UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

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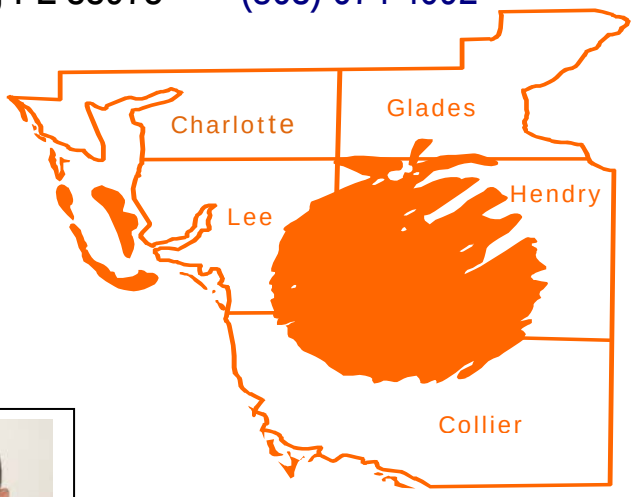
Flatwoods Citrus



Vol. 20, No. 9 **September 2017**

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

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

Seminar

Title: Breeding Citrus for HLB Tolerance

Location: Southwest Florida Research and Education Center, Immokalee
Date & time: Wednesday, 20 September 2017, 10:00 AM – 12:00 Noon
Speakers: Dr. Jude Grosser and Dr. Fred Gmitter, UF-IFAS
Program Coordinator: Dr. Mongi Zekri, UF-IFAS
Program Sponsors: Frank Miele with Magna-Bon, Ward Gunter with ICL Specialty Fertilizers, Heath Prescott with KeyPlex, and Jack Zorn & Todd Wilson with Tiger-Sul

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

Pre-registration is required. No registration fee and lunch is free Thanks to Frank Miele with Magna-Bon, Ward Gunter with ICL Specialty Fertilizers, Heath Prescott with KeyPlex, and Jack Zorn & Todd Wilson with Tiger-Sul. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

Agenda

DEVELOPMENT OF HLB-TOLERANT CITRUS VARIETIES AND ROOTSTOCKS:

Identification of natural variation for HLB sensitivity
Breeding and potential mutant selection
Characterization of tolerance mechanisms by genetic and anatomical analyses
Potential applications of GMO or CRISPR technologies, and associated challenges
Variation in Rootstock Responses to HLB in ongoing field trials
Screening new rootstock candidates directly for HLB tolerance
Effects of HLB on root nutrition – secondary and micronutrient deficiencies
Emerging successful nutrition programs focusing on root health

----10:00 AM – 10:55 AM
Dr. Fred Gmitter, UF-IFAS will cover scion breeding and he will also talk about genetic work to understand tolerance and how that potentially is applied using CRISPR technology.

10:55 AM – 11:05 AM Break

----11:05 AM - 12:00 Noon
Dr. Jude Grosser, UF-IFAS will cover rootstocks and genetic X nutritional interactions and impacts on scion performance.

CCA Training

University of Florida/IFAS Certified Crop Adviser CEU Session
Wednesday, October 11, 2017
Lake Alfred, Balm, Gainesville, Ft. Pierce, and Immokalee
For more information, contact: Rao Mylavarapu, Ph.D.
Professor and Director of IFAS Analytical Services Laboratories
Phone: 352 294 3113
E-mail: raom@ufl.edu

Seminar

Title: Nutrient management of citrus trees

Location: Southwest Florida Research and Education Center, Immokalee
Date & time: Wednesday, 25 October 2017, 10:00 AM – 12:00 Noon
Speakers: Dr. Kelly Morgan, Dr. Mongi Zekri, and Eric Waldo
Program Coordinator: Dr. Mongi Zekri, UF-IFAS
Program Sponsors: Eric Waldo with YARA
2 CEUs for certified crop advisors (CCAs)

Seminar

Citrus Health Management Areas (CHMAs)

Title: Citrus Health Management Area (CHMA)

Location: Southwest Florida Research and Education Center, Immokalee
Date & time: Tuesday, 14 November 2017, 10:00 AM – 12:00 Noon
Speakers: Dr. Phil Stansly and others
Program Coordinators: Ron Hamel, GCGA and Mongi Zekri, UF-IFAS
2 CEUs for pesticide license renewal
2 CEUs for certified crop advisors (CCAs)

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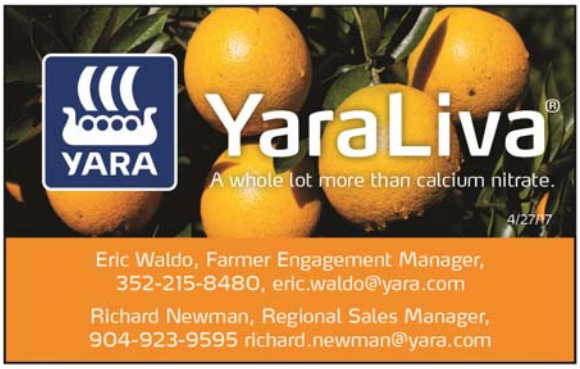

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

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

10 August 2017

ENSO Alert System Status: Not Active

Synopsis: ENSO-neutral is favored (~85% chance during Jul-Sep, decreasing to ~55% during Dec-Feb) through the Northern Hemisphere winter 2017-18.

During July, ENSO-neutral continued, as equatorial sea surface temperatures (SSTs) were near average across most of the Pacific Ocean (Fig. 1). The latest weekly Niño SST index values were close to zero in all four Niño regions (Fig. 2), having recently decreased from higher levels in the Niño-4 and Niño-3.4 regions. The upper-ocean heat content anomaly was near average during July (Fig. 3), reflecting below-average temperatures along the thermocline across the central and eastern Pacific overlain by slightly above-average temperatures (Fig. 4). Tropical convection was near average over the eastern half of the Pacific and enhanced over the western Pacific and the Maritime Continent (Fig. 5). The lower-level trade winds were slightly enhanced near the International Date Line, and upper-level winds were near average over most of the tropical Pacific. Overall, the ocean and atmosphere system remains consistent with ENSO-neutral.

The majority of models favor ENSO-neutral through the remainder of 2017 (Fig. 6). These predictions, along with the demise of the recent Pacific warmth and continued near-average atmospheric conditions over the Pacific, lead forecasters to favor ENSO-neutral through the winter. However, some chance for El Niño (15-20%) or La Niña (25-30%) remains during the winter. Also, ENSO-neutral conditions are predicted for the upcoming peak months (August-October) of the Atlantic hurricane season. In summary, ENSO-neutral is favored (~85% chance during Jul-Sep, decreasing to ~55% during Dec-Feb) through the Northern Hemisphere winter 2017-18 (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

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 14 September 2017. 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

EFFECT OF WATER pH ON EFFICACY OF PESTICIDES

Successful citrus growers should check the soil pH of their groves yearly and do their best to adjust it for better fertilizer efficiency, tree growth, and fruit production. Soil pH is usually increased by liming and decreased by applying sulfur or acid-forming fertilizers. The pH indicates whether the solution or media is acidic or basic (alkaline). The pH scales goes from 0 to 14, where 7 indicates neutrality. Values less than 7 indicate acidic solutions and values greater than 7 indicate a basic condition. Most of Florida fresh waters have pH values between 7 and 8. Although the pH is the most common measured property or characteristic of a solution or a media, some growers and production managers still ignore to adjust the pH of their water when used for pesticide mixing. For better efficacy, anyone involved in pesticide mixing should use a pH meter. The pH affects the rate at which some herbicides are absorbed by plants. Adjusting the pH of the water allows the user to reduce the rates of herbicides without reducing their efficacy. The effectiveness of spray mixture in the spray tank can be affected by a number of variables. A significant impact on the efficacy of many spray materials is the pH of the water used in the tank. In general, it is desirable to have the pH of the water below 7. Although several chemicals used today are effective at a wide range of pH conditions, many others can be subject to breakdown of the active ingredient at relatively high pH values. With extremely sensitive chemicals, this breakdown can begin between mixing and application. Sevin is among the common pesticides that lose their effectiveness quickly in alkaline (pH values greater than 7) solution. Therefore, it is recommended to reduce the pH of the water in the tank to increase the efficacy of some chemicals. Acidifying agents such as phosphoric acid and citric acid will lower the pH, but can drop it too low. Buffering agents, available from most distributors, will lower the pH to the desired range and help maintain it at that level. It is important to add the buffer to the spray tank water before pesticides are added. **Glyphosate works better when ammonium sulfate is added to the spray tank at rates of 8.5 to 17 pounds for every 100 gallons of spray solution.** Be careful when buffering tank mixes containing copper fungicides. Copper is more soluble in acidic water, and the resulting high concentrations will cause leaf and fruit burn. Aliette makes acid spray. Therefore, do not mix Aliette with copper. **Always read the label of the buffering material as well as the label of the pesticide**. It is also recommended to ask your chemical supplier for up-to-date information on the susceptibility of a material to hydrolysis. A good rule of thumb is to spray pesticide mixtures as soon after mixing as possible, mix only enough to treat the crop and do not allow the mixture to stand for a long period of time or overnight.

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.

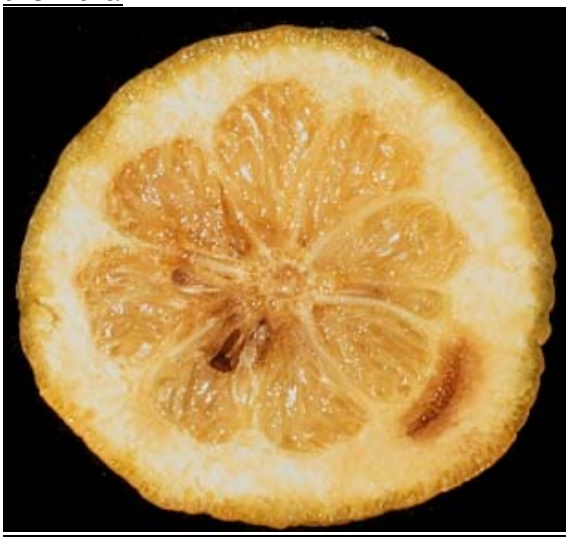
FALL NUTRITION OF CITRUS TREES

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]

Zekri, M. and T.A. Obreza. Boron and chlorine for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS61900.pdf

Zekri, M. and T.A. Obreza. Molybdenum and nickel for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS61800.pdf

Zekri, M. and T.A. Obreza. Iron and copper for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS61700.pdf

Zekri, M. and T.A. Obreza. Manganese and zinc for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS61600.pdf

Zekri, M. and T.A. Obreza. Nitrogen (N) for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS58000.pdf

Zekri, M. and T.A. Obreza. Phosphorus (P) for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS58100.pdf

Zekri, M. and T.A. Obreza. Potassium (K) for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS58300.pdf

Zekri, M. and T.A. Obreza. Magnesium (Mg) for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS58200.pdf

Zekri, M. and T.A. Obreza. Calcium (Ca) and sulfur (S) for citrus trees.
http://edis.ifas.ufl.edu/pdffiles/SS/SS58400.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 (?).

Suggested Facility Security Practices

Awareness
- Conduct a security assessment of your facility.
- Use opening and closing security check lists; note any discrepancies or irregularities.
- Initiate or join your local “crime watchers” program.

Access
- Escort all customers or visitors in storage yards or near loading docks.
- Establish a uniform or ID badge system to distinguish employees.

Alarms
- Install alarms and use a security alarm monitoring service.
- Ensure that phone lines are protected or have a service interruption alarm.
- Locate exterior strobe lights with alarms where neighbors and law enforcement can see them.

Barriers
- Construct structural barriers, including steel doors and barred windows.
- Install fencing as a deterrent where appropriate; fencing should be such that law enforcement and passers-by can view the property.
- Install access gates where fencing is not appropriate.
- Install bollards and chains across driveways or block with trucks and other equipment during off-hours.

Community
- Establish a process for including neighbors and the community as part of facility security and emergency response planning.

Inventory Control
- Know your inventory.
- Establish an ongoing process for inventory control of materials stored at the facility.
- Do not allow unattended, loaded trailers on site.
- Record stored nurse tanks by identification number and weight of remaining product.
- Inspect tanks visually each morning.
- Keep bills of lading, blank forms and all shipping/receiving paperwork secured.

Law Enforcement
- Establish and maintain relationships with local law enforcement and emergency responders. Provide them with your emergency plans and keys to locked gates.
- Provide law enforcement dispatchers with current emergency contact information for the facility. Keep this information current.
- Immediately report unusual or suspicious persons, vehicles or activity to local law enforcement.

Lighting
- Contact your local power company for a lighting assessment and information on leasing lights for your property.
- Install sufficient exterior lighting for law enforcement and passers-by to see your property.
- Discuss your lighting plan with local law enforcement.

Locks
- Establish a procedure and responsibility for locking up at close of business.
- Use high-security locks for doors, enclosures and gates, following local fire code requirements. Keep padlocks locked on hasps while not in use to prevent your lock from being replaced by someone else’s.
- Use deadbolt locks on doors with a minimum of 1.5-inch throw.
- Implement key control for locked containers, equipment, hoppers, vehicles and vessels.

Signage
- Post alarm monitoring service signs in highly visible locations. Include signage for:
- No trespassing
- Private property
- Closed circuit TV surveillance
- Patrolled
- No vehicles beyond this point
- All visitors must check-in with front office
- All visitors must be escorted

Surveillance
- Install CCTV surveillance cameras to monitor less visible or high-risk areas.

Training
- Involve employees in security planning.
- Train employees to spot suspicious individuals and behavior.
- Conduct periodic emergency drills, e.g. fire, evacuation and security, with employees.

Vendors
- Know vendors that service your facility.
- Require all vendors to check in.
- Escort vendors.

Visibility
- Assure an open area around the facility, unlimited by shrubs, trees, large signs or other barriers to open sight.

SUGGESTED CUSTOMER TRANSACTION PRACTICES

Awareness
- Heighten employee awareness of what constitutes an unusual customer and sales transaction.
- Heighten customer awareness of potential for criminal misuse of agricultural chemicals.
- Advise customers to contact law enforcement immediately with any concerns about unusual persons, vehicles or activities in the vicinity of your facility or theirs.

Sales Transaction

- Know your customer.
- Follow all requirements for verification when selling restricted use pesticides.
- For all sales, record customer's name, address, telephone number. If in doubt ask for a driver's license.
- Make deliveries only when the customer or agent is available to take custody and sign for the material.
- Do not deliver tanks or other products to empty fields or other unattended locations.
- Make follow-up calls to verify receipt of materials by customer in quantity ordered.
- Be alert to those who:
  - Pay in cash;
  - Won't take delivery;
  - Behave in an unusual manner;
  - Hesitate when asked for ID to complete the sale;
  - Don't know the product;
  - Insist on certain products, such as ammonium nitrate, and will not consider other suggestions;
  - Ask questions about product manufacturing;
  - Aren't familiar with farming, pesticides or fertilizer products.
- If in doubt:
  - Write down vehicle color, make, license number and state and a physical description of the individual;
  - Retain papers the customer may have touched for fingerprints;
  - Save this information in the event that it needs to be provided to law enforcement.

Certain agricultural inputs stored at your facility may warrant special security measures, such as anhydrous ammonia, ammonium nitrate, bulk urea and insecticides.

Alarms

- Install alarms near tanks.
- Install explosion-proof alarm systems near combustible material.

Awareness

- Be alert to those attempting to buy ammonia if they cannot state a legitimate, agronomic need for the product.
- Inspect tank and bulk storage areas daily.
  - Check for fresh tracks in mud or snow or disturbed ground around tanks and bulk storage areas;
  - Check to see if tank valves are closed tightly;
  - Look for suspicious items near tanks such as duct tape, garden hose, bicycle inner tubes, buckets and coolers;
  - Check for broken or missing wire ties or seals that you may have placed on valve wheels as markers.
- Make customers aware of the potential for theft or tampering with tanks and bulk ag chemicals.
- Remove hoses between tool bars and nurse tanks; relieve pressure with the bleed valves when left overnight. Encourage end-users to do the same.

Law Enforcement

- Work with local law enforcement to encourage frequent nighttime patrols.
- Contact local law enforcement immediately if you suspect tampering or theft at your facility or the presence of unusual persons, vehicles or activities.
- Do not disturb a potential crime scene.

Locks for Tanks

- Use brightly colored plastic ties or wire seals between the valve wheel and the roll cage to ease visual checks and to identify tampering.
- Use tamper resistant seals and locks.
- Use high-security locks.
- Use specialized tank locks for nurse tanks containing anhydrous ammonia.
- Paint tank locks red so law enforcement can identify anhydrous ammonia tanks.

Visibility

- Store tanks in well-lit areas with a clear line-of-sight.
- Store tanks with flow valves facing outward to speed visual inspections.
- Do not leave tanks in remote areas.

SUGGESTIONS FOR PARTNERING WITH YOUR CUSTOMERS ON SECURITY AND SAFETY

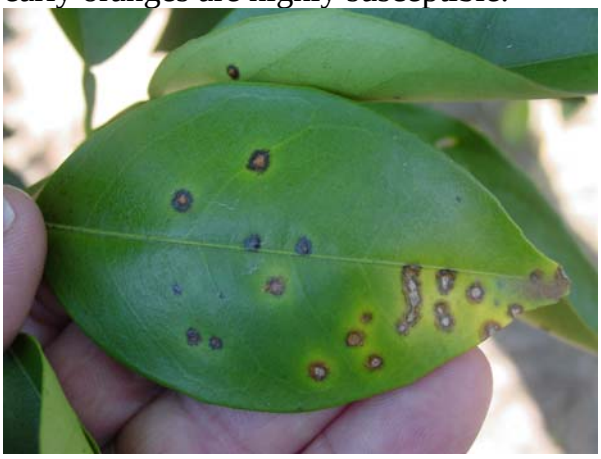
- Take delivery of tanks as close to time of application as possible.
- Position tanks in open, visible areas.
- Don't take delivery of tanks to unattended locations.
- Don't store tanks and tool bars inside buildings, near the farmhouse or livestock confinement houses.
- Remove hoses between tool bars and nurse tanks and relieve pressure with the bleed valves if tanks are left overnight. Store hoses and tool bars away from tanks.
- Don't leave tanks unattended for long periods of time.
- Inspect tanks every day, especially after a weekend when most thefts occur.
- Return tanks immediately after use.
- Inspect and record the condition of each nurse tank upon delivery and return.
- Store all agricultural chemicals, e.g. bulk, bagged, in a secured area.
- Where appropriate, use alarm systems to protect secured storage areas and chemicals.
- Be aware of and maintain inventory control.
- Lock any containers, equipment, hoppers, tanks and vessels containing product whenever possible.
- Be aware of signs of theft of anhydrous ammonia, ammonium nitrate or bulk urea.

Law Enforcement

- Urge customers to contact local law enforcement immediately if tampering or theft is suspected or suspicious persons or vehicles are seen.
- Do not approach or confront suspicious individuals.
- Do not disturb the area around a possible crime scene.

Citrus Canker is 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/2017/ACP%20and%20Leafminer.pdf

http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/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 863-298-7777.

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 Yates, 863-956-1151 ext. 1302 or jdyates@crec.ifas.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/2017/Citrus%20Black%20Spot.pdf

FLATWOODS CITRUS NEWSLETTER EVALUATION FORM

Please take a moment to rate the quality and usefulness of the information presented in the Flatwoods Citrus newsletter. Please send back the form to:

Dr. Mongi Zekri
University of Florida, IFAS
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975
or Fax to 863 674 4636 or E-mail to maz@ufl.edu **Thank you for your input!!!**

Please circle or bold your answer

1	Was the information up to date and accurate?	Yes	No	Uncertain
2	Was the information delivered on time to be useful?	Yes	No	Uncertain
3	Was the information relevant to your situation?	Yes	No	Uncertain
4	Was the information easy to understand?	Yes	No	Uncertain
5	Have you had an opportunity to use the information?	Yes	No	Uncertain
6	Have you shared the information with someone else?	Yes	No	Uncertain

7 Overall, how do you feel about the Flatwoods Citrus Newsletter?

Satisfied Neither Satisfied Nor Dissatisfied Dissatisfied

8 **Do you have any suggestions that might improve the newsletter?**

(Please write in any comments)

9. How many years have you been using the Extension Service? _____ Years

10. What is your employment status?

_____ Grower	____ Chemical Industry	____ Service Provider
_____ Production Manager	____ Regulator	____ University
_____ Consultant	____ Association	Other _____

We appreciate your reactions and the time you have given us. Thank you, and please contact us when we may be of service to you.

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