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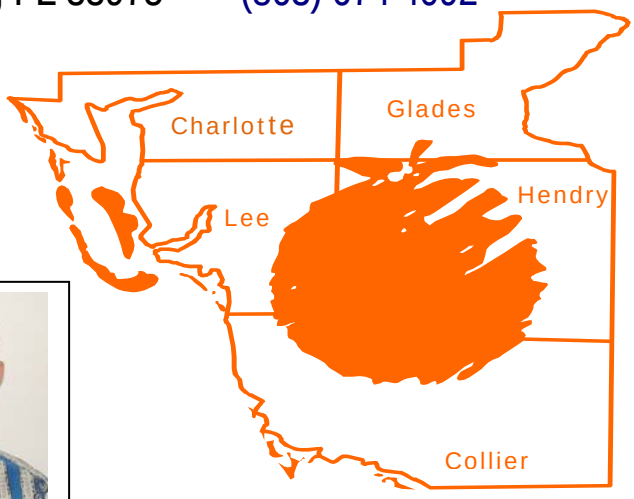
Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 16, No. 8 **August 2013**

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

SEMINAR

Florida Citrus Industry, Brazilian Citrus Industry, Preharvest Fruit Drop and Growth Regulators for Citrus

Program Coordinator: Dr. Mongi Zekri, UF-IFAS Extension
Program Sponsor: Ray Bassett and Justin Newsome with Aglime Sales, Inc.
Date: Thursday, September 26th, 2013, Time: **10:00 AM** – 12:00 Noon
Location: Southwest Florida REC (Immokalee)
UF-IFAS Southwest Florida Research and Education Center
2685 SR 29, Immokalee, FL 34142
See: **http://www.imok.ufl.edu/** for directions

Agenda

10:00 AM – 10:35 AM

1. Outlook of the Florida citrus industry and economic challenges**- Dr. Fritz Roka, UF-IFAS**

10:35 AM – 11:10 AM

2. Observations on the Brazilian Citrus Industry – June 2013 **–Thomas Stopyra, The Packers of Indian River, Ltd**

11:10 AM – 11:20 AM - Break

11:20 AM – 12:10 PM

3. Preharvest fruit drop, what will this season bring and can we do anything about it? **- Dr. Gene Albrigo, UF-IFAS**

2 CEUs for Pesticide License Renewal

2 CEUs for Certified Crop Advisors (CCAs)

No registration fee. A complimentary lunch will be provided. Thanks to **Ray Bassett** and **Justin Newsome** with **Aglime Sales, Inc.** Advance registration is required for an accurate meal count. Call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at **maz@ufl.edu**

Sept. and Oct. 2013 Farm Labor Supervisor Core Training Program.

For more details, see Page 28.

Presentations from 2013 Florida Citrus Growers' Institute

The 2013 Institute held on April 2 in Avon Park drew over 300 growers to the South Florida State College campus. For those of you who attended and those who could not make it, video recordings were made of the presentations and most of them are posted on the Citrus Agents Website.
http://citrusagents.ifas.ufl.edu/events/GrowersInstitute2013/GrowersInstitute2013.htm

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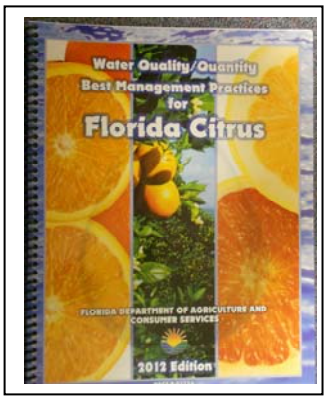


Department adopts new statewide citrus BMP manual

The Florida Department of Agriculture and Consumer services (FDOACS) adopted a new statewide citrus BMP manual, *Water Quality/Quantity Best Management Practices for Florida Citrus*, on Jan. 9. This new manual incorporates the four region-based citrus programs: Ridge Citrus, Indian River Citrus, Gulf Citrus and the Peace River/Manasota basins. All citrus operations that enroll in department BMPs as of Jan. 9 must submit a Notice of Intent (NOI) under the new statewide manual.

Over the past month, growers representing about 10,000 acres have enrolled or re-enrolled under the new statewide citrus manual. Benefits of participation include a presumption of compliance with state water quality standards, a release from fines or damages related to pollutants addressed by BMPs, and eligibility for BMP implementation cost-share funds.

Ridge Citrus Growers

Growers now participating in the Ridge Citrus BMP have until Jan. 8, 2015, to enroll in the statewide manual and implement applicable BMPs, in order to maintain their presumption of compliance with state water quality standards. Notices of Intent to implement BMPs submitted under the previous Ridge Citrus rule will be invalid after this 2-year period. David "Bo" Griffin is leading the effort to reenroll Ridge Citrus growers in the new statewide manual, and can be contacted at (863) 402-7020 or David.Griffin@FreshFromFlorida.com. Growers also may contact Susie Bishop at sbishop@highlandsswcd.org. Please contact Bo or Susie for Ridge Citrus reenrollment or first-time enrollment soon to take advantage of cost-share opportunities.

Flatwoods Citrus Growers

Growers currently enrolled under one of the three region-based Flatwoods Citrus Manuals (Indian River, Gulf and Peace River/Manasota) are grandfathered under the new rule.

However, growers must continue to implement the applicable BMPs and must follow guidelines in Nutrition of Florida Citrus Trees, Second Edition, UF/IFAS Publication SL253 from January 2008, that are relevant to their operations.
Flatwoods Citrus growers who are re-establishing or renovating groves already enrolled under a region-based manual must contact the department for assistance in submitting an NOI under the new statewide manual at (850) 617-1727 or AgBMPHelp@FreshFromFlorida.com.
In the Gulf region, to get more information, to enroll, and/or to get a hard copy of the citrus BMP manual, contact Callie Walker, Office of Agricultural Water Policy, Florida Department of Agriculture & Consumer Services, 483 E. Cowboy Way, LaBelle, FL 33935, Phone: 863-674-4160, Fax: 863-674-4161, Callie.Walker@FreshFromFlorida.com or Mongi Zekri at 863 674 4092, maz@ufl.edu

DRAINAGE FOR FLATWOODS CITRUS

Brian Boman & Dave Tucker

Drainage of water is especially important in the wet season since citrus root damage may occur under relatively prolonged conditions of high water table. Both surface and subsurface drainage are generally required for citrus grown in Flatwoods areas. Drainage systems in Flatwoods groves consist of systems of canals, retention/detention areas, open ditches, subsurface drains, beds, water furrows, swales, and the pumps required to move the drainage water. These systems require continued good maintenance in order to minimize the chances of root damage from prolonged exposure to waterlogged soils following high intensity rains. Drainage systems should generally be designed to allow water table drawdown of 4 to 6 inches per day, which should be adequate to prevent root damage.

Soil Water Dynamics

Research has shown that there is potential for water damage to citrus trees if roots are submerged in water for 4 days or more during frequent extended summer rains. During the cooler months of December through February, citrus trees can tolerate flooded conditions for longer periods than during the hot summer months.

Observation wells are good tools for observing soil-water dynamics. They are the only reliable method for evaluating water-saturated zones in sites subject to chronic flooding injury. These wells can also be used to measure the rate of water table drawdown, which is the real key to how long roots can tolerate flooding. Observation wells constructed with float indicators allow water tables to be visually observed while driving by the well site. Local offices of the Natural Resources Conservation Service (NRCS) can assist with water table observation, well construction, and monitoring.

Water Damage to Trees

It can be detected by digging into the soil and smelling soil and root samples. Sour odors indicate an oxygen deficient environment. The presence of hydrogen sulfide (a rotten egg odor) is an indication that feeder roots are dying.

Anaerobic bacteria (which grow only in the absence of oxygen) will develop rapidly in flooded soils and contribute to the destruction of citrus roots. In a field survey of poorly drained groves, toxic sulfides were formed by anaerobic sulfate-reducing bacteria at more than half the locations. Nitrites, formed by nitrate-reducing bacteria, and other organic acids that are toxic to roots were also found in these flooded soils.

Improper bed construction has been linked to areas with chronic root damage in several groves. Severe sulfide problems have often been found in grove areas that were developed over old swamps which were filled in before planting. Palmetto, cabbage palms, and other decomposable organic debris were frequently buried in these areas where land was leveled during preparation. It can take many years for Palmetto roots and stems to decompose in this environment. Certain organic acids in Palmetto, grass, and citrus roots provide a good source of energy for reducing bacteria which require both energy and sulfates in order to reduce sulfates to sulfides. Thus, it is possible for citrus roots to contribute to their own destruction by acting as an energy source for these bacteria. Only small amounts of sulfur (3 ppm) are required for the bacteria to function at peak capacity. The forms of sulfur used by the bacteria can be elemental sulfur, thiosulfate, sufites, or sulfates which are usually present in all Florida soils.

Using topography alone as a diagnostic factor to assess potential for flood damage may be misleading. Flooding

injury can occur in obvious spots such as poorly drained depressions, but it may also be present where least expected. Flood injury has been observed on hillsides, on relatively high ground, on isolated areas of flat land, and even on raised beds. Hillsides may have pockets of clay. In flat areas, the problem may be impervious clay, marl, or organic-layered pockets that hold the water and prevent movement. Even beds in apparently uniform sandy areas can have buried palmetto roots and organic materials. These areas are subject to root damage since the soils are able to support bacteria which can quickly generate toxic hydrogen sulfide if flooded. Old pond sites are prone to severe flooding injury. Trees on the periphery of old pond sites are often damaged as much as those in the middle.

Good drainage allows air to move into the soil and prevents oxygen-deprived conditions. Flooding stress is usually less when water is moving than when water is stagnant, for anaerobic bacteria cannot multiply if oxygen is present. Also, a higher subsoil pH may help to delay, for a few days at least, the death of citrus roots under flooded conditions.

With experience, flooding injury can be diagnosed during periods when groundwater levels are high. Even before there are visible tree symptoms, auguring and digging in the root zone may give an estimate of future tree condition. Indications of problems include high water tables with saturated soils in the root zones, sloughing roots, and sour odors in the soil. When the water table recedes, visible damage to the trees may become more obvious.

Symptom expression of damage may occur over a period of time depending on the severity of root damage. Symptoms usually start to show up after the water table drops and the soil dries out. Root damage symptoms include leaf yellowing, chlorosis, wilting, fruit drop, leaf drop, and dieback. Often root damage is so severe that trees may go into a wilt even though water furrows are still wet. Because the root system was pruned by the flooding, the full extent of damage may not be known for several months or until drought conditions occur.

Young trees are often more sensitive to flooding and may develop symptoms resembling winter chlorosis. More subtle symptoms include reduced growth and thinner foliage. This can occur at locations only a few inches lower in elevation than the surrounding area.

Hot, dry conditions following flooding will hasten the onset of stress and symptom expression. The reduced root system resulting from summer flooding is incapable of supporting the existing tree canopy. When this occurs, irrigation management becomes critical. Excessive water could compound existing problems. If root system damage is extensive and tree canopy condition continues to deteriorate with permanent wilt and foliage dieback, some degree of canopy pruning may be necessary to reestablish a satisfactory shoot/root balance.

Light frequent irrigations will be required until the root zone has been reestablished. If irrigation water is high in salts, frequent irrigations are essential to prevent salt buildup, which will compound the flooding problem. Fertilization rates and schedules may need to be adjusted for flood-damaged trees. Light ground applied or foliar fertilizer applications on a more frequent schedule are preferred until the root system becomes re-established.

DEALING WITH IRON IN IRRIGATION WATER

Tom Obreza, Ed Hanlon, and Mongi Zekri

Iron Scaling and Treatment

Scaling caused by iron is more difficult to deal with than scale formed by calcium. Given Florida's sandy soils and geologic time, iron compounds move through the soil and enter the shallow groundwater. Much of the rust or brownish red color found in many Florida soils is due to the presence of iron oxides and related compounds.

Irrigating with iron-rich water may result in staining, not only of equipment, but also on foliage in contact with the water source. Within the irrigation system itself, iron scaling can reduce flow in pipes and clog emitters. When iron concentrations exceed 0.3 ppm, staining and scaling conditions exist.

Iron chemistry is complex because ionic Fe can exist in two forms. The reduced cationic form, exhibiting two plus charges, is the ferrous form (Fe2+). The ferrous form may be introduced into the irrigation system with the source water because this form of iron is soluble. Chemical conditions may change within the irrigation system itself, resulting in formation of a highly insoluble oxidized form with three positive charges (ferric, Fe3+). It is the ferric form that causes scale within the irrigation system. The maximum amount of ferric iron that can be retained in solution as ferric oxide is 0.6 parts per billion (ppb), considerably less than the iron concentrations reported above (0.1 to 7.0 ppm iron) found in southwest Florida groundwater.

The conversion from ferrous (soluble) to ferric (insoluble) form is affected by several chemical parameters, the most important of which are oxygen content and water pH. The ferrous form results when oxygen content of the water is low, such as in groundwater of many aquifers. When water is pumped from these locations into the irrigation system, it moves from an anaerobic condition to an aerobic condition with much higher levels of oxygen. When the ferrous form is exposed to oxygen, the result is a rapid conversion to the ferric form, with subsequent precipitation (scale). The pH of the water has an effect on the rate of this conversion (Table 1). Since many of the aquifers in Florida are limestone, the initial pH of water pumped from those aquifers is alkaline, often at or more than 8.0. Scale at this pH can form quickly once sufficient oxygen is present. Usually, sufficient oxygen is introduced throughout the irrigation system, and scale forms within the system, especially at or near oxygen sources such as leaking pipes or emitters (Table 1).

Table 1. Conversion of iron from ferrous to ferric forms in the presence of 2 ppm oxygen at 70° Fahrenheit.

pH	***Time***
6.0	100 hours
7.0	1 hour
8.0	30 seconds

Table 2. Interpretations to be used with laboratory water testing results, indicating the potential hazard from plugging of micro-irrigation systems.

	Plugging hazard based on concentration			
Measurement	**Units**	**Slight**	**Moderate**	**Severe**
Suspended solids[1]	ppm	< 50	50 – 100	> 100
pH		< 7.0	7.0 – 7.5	> 7.5
Total dissolved solids[1]	ppm	< 500	500 – 2000	> 2000
Iron[1]	ppm	< 0.1	0.1 – 1.5	> 1.5
Manganese[1]	ppm	< 0.1	0.1 – 1.5	> 1.5
Calcium[1]	ppm	< 40	40 – 80	> 80
Alkalinity as $CaCO_3$[1]	ppm	< 150	150 – 300	> 300
Hydrogen sulfide[1]	ppm	< 0.2	0.2 – 2.0	> 2.0
[1]mg/L or parts per million (ppm). Factors in *italics*: Measure in the field if at all possible.				

Use of a Sedimentation Pond

A sedimentation pond allows the oxygenation of the water, and hence the precipitation of ferric iron, before the water is introduced into the irrigation system. Well water is pumped into a pond allowing equilibration of the water with the atmosphere. As oxygen enters the water, ferric iron is formed and precipitates. Factors affecting the time needed for precipitation include water temperature, wind speed, depth and mixing of the water, aeration and wave action. A good first estimate for the minimum time required is several hours, especially if the water is aerated. After the iron precipitates, water is removed from the pond and conveyed into the irrigation system for subsequent filtering and distribution.

Advantages of a Sedimentation Pond

A sedimentation pond permits the removal of iron from the system without any chemical treatment, leaving behind iron scale in the pond itself. Since most Florida aquifers are composed of limestone, initial water pH from these aquifers is quite high. The sedimentation pond, in addition to oxygenating the water to remove ferric iron, also allows time for the equilibration of the water with Earth's atmosphere and the dissipation of carbonates and bicarbonates. As the carbonates and bicarbonates dissipate from the water source, the initial high water pH is lowered 1 to 2 pH units, improving water quality for irrigation.

Disadvantages of a Sedimentation Pond

Unfortunately, while the sedimentation pond improves water quality with respect to both iron and the high pH caused by carbonates, it is an open water source. The pond is likely to introduce organic materials and living organisms into the irrigation system.

A second disadvantage is that an additional pumpage is required between the pond and the irrigation system. The introduction of water to the pond from the well source and its subsequent withdrawal for use in irrigation system must be considered when designing the size of the sedimentation pond to minimize turbidity and the introduction of grit into the irrigation system. A sedimentation pond requires two pumps as described above. Additionally, a properly sized sedimentation pond requires sufficient land surface, which may take a substantial tract of land out of production.

Oxygenation and Filter Systems

The next alternative in iron scaling prevention is much more high tech. This system includes a gas chlorinator, hydro-cyclone filters, sand media filters, and backup disk filters.

The gas chlorinator (Fig. 1) introduces chlorine gas into the water system, which causes the iron to oxidize (ferrous to ferric forms). The filtering system traps the scale that has formed before the scale is introduced into the remaining portions of the irrigation system.

Advantages of Oxygenation and Filtration

Chlorine gas is relatively inexpensive. Using chlorine to oxidize iron from ferrous to ferric also provides active chlorine within the irrigation system to control microbial activity. This system also requires considerably less land area compared with the sedimentation pond system.

Disadvantages of Oxygenation and Filtration

Safety precautions for workers and equipment must be in place and followed correctly when handling chlorine gas. Because sand media filters are normally used to remove the scale, they require frequent backwashing (e.g. in 1-to-2 hour intervals).

Irrigation Line Maintenance

In situations where iron has already formed, or as a preventive measure in situations where iron scale has been problematic for other users of the same water source, scale can be controlled by appropriate injection rates of chemicals, which can be grouped according to their reactions (Table 3). Inorganic acids react quickly with water and solids to help prevent scale formation. The reaction is partially controlled by regulating the strength of the acid through dilution with water. In some cases, these acids may also supply nutrients after they have reacted in the irrigation system.

Chelating agents are organic compounds that sequester or occlude iron from further

reactions by binding sufficiently tightly to the iron, removing it either as a free agent in solution or as scale. The iron is held by the chelating agent and the combined molecule flows out of the irrigation system. In some cases, the iron and other elements chelated by this group of chemicals may later serve as a nutrient source for the crop. The last chemical group is of the reducing agents. These chemicals cause ferric iron to revert to ferrous iron, greatly increasing the solubility of the iron, which may then exit the irrigation system in solution. This group of chemicals can be quite reactive and yet can be handled and stored safely for agricultural purposes. Some of these chemicals are the byproducts of industrial processes, contributing to a so-called green re-use in the treatment of scale.

Table 3. List of irrigation line treatment chemicals, grouped by chemical reaction.

Inorganic acids	**Chelating agents**	**Reducing agents**
Hydrochloric acid	Citric acid	Sodium sulfite
Phosphoric acid	Glycolic acid	Sodium hydrosulfite
Sulfuric acid	Malic acid	Sodium metabisulfite
Nitric acid	Gluconic acid	
Sulfamic acid	Oxalic acid	
	Sodium EDTA	
	Sodium citrate	

Scale Removal from Irrigation Lines

In addition to preventing iron scaling, many of these chemicals may help remove iron scale from irrigation tubing. The irrigation manager should understand that preventing scaling from forming in the first place is usually much more effective than trying to restore an iron scale-impaired system.

Efficacy of selected chemicals in removing iron scale from irrigation tubing

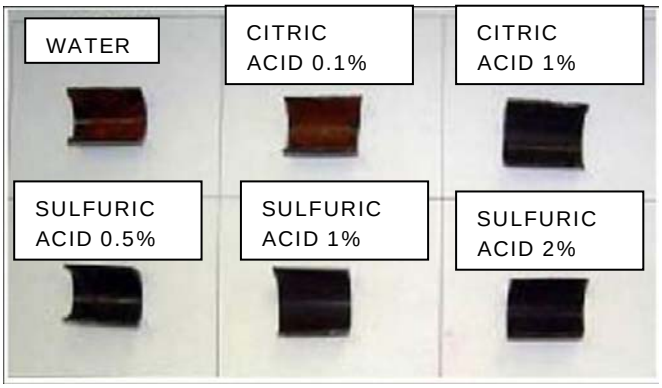
Sodium hydrosulfite proved to be quite effective at removing scale. This chemical is readily available from many sources, and proved to be the best chemical for removing scale in this study.

The next best chemical was a chelating agent, citric acid, which is readily available from many sources and does not pose the same level of handling problems as sodium hydrosulfite.

The discharge water from systems treated with sodium hydrosulfite, a reducing agent, and citric acid, a chelating agent, turns different colors as scale is being removed from the system. The water from the sodium hydrosulfite contains ferrous iron, which is relatively colorless, while the chelated iron from the citric acid treatment remains in the ferric state, imparting a rust or reddish brown color to the flush water.

Summary and Concluding Remarks

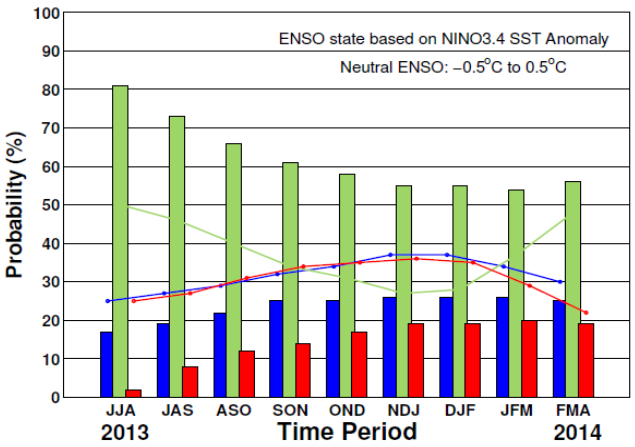
Proper filtration equipment is available to address many of the irrigation water quality problems faced by southwest Florida growers. Iron scaling is a common problem in some areas, and pre-treating the water before it enters the irrigation system is the most reliable way to avoid iron-related problems. However, if the system has already been impaired by iron scaling, chemicals and management strategies are available to at least partially remediate the irrigation system. Treatment of existing scaling problems may increase the problems with plugged emitters due to particles of scale migrating to the emitters as the scale is removed from the tubing. Flushing, subsequent chemical treatment, and additional flushing may also ameliorate some of the existing scale problems. Avoiding iron scale through the pretreatment of irrigation water is by far the best solution.



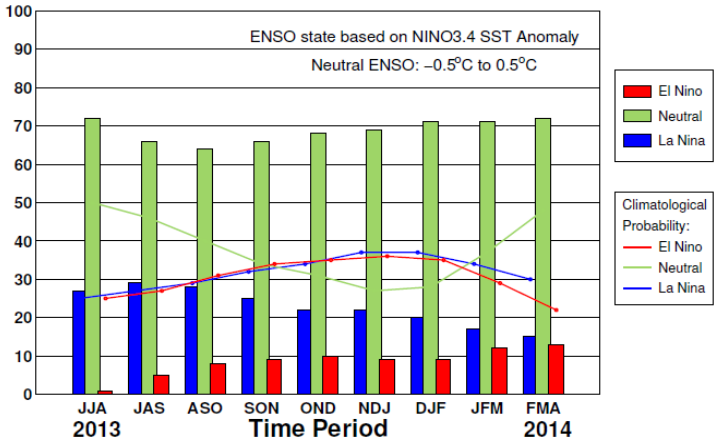
ENSO *QUICK LOOK* **July 5, 2013 A monthly summary of the status of El Niño, La Niña and the Southern Oscillation, or "ENSO",** based on NINO3.4 index (120-170W, 5S-5N)

During May through June the observed ENSO conditions remained neutral. Most of the ENSO prediction models indicate a continuation of neutral ENSO into northern autumn. However, a few models, mainly but not exclusively statistical models, call for cooling toward borderline or weak La Niña conditions during the northern summer season into the latter part of 2013.

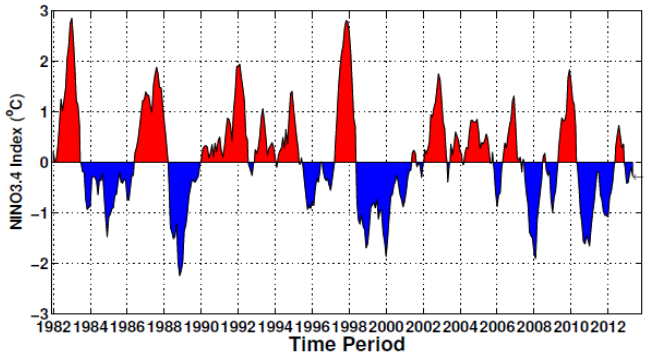
Early-Jul CPC/IRI Consensus Forecast[1]



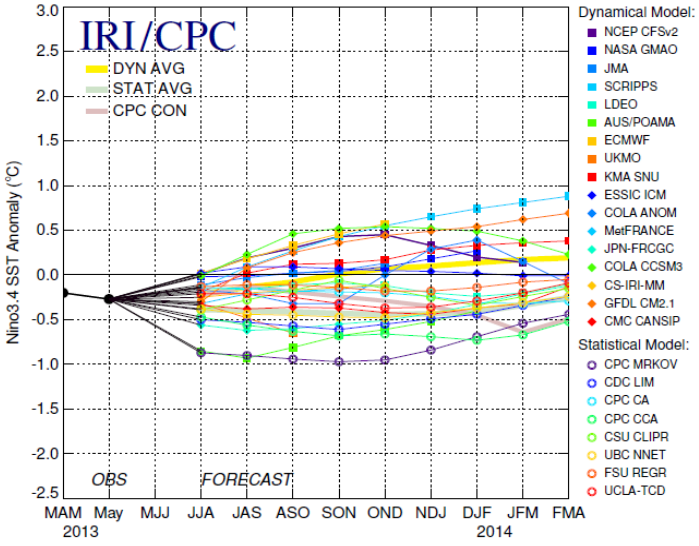
Mid-Jun IRI/CPC Plume-Based Forecast[2]



Historical Sea Surface Temperature Index



Mid-Jun 2013 Plume of Model ENSO Predictions



Historically Speaking

El Niño and La Niña events tend to develop during the period Apr-Jun and they:
- Tend to reach their maximum strength during Dec-Feb
- Typically persist for 9-12 months, though occasionally persisting for up to 2 years
- Typically recur every 2 to 7 years

[1]Based on a consensus of CPC and IRI forecasters, in association with the official CPC/IRI ENSO Diagnostic Discussion.
[2]Purely objective, based on regression, using equally weighted model predictions from the plume.

DRAINAGE SYSTEM

Beds and Water Furrows
Rows are typically oriented north-south and consist of beds constructed with vee-ploughs and/or motor graders between water furrows that are generally 48 ft to 55 ft apart. Water furrows are cut 2 to 3 ft deep and the soil is mounded between them to provide a 2.5-3.5 ft bed height from the bottom of the water furrow to the crown of the bed. Beds of these dimensions are the most common and they accommodate two rows of trees 22 ft to 26 ft apart.

Lateral Ditches
Lateral drainage ditches should be cut at right angles to the beds and water furrows and spaced no further apart than 1320 ft center to center. Topsoil spoil from the ditches can be used to provide fill for low areas in the adjoining fields. Subsoil spoil can provide a grove road base on either side of the lateral ditch. Swales drain into the ditches via 6-8 inch flexible polyethylene or rigid pipe that can be installed either before or after swale construction. A laser level is sometimes employed in this operation, but is not essential. The pipe is installed in the bottom of the water furrow and sloped to discharge approximately 1 ft above the bottom of the ditch. Ditch size will vary depending upon the area served and water management district criteria. In general, lateral ditches should have a minimum of 14-15 ft top width, 4 ft bottom width, 2:1 side slopes, and a depth of at least 5 ft.

Collector Ditches
Drainage water from several lateral ditches runs into collector ditches and is conveyed off-site. Gravity drainage is preferred if topographic relief allows. However, discharge pumps are required where there is insufficient relief. Size of the collector ditches and any related pumping facilities is dependent on several factors, such as size of the area being served, soils, bed and water furrow design, and slope of ditches. The surface water drainage system should be designed to remove at least 4 inches per day from the grove.

Off-Site Discharges
The main grove runoff concerns center around effects on wetlands and water quality. In addition changes to surface water discharge rates must be addressed to meet criteria adopted by the Water Management Districts. A surface water management system for citrus production in the Flatwoods should be designed to remove at least 4 inches in 24 hours. Properly designed surface water management systems can minimize storm water runoff rates. Runoff rates are reduced by designing surface water detention areas that are interspersed between the grove area and the ultimate off-site discharge points. Typically these are diked off areas that receive inflow from the grove area either via gravity or pumped discharge. Outflow from the detention areas (often called reservoirs) passes through discharge structures that are designed to restrict the flow rate to pre-development peak rates. Water levels thus build up in detention areas for a short period of time following major rainfall events.

Perimeter Ditch and Off-Site Discharge
In order to intercept and control the off-site water table and off-site surface flows, it is necessary to construct a perimeter ditch and dike. The dike is located external to the ditch. Frequently the ditches can serve as collector ditches. The actual size of the ditches

depends on anticipated flow rates. High water tables or natural drainage from adjacent undeveloped properties may result in subsurface flow towards a grove. Pumps may be required in the perimeter ditches to intercept this seepage water in order to maintain satisfactory water table depths in the developed grove.
Discharges are normally controlled with some type of water control structure where the water depth and discharge rate can be regulated. In areas prone to erosion or at changes in ditch direction, structures may be required to prevent scouring of banks.

Tile Drainage-Design Considerations
Drain tiles may be installed for additional control of the water table. Perforated 4 inch diameter, flexible polyethylene pipe covered with a nylon fabric sock installed down the center of every other bed normally provides effective control. The pipe should be installed on a slope corresponding to the flow of the swales at depths averaging 3 ft to 4 ft depending upon the location of spodic or clay horizons. Drain tile should not be installed below the depth of the hard pan horizons.

Drain Capacity
The drainage coefficient should be at least 0.5 to 0.75 inches per day, which should provide a water table drawdown of 4 to 6 inches per day. This rate should be adequate to prevent root damage in most cases. If surface water must also be removed, the drainage coefficient should be doubled to accommodate the extra water which needs to pass through the drains. Approximately one inch of rainfall entering the soil can raise the water table as much as one foot.

Grade
The grade (slope) at which the drain is installed should be based on site conditions, size of drain, and quality of installation. Minimum grades are: 4-inch = 0.10% (1.2 inches per 100 ft), 5-inch = 0.07% (0.8 inches per 100 ft) and 6-inch = 0.05% (0.6 inches per 100 ft).

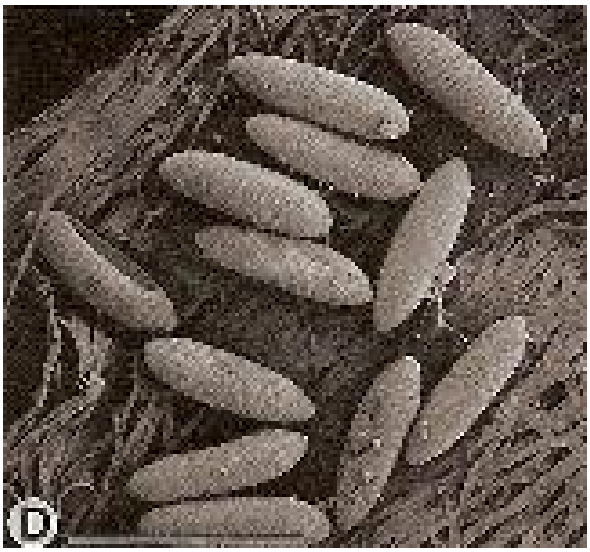
Outlet
Outfall from the grove site is a first priority. Sufficient engineering surveys must be conducted to determine the existence of a natural water outlet from the grove site before considering a drainage system. Permits might be required by Water Management Districts or other agencies before large quantities of water can be removed rapidly from poorly drained wetlands. Drainage outlets that discharge into state waters are considered point source discharges by local and state pollution control authorities, and approval to discharge into such waters should be obtained during the planning stage of a drainage or water management system. A sump-and-lift-pump type outlet may be necessary for subsurface drainage, but it may significantly increase drainage system construction costs. Sumps should be located at low ends of collector ditches. Float-controlled pumps that allow automatic operation are preferred. The pump should be sized to remove the design capacity for the drained area. Drain outlets should be 6 inches above the normal water level in the ditch. In addition to sunlight weakening the plastic drainage tubing, it can be destroyed by fire or damaged by rodents or ditch maintenance procedures. Therefore, the discharge end should be rigid PVC. At least 2/3 of the PVC pipe should be embedded in the ditch bank. The rigid outlet pipe may need an animal guard to keep rodents from entering and plugging the tubing.

MOSQUITOES

By **Roxanne Connelly**, UF-IFAS

Mosquitoes go through four developmental stages during their life: eggs, larvae, pupae, and adults. Dozens of species of mosquitoes reside in Florida, and the different species have differing means of surviving.
In addition to many environmental variables, there are two biological attributes related to mosquito egg-laying that contribute to the numbers of mosquitoes seen and felt during a post-hurricane period. The attributes separate mosquitoes on the basis of the conditions in which they lay their eggs. The two groups are floodwater mosquitoes and standing-water mosquitoes.

Floodwater Mosquitoes
Many people associate mosquitoes strictly with standing water, with the belief that mosquitoes have to have water to lay their eggs. The fact is, mosquito eggs need water to HATCH – but some species lay their eggs in moist soil (not standing water) and actually the eggs need to dry out before they can hatch. These mosquitoes are the “floodwater” species.



Floodwater mosquito eggs

As far back as one year from the time the floodwater mosquitoes are noticeable, the adult female mosquitoes were flying around, feeding on blood, and laying eggs (one female floodwater mosquito has the potential to lay 200 eggs per batch) in moist areas of pastures, citrus furrows, salt-marsh, and swales. These moist areas eventually dry out, and the mosquito eggs also dry and become encased in the cracks and crevices of the dried mud. Because of their unique biology, the eggs need to dry out before they can hatch into larvae. The eggs survive in the dry soil through the winter and spring, and then with rains from storms or hurricanes, those areas are inundated with water. The water that reaches the eggs provides a cue to hatch.
One can consider the potential extent of this habitat by thinking about how much land in Florida is pasture, citrus grove, or large expanses of uninhabited flat land. There are estimates of the number of mosquito eggs in a floodwater habitat between 0.7 and 1.3 million eggs per acre. Yes – per acre. If only a small percentage of those eggs hatched and survived to the adult stage, the number of adult mosquitoes flying around looking for blood at one time is almost incomprehensible. Unfortunately, for those who are diligent about dumping water and cleaning up containers around their home, this type of local and small scale effort will not contribute much impact to reducing mosquitoes in the floodwater sites.

Standing Water Mosquitoes
Mosquitoes that are not in the “floodwater” group lay their eggs on standing water. Another difference between the two groups is that mosquito eggs in this category cannot withstand drying out. If the water dries up, or the egg gets stranded on the grass or soil, the egg dries and that will be the end; it will not hatch into a larva.
Females will lay their eggs on the water surface and the eggs will typically hatch in about 24 hours. Water is necessary to complete the life cycle, and soon the larva will change into a pupa and then emerge into an adult that will soon be hungry for blood. After the newly emerged female mates and finds a blood source, she can start the cycle all over

again by laying her eggs on the standing water.

Standing water mosquito and eggs

What can individuals do to relieve mosquito-biting pressure?

Many people have committed to memory the 5 Ds that have been promoted in recent years and know that one “D" stands for DRAIN the water. But just how are you going to drain an acre full of water? The recommendation to dump the water applies to mosquitoes that lay their eggs in water-holding containers that individual homeowners have control over, such as pet dishes, vases, and cans. The advice is good for average, everyday situations – that is – the times when Florida has not been in the path of a hurricane or tropical storm. The mosquito habitats resulting from the types of rain events from hurricanes are too vast for an individual homeowner to attempt to impact. It is best to leave the source reduction and treatment of such vast water sources to the mosquito control agencies.

Mosquito larvae

In counties that have mosquito-control programs, help may not be immediate because there are such large areas that may need to be treated. And it may not be permanent - remember that mosquitoes fly. Even though an area may be treated to knock down the biting mosquitoes, there will likely be re-infestations from other areas due to the wide-spread flooding in the state.

The most effective way to stop a mosquito from biting is by wearing an effective mosquito repellent on the exposed portions of the body. Protective clothing is often mentioned as a deterrent, but during the very warm summer and fall evenings in Florida, especially for those who may not have electricity, long sleeves and long pants may not be practical.

The second best advice is to stay indoors. Check for damage to your home from the storms that may not be obvious. Look for holes in window and door screens; check for any newly formed open areas around your roof and windows where mosquitoes may gain access indoors; if you have pets that have access to both indoors and outdoors, brush their coats with your hands before they come inside to remove any mosquitoes that may be hanging on.

In addition to the efforts of mosquito control agencies, wearing repellents, and staying indoors during the evenings, the water does eventually drain and cool weather and shorter days will stop the mosquito breeding.

Mosquito control

MOSQUITO CONTROL TIPS

Along with hot sunny days, swimming and picnics, mosquitoes seem to be an inevitable part of summer. They would be bad enough if the only problems they caused were annoying buzzing and itchy bites. Unfortunately, they also carry a number of serious human and animal diseases worldwide including Malaria, West Nile Virus, Dengue, Yellow fever, St. Louis encephalitis, Dog heartworm, and a few varieties of equine encephalitis.

Backyard mosquito control begins with prevention. Backyard mosquito control can also include the plants you use in your garden. There are many types that mosquitoes find repellent and planting a few of these around your garden can help to keep adult mosquitoes from entering your garden, backyard and patio areas. Some of the plants which are considered to be effective include Catnip, Rosemary, Marigolds or if you like taller plants Citronella Grass.

Citronella Grass, Herb lemon grass

Marigolds

Basil

Lemon Thyme

Sage

Rosemary

Geraniums

Lemon Balm

Mosquitoes typically require standing water to lay their eggs. Ensuring that any items that are likely to collect water are emptied on a regular basis should help to kill any larvae. This in turn will reduce the number of adults.

Strategies for home mosquito control

●Repair any outside dripping faucets.

●Make sure your air-conditioner's water run-off does not collect in a pool.

●Inspect your yard for standing water. Even a tiny pool of water can bring mosquitoes. Dump out any standing water you find and continue to monitor your yard regularly.

●Dump anything that holds water twice per week if it has rained. Birdbaths, non-chlorinated wading pools, footbaths, garbage can lids, tires, buckets, bowls, pots, and pottery will all attract breeding mosquitoes.

●Remember to empty the saucers under your flower pots, and don't leave water in pet bowls for more than two days.

●Turn over canoes and small boats, be sure any tarps you have out are arranged so they don't collect water.

●Treat or remove any lagoons or sewage leaks.

●Keep gutters clean and unclogged. Be sure your downspouts drain properly, without leaving puddles in the drainage area. You may need to reroute your downspouts or add extensions to carry water away.
●Keep swimming pools cleaned and chlorinated, even when not in use. Homeowners who go on vacation without chlorinating their pools may return to a veritable mosquito hatchery.
●Walk your property after a heavy rain, and look for areas in the landscape that are not draining well. If you find puddles that remain for four or more days, regrade the area.
●Ornamental ponds should be aerated to keep water moving and discourage mosquitoes from laying eggs. Alternately, stock the pond with mosquito-eating fish.

Mosquito Control Products & Natural Repellants
Even if they aren't breeding on your property, airborne mosquitoes will eventually find their way to your home. Here are some ways to discourage them from hanging around:
●Screens: Keep window and door screens in good repair, and always keep them closed so mosquitoes can't get into your house. Consider screening in open porches.
●Citronella: Try lighting specialized candles or torches in the areas of your yard where you are spending time. Some brands also offer clip-on personal mosquito repellants.
●Wind: Mosquitoes dislike windy conditions, so a portable fan on your porch or patio will keep them at a distance.
●Natural repellants: Apply new, all-natural granular products to your lawn and keep mosquitoes away for weeks. Since these products are made of herbs such as lemon grass, garlic and mint, they'll leave your yard smelling really nice too.
●Mosquito Traps: Put some traps in your yard to reduce the population.
●The mosquito magnet: This is a machine that burns propane to send a stream of carbon dioxide. Mosquitoes are attracted to the carbon dioxide and then sucked into a net and killed. One mosquito magnet can control the mosquito population on an entire acre of property.

Protecting Yourself from Mosquitoes
●Cover as much exposed skin as is practical when working outdoors. This might include wearing long pants, long sleeves, shoes, socks and a hat.
●Neem oil cream is considered an effective natural mosquito repellent.
●Try natural herbal mosquito repellant creams and lotions.
●Make your own natural mosquito repellant by adding 10 drops of certain essential oils to two tablespoons of vegetable oil. Essential oils found effective at repelling mosquitoes include: marigold, thyme, lemon balm, peppermint, rosemary, geranium, lemongrass, cedar wood, and eucalyptus.

HEALTH BENEFITS OF CITRUS FRUITS

Citrus fruits are a rich source of vitamins, minerals, fiber and phytochemicals. Citrus fruits are not only loaded with vitamin C, they also strengthen your immune system.

Research studies have proven that oranges have phytonutrients such as citrus flavanones, polyphenols, anthocyanins and hydroxycinnamic acids which are beneficial to the health of the human body. The fruit contains hesperidin which studies have proven contain anti-inflammatory properties and can reduce symptoms of hypertension.

The vitamin C provides antioxidant protection against cancer-causing free radicals and helps to boost immune system function. Vitamin C can also reduce the severity of inflammatory conditions such as osteoarthritis, rheumatoid arthritis and asthma. The vitamin C in citrus can also reduce the risk of death associated with cardiovascular disease, cancer and stroke. Not only are the citrus fruits delicious and refreshing, they earn their definition of an all-star food for their richness in compounds called flavonoids, which have anticancer properties. Citrus fruit flavonoids have been shown to inhibit the growth of cancer cells and prevent the spread of tumors.

Citrus flavonoids are also antioxidants that can neutralize free radicals and may protect against heart disease. Studies show that citrus flavonoids may improve blood flow through coronary arteries, reduce the ability of arteries to form blood clots and prevent the oxidation of LDL (“bad”) cholesterol, which is an initial step in the formation of artery plaques.

Citrus fruits are also high in vitamin C, and are good sources of folate and potassium. Vitamin C is a powerful antioxidant and protects the body from damaging free radicals. It is also required for the synthesis of collagen, which helps wounds heal and helps hold blood vessels, tendons, ligaments and bone together. Potassium is a mineral and electrolyte that is essential for the function of nerves, heart contraction, and some enzymes involved in carbohydrate metabolism.

A single orange contains more than 60 flavonoids and 170 different phytonutrients which possess blood clot inhibiting abilities, anti-inflammatory and anti-tumor qualities. Oranges also contain the polyphenol gallic acid which provides anti-allergy, antihistamine, anti-inflammatory and anti-carcinogenic properties and researchers have begun to study the role the fruit could play in brain functioning.

Citrus fruits contain substances called limonoids which are proven to fight cancer of the skin, mouth, lungs, breast, colon and stomach. Because limonoid is so readily available and ever-present, oranges act as a natural antioxidant by helping prevent free radicals from damaging the DNA of cells and causing cancer.

Citrus fruits contain many different minerals, vitamins and nutrients which can be beneficial for the daily diet of human beings. They are the focus of intensive medical and research studies to better understand everything oranges have to offer the human body in terms of health and wellbeing.

FOLIAR NUTRITION

Foliar feeding, a term referring to application of essential plant nutrients to the tree canopy, has been documented over a century ago. More recently, foliar feeding has been widely used and accepted as an essential part of crop production, especially on citrus trees. The benefits of foliar feeding have been well documented and increasing efforts have been made to achieve consistent responses. The purpose of foliar feeding is not to replace soil fertilization. Supplying a plant's macronutrients needs (nitrogen, phosphorus, and potassium) is most effective and economical via soil application. However, foliar application has proven to be an excellent method of supplying plant requirements for calcium, magnesium, sulfur and micronutrients (zinc, manganese, copper, boron, and molybdenum), while supplementing N-P-K needs for short and/or critical growth stage periods. Foliar feeding can be an effective management tool to favorably influence bloom, fruit set, fruit size, and fruit yield by compensating for environmentally induced stresses of adverse growing conditions and/or poor nutrient availability. Foliar applications of nutrients have become an important practice in citrus crop production particularly after the introduction of HLB (citrus greening).

The advantages of foliar feeding in accomplishing the desired crop responses are two-fold:

1. It is a highly efficient and timely method of applying needed and/or critical plant nutrients.
2. It is a means of compensating for soil or environmentally induced nutrient deficiencies.

In order to achieve the benefits of foliar feeding, combining proper methods of application and the best suited nutrient materials related to specific goals is essential.

I. Proper Timing of Foliar Applications

a. Proper Growth Stage: This is one of the most critical aspects of a foliar feeding program. Foliar applications should be timed to provide needed nutrients during the time frame of growth, which will in turn favorably influence the post reproductive development stages. Multiple, low rate applications may show the most favorable responses within these time frames. A comprehensive plant tissue analysis following IFAS guidelines is also essential to establish a good nutritional program providing the proper amounts and balance of nutrients.

b. Proper Crop Condition: Generally speaking, crops that are nutritionally sound will be most likely to respond to foliar feeding. This is due to better tissue quality (allowing for maximum absorption of nutrients into leaf

and stem) and better growth vigor (allowing nutrients to be rapidly moved to the rest of the tree). Stressed trees show less response to foliar applications due to lower leaf and stem absorption rates and poor vigor. However, foliar feeding does benefit crop performance and yield if an application was made prior to water stress. Recovery from freeze or herbicide damage can be hastened with proper foliar applications.

c. Proper Meteorological Conditions: Time of day, temperature, relative humidity and wind speed influence the physical and biological aspects of foliar applications. Plant tissue permeability is an important factor in absorption of nutrients into the plant. Warm, humid and calm conditions favor highest tissue permeability, conditions found most often in the late evening hours, and in the early morning hours. Rainfall within 24 to 48 hours after a foliar application may reduce the application effectiveness, as not all nutrient materials are immediately absorbed into the plant tissue.

II. Types of Fertilizer Materials: Not all fertilizers are suitable for use as a foliar spray. The primary objective of a foliar application is to allow for maximum absorption of nutrients into the plant tissue. Foliar fertilizer formulations should meet certain standards in order to minimize foliage damage. Qualifications for fertilizer materials follow:

a. Low salt index: Damage to plant cells from high salt concentrations can be considerable, especially from nitrates (NO_3^-) and chlorides (Cl^-).

b. High solubility: Needed to reduce the volume of solution needed for application.

c. High purity: Needed to eliminate adverse effects on foliage.

Nitrogen Materials: Urea may be the most suitable nitrogen source for foliar applications, due to its low salt index and high solubility in comparison with other nitrogen sources. Urea has been shown to stimulate absorption of other nutrients by increasing the permeability of leaf tissue. However, the urea utilized in foliar sprays should be low in biuret content (0.2% or less) to avoid leaf burn. Other sources of nitrogen can be obtained from ammonium polyphosphates, ammoniated ortho-phosphates (liquid), potassium nitrate, calcium nitrate, ammonium thiosulfate. These sources, when utilized at low foliar rates, are excellent supplemental nitrogen carriers with no minimal foliage burn side-effects. Triazone nitrogen has been shown to significantly reduce leaf burn and enhance foliar absorbed nitrogen compared with urea, nitrate, and ammonium nitrogen sources.

Phosphorus Materials: A combination of poly and ortho-phosphates has been shown to lessen leaf burn and aid in leaf phosphate absorption. Furthermore, the polyphosphate advantage may also be due to supplying both ortho and polyphosphate forms simultaneously.

Potassium Materials: Depending on availability, potassium polyphosphates are an excellent source of low salt index, highly soluble potassium. Potassium sulfate is suitable also, having a low salt index, but with low solubility. Potassium hydroxide, potassium nitrate and potassium thiosulfate sources combine both low salt index and high solubility characteristics.

Calcium, Magnesium, Sulfur and Micronutrient Materials: Foliar application of these nutrients (calcium, magnesium, sulfur, zinc, manganese, copper, boron and molybdenum) can be highly effective, but because of difficulties associated with leaf

tissue absorption and translocation of some of these nutrients (such as calcium magnesium, boron and molybdenum), choosing the correct fertilizer sources for these nutrients becomes very critical. Chelate sources, while valuable for soil application, have been shown to be generally unfavorable for foliar application because most chelating agents have a molecular size too large to be effectively absorbed by leaf tissue. Chelated zinc is no better than inorganic sources, and not as effective as $ZnSO_4$. The relative ineffectiveness of iron foliar sprays has not been improved by using chelated sources. Copper chelate sprays were not found as effective as Bordeaux (copper sulfate + calcium hydroxide), and chelated Mg was inferior to magnesium nitrate. However, organic chelating agents (including citric and malic acids, amino acids, phenolic acids, lucoheptonate and glucosylgycine) have been shown to enhance micronutrient foliar absorption. Good sources for supplying many of the micronutrient elements are the sulfate sources. The overall effectiveness of micronutrient foliar applications, depends on multiple (2-4) applications of low rate spray solutions containing nitrogen (3-8%N).

Base Fertilizer Formulations: In order to enhance the effectiveness of any foliar application, nitrogen should always be present in any base solution. Micronutrients should be applied according to need and should always be applied along with nitrogen in the solution. Combinations of certain nutrients may pose solution solubility problems, especially where nutrient solutions are combined with fungicides and pesticides. Generally speaking, unless compatibility with fungicides and pesticides is known, nutrient sprays should be applied separately. Urea is compatible with most pesticides, exceptions being lime, sulfur, and Sevin. Magnesium sulfate is not compatible with copper sprays. Zinc sprays are not compatible with oil. Manganese solutions should not be mixed with phosphate.

Additives: Agents added to the foliar fertilizer solution which buffer the pH of the solution (preferably between pH of 5.0 and 6.0) and provide for quick and uniform coverage of the spray droplets are highly recommended. Foliage burn is caused by a high concentration of fertilizer salts (i.e., nitrate and chloride) rather than low pH in the fertilizer solution. Low pH fertilizer foliar solutions have been shown to increase the absorption rate of fertilizer materials.
Leaf and stem tissues can inhibit initial nutrient absorption by means of waxy substances in the cuticle (outer layer of plant cells). To achieve maximum nutrient absorption via foliar applications, a fine mist application with spreading and wetting agents is desired. These agents provide quick wetting of plant tissue and more uniform coverage with increased spray retention by reducing the surface tension of the spray droplets. Effective foliar applications depend on maximum absorption of soluble nutrients, avoiding losses due to evaporation and/or runoff as much as possible.

Compatibility Agents. Pesticides can sometimes be combined with liquid fertilizers for application, saving a trip through the field. But an applicator must guard against unequal distribution of the pesticide and the pesticide formulation breaking under the influence of the strong salt solutions in liquid fertilizers. Try small-scale tests in small jars to determine stability before mixing in a spray tank unless the pesticide concentration formulation specifically states that it is compatible with liquid fertilizers.

Water: Water is taken for granted in formulating fertilizer solutions, but the quality as well as the amount of water used must be considered. Water quality, especially pH, hardness, and possible excess in sulfates, nitrates, carbonates and iron, should be determined before a water source is used for foliar fertilizer formulations. For mature trees, with ground sprayers, rates of 50 to 100 gallons of water per acre are required.

Advantages of Foliar Applications

Several factors have contributed to the current widespread interest and potentialities in foliar feeding. With fruit trees, disorders and nutritional deficiencies are becoming more frequent and foliar sprays are often the most effective and the most practical means of correction and control. Soil imposed problems of dilution, penetration, and fixation are circumvented. Thus a greater response per unit of applied nutrient is realized. A plant's entire requirement for many trace elements may often be supplied by one or two foliar applications. Quantities needed are small, and tolerances for the applied materials, and rates of uptake are adequate. For the macronutrients used in large quantities, however, only a part of the nutrient needs are satisfied, but the contribution can still be significant.

Favorable results from foliar feeding are most likely to occur when the total leaf area is large. Foliar feeding is often effective when roots are unable to absorb sufficient nutrients from the soil. Such a condition could arise from an infertile soil, a high degree of soil fixation, losses from leaching, cold soil temperatures, a lack of soil moisture, or a restricted, injured, or diseased root system.

Crop response to nutrient sprays is more rapid but also more temporary than from soil treatments. This offers a quick recovery from deficiencies and more precise control over the equilibrium between vegetative growth and fruit production. As a supplement to the soil fertilizer treatments, favorable responses from foliar fertilization have been observed during periods of slow growth and during flowering. After flowering, having achieved their maximum leaf surface, fruit trees show a marked depression in general overall metabolic activity, including nutrient uptake by the roots. Foliar applications of nutrients should be especially beneficial under such conditions.

Color transitions and greening of the foliage can occur within hours. Even though these color differences cannot always be translated immediately into yields, the improved appearance of the foliage is justification enough for many growers to continue with the practice.

Conclusions

From a small beginning of over 100 years ago where iron sprays were used to correct leaf chlorosis on crops grown in alkaline soils, foliar feeding today plays an important role in crop production. Some crops are fed almost exclusively through the leaves. With almost all crops, foliar feeding plays some role in their nutrition at one time or another in their development. Leaf feeding is rapidly being standardized as an insurance against specific deficiencies, disorders and the hazards of unpredictable weather. The concept that foliar sprays should be applied only after the appearance of a deficiency disorder is unsound, since depressions in yield and quality usually precede the appearance of visual symptoms. Nutrient sprays like fertilizers applied to the soil should be used with the objective of maintaining crops at an optimal rather than at a suboptimal or marginal productivity status.

ALGAE

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

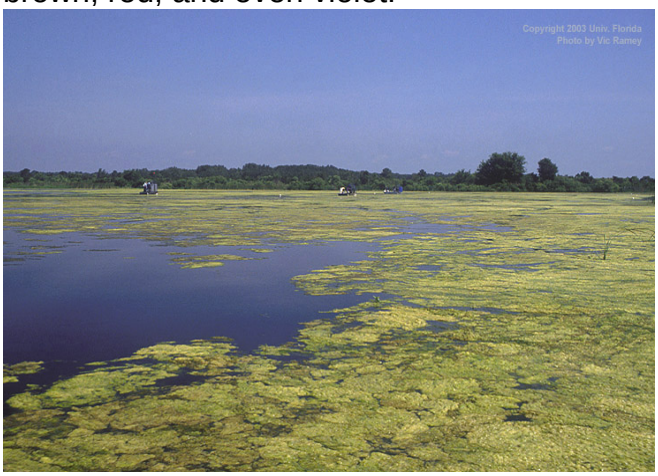
In Florida's freshwaters, algae are what make the water green, or even "slimy". However, green water is not necessarily undesirable, and neither are algae. In fact, algae are essential to the ecosystem and to life as we know it, and must be treated with respect.

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.

Brazil may have good news for Florida citrus growers

Gary Pinnell, Highlands Today

SEBRING – What's bad for the rest of the world might be good for Florida.

Global orange production in 2012-13, estimated at 49.6 million metric tons, is down 4.3 million tons from the previous year based on a smaller Brazilian crop. "Brazil's production is estimated to drop nearly 20 percent to 16.6 million tons, based on less land dedicated to oranges and expected poor yields as trees are stressed from good crops the previous two years," said a July 2013 USDA crop report. "Citrus: World Markets and Trade." "There is no doubt that a smaller Brazilian crop puts less pressure on there being an oversupply of juice worldwide," said Ray Royce, executive director of Highlands County Citrus Growers Association. A smaller crop means Brazil will fill its own market needs first. Although Brazil is the world's largest producer, most of the crop is processed domestically for juice with very little fruit for export. "And there will be less reason to find a home for their crop in the U.S." Royce said. Moreover, Brazilian producers are less likely to dump what has become a one billion gallon orange juice inventory on the U.S. "Brazil also sells a lot of fresh fruit into their domestic markets," Royce said. "They juice it in their homes and their businesses a lot more than we do. You see restaurants in Brazil squeezing fruit right in the restaurant." Lower OJ prices and citrus diseases have turned Brazilian growers to other crops such as sugarcane and soybeans, the crop report said. "They move in and out of citrus more readily than we do," said Royce, who was in Brazil a year ago. The result of a lower supply could be higher prices in the U.S., the USDA crop report said. Brazil is the largest producer of oranges in the world, Royce said. Florida is number two. "So what Brazil does always has an impact on fruit processing in the U.S.," Royce said. "Orange juice is traded as a global commodity." United States production is estimated at 7.6 million tons, down 7 percent largely because Florida's warm, dry, winter weather and disease pressure caused severe fruit drop in 2012-13 crop. "This will not affect trade since most fresh oranges for export come from California, where another good harvest will keep exports at nearly 700,000 tons, the report said. South Americans have expanded here. "They are processing fruit grown in the state of Florida," Royce said. "Cutrale is actually going to get in the business of growing oranges here. They and their partners are facilitating 25,000 acres in the U.S." Cutrale, which owns a juice processing plant in Polk County, has an office in Sebring and bought the 8,000 acre Southern Farms in Venus. The acreage was planted in fruit decades ago, but much was lost to canker, Royce said. Many of those acres were converted to farmland by Ron Grigsby's family, other acres were planted in grass and grazed by cattle. Cutrale is going to replant many of those acres in citrus. Orange acreage is declining around the world: 16.6 million tons in Brazil, 7.6 million in America, 6 million tons in Europe, 1.5 million tons in South Africa, 0.78 million tons in Morocco. Global OJ production is down 1.9 million tons. Lime, lemon and grapefruit production is down 12 million tons. As for the Highlands County crop, Royce said it's too early to accurately predict. "But rainfall has been very helpful on the Ridge. In fact, there has been some isolated stress due to too much water, but I rode with some growers a few weeks back and they were very pleased by the crop on the trees." Last year, trees dropped 20 to 30 percent of their fruit three-quarters into the nine-month citrus season. "We're hoping that was due to trauma," Royce said. Late 2012 and early 2013 was dry. "If the rainfall is adequate this season, maybe we won't have that drop.

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Farm Labor Supervisor Training Program

UF UNIVERSITY of FLORIDA IFAS Extension

2013
FARM LABOR SUPERVISOR CORE TRAINING PROGRAM

Training in four key areas:

MORNING SESSIONS

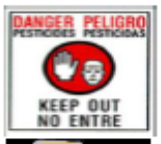
8:00am-10:00am

WAGE & HOUR

10:00am-12:00pm
DISCRIMINATION/HARASSMENT
EEOC

AFTERNOON SESSIONS

1:00pm-3:00pm
WPS/ FIELD SANITATION/
FOOD SAFETY



3:00pm-5:00pm
SAFE DRIVING

WHO: Supervisors of farm workers including field supervisors, Labor Contractors, crew leaders, growers, bus and van drivers, office staff including payroll and HR.

LANGUAGE: English and Spanish, please state preference when registering

TIME: 8:00am to 5:00 pm

FEE: $ 80.00 includes lunch.

Help protect your company from costly mistakes. !!!
Limit your potential liabilities that may result from unknowing non-compliance.
Show your buyers and employers you know the regulations.

REGISTRATION INFORMATION

Homestead	**Tuesday September 10, 2013**	**http://fls2013homestead.eventbrite.com**
Belle Glade	**Tuesday September 24, 2013**	**http://fls2013belleglade.eventbrite.com**
Arcadia	**Tuesday October 22, 2013**	**http://fls2013arcadia.eventbrite.com**
Bartow	**Wednesday October 23, 2013**	**http://fls2013bartow.eventbrite.com**
Immokalee	**Tuesday October 29, 2013**	**http://fls2013immokalee.eventbrite.com**

For more information please contact: Julie Carson at: carsonj@ufl.edu or 239-658-3462

Participants will receive an ***Attendance Certificate***.

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Flatwoods Citrus

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Hendry County Extension Office
P.O. Box 68
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Racial-Ethnic Background

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

Gender

__Female
__Male