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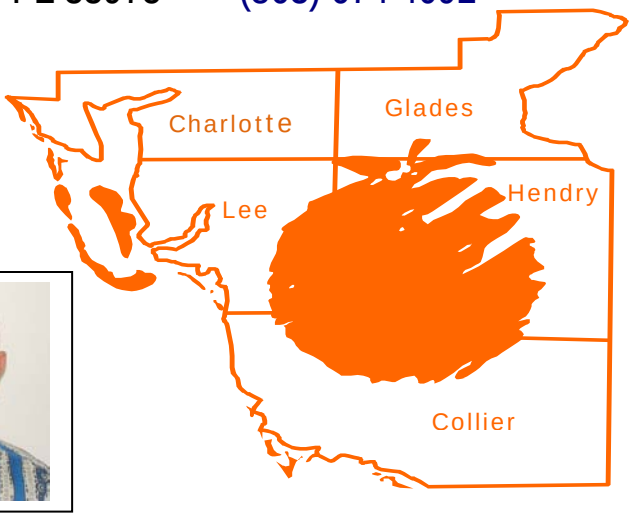
EXTENSION

Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 18, No. 9 **September 2015**

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

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Previous issues of the Flatwoods Citrus newsletter can be found at:
http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm
http://irrec.ifas.ufl.edu/flcitrus/

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

Compost and Citrus Production Workshop 2015

Location: Immokalee IFAS Center, FL
Date: Tuesday, September 22, 2015
Time: 8:30 am to 1 pm
CEUs for Certified Crop Advisors (CCAs) will be provided!

Once compost has passed regulatory health and safety standards, citrus growers and compost producers are interested in potential benefits of its use. Participants will learn the proper use of compost in citrus production. Training will be based on composting principles which promote the improvement of soil physical, chemical and biological properties.

Agenda

8:30-8:45 am Welcome and Introduction by Dr. Mongi Zekri and Dr. Monica Ozores-Hampton

8:45-9:00 am Pre-test

9:00- 9:30 am What is compost? Dr. Monica Ozores-Hampton

9:30-10:00 am The composting process. Dr. Monica Ozores-Hampton

10:00-10:30 am What is considered quality compost for citrus production? Dr. Monica Ozores-Hampton

10:30-10:45 AM Break

10:45-11:15 am Compost benefits and quality considerations. Dr. Monica Ozores-Hampton

11:15-11:45 am Effect of pre-plant compost application on incidence of Asian citrus psyllid and HLB. Dr. Phil Stansly.

11:45 am-12:15 pm Evaluation of long term compost application on soil quality, tree growth and leaf tissue of young grapefruit trees. Dr. Monica Ozores-Hampton

12:15 pm Post-test and Lunch

Pre-registration is required. To reserve a seat, call 863 674 4092 or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

Advanced Citrus Production Systems (ACPS) Field Day

Thursday, October 29, 2015

University of Florida, IFAS, Citrus Research and Education Center
700 Experiment Station Road, Lake Alfred, Florida 33850
CUPS Research Area (next to Ben Hill Griffin Building)

PURPOSE: To demonstrate novel integrated approaches for sustainable citrus production in HLB-endemic environments

TOPICS: Citrus Undercover Production Systems (CUPS), Whole Tree Thermotherapy (WTT), high density planting, scion and rootstock varieties, canopy pruning, drip fertigation, autonomous spraying vehicle, economics

PROGRAM

8:30 am Check-in begins
9:00 am View CUPS/WTT Facility (Arnold Schumann, UF/IFAS CREC)
9:45 am The CUPS/WTT Integrated Pest and Disease Management Program at CREC (Arnold Schumann, UF/IFAS CREC)
10:15 am Economics of Fresh Citrus Production with CUPS (Ariel Singerman, UF/IFAS CREC)
10:35 am Promising Fresh Fruit Varieties and Rootstocks (Fred Gmitter and Jude Grosser, UF/IFAS CREC)
10:55 am The CUPS program at IRREC, Irrigation & Fertigation (Brian Boman, UF/IFAS IRREC)
11:15 am Move to Pruning Trial Site
11:30 am Corrective Canopy Pruning for HLB Rehabilitation (Tripti Vashisth, UF/IFAS CREC)
12:00 pm High density 'Valencia' ACPS trial (Arnold Schumann, UF/IFAS CREC)
12:30 pm Conclusion and Depart

Pre-registration is required by October 23rd
Limited to 80 people

Four Easy Ways to Register

1. Online at https://acpsfieldday2015.eventbrite.com
2. Fax the registration form below to 863-956-8767
3. Call Sarah White 863-956-8632
4. Email completed registration form to Sarah White sewhite@ufl.edu

USDA-SCRI | CREF Citrus Research and Education Foundation, Inc. | IFAS Research Florida Agricultural Experiment Station

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REGISTRATION FORM

ACPS Field Day
Thursday, October 29, 2015
Submit form to: Sarah White, sewhite@ufl.edu Phone: 863-956-8632 Fax: 863-956-8767

Participant Name: _____

Company Name: _____

Mailing Address: _____

Phone: _____ Fax: _____

Email: _____

Field day participants will be limited to 80 people
Pre-registration required by Friday, October 23rd

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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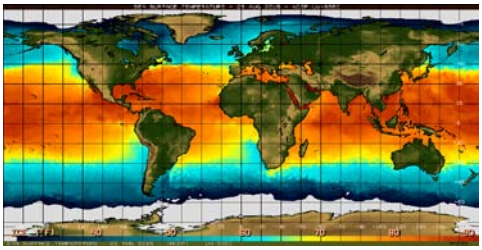
ENSO Alert System Status: El Niño Advisory

http://www.artemis.bm/blog/2015/08/14/el-nino-forecast-suggests-one-of-strongest-on-record-in-2015-noaa/



El Niño forecast suggests one of strongest on record in 2015: NOAA
By Artemis on August 14, 2015

The latest update and forecast update on the El Niño Southern Oscillation (ENSO) from the U.S. NOAA's Climate Prediction Center suggests that the current 2015 El Niño could be among the very strongest on record.

In July the NOAA forecast said that it was likely that El Niño conditions would be stronger and last longer, giving it an 80% chance that it will persist into Spring 2016.

At the latest update yesterday, the NOAA has again increased the likelihood of the 2015 El Niño being strong and long lasting, with a greater than 90% chance that it will continue through the Northern Hemisphere winter of 2015-16, and an 85% chance it will last into early spring 2016.

All models surveyed predict El Niño to continue into the Northern Hemisphere spring 2016, and all multi-model averages predict a strong event at its peak in late fall/early winter (3-month values of the Niño-3.4 index of +1.5oC or greater.

At this time, the forecaster consensus unanimously favors a strong El Niño, with peak 3-month SST departures in the Niño 3.4 region potentially near or exceeding +2.0oC.

Overall, there is a greater than 90% chance that El Niño will continue through Northern Hemisphere winter 2015-16, and around an 85% chance it will last into early spring 2016.

The impacts from El Niño are already being felt in regions such as South America, where there have been a number of severe flooding and rainfall events in recent weeks, as well as in the record start to the Pacific typhoon and tropical season.

For the United States, the temperature and precipitation impacts associated with El Niño are expected to remain minimal during the rest of the summer, but increase into the late autumn and winter. Higher than normal precipitation and above average temperatures would normally be expected.

The stronger the El Niño gets and the longer it lasts the greater the chances of impact all around the world. However the actual impacts do depend on other atmospheric and meteorological factors, making predictions very hard for scientists.

The stronger the El Niño conditions are, typically the clearer cut the impacts are typically expected to be around the globe, which could exacerbate the potential for any El Niño related hit to insurance and reinsurance markets, agriculture and other exposed sectors.

As the forecast consensus becomes increasingly focused on a strong, perhaps almost record, El Niño and a long-lasting one, the potential for it to impact insurance and reinsurance markets grows. It also has ramifications for the weather risk markets, where transactions could be exposed to greater rainfall or temperature anomalies.

ALGAE

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Algae are in the plant kingdom, but maybe they're not really plants!

In Florida's freshwaters, algae are what make the water green, or even "slimy". However, green water is not necessarily undesirable, and neither are algae. In fact, algae are essential to the ecosystem and to life as we know it, and must be treated with respect.

Algae are a diverse group of organisms, which survive in all different types of habitats. They range in size from microscopic to meters in length and in complexity from single-celled to complex organisms that would rival even large plants. Though these organisms may look like the true, "higher", plants, they are anything but, since they do not have roots or true stems and leaves.

Algae are one of the first steps of the food web. There are microscopic algae, like phytoplankton, and there are macroalgae, algae that can be seen by the naked eye. Algae occur naturally in all types of systems and may be considered indicators of ecosystem condition. Even the mere presence of a species can give an indication of the amount and type of nutrients that run through the system. Algae provide food for all types of animals, including fish, insects, mollusks, zooplankton (microscopic animals), and humans.

What causes an algae bloom?

At times algae can grow so quickly and densely that they form a "bloom". Many people don't like the "look" of a bloom, though blooms can be a natural occurrence. Blooms are not necessarily green, though that is the most common color. They can be blue-green, brown, red, and even violet.

Some blooms turn the water a certain color; this is usually a bloom associated with phytoplankton (microscopic algae). Other blooms form clumps or mats that float on top of the water, or that grow attached to the bottom or to plants. Still others can form dense mats that cover the water surface. Algae need nutrients, such as nitrogen and phosphorous, and light to grow. The level of growth or productivity is often dependent on the amount of nutrients in a system. There is a classification for productivity of a system; it ranges from oligotrophic (low productivity and nutrients) to hypereutrophic (very high nutrients). Also, since algae need light to photosynthesize, how far light penetrates the water is also another limiting factor.

Blooms can have far reaching effects on the environment. Some can become so dense they can ultimately cause a problem with low oxygen levels. A decrease in oxygen causes hypoxia (low oxygen) or anoxia (no oxygen) and the other organisms in the water that need oxygen to survive, such as fish, become stressed and may die. Other

blooms may release toxins that can be harmful to animals.

There is a general consensus that rapidly growing human development, and increased human use and disposal of nutrients over the past few centuries, has increased the frequency and intensity of algal blooms in many regions of the world. This has created a global effort to control harmful blooms.

Controlling blooms

The most direct way to control blooms is to reduce the availability of nutrients. Most water management organizations throughout the world are actively pursuing a variety of nutrient control strategies. However, for some aquatic ecosystems nutrient control is impractical, ineffective or simply too costly. For some cases chemical or biological treatments can be helpful alternatives.

Chemical Treatments

Copper sulfate (bluestone) and **chelated copper compounds** such as Cutrine-Plus, Algae Pro, and K-TEA, as well as Endothall are common chemical treatments used to kill algae. Chemical compounds that shade out the light for algae growth, e.g. Aquashade, are also used to control blooms. Each chemical has its own restrictions and toxicity to animals. Read the directions carefully before application.

Biological Treatments

The main biological treatment that is employed today is the use of various carp fish species to control submersed and floating algae. **Grass carp** (*Ctenopharyngodon idella*) is mainly used for aquatic weeds and attached submersed algae, such as *Nitella* sp., and *Chara* sp. Where they do not prefer filamentous algae to eat, grass carp will eat *Lyngbya*. The **silver carp** (*Hypophthalmichthys molitrix*) has been shown to be an effective treatment for controlling filamentous algae, including blue-green algae.

Both species are non-native species and there are many restrictions to employing them as a means of weed control; some states prohibit their use altogether. When they are allowed, the use is restricted to **triploid carp**. Triploid carp have an extra set of chromosomes that render the fish sterile, therefore prohibiting a population explosion if the fish escapes into an uncontrolled area.

Physical Treatments

Physical treatments for algae in ponds include aeration and airlifts. While aeration does not kill or remove algae from the water, it oxygenates and stirs the water column, and can create conditions to shift from toxic and smelly blue-green algae to preferred green algae species. The resultant algal population is usually not as dense or as toxic to other organisms in the ponds.

Mechanical Treatments

Harvesters are sometimes used to skim dense mats of blue-green lyngbya alga from the surface of lakes and rivers. Lyngbya normally grows in dense mats at the bottoms of nutrient enriched lakes. These mats produce gasses during photosynthesis that often causes the mats to rise to the surface. At the surface, winds pile the algal mats against shorelines or in navigation channels; these mats can be several acres in size. Managers have developed a process called "grubbing" whereby harvesting machines lift the mats off of submersed plants such as native eelgrass, without cutting the eelgrass. By removing the blanket of lyngbya from the eelgrass, the plants grow and expand. Eelgrass is an important food source for manatees in the Crystal and Homossassa Rivers.

WHERE FLORIDA'S WATER COMES FROM?

Please be active in conserving and protecting our waters

Average annual rainfall in Florida is 53 inches, making it one of the wettest states in the nation. The state's differing climate types yield much rainfall variability from region-to-region and from year-to-year. In central and South Florida, most of the rain falls during four summer months and much of the annual amount is "lost" to the natural hydrologic system through evaporation. The region is prone to wide weather extremes of flood and drought.

Nearly two-thirds of Florida's freshwater use is pumped from vast underground reservoirs called aquifers. Of Florida's groundwater sources, the deep Floridan Aquifer, which spans the majority of the state, supplies 62%; the shallower Biscayne Aquifer (underlying most of Miami-Dade and Broward and portions of Palm Beach and Monroe counties), provides 17%; the remaining 21% is supplied by surficial and intermediate unnamed aquifers. The state's remaining freshwater is supplied from surface waters, including lakes and rivers.

In South Florida, approximately 90% of the water used in homes and businesses comes from groundwater sources. The remaining 10% comes from surface waters. Both surface and groundwater supplies are highly dependent on rainfall for replenishment.

At the heart of the South Florida system sits Lake Okeechobee – the largest natural water body in the southeastern United States. It serves as a source of public water supply for the City of Okeechobee (16,000 utility customers) and provides a supplemental source of irrigation water to more than 700,000 acres in agricultural production. In addition, it serves as the back up water supply for more than five million residents. The massive lake also plays a critical environmental and economic role as a sport and commercial fishery, navigation/recreation waterway and natural habitat for fish, wading birds and other wildlife, including a variety of endangered and threatened species.

While heavy rainfall throughout South Florida benefits and recharges underground supplies, the ability to capture and store the rainwater for future use is extremely limited. When floods threaten – even during water shortage situations – the top priority is channeling the excess water away from homes and businesses as quickly as possible. To lower the levels in coastal canals and accommodate direct rainfall and stormwater runoff, freshwater must oftentimes be released to the ocean or gulf.

The demand for water by growing urban populations and agricultural operations in South Florida is expected to increase significantly in the coming decades. Meeting the growing need for water hinges on our efforts to develop region-specific sources that offer an alternative to traditional ground water and surface water. Alternative water sources are important to Florida's future. They also help to make communities less susceptible to the effects of drought.

Developing alternative water sources diversifies our supply while reducing our dependence on fresh water resources. Examples of Alternative Water Supply are:

- saltwater and brackish water
- water reuse
- surface water captured predominately during heavy rainfalls
- sources made available through the addition of new storage capacity
- stormwater (for use by a consumptive use permittee)
- any other source designated as nontraditional in a regional water supply plan

To address the challenge of ensuring the state's current and future water supply, the 2005 Florida Legislature enacted the Water Protection and Sustainability Program. This precedent-setting law encourages cooperation between municipalities, counties and the state's five water management districts to protect and develop water supplies in a sustainable manner. Water management districts are promoting and supporting local government alternative water supply projects that support smart growth and reduce the use of fresh ground and surface water supplies, such as aquifers and lakes for a sustainable future.

Water reuse plays an important role in water resource, wastewater and ecosystem management in Florida. When reclaimed water is used, it eases the demand on traditional, often limited, sources of water. By recycling or reusing water, communities can still grow while minimizing or even reducing their impact on the water resources around them.

Water reuse involves using highly treated domestic wastewater for a new purpose. Reclaimed water systems are continually monitored to ensure the health and welfare of the public and the environment are protected.

Using reclaimed water also reduces discharges to surface waters, recharges ground water and postpones costly capital investments in the development of new, more costly water sources and supplies. Reclaimed water is an excellent water source for:

--Irrigating golf courses, residences, highway and street medians and other landscaped areas
--Meeting urban demands for water to wash cars, flush toilets and maintain ponds and fountains
--Meeting industrial and commercial demands for water at power plants and for processing needs
--Irrigating food crops, such as citrus, and irrigating other crops and pastures for livestock
--Creating wetlands and enhancing restoration
--Recharging groundwater

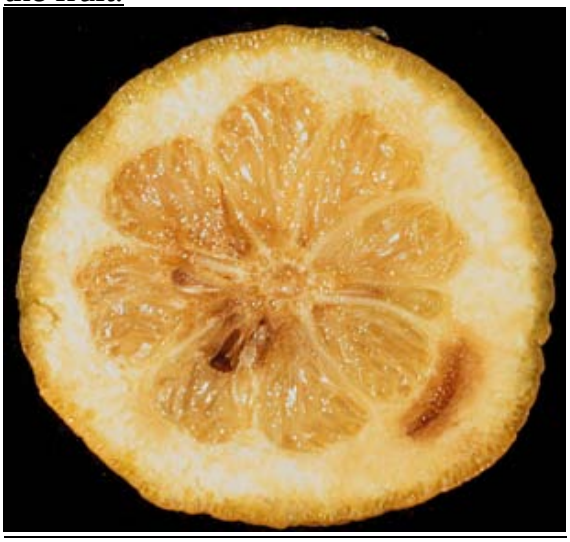
FALL NUTRITION OF CITRUS TREES

To increase fertilizer efficiency, soil and leaf analysis data should be studied and taken into consideration when generating a fertilizer program and selecting a fertilizer formulation. Dry fertilizer application should be split into 3 to 4 applications per year with a **complete balanced fertilizer**. Based on tree demands, 1/4 to 1/3 of the yearly fertilizer amount should be applied in the fall to satisfy vegetative growth demand. However, late fall fertilizer applications may delay fruit color development and fruit maturity for early season tangerine cultivars.

Boron (B)

Boron is particularly necessary where active cell division is taking place. Boron plays an important role in flowering, pollen-tube growth, fruiting processes, nitrogen (N) metabolism, and hormone activity. Florida sandy soils are low in B, and a deficiency of this element in citrus occasionally occurs under field conditions. The deficiency may be aggravated by severe drought conditions, heavy lime applications or irrigation with alkaline water, and by citrus greening. Boron is very mobile in the soil profile of sandy soils and readily leaches by rainfall or excess irrigation.

Boron deficiency is known as "hard fruit" because the fruit is hard, low in juice content, and even dry due to lumps in the rind caused by gum impregnation. The chief fruit symptoms include premature shedding of young fruits. Such fruit have brownish discoloration in the white portion of the rind (albedo), described as gum pockets or impregnations of the tissue with gum and unusually thick albedo. Older fruit are undersized, lumpy, misshaped with an unusually thick albedo containing gum deposits. Affected fruit is low in sugar content. Seed fails to develop and gum deposits are common around the axis of the fruit.



The first visual symptoms of B deficiency are generally the death of the terminal growing point of the main stem. Further symptoms are a slight thickening of the leaves, a tendency for the leaves to curl downward at right angles to the midrib, and sometimes chlorosis. Young leaves show small water soaked spots or flecks becoming translucent as the leaves mature. Leaves of boron deficient citrus trees exhibit vein corking and enlargement.

Associated with this is a premature shedding of leaves starting in the tops of the trees and soon leaving the tops almost completely defoliated. Fruit symptoms

appear to be the most constant and reliable tool for diagnostic purposes.

To treat citrus affected with B deficiency, B compounds can be applied either foliarly or in the fertilizer. As a maintenance program, apply B in the fertilizer at an annual rate equivalent to 1/250 of the N rate. In Florida, foliar spray applications have been found much safer and more efficient than soil application. Soil applications frequently fail to give satisfactory results during dry falls and springs and may result in toxicity problems if made during the summer rainy season. Boron solubility in the soil is reduced at soil pHs below 5 and above 7. Foliar spray may be applied during the dormant period through post bloom and in the fall. Boron does not move very readily from parts of the tree to others. For maintenance spray application, 0.25 lb/acre of B may be used. Boron levels in the leaf tissue should not drop below 40 ppm or exceed 120 ppm (dry wt basis). Where deficiency symptoms are present, double the amount suggested. Use care not to apply more than the recommended amount because it is easy to go from deficiency to excess.

MAGNESIUM NUTRITION

In Florida, magnesium (Mg) deficiency is commonly referred to as "bronzing". Trees with inadequate Mg supply may have no symptoms in the spring growth flush, but leaf symptoms will develop as the leaves age and the fruit expand and mature in the summer and fall. Magnesium deficiency symptoms occur on mature leaves following the removal of Mg to satisfy fruit requirements. During the summer, when a rapid increase in fruit size occurs, the symptoms appear on leaves close to the developing fruit. Magnesium deficiency symptoms appear as a result of translocation of Mg from the leaves to the developing fruit, although there may also be a translocation from older leaves to young developing leaves on the same shoot.

Disconnected yellow areas or irregular yellow blotches start near the base along the midribs of mature leaves that are close to fruit. They become gradually larger and eventually coalesce to form a large area of yellow tissue on each side of the midrib. This yellow area enlarges until only the tip and the base of the leaf are green, showing an inverted V-shaped area pointed on the midrib.

In acute deficiency, the yellow area may gradually enlarge until the entire leaf becomes yellow or bronze in color.

Leaves that have lost most of their green color due to Mg deficiency drop freely under unfavorable conditions. Defoliated twigs become weak and usually die by the following spring. Severe defoliation will reduce the average size of individual fruit

and cause a general decline in fruit production. In Florida, Mg deficiency in citrus is caused primarily by low levels of Mg on acid light sandy soils and on calcareous soils. Leaching of added Mg is particularly serious and substantially rapid when the soil pH is 4.5 to 5.0. Under such conditions, the use of dolomite to bring the pH to 6.0 will furnish Mg at the same time.

FIXING Mg DEFICIENCY

Soil application of Mg sulfate or oxide to provide 50-60 lbs of Mg per acre can be successful in correcting Mg deficiency when the soil pH is adjusted. Under calcareous soils, the amounts of Mg applied must be greater than those applied on soils low in calcium or potassium. Foliar spray applications of Mg nitrate (3-5 gallons/acre) can be effective when applied on the spring and summer flush leaves when they are about fully expanded. Remember that Magnesium should be applied regularly at 1/5 (or 20%) of the N rate unless leaf analysis shows more than 0.50% Mg. If leaf Mg deficiency symptoms occur, Mg should be applied in the fertilizer, and the rate should be increased up to 30% of the N rate until symptoms are no longer present in mature leaves of subsequent flushes.

For more information on citrus nutrition, **go to the following EDIS publications:**

Increasing Efficiency and Reducing Costs of Citrus Nutritional Programs
Mongi Zekri, Thomas Obreza and Arnold Schumann [pdf]

Irrigation, Nutrition, and Citrus Fruit Quality
Mongi Zekri, Thomas A. Obreza and Robert Koo [pdf]

Micronutrient Deficiencies in Citrus: Iron, Zinc, and Manganese
Mongi Zekri and Thomas A. Obreza [pdf]

Micronutrient Deficiencies in Citrus: Boron, Copper, and Molybdenum
Mongi Zekri and Thomas A. Obreza [pdf]

Macronutrient Deficiencies in Citrus: Calcium, Magnesium, and Sulfur
Mongi Zekri and Thomas A. Obreza [pdf]

Macronutrient Deficiencies in Citrus: Nitrogen, Phosphorus, and Potassium
Mongi Zekri and Thomas A. Obreza [pdf]

Magnesium (Mg) for Citrus Trees
Mongi Zekri and Tom Obreza
http://edis.ifas.ufl.edu/ss582

Boron (B) and Chlorine (Cl) for Citrus Trees
Mongi Zekri and Tom Obreza
https://edis.ifas.ufl.edu/ss619

Plant Nutrients for Citrus Trees
Mongi Zekri and Thomas A. Obreza [pdf]

Controlled-Release Fertilizers for Florida Citrus Production
Tom Obreza and Bob Rouse [pdf]

Prioritizing Citrus Nutrient Management Decisions Thomas A. Obreza [pdf]

Managing Phosphorus Fertilization of Citrus using Soil Testing Thomas A. Obreza [pdf]

Effects of P and K Fertilization on Young Citrus Tree Growth Thomas A. Obreza [pdf]

IRRIGATION, NUTRITION AND FRUIT QUALITY

Florida has the highest citrus fruit quality standards in the world. Fruit quality factors include juice content, soluble solids and acid concentrations, soluble solids-acid ratio, fruit size, and color. Florida citrus growers know that quality factors differ for the fresh and processing markets. For example, fruit size, shape, color, and maturity date are most important for fresh fruit, but high juice content and soluble solids are desired for processing fruit. Fruit quality is affected by several factors including cultivar, rootstock, climate, soil, pests, irrigation, and nutrition.

The effects of irrigation and nutrition on fruit quality are very important and should be understood and taken into consideration by citrus growers and production managers to increase their profitability and enhance their sustainability and competitiveness on a worldwide basis. In general, excessive irrigation and nutrition reduce fruit quality. Therefore, balanced nutrition with sound irrigation scheduling based on **IFAS** recommendations should be a high priority management practice for every grower. Citrus trees require a properly designed, operated, and maintained water management system and a balanced nutrition program formulated to provide specific needs for maintenance and for expected yield and fruit quality performance. Irrigation contributes to the efficiency of fertilizer programs. 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 watering or fertilization will result in poor fruit quality. The most important management practices influencing fruit quality are irrigation and nitrogen, phosphorus, potassium, and magnesium nutrition. However, when any nutrient element is severely deficient, fruit yield and fruit quality will be negatively altered. Trends in fruit quality response to high nutrition and irrigation are described and summarized below.

Nitrogen (N)

- Increases juice content and color, total soluble solids (TSS), and acid content.
- Increases soluble solids per box and per acre. However, excessive N, particularly with inadequate irrigation, can result in lower yields with lower TSS per acre.
- Decreases fruit size and weight.
- Increases peel thickness and green fruit at harvest.
- Increases incidence of creasing and scab but decreases incidence of peel blemishes such as wind scar, mite russeting, and rind plugging.
- Reduces stem-end rot incidence and green mold of fruit in storage.

Phosphorus (P)

- Reduces acid content, which increases soluble solids-acid ratio. Phosphorus rates have no effect on soluble solids per box but may increase soluble solids per acre due to increase in fruit production in soils that are low in P.

- Increases number of green fruit but reduces peel thickness.
- Increases expression of wind scar but reduces that of russeted fruit.

Potassium (K)

- Potassium produces mostly negative effects on juice quality except soluble solids per acre. Potassium increases fruit production therefore producing more soluble solids per acre.
- Decreases juice content, soluble solids, ratio, and juice color.
- Increases acid content.
- Increases fruit size, weight, green fruit and peel thickness.
- Reduces incidence of creasing and fruit plugging. In storage, reduces stem-end rot.

Magnesium (Mg)

- Slightly increases soluble solids, soluble solids-acid ratio, soluble solids per box and soluble solids per acre.
- Slightly increases fruit size and weight but decreases rind thickness.

Irrigation

- Increases juice content and soluble solids-acid ratio.
- Reduces soluble solids and acid contents. Soluble solids per box will decrease, but soluble solids per acre may increase due to yield increase.
- Increases fruit size and weight, increases green fruit at harvest, but decreases rind thickness.
- Increases incidence of blemish from wind scar, scab and *Alternaria* brown spot, but reduces rind plugging.
- Reduces stem-end rot incidence but increases incidence of green mold in storage.

Specific effects on juice and external fruit qualities are summarized in the Table below. This summary is based on numerous field experiments conducted over many years. Most of these effects were consistently observed, but some of them appear to depend on local conditions and growing regions.

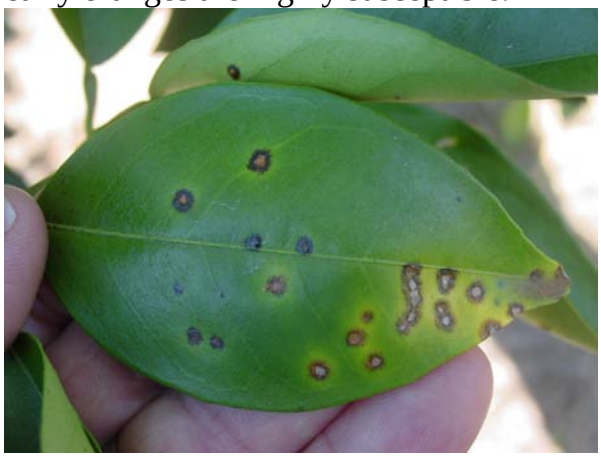
EFFECTS OF MINERAL NUTRITION AND IRRIGATION ON FRUIT QUALITY

Variable	N	P	K	Mg	Irrigation
Juice Quality					
juice content	+	0	-	0	+
soluble solids (SS)	+	0	-	+	-
acid (A)	+	-	+	0	-
SS/A ratio	-	+	-	+	+
juice color	+	0	-	?	0
solids/box	+	0	-	+	-
solids/acre	+	+	+	+	+
External Fruit Quality					
size	-	0	+	+	+
weight	-	0	+	+	+
green fruit	+	+	+	0	+
peel thickness	+	-	+	-	-

Increase (+), Decrease (-), No change (0), No information (?).

Citrus Canker is still a devastating problem

Citrus canker is a serious bacterial disease that affects citrus. Grapefruit and some early oranges are highly susceptible.



Major outbreaks of citrus canker occur when new shoots are emerging or when fruit are in the early stages of development. Frequent rainfall in warm weather, especially during storms, contributes to disease development. Citrus canker is mostly a leaf-spotting and fruit rind-blemishing disease, but when conditions are highly favorable for infection, it causes defoliation, shoot die-back, and fruit drop. When feeding galleries of Asian leafminer on leaves, stems, and fruit become contaminated with the bacterium, the number and size of individual lesions greatly increases and results in tremendous inoculum production.

Canker is more severe on the side of the tree exposed to wind-driven rain. Spread over longer distances can occur during severe tropical storms, hurricanes, and tornadoes. Workers can carry bacteria from one location to another on hands, clothes, and equipment. Grove equipment spreads the bacteria in blocks within groves, especially when trees are wet. The entire state of Florida has been under quarantine, and fruit movement is subject to specific regulations based on market destination.

Windbreaks. Windbreaks are highly effective in reducing the spread of canker, but more importantly, they reduce the severity of the infection in endemic situations. The vast majority of the infection occurs by wind-blown rains. Winds of 18 to 20 mph are needed to actually force bacteria into the stomates on leaves and fruit. Windbreaks are the single most effective means of dealing with canker. To be effective for canker control, windbreaks need not to be dense. All that is required is to reduce wind speed to less than 20 mph.
It is recommended that growers plant windbreaks along fence lines, ditches, around wetlands, or wherever they can plant without removing citrus trees. If it becomes obvious that more windbreak protection is needed, rows of citrus or end trees can be removed to accommodate windbreaks.

Copper sprays. Copper products are quite effective in preventing infection of fruit, less effective for reducing leaf infection, and have limited value in reducing spread of the disease. Application of copper to young leaves protects against infection, but protection is soon lost due to rapid expansion of the surface area. Fruit grows

more slowly and is easier to protect. Fruit is susceptible to infection after the stomates open when the fruit is about 1/2- to 1-inch in diameter until they develop resistance in mid to late July. Infection through wounds can occur at any stage.
It is believed that most of the infection will occur during June and July. With endemic canker, we suggest that three copper sprays be used for early oranges grown for processing, one in mid-May, a second in mid-June, and a third in mid-July. If canker continues to be very severe, another application of copper in August will be needed. Two applications should be sufficient for Valencias, in early June and early July.
Programs for fresh fruit are more complex, but many copper sprays are already used on these varieties. For fresh market grapefruit, a low rate of copper should be added to the spray of spring flush for scab. Subsequently, the copper spray program used for melanose control should also control canker, but additional applications may be needed in late June, July, and August. Copper may need to be added to applications of fungicides or petroleum oil.
Most tangerines are fairly tolerant to canker. Programs used for control of Alternaria should also protect against canker, but copper will have to be used in each spray. Navel oranges are highly susceptible to canker and will probably need to be sprayed every 3 weeks from late April through August. Fallglo is more tolerant and probably three sprays in May, June, and July should suffice.
The rates needed depend on the length of protection expected and the weather. As little as 0.5 to 1.0 lb of metallic copper will protect spring flush growth or fruit during the dry spring season. However, in the rainy season, 2 lb of metallic copper will be required to protect fruit for 3 to 4 weeks.
Copper usage should be minimized since this metal accumulates in soil and may cause phytotoxicity and creates environmental concerns.

Leafminer control. The citrus leafminer does not spread canker, but extensive infestation by leafminer greatly increases canker inoculum levels making the disease difficult to control. Leafminer control on the first summer flush can reduce disease pressure considerably. If properly timed, applications of petroleum oil, Agri-mek plus oil, Micromite, Spintor, or Delegate will reduce damage by leafminer. Late summer flushes tend to be erratic and effective control at that time will probably be difficult.

The Citrus Leafminer

Leafminer populations decline to their lowest levels during the winter, due to cool temperature and the lack of flush for larval development. Populations of leafminer build rapidly on the spring flush, although their presence is not apparent until late spring as populations increase while the amount of new foliage decreases. The summer period of high leafminer damage coincides with the rainy season when canker spread is most likely.

Citrus leafminer greatly exacerbates the severity of citrus canker caused by *Xanthomonas axonopodis* pv. *citri*. This insect is not a vector of the disease. Nevertheless, leafminer tunnels are susceptible to infection much longer than mechanical wounds. Tunnels infected by canker produce many times the amount of inoculum than in the absence of leafminer. Control of leafminer should be optimized in areas where infection by canker is high. Natural enemies already present in Florida have responded to leafminer infestations, causing in excess of 50% mortality of larvae and pupae in some areas. The introduced parasitoid *Ageniaspis citricola* has established throughout most of Florida, with rates of apparent parasitism reaching 90% or more. However, these high rates of parasitism are not seen until late in the year.

Leafminer Management

Nonbearing Trees

On young trees, use of the soil-applied systemic insecticides is the most effective means of preventing mining damage on the new flush and has little direct effect on natural enemies. Soil drenches directly to the base of the tree with Imidacloprid (Admire), Clothianidin (Belay) or Thiamethoxam (Platinum) have been shown to provide at least 8 weeks control of leafminer.

Soil applications of soil-systemic insecticides should be made about 2 weeks prior to leaf expansion to allow time for the pesticide to move from the roots to the canopy. Avoid applications 24 hours prior to significant rainfall events which will result in movement of the product out of the root zone before it can be taken up by the plant. When the residual effects of the spring application have worn off, typically during the mid-summer rainy season, foliar sprays can be used on small trees to reduce leafminer damage.

Bearing Trees

If canker is present in a grove (or in a nearby grove), healthy trees with leafminer damaged leaves are more likely to become sites for new canker infection. The only products currently available for leafminer control on large trees are foliar insecticide sprays. While there are a number of products that are effective for controlling leafminer, achieving control of leafminer using foliar sprays on large trees is difficult due to the unsynchronized flush typically encountered during the summer period when leafminer populations are at their highest levels.

Since leafminers affect only developing leaves, coverage of peripheral leaves in the canopy should be adequate to exert suppression when applying foliar pesticides.

For more information, go to
http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/ACP%20and%20Leafminer.pdf

http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Canker.pdf

CITRUS BLACK SPOT Quarantine Area Keeps Expanding

History of Citrus Black Spot

Citrus black spot, caused by the fungal pathogen *Guignardia citricarpa* (sexual stage) and *Phyllosticta citricarpa* (asexual stage), was first found in southwest Florida in March 2010. Around the world, black spot can be found in Argentina, Australia, Brazil, China, Ghana, Mozambique, Philippines, South Africa, Sub-Saharan Africa, Taiwan and other regions of South America.

Fruit Symptoms

Black spot symptoms occur in several forms called hard spot, cracked spot, false melanose and virulent spot which are described below.
Hard spot is the most common and diagnostic symptom. The lesions are small, round, sunken with gray centers and brick-red to chocolate brown margins. Green halos are often seen around hard spot lesions. Fungal structures appear as slightly elevated black dots in the center of lesions. They appear as fruit begins to color where light exposure is greatest.
False melanose is observed as numerous small, slightly raised lesions that can be tan to dark brown. It may occur on green fruit and does not have pycnidia (fungal structures). False melanose may become hard spot later in the season.

Cracked spot has large, flat, dark brown lesions with raised cracks on their surface. It is thought to be caused by an interaction between the pathogen and rust mites. It occurs on green as well as mature fruit and can become hard spot later in the season.

Early virulent spot, also known as freckle spot, has small reddish irregularly shaped lesions. It occurs on mature fruit as well as post-harvest in storage. It can develop into either virulent spot or hard spot. Virulent spot is caused by the expansion and/or fusion of other lesions covering most of the fruit surface toward the end of the season. Many fungal structures can be found in these lesions.
Severely affected fruit can drop before harvest causing significant yield loss.

Leaf and Stem Symptoms

Leaf and stem symptoms are not as common as fruit symptoms. They are most commonly found on lemons, a very susceptible species.

Regulations

Stipulations for Movement of Citrus Fruit from EAN Regulated Areas for Citrus Black Spot PDF
More information will be added as it becomes available. However, for most up-to-date information from regulatory agencies, please contact the Florida Division of Plant Industry 863-298-3000.

Spread

•Wind-borne ascospores are forcibly ejected from fungal fruiting bodies embedded in leaves in the leaf litter under trees and are carried by air currents, approximately 75 feet (25 meters) from leaf litter.
•Rain splash may also move spores from infected fruit (conidia) and/or leaf litter (conidia and ascospores), but moves the spores only a few inches (centimeters).
•Live leaves that have latent infections (infections that are not visible) are common means of long distance spread. These often are moved as trash in loads of fruit.
•Infected nursery stock is another potential means of spread. This can occur very easily since these latent infections cannot be seen in otherwise healthy-looking trees.
•Leaf litter movement may be either by wind or human activities
•Humans are the main form of long distance movement

Diagnostics

If you suspect you may have black spot, please contact your local CHRP office for further diagnostic testing.

Management

•Always plant clean, certified nursery stock. Keeping nursery stock clean is much easier with the new covered nursery regulations but black spot is still a threat. This will help prevent movement of black spot and other diseases into newly established grove plantings.
•Increase air flow in grove to reduce leaf wetness where possible. *G. citricarpa* needs 24-48 hours of leaf wetness for spore germination and infection as do many other fungal diseases.
•Reduce leaf litter on grove floor to decrease ascospore load through enhanced microsprinkler irrigation.
•Fungicides registered for citrus in Florida that have been found effective in other countries:
-Copper products (all formulations have been found to be equivalent)
-Strobilurins fungicides are also useful and approved.
•The best fungicide application method is with air blast sprayer. Aerial applications are not likely to get adequate canopy penetration for control. It is important that the leaves and fruit are covered with fungicide.
•For enhanced coverage, increase the gallons used to 250 gallons/acre for applications to ensure full coverage.
•Strategies for Effective Eradication of Citrus Black Spot in Collier and Hendry Collier

Links

Florida Division of Plant Industry Citrus Black Spot Updates website
USDA Press Release-English PDF
USDA Press Release-Spanish PDF
Florida Division of Plant Industry Pest Alert PDF
Fungicide resistance: Why it happens and how it may affect you. Citrus Industry, March 2010 PDF
Citrus black spot. Citrus Industry, January 2010 PDF

•It is important to get good canopy coverage with fungicides for black spot control. To ensure complete coverage consider using a spray volume of 250 gallons per acre.
•Leaf litter management is also an important tool for black spot management since the primary spores are produced in the litter like greasy spot. The measures described below have shown to effectively reduce greasy spot inoculum, although not enough to eliminate fungicide applications.
•Urea (20.8 lb/treated acre) through the herbicide boom or ammonium sulfate (561 lb/acre) application will reduce the number of fungal structures and spore production.
•Enhanced irrigation with microsprinkler five times a week starting mid-March and continuing until litter is decomposed.

Resources

If you would like to obtain laminated identification sheets or copies of the other various educational materials, please contact your citrus extension agent or Jamie Burrow, 863-956-8648 or jdyates@ufl.edu.
Citrus Black Spot ID Sheet PDF
Citrus Black Spot Management Timing Schedule PDF
Citrus Black Spot Poster for Growers (18 x 27) PDF
Citrus Black Spot Poster for Packinghouses (32 x 26) PDF

Recommended Chemical Controls

Monthly fungicide applications of copper and/or strobilurins (Abound, Gem, or Headline) will be needed from early May to mid-September to control black spot. If there is substantial rain in April, starting fungicide applications in April is advised. Our fungicide recommendations have been based on efficacy data from trials in other countries with black spot and products registered for use on citrus in Florida. Field testing in Florida of fungicides including Abound, copper-based products, Enable, Gem, Headline, Pristine, and Quadris Top indicate that all of these fungicides can be useful in a fungicide program. Since only four strobilurin fungicides can be used in a season for any purpose, it is recommended for fresh fruit to reserve strobilurin fungicides for times when phytotoxicity from copper applications is a concern (temperatures >94°F). For processing fruit, strobilurins can be used earlier in the season and applications combined for greasy spot and melanose. It is recommended that strobilurin fungicides not be applied in two consecutive sprays to manage pathogen resistance and rotated with a fungicide containing another mode of action.

READ THE LABEL. See Table 1.
Rates for pesticides are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment including handguns, mix the per acre rate for mature trees in 250 gallons of water. Calibrate and arrange nozzles to deliver thorough distribution and treat as many acres as this volume of spray allows.

TABLE 1. RECOMMENDED CHEMICAL CONTROLS FOR CITRUS BLACK SPOT

Pesticide	FRAC MOA[2]	Mature Trees Rate/Acre[1]
copper fungicide	M1	Use label rate.
Abound[3]	11	9.0-15.5 fl oz. Do not apply more than 92.3 fl oz/acre/season for all uses. Best applied with petroleum oil.
Enable 2F[4]	3	8.0 fl/oz. Do not apply more than 24 oz/acre/season
Gem 500 SC[3]	11	1.9-3.8 fl oz. Do not apply more than 15.2 fl oz/acre/season for all uses. Best applied with petroleum oil. Do not apply within 7 days of harvest.
Headline SC[3]	11	12-15 fl oz. Do not apply more than 54 fl oz/acre/season for all uses. Best applied with petroleum oil.
Pristine[3,4]	11 + 7	16-18.5 oz. No more than 74 oz/acre/season
Quadris Top[3,4]	11 + 3	15.4 fl oz. Do not apply more than 61.5 fl oz/acre/year

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

[2] Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2014. Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2015 Florida Citrus Pest Management Guide for more details.

[3] Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides.

[4] Do not make more than 4 applications of Pristine or Quadris Top/season. Do not make more than 2 sequential applications of Pristine or Quadris Top before alternating to a non-strobilurin, SDHI or DMI

http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Citrus%20Black%20Spot.pdf

Flatwoods Citrus

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☐ 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

Subscriber's Name:_____

Company:_____

Address:_____

City:_____State:_____Zip:_____

Phone:_____

Fax:_____

E-mail:_____

Racial-Ethnic Background

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

Gender

__Female
__Male