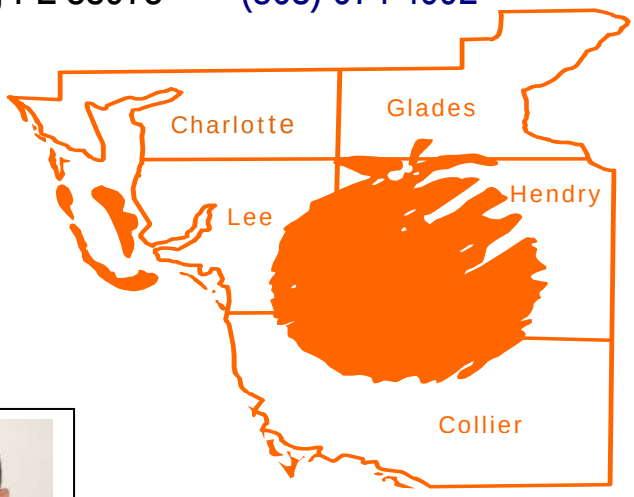
UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 22, No. 4 **April 2019**

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

Table of Contents

Seminar

Pre-registration is required.

No registration fee and lunch is free Thanks to **Charles McCartney** with Timac Agro USA. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

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

Soil Microbes, Soil Amendments, and Biostimulants During the HLB (Citrus Greening) Era

Date: Thursday, April 25, 2019, Time: 10:00 AM – 12:10 PM
Location: Immokalee IFAS Center
Program Coordinator: Mongi Zekri, UF-IFAS
Program Sponsor: Charles McCartney with Timac Agro USA

Agenda

----10:00 AM - 10:55 AM
"Examining the interactions of soil microbes with soil amendments and citrus growth"

- Factors influencing soil microbe populations, How soil microbes can interact with citrus, How soil amendments interact with microbes

Dr. Sarah Strauss, UF-IFAS

10:55 AM – 11:00 AM Break

----11:00 AM - 11:35 AM
"Can beneficial microbes and other soil amendments improve citrus tree health under HLB-endemic conditions?"

- Definition of plant biostimulants, Mode of action, Effects on citrus root health, Effects on tree nutrient status, Effects on tree health

Dr. Ute Albrecht, UF-IFAS

----11:35 AM – 12:10 PM
"Improving citrus water use and soil moisture storage with soil amendments"

- Water use in HLB-affected citrus, Effect of soil amendment on soil water storage, Relationship of soil amendments to water storage, Effect of soil amendment on tree growth, Lessons for citrus production from other cropping systems

Dr. Davie M. Kadyampakeni, UF-IFAS

The 29th Annual Farm Safety Day

Friday, 3 May 2019
Saturday, 4 May 2019

AN IMPORTANT MESSAGE TO EMPLOYERS

Safe and competent equipment operators are important to you as an employer. Accidents, which cause damage, injury or death to employees, equipment and crops, are costly. We believe all types of accidents can be reduced with proper employee training. Our training has been designed to help your employees perform better, operate safely to prevent accidents, fulfill necessary training requirements and build pride in themselves and their farm company.

Certificates

The 2018 Southwest Florida Farm Safety Day is almost here. Farm Safety Day is an educational event designed to emphasize the importance of farm/equipment safety. Each participant is presented with a certificate of attendance and **the employer will be provided with a certificate of training that can be placed into the employee's file**.

Registration Info

The deadline for registration is Friday, April 12, 2019. It is the employer's responsibility to assure that the employee is present at 7:30 AM on Friday, May 3 **or** on Saturday, May 4 at the Immokalee IFAS Center, 2685 State Rd. 29 North, Immokalee, FL 34142 to receive their nametag. Upon arrival each participant will check in at the registration table and receive a packet containing their nametag, instructions (in both English and Spanish) session handouts, an evaluation form, rodeo cap and pencil. They will be directed to their respective course sessions.

Please give us the names of those who will be attending our 29th Farm Safety Day on **Friday, 3 May or Saturday, 4 May 2019 (please select the date)**. The cost is **$20.00** per person, which will include educational sessions, handouts, pencils, refreshments, lunch, and a cap.

Make checks payable to: SW Florida Citrus Advisory Committee
Mail registration and checks to:
University of Florida, IFAS, SWFREC
Attention: Barbara Hyman
2685 State Rd. 29 North
Immokalee, FL 34142
or fax registration to: 239 658 3403
Deadline is Friday, April 13, 2018

Don't wait. The number of trainings offered and attendance at each training is LIMITED. For each day, class size is limited to the first 80 Spanish-speaking and 20 English-speaking people.

TWENTY NINTH ANNUAL SAFETY DAY

Friday, 3 May 2019
Saturday, 4 May 2019

Location: University of Florida, IFAS, SWFREC
2685 State Rd. 29 North
Immokalee, FL 34142

SCHEDULE:

7:30-8:10	Check In, Coffee, Juice, Refreshments, Door Prizes
8:10-9:00	Session 1 (Begin sessions)
9:00-9:10	Break (change session, door prizes)
9:10-10:00	Session 2
10:00-10:10	Break (change session, door prizes)
10:10-11:00	Session 3
11:00-11:10	Break (change session, door prizes)
11:10-12:00	Session 4
12:00-1:30	Lunch and Adjourn

Topics

--WPS for handlers
--How to use a Respirator
--Wildlife Safety
--Transportation Safety

The 2019 FARM SAFETY DAY
REGISTRATION FORM

Please give us the names of those who will be attending our 27th Farm Safety Day on **Friday, 3 May or Saturday, 4 May 2019** at the Immokalee IFAS Center, 2685 State Rd. 29 North, Immokalee, FL 34142. The cost is **$20.00** per person, which will include educational sessions, handouts, refreshments, lunch, and a cap.

Make checks payable to:
Citrus Advisory Committee

Mail registration and checks to:
University of Florida, IFAS, SWFREC
Attention: Barbara Hyman
2685 State Rd. 29 North
Immokalee, FL 34142

Or fax registration to: 239 658 3403
Deadline is Friday, April 12, 2019

Company Name:

Administrative Contact Person:

E-mail address:

Mailing Address:

Telephone: _____ Fax:_____ County:_____

Please list the employees who will be attending our safety training and please check their language preference*****. If there is not enough space to fill in all attendants, please attach an additional sheet with the necessary information.

Name	Friday or Saturday	English	Spanish	Name	Friday or Saturday	English	Spanish
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***Please Note: It is very important that we know the date (Friday, 3 May or Saturday, 4 May 2019) and the language capabilities for each attendee.**
Next to each attendee's name please mark in which language they are more fluent.
If there are any questions, please contact **Barbara Hyman (hymanb@ufl.edu) at 239 658 3400.** **Don't wait. The number of trainings offered and attendance at each training is LIMITED. For each day, class size is limited to the first 80 Spanish-speaking and 20 English-speaking people.**

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

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

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

14 March 2019

ENSO Alert System Status: El Niño Advisory

Synopsis: **Weak El Nino conditions are likely to continue through the Northern Hemisphere spring 2019 (~80% chance) and summer (~60% chance).**

El Niño conditions strengthened during February 2019, as above-average sea surface temperatures (SSTs) increased across the equatorial Pacific Ocean [Fig. 1] and the associated atmospheric anomalies became increasingly well-defined. The SST index values in the Niño3, Niño3.4 and Niño4 regions all increased during February, with the latest weekly values near +1°C in each region [Fig. 2]. The anomalous upper-ocean heat content (averaged across 180°-100°W) increased appreciably during February [Fig. 3], due to an increase in above-average temperatures at depth in association with a downwelling equatorial oceanic Kelvin wave [Fig. 4]. Enhanced equatorial convection prevailed near the Date Line, while suppressed convection was observed over Indonesia [Fig. 5]. Low-level wind anomalies were westerly in the central Pacific Ocean, while upper-level wind anomalies were mostly westerly over the far western and far eastern Pacific. The equatorial and traditional Southern Oscillation Index values were both negative (-1.4 standard deviations). Overall, these features are consistent with weak El Niño conditions.

The majority of models in the IRI/CPC plume predict a Niño 3.4 index of +0.5°C or greater through the Northern Hemisphere early autumn 2019 [Fig. 6]. Given the recent downwelling Kelvin wave, and the increase in both the SSTs and subsurface ocean temperatures, most forecasters expect positive SST anomalies to persist across the central and eastern Pacific for at least the next several months. During that time, forecasters predict the SST anomalies in the Niño 3.4 region to remain between +0.5°C and +1.0°C, indicating weak El Niño conditions. However, because forecasts made during spring tend to be less accurate, the predicted chance that El Niño will persist beyond summer is currently about 50%. In summary, weak El Niño conditions are likely to continue through the Northern Hemisphere spring 2019 (~80% chance) and summer (~60% chance); 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 CPCs Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 11 April 2019.

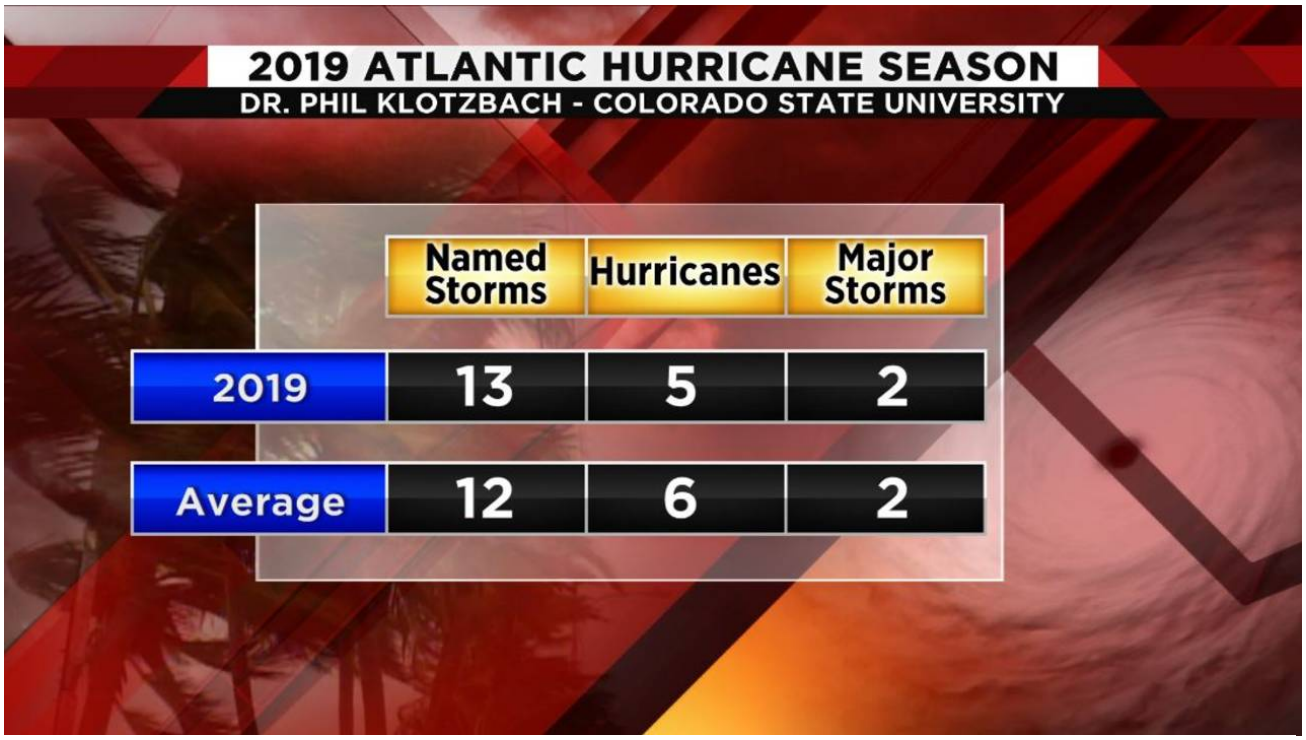
To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

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

2019 HURRICANE SEASON OUTLOOK: SLIGHTLY BELOW-NORMAL ATLANTIC ACTIVITY

Slightly below normal activity anticipated

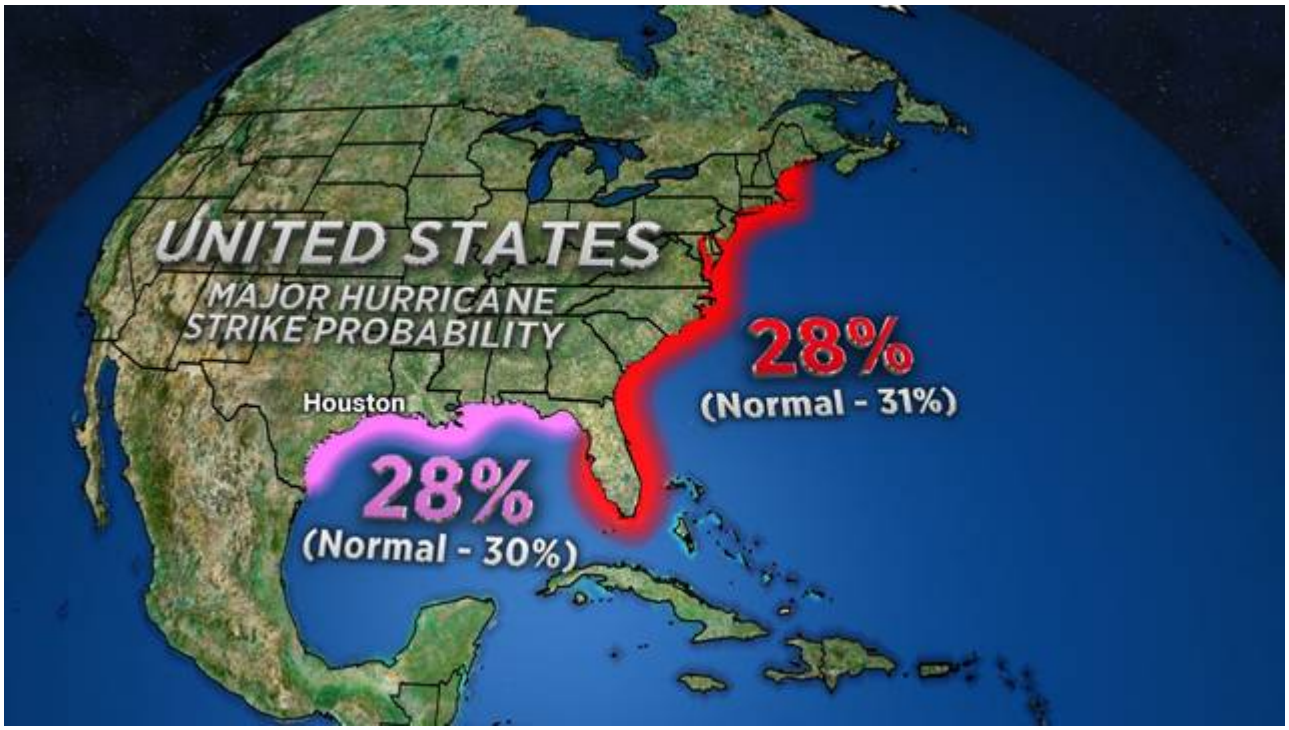
By Eric Braate - Weather Executive Producer



HOUSTON - Dr. Phil Klotzbach, a renowned meteorologist and hurricane expert from Colorado State University, issued his annual early-spring Atlantic hurricane season outlook Thursday. He predicts slightly below-normal activity for 2019.

Klotzbach predicts 13 named storms, five hurricanes and two major hurricanes, which is very close to a normal season.

He believes that the Gulf Coast and the Atlantic Coast of the U.S. each have a 28 percent chance for a major hurricane strike this season. Again, that is only slightly below the climatological average probability.



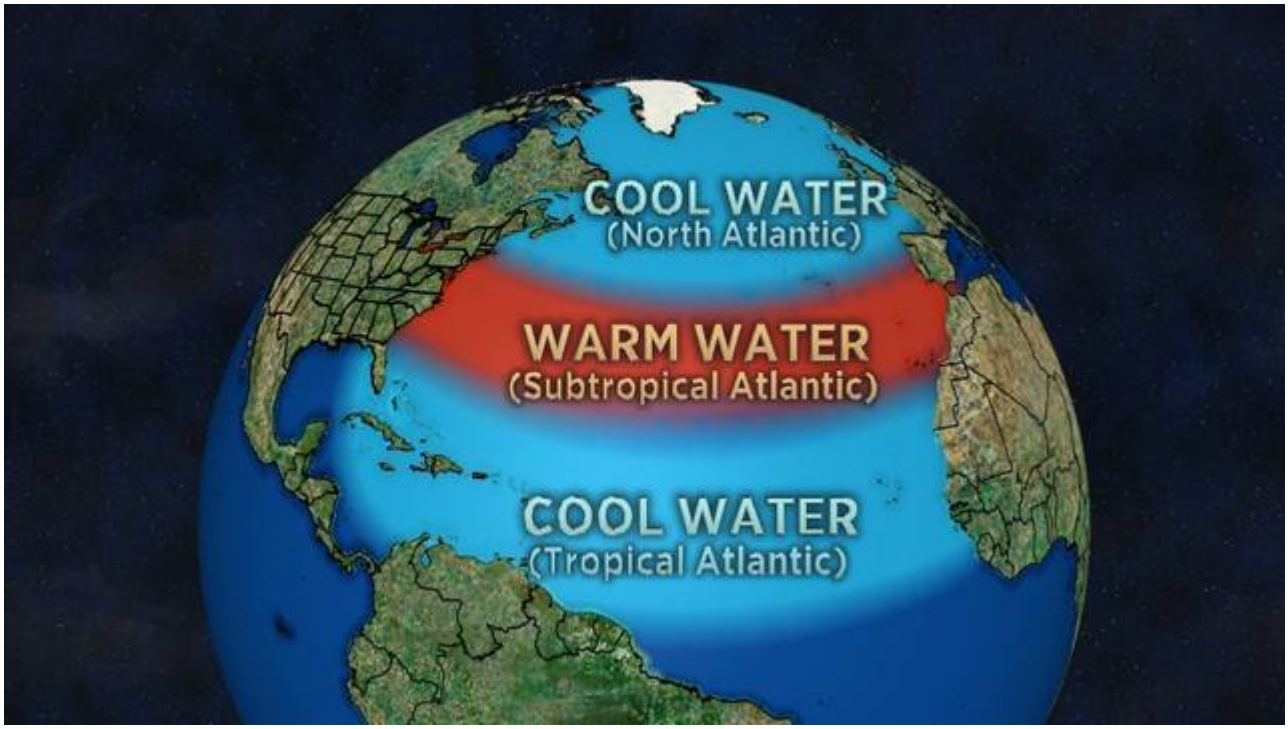
Klotzback uses both historic climate data and forecast data to predict activity for the upcoming tropical season.

One key factor this year is the presence of an El Nino, characterized by above-normal temperatures in the equatorial Pacific Ocean off the coast of South America.

El Nino events tend to create strong upper level wind patterns in the Atlantic basin, which inhibit hurricane formation.

Another variable Klotzback watches closely is Atlantic Ocean water temperature. Warmer-than-normal water has more energy available to support hurricane formation, which would signal an active season. Right now, only the subtropical Atlantic has above normal temperatures.

The tropical and far north Atlantic regions are both cooler than normal, which would indicate slightly below-average activity.



There are many other variables and considerations that go into hurricane season outlooks. They need to be monitored closely throughout the summer months to see how they stack up to the original forecast. Likely, the forecast will need to be tweaked in real time as the season unfolds. For that reason, Klotzbach will issue an updated outlook in early June based on the newest data available.

One thing to stress is that it only takes one storm to hit your home for the season to be catastrophic for you. Therefore, it is extremely important to develop a plan of action now so that you know what to do the next time a hurricane threatens the Upper Texas Coast. And remember, there is no doubt that there will be a next time. It is just a matter of when, so be prepared now.

FIRST FORECAST: EXPERTS PREDICT 5 HURRICANES THIS SEASON

Doyle Rice, USA TODAY
https://www.usatoday.com/story/news/nation/2019/04/04/hurricane-forecast-colorado-state-forecasters-say-5-form-2019/3363430002/

The 2019 hurricane season begins June 1 and runs through Nov. 30. Here are the storm names for the upcoming season. Maureen Kenyon, maureen.kenyon@tcpalm.com

Story Highlights

13 tropical storms are forecast to form, of which 5 will be hurricanes.
A weak El Nino and cool Atlantic waters are 2 limiting factors this year.
Insurance companies, emergency managers and the media use the forecasts.

After yet another catastrophic hurricane season in the USA in 2018, which featured such ferocious storms as Florence and Michael, top hurricane forecasters made their first prediction for the 2019 season, which begins June 1.

Thanks to a weak El Niño, experts expect a "slightly below-average Atlantic hurricane season." Meteorologist Phil Klotzbach and other experts from Colorado State University – among the nation's top seasonal hurricane forecasters – predict 13 named tropical storms will form, five of which will become hurricanes.

An average season has 12 tropical storms, six of which are hurricanes.

A tropical storm becomes a hurricane when its wind speed reaches 74 mph.

Of the five predicted hurricanes, two are expected to spin into major hurricanes – Category 3, 4 or 5 – with sustained wind speeds of 111 mph or greater. The group said there's a near-average chance for major hurricanes to make landfall along the U.S. coastline. Klotzbach put the chance of a major hurricane strike at 39%.

Last year, Florence and Michael combined to kill more than 100 Americans and cost nearly $50 billion in damage, the National Oceanic and Atmospheric Administration said.

The Atlantic hurricane season runs from June 1 to Nov. 30, though storms sometimes form outside those dates.

The team predicts that 2019 hurricane activity will be about 75% of the average season. By comparison, 2018’s hurricane activity was about 120% of the average season.

Colorado State's prediction in 2018 was quite good. Last year, the team predicted 14 tropical storms would form, of which seven would become hurricanes. In all, 15 tropical storms developed, and eight strengthened into hurricanes.

One of the major determining factors in hurricane forecasting is whether the USA is in an El Niño or La Niña climate pattern.

"The current weak El Niño event appears likely to maintain intensity or perhaps even strengthen during the summer/fall," according to the forecast.

El Niño is a natural warming of tropical Pacific Ocean water, which tends to suppress the development of Atlantic hurricanes. Its opposite, La Niña, marked by cooler ocean water, tends to increase hurricanes in the Atlantic.

Another limiting factor: Tropical Atlantic sea surface temperatures are slightly cooler than average. Hurricanes are fueled in part by warm seawater.

MICRONUTRIENTS IN CITRUS NUTRITION

Iron (Fe): One of the functions of Fe is to act as a catalyst in the production of chlorophyll. Iron deficiency has been of importance on calcareous soils in certain areas of Florida where the soil contains high amount of calcium carbonate and has a pH of 8.0. Iron deficiency is attributed to low Fe content in white sandy areas near lakes and places known locally as "sand soaked areas". Iron deficiency can be induced by high levels of P and accumulations of heavy metals, primarily Cu, in the soil. In Florida, Fe deficiency is commonly associated with Zn and Mn deficiencies.

The symptoms of Fe deficiency are also known as "iron chlorosis". They occur on new growing leaves which are very light in color and sometimes almost white but with the veins greener than the remainder of the leaf. In acute cases, the leaves are reduced in size, very thin, and shed early. The trees die back severely on the periphery and especially in the top. Fruit set, yield, and fruit size will be reduced.

Iron deficiency is usually associated with high soil alkalinity, but it is also associated with over irrigation, prolonged spells of wet soil conditions or poor drainage and low soil temperature. Several areas affected with Fe chlorosis in south Florida have been materially helped or completely cured by careful control of irrigation and drainage. Iron deficiency sometimes occurs where excess salts are present in the soil.

Iron deficiency has been found to be one of the most difficult deficiencies to correct especially on calcareous soils. Foliar applications of Fe are not recommended because of their lack of effectiveness and risk of leaf and fruit burn. At their best, foliar sprays of Fe produce a spotted greening of the leaves rather than an overall greening. The most reliable means of correcting Fe chlorosis in citrus is by soil application of iron chelates. Iron sulfate has not given satisfactory control on either acid or alkaline soils. Citrus rootstocks vary in their ability to absorb Fe. Trifoliate orange and its hybrids (Swingle citrumelo and Carrizo citrange) are the least able to do so.

Iron Chelates	Effective pH Range
Fe-EDTA	4 to 6.5
Fe-HEDTA	4 to 6.5
Fe-DTPA	4 to 7.5
Fe-EDDHA	4 to 9.0

Zinc (Zn): Zinc is essential for the formation of chlorophyll and function of normal photosynthesis. Zinc is also needed for the formation of auxins which are growth-promoting substances in plants.

Zinc deficiency symptoms are characterized by irregular green bands along the midrib and main veins on a background of light yellow to almost white. The relative amounts of green and yellow tissue vary from a condition of mild Zn deficiency in which there are only small yellow splotches between the larger lateral veins to a condition in which only a basal portion of the midrib is green and the remainder of the leaf is light yellow.

In less acute stages, the leaves are almost normal in size, while in very acute cases the leaves are pointed, abnormally

narrow with the tendency to stand upright, and extremely reduced in size. In mild cases, Zn deficiency symptoms appear on occasional weak twigs. Fruit formed on these weak twigs are drastically reduced in size and have an unusually smooth light-colored thin skin and very low juice content.
Zinc deficiency symptoms can be so severe that they may mask or noticeably alter the symptoms of other deficiencies or disorders. Deficiency in Zn can develop due to soil depletion or formation of insoluble compounds. Excessive P or N has also been found to induce or aggravate Zn deficiency.

Foliar spray applications of 3-5 lbs/acre of zinc are recommended on each of the three major flushes of citrus trees to prevent nutrient deficiencies, cope with HLB, and improve production. Sulfate forms are less expensive and nitrate forms appear to facilitate the uptake of micronutrients. Maximum benefit is obtained if spray is applied to the young growth when it is two-thirds to nearly fully expanded and before it hardens off.

Manganese (Mn): Manganese is involved in the production of amino acids and proteins. It plays a role in photosynthesis and in the formation of chlorophyll.

Manganese deficiency occurs commonly in Florida. It is particularly evident in the spring after a cold winter. Manganese deficiency leads to a chlorosis in the interveinal tissue of leaves but the veins remain dark green. Young leaves commonly show a fine pattern or network of green veins on a lighter green background but the pattern is not so distinct as in Zn or Fe deficiencies because the leaf is greener. By the time the leaves reach full size, the pattern becomes more distinct as a band of green along the midrib and principal lateral veins with light green areas between the veins.

In more severe cases, the color of the leaf becomes dull-green. Interveinal leaf areas may develop many whitish opaque spots which give the leaf a whitish or gray appearance. The leaves are not reduced in size or changed in shape by Mn deficiency, but affected leaves prematurely fall from the tree. No particular twig symptoms have been related to Mn deficiency. In cases of acute Mn deficiency, the growth is reduced giving the tree a weak appearance.

Manganese deficiency may greatly reduce the crop and the color of the fruit. Manganese deficiency is frequently associated with Zn deficiency. This combination of the two deficiency symptoms on leaves is characterized by dark green veins with dull whitish green areas between the veins. In such combinations, the Mn deficiency is acute and the Zn deficiency is relatively mild.

In Florida, Mn deficiency occurs on both acid and alkaline soils. It is probably due to leaching in the acid soils and to insolubility in the alkaline soils. For deficient trees on alkaline soils, treatments by sprays of Mn compounds are recommended. On acid soils, Mn can be included in the fertilizer. Foliar

spray application quickly clears up the pattern on young leaves but older leaves respond less rapidly and less completely. When Mn sprays are given to Mn-deficient orange trees, fruit yield, total soluble solids in the juice and pounds solids per box of fruit increase. Foliar spray applications of 3-5 lbs/acre of manganese are also recommended on each of the three major flushes of citrus trees to prevent nutrient deficiencies, cope with HLB, and improve production. Sulfate forms are less expensive and nitrate forms appear to facilitate the uptake of micronutrients.

If N is needed, adding 7 to 10 lbs of low biuret urea will increase Mn uptake.

Boron (B): Boron is particularly necessary where active cell division is taking place. Boron plays an important role in flowering. 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. 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 and 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, mis-shapen with an unusually thick albedo containing gum deposits. 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. 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.

Borax and other B compounds are generally used in treating citrus affected with B deficiency. They can be applied either foliarly or in the fertilizer. As a maintenance program, apply B in the fertilizer at an annual rate equivalent to 1/300 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, but preferably during early flower development. Treating at this growth stage is important because boron does not move very readily from other parts of the tree to the buds. Applying boron at this time will assist in flower initiation and pollen production, satisfy the needs for pollen tube growth, and enhance fruit set. Foliar spray applications of 0.25-0.50 lb/acre of boron are also recommended on each of the three major flushes of citrus trees.

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.

Copper (Cu): Copper also has a role in photosynthesis and chlorophyll formation. The functions of Cu in the mineral nutrition of plants are numerous. Heavy fertilization

with N tends to increase the severity of Cu deficiency.

If Cu in citrus leaves falls below 4 ppm in dry matter, severe Cu deficiency will develop. In the range of 4 to 5 ppm, mild to moderate deficiency symptoms may occur. Copper deficiency rarely occurs when the Cu concentration in leaves is 6 ppm or above.

Excessive applications of nitrogenous fertilizers have been considered for years a contributing cause for this trouble giving rise to the term “ammoniation”. The cause might be an unbalanced N/Cu ratio.

The first symptom is the formation of unusually vigorous large dark green foliage with a “bowing up” of the midrib. The twigs are also unusually vigorous, long, soft, angular, frequently “S” shaped and more or less drooping.

Fruit symptoms are most pronounced on oranges. Brown stained areas of hardened gum on the rind of the fruit may precede the appearance of leaf and twig symptoms. In severe cases, dieback of young twigs will occur and the twigs will be covered by reddish brown droplets of gums.

Insufficient available Cu in the soil is believed to be the primary cause of the symptoms described. Copper deficiency is more of a problem on newly planted flatwoods land than the ridge. Prevention or cure of Cu deficiency is accomplished by either foliar sprays or soil applications of Cu compounds. A Cu spray of solution containing 3 to 5 lbs of elemental Cu applied during bloom time commonly causes an almost immediate recovery and results in a good setting of normal fruit. Copper deficiency can be a controlling factor in fruit production, and acute Cu deficiency may put trees entirely out of production. Foliage sprays are often valuable emergency treatments when symptoms of Cu deficiency are first observed.

CONCLUSION

Most micronutrient deficiencies may be recognized by visual symptoms. However, leaf analysis is helpful in verifying deficiencies particularly when non-typical symptoms or multiple nutrient deficiencies appear. Leaf analysis also provides information on low, but not yet deficient, amounts of an element so that treatment may be applied to prevent a deficiency.

For more details and more information on citrus nutrition, go to Nutrition of Florida Citrus Trees at:

http://edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf

CITRUS CANKER,

caused by the bacterium *Xanthomonas citri subsp. citri*, is a leaf, fruit, and stem blemishing disease that affects most citrus. Grapefruit, Mexican lime, and some early oranges are highly susceptible to canker. Navel, Pineapple, and Hamlin oranges, as well as, lemons and limes are moderately susceptible. Mid-season oranges, Valencias, tangors, tangelos, and other tangerine hybrids are less susceptible. Tangerines are tolerant.

Major citrus canker outbreaks generally occur when new shoots are emerging or when fruit are in the early stages of development, especially if a major rainfall event occurs during this critical time. Frequent rainfall in warm weather, especially storms, contributes to disease development. Citrus canker causes defoliation, shoot die-back and fruit drop.

With endemic canker, infection starts as early as <u>April</u>.

Leaf susceptibility is complicated by the Asian leafminer. The galleries caused by leafminer larvae do not heal quickly and increase leaf susceptibility. This results in leaves with highly susceptible wounds for long periods of time through which the bacterium can infect the leaf.

Almost all leaf and stem infections occur within the first 6 weeks after initiation of growth unless there is a leafminer infestation. The most critical period for fruit infection is when the fruit are between 0.5-1.5 inch in diameter for grapefruit and 0.25-1.25 inch in diameter for oranges. That is the stage when the stomates on the fruit surface are opening and fruit are particularly susceptible to bacterial penetration. After petal fall, fruit remain susceptible during the first 60 to 90 days for oranges or tangerines and 120 days for grapefruit.

Management

The Citrus Health Response Plan (CHRP) does not require removal of affected trees. Thus, growers should use their best judgment in management of citrus canker. The entire state of Florida is under quarantine, and fruit movement is subject to specific regulations depending on market destination.

Canker losses can be severe under Florida conditions, and can be difficult to control on grapefruit and the most susceptible early season orange varieties.

Endemic Canker. Where canker is already endemic, the primary means of control are: 1) planting of windbreaks, 2) protection of

fruit and leaves with copper sprays, and 3) control of leafminer.

Windbreaks. Windbreaks are highly effective for 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 that push the bacteria into tissues. Winds of 18 to 20 mph are needed to force bacteria into stomates on leaves and fruit.
For more information on selection of plant species and design, see the CREC Web site (http://www.crec.ifas.ufl.edu/extension/windbreaks/).

No material has proven more effective than copper products. Copper products are quite effective for preventing fruit infection, but much less effective for reducing leaf infection. Application of copper to young leaves protects against infection, but it is soon lost due to rapid expansion of the surface area. Also, copper has limited value in reducing disease spread.

For oranges with endemic canker, most of the infection will occur from April to July. No more than five copper sprays applied at 21-day intervals are recommended for early processing oranges: one in early April (fruit at 0.25 to 0.5-inch stage); a second in late April, a third in mid-May, a fourth in early June and a fifth in late June to early July when the fruit is about 1.5-inch diameter. Three applications at a 21-day interval should be sufficient for Valencias and midseason varieties, in mid-April (fruit at 0.25 to 0.5-inch stage), in early/mid-May, and late May/early June. Varieties of early oranges grown for higher color score (Early Gold, Westin, Ruby, Itaborai) are more susceptible than Hamlin and may require additional sprays before April and beyond July.

The most critical period for fruit infection is when the fruit is between 0.5-1.5 inch in diameter

Navel oranges are susceptible to canker and will probably need to be sprayed every 21 days from early April to mid-July. Fallglo is relatively tolerant and probably three sprays in April, May and June should suffice. Newly planted trees in canker exposed settings are more susceptible because they produce leaf flushes more often and the flush tissue represents a high proportion of the canopy volume. The recommendation for the more susceptible varieties (grapefruit and early oranges) is that the trees be sprayed every 3 to 4 weeks to coincide with vegetative flush cycles from spring though the fall. Sprays should be applied with a hoop sprayer that thoroughly covers the foliage on all sides of the canopy.

Spray volumes for young and fruiting trees will have to be adjusted as more experience is gained. The rates of copper products 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, more than 1 lb of metallic copper may be required to protect fruit for 3-week periods.

TABLE 1. Recommended Chemical Controls for Citrus Canker

Pesticide	FRAC MOA[1]	Mature Trees Rate/Acre[2]
Actigard 50WG	P01	See Table 2
copper fungicide	M01	Use label rate

1 Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2018. Refer to ENY624, Pesticide Resistance Management, in the 2018-19 Florida Citrus Production Guide for more details.
2 Lower rates can be used on smaller trees. Do not use less than the minimum label rate.

TABLE 2. Recommended Rates and Use Patterns for Actigard 50WG/100 Trees

Number of Applications /Year[1]	Tree Age and Rate[2,4] (oz.)/Application			
	< 1 year3	1-2 years	2-3 years	>3 years
4 or less	0.125 - 0.25	0.25 - 0.50	0.50 – 0.75	0.75 – 1.5
5 or more	0.125	0.25	0.50	0.75 – 1

1 Minimum interval between applications is 30 days. If tree stunting, yellowing or other symptoms of possible phytotoxicity are observed reduce the use rates in subsequent applications to the low end of the recommended rate range and increase the application interval to 60 days.
2 Do not use more than 12.8 oz./A/year and no more than 3.2 oz./A/application.
3 For newly planted trees delay applications until trees become established & overcome transplant shock and initiate treatment at 0.125 oz./100 trees.
4 As tree size increases during the season dosages should be adjusted towards the upper end of the recommended rate range.

https://crec.ifas.ufl.edu/media/crecifasufledu/extension/plant-pathology-/florida-citrus-production-guide/pdf/Canker.pdf

IMPORTANCE OF SPRAYER CALIBRATION

Sprayers must be checked to ensure all nozzles are applying pesticides uniformly and at the correct rate. Make sure your equipment is working properly and calibrated to ensure the correct amount of pesticide is delivered to the target area.

Pesticide application, greater than the label rate, is illegal and can result in needless risk to groundwater, increased production costs, and crop damage. Under-application might be costly by not properly controlling the target pest. Although you can sometimes repeat the application, doing so is time-consuming, costs more, increases the risk of applying too much and increases the risk in pesticide resistance.

Regular sprayer calibration includes measuring the output of each nozzle to ensure all nozzles are functioning properly. Specific calibration guides are available from a number of sources. Sprayer calibration should be done every time a different pesticide is applied or at least once each season.

The rate of application depends partly on the particle or droplet size, texture, and other properties of the pesticide being applied. Use only water during the test if the pesticide is a liquid. Contact the manufacturer to get reliable information regarding carrier material to perform the tests if the pesticide is a dust, granule, or fumigant, or a liquid diluted with a liquid other than water.

Follow calibration and mixing instructions carefully. Mixing, loading, and calibration methods must also conform to the speed of the application machinery. Moving too fast or too slow changes the rate of application.

Minimizing spray drift

Spray drift, movement of a pesticide through air during or after application to a site other than the intended site of application is a challenging issue facing pesticide applicators. Complete elimination of spray drift is impossible. However, drift can be minimized by following these control measures:

1. Read and follow the pesticide label.
2. Select low or nonvolatile pesticides.
3. Use spray additives following label guidelines.
4. Use large orifice sizes for spray nozzles.
5. Avoid high sprayer pressures, which create finer droplets.
6. Use drift reduction nozzles.
7. Use wide-angle nozzles, lower spray boom heights, and keep spray boom stable.
8. Do not spray when wind speeds exceed 10 mph and when wind direction is directed toward sensitive vegetation.
9. Use a shielded spray boom when wind conditions exceed preferred conditions.
10. Avoid spraying on extremely hot and dry days, especially if sensitive vegetation is nearby.
11. Keep good records and evaluate the results.

IMPORTANCE OF FERTILIZER SPREADER CALIBRATION AND MAINTENANCE

Properly calibrated and maintained equipment ensures a more uniform distribution of nutrients. This, combined with other conservation practices, reduces production costs, soil surface runoff, and nutrient movement to nearby surface waters. Spreaders that have not been properly maintained and calibrated will have problems delivering accurate rates and evenly distributed fertilizer amounts to the grown crop.

Calibration

Calibration is the process used to help ensure that the equipment applies proper rates of the selected product. Proper calibration is the key to successful fertilizer use efficiency. Failure to calibrate equipment can result in ineffective applications. Applying too much is costly, unlawful and may cause crop injury. Applying too little can result in poor crop growth and production. It is important to calibrate equipment on a regular basis to compensate for variations. The equipment will become worn or damaged with use and result in inaccurate output and spread pattern.

Two items must be considered when calibrating a spreader. The first is the distribution pattern of the spreader. The second is the product application rate, which is the amount of product applied per acre. There are many factors that affect the distribution pattern of a rotary spreader and some of them relate directly to the product. For this reason, it is recommended that the spreader be calibrated separately for every product to be applied. Spreader calibration should be checked more often when the spreader is used frequently.

Product & application

Choose a product according to the need of the crop. Before applying the product, read the spreader manual. The spreader manual will usually indicate proper settings for various application rates. However, calibration still needs to be performed to ensure the settings are accurate and to compensate for wear and variations in equipment. Be sure that the proper procedures and application rates are followed. Check the ‘spread pattern’ and amount being applied. The physical properties of dry fertilizer can vary widely. Since larger particles are thrown further than small particles, a product of uniform size should be used to achieve a consistent application pattern. It is essential to maintain a constant speed when using a rotary spreader to obtain uniform and accurate distribution.

Maintenance and Cleaning

Proper care and maintenance will help retain precise applications and prolong the life of spreaders. Manufacturer’s directions on cleaning and lubricating should be followed. With the shutter or gate wide open, remove all granules from the spreader at the end of each application. Then, the spreader should be thoroughly washed and allowed to dry. Hot water may help break lose fertilizer which is caked on. Finally, lubricate the spreader according to instructions. Spreaders should be stored in a clean, dry place out of direct sunlight.

Flatwoods Citrus

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Racial-Ethnic Background

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

Gender

__Female __Male