencia and Murcott production.

Severe hedging may create problems of brush disposal and stimulates vigorous new vegetative growth, especially when done before a major growth flush. This happens because an undisturbed root system is providing water and nutrients to a reduced canopy area. The larger the wood that is cut, the larger is the subsequent shoot growth. Severe pruning reduces fruiting and increases fruit size.

The best time of year to hedge and/or top depends on variety, location, severity of pruning, and availability of equipment. Since pruning is usually done after removal of the crop, early maturing varieties are generally hedged before late maturing varieties. Most growers prefer to hedge before bloom, but trees will get more vegetative regrowth, which may not be desirable. Pruning could begin as early as November prior to harvesting in warmer areas. During this period, conducted pruning operations should only cut minimal foliage and fruit from the trees.

Valencia trees may be hedged in late fall with only minimal crop reduction when the hedging process removes only a small amount of vegetative growth. In cases where excessive growth is to be removed, the trees are usually harvested before hedging is conducted. Light maintenance pruning can be done throughout the summer and until early fall with little or no loss in fruit production. Moderate to severe pruning should not continue into the winter in freeze-prone areas, as trees with tender regrowth are susceptible to cold injury.

With citrus canker and greening diseases, selecting the best time for hedging and topping is becoming more complicated. New growth flushes promoted by hedging and topping in late spring, during the summer, and early fall can increase the population of leafminers and psyllids and aggravate the spread of citrus canker and greening. Declining trees with defoliated tops, dieback, reduced cropping, and severe root loss due to citrus greening are being hedged and topped to help balance the shoot to root ratio to improve tree performance and extend tree longevity.

Skirting is the pruning to raise tree skirts. Without skirting, the movement of herbicide booms is impeded. Fruit and limbs near the ground are often damaged by the passage of such equipment and by herbicide spray and fertilizer contact. Skirting allows uniform distribution of granular fertilizers and good water coverage of microsprinkler irrigation systems under tree canopies. Skirting facilitates the inspection of microirrigation systems and reduces the incidence of Phytophthora foot rot and brown rot because it allows good air circulation.

Red Tide Information

http://lee.floridahealth.gov/programs-and-services/environmental-health/healthy-beaches/red-tide.html

What is red tide?

A red tide, or harmful algal bloom, is a higher-than-normal concentration of a microscopic alga (plantlike organism). In Florida and the Gulf of Mexico, the species that causes most red tides is

Karenia brevis, often abbreviated as *K. brevis*. At high concentrations, the organisms may discolor the water, sometimes red, light or dark green, brown or the water may appear clear.

What causes red tide?

A red tide bloom develops when biology (the organisms), chemistry (natural or man-made nutrients for growth) and physics (concentrating and transport mechanisms) interact to produce the algal bloom. No one factor causes the development of a red tide bloom.

Where can I check the status of red tide at my local beach?

Local Beach Conditions or call 1-941-BEACHES (Press 4 for Lee County conditions)

National Oceanic and Atmospheric Administration (NOAA)

Are red tides new?

No. Red tides were documented in the southern Gulf of Mexico as far back as the 1700s and along Florida's Gulf Coast since the 1840s. While red tides and other algal blooms occur worldwide,

K. brevis is found almost exclusively in the Gulf of Mexico but has been found on the east coast of Florida and off the coast of North Carolina.

How long does a red tide last?

Red tide blooms can last days, weeks or months, and can also change daily due to wind conditions. Onshore winds and water movements normally bring it near the shore and offshore winds drive it out to sea.

Is red tide predictable?

Although the occurrence of a red tide cannot be predicted, scientists can forecast its movement using wind and water current data once a bloom is located. Red tide movement and concentration are important because the effects of a red tide, such as human respiratory irritation, depend on these factors. The information provided by forecasting and monitoring allows people to make healthy and informed decisions regarding beach-going activities.

Is it safe to swim in water affected by red tide?

While people may swim in red tide, some individuals may experience skin irritation and burning eyes. If your skin is easily irritated, avoid red tide water. If you experience irritation, get out of the ocean and thoroughly wash off with fresh water.

Can red tide affect me when I am not on the beach?

It is possible that people in coastal areas in close proximity to the shoreline may experience varying degrees of eye, nose, and throat irritation. When a person leaves an area with red tide, symptoms usually go away. If symptoms persist, please seek medical attention.

Are there people who are more sensitive to the toxins caused by red tide?

People with respiratory problems (like asthma or bronchitis) should avoid red tide areas, especially when winds are blowing on shore. If you go to the beach and have one of these conditions, a short-acting inhaler usually helps. If you have symptoms, leave the beach and seek air conditioning (A/C). If symptoms persist, please seek medical attention.

What can I do to lessen the effects of red tide?

People get relief from respiratory symptoms by being in air conditioned spaces. This is also true when driving: keep your car windows up and the A/C or heat on. For people without asthma or any other chronic respiratory problems, over-the-counter antihistamines may relieve symptoms. People with chronic lung ailments should be especially vigilant about taking prescribed medications daily. Always seek medical care if your symptoms worsen.

Can red tide affect pets?

Just like people, pets may be affected by red tide. If you live close to the beach, consider bringing outdoor pets inside during a bloom to prevent respiratory irritation. If you are at the beach with your pets, do not allow them to play with dead fish or foam that may accumulate on the beach during or after a red tide.

- **Useful Facts and Tips about Red Tide Reference Card**
- **More information on K.Brevis**
- **Lee County Beach Conditions or call 1-941-BEACHES (Press 3 for Lee County conditions)**
- **National Oceanic and Atmospheric Administration (NOAA)**
- **Centers for Disease Control and Prevention (CDC)**
- **Health related information or to report illness from exposure to red tide: call 24/7 toll free Florida Poison Control at 1-800-222-1222**

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 'Robinson', 'Nova', 'Orlando', 'Minneola', or other 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.

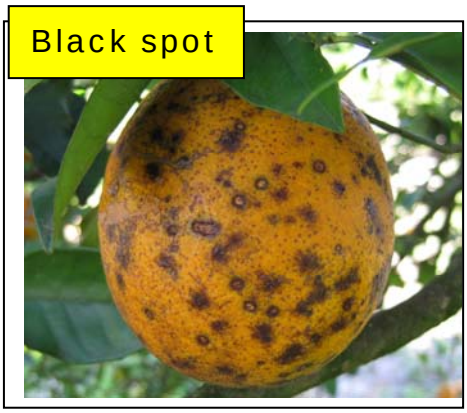
It is well established that shoots with fruit do not flower the following year. A heavy fruit crop tends to deplete carbohydrates and results in a small crop and increased vegetative growth the following year. Pruning after a heavy crop additionally stimulates vegetative growth and reduces fruit yield 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.

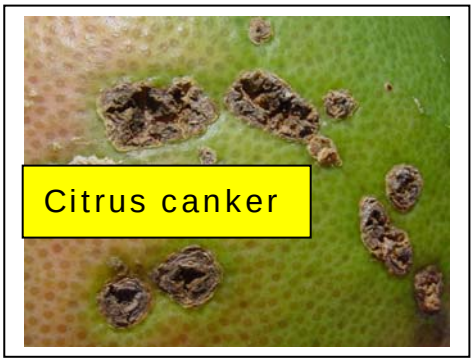
CONCLUSION

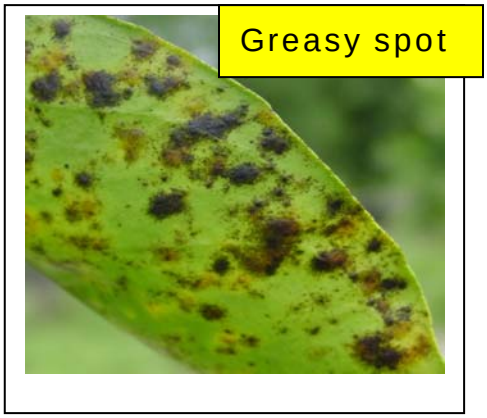
The improvement in citrus fruit production and quality that a grower can achieve through choice of scion/rootstock combinations, good irrigation management, balanced nutrition, and proper pruning may easily be overwhelmed by pests, diseases, and other injuries. Excessive leaf loss will noticeably reduce 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.

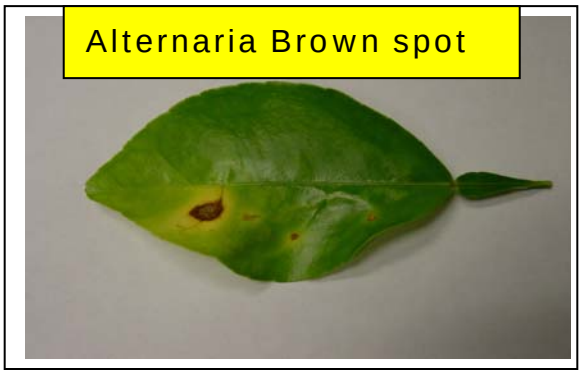
Fungicide effectiveness

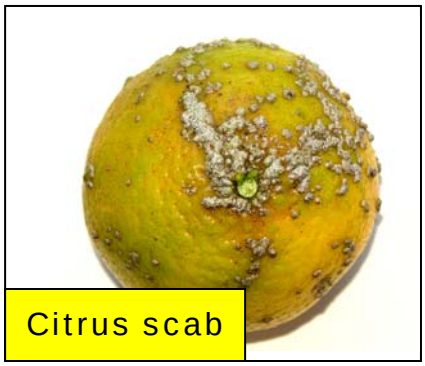
Products	Canker	Greasy Spot	Alternaria	Scab	Melanose	Black spot	PFD
Copper	**Good**	**Good**	**Good**	Moderate	**Good**	Moderate	**Weak**
Oil	None	**Good**	None	None	None	None	None
Ferbam	None	Weak	Moderate	Moderate	Weak	Weak	Weak
Enable 2F		**Good**		**Good**		**Good**	
Headline	None	**Good**	**Good**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

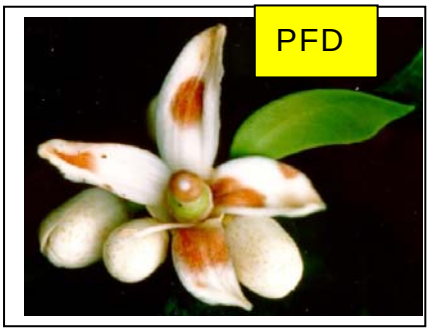












Flatwoods Citrus

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