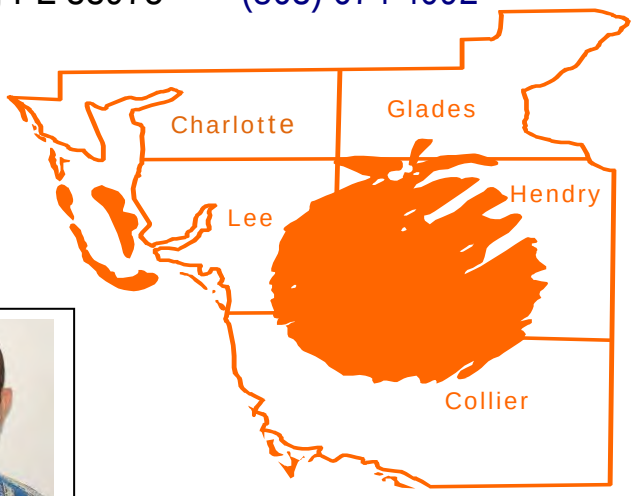
UF UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 26, No. 4 **April 2023**

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

Mongi Zekri

Table of Contents

United States Department of Agriculture
National Agricultural Statistics Service

CITRUS

APRIL FORECAST
MATURITY TEST RESULTS AND FRUIT SIZE

Cooperating with the Florida Department of Agriculture and Consumer Services
851 Trafalgar Ct, Suite 310E, Maitland, FL 32751-4132
(407) 648-6013 · (855) 271-9801 FAX · www.nass.usda.gov/fl

April 11, 2023

Florida All Orange Production Unchanged from March Forecast
Florida Non-Valencia Orange Unchanged
Florida Valencia Orange Production Unchanged
Florida All Grapefruit Production Up 6 Percent
Florida All Tangerine and Tangelo Unchanged

FORECAST DATES - 2022-2023 SEASON		
May 12, 2023	June 9, 2023	July 12, 2023

Citrus Production by Type – States and United States

Crop and State	Production [1]		2022-2023 Forecasted Production [1]	
	2020-2021	2021-2022	March	April
	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)
Non-Valencia Oranges [2]				
Florida	**22,700**	**18,250**	**6,100**	**6,100**
California	41,300	31,500	38,000	37,000
Texas	1,000	170	900	700
United States	65,000	49,920	45,000	43,800
Valencia Oranges				
Florida	**30,250**	**22,950**	**10,000**	**10,000**
California	7,700	7,600	8,100	8,100
Texas	50	30	250	350
United States	38,000	30,580	18,350	18,450
All Oranges				
Florida	**52,950**	**41,200**	**16,100**	**16,100**
California	49,000	39,100	46,100	45,100
Texas	1,050	200	1,150	1,050
United States	103,000	80,500	63,350	62,250
Grapefruit				
Florida-All	**4,100**	**3,330**	**1,600**	**1,700**
Red	**3,480**	**2,830**	**1,440**	**1,520**
White	**620**	**500**	**160**	**180**
California	4,200	4,100	4,300	4,200
Texas	2,400	1,700	2,200	2,400
United States	10,700	9,130	8,100	8,300
Lemons				
Arizona	750	1,250	1,500	1,700
California	20,100	25,200	22,000	23,000
United States	20,850	26,450	23,500	24,700
Tangerines and Tangelos				
Florida	**890**	**750**	**500**	**500**
California [3]	28,800	17,500	22,000	21,000
United States	29,690	18,250	22,500	21,500

[1] Net pounds per box: oranges in California-80, Florida-90, Texas-85; grapefruit in California and Texas-80, Florida-85; lemons-80; and tangerines and mandarins in California-80, Florida-95.
[2] Navel and miscellaneous varieties in California. Early (including Navel) and midseason varieties in Florida and Texas.
[3] Includes tangors.

All Oranges 16.1 Million Boxes

The 2022-2023 Florida all orange forecast released today by the USDA Agricultural Statistics Board is unchanged at 16.1 million boxes. If realized, this will be 61 percent less than last season's revised production. The forecast consists of 6.10 million boxes of non-Valencia oranges (early, mid-season, and Navel varieties) and 10.0 million boxes of Valencia oranges.
A 9-year regression has been used for comparison purposes. All references to "average", "minimum", and "maximum" refer to the previous 10 seasons, excluding the 2017-2018 season, which was affected by Hurricane Irma. Average fruit per tree includes both regular and first late bloom.

Non-Valencia Oranges 6.10 Million Boxes

The forecast of non-Valencia orange production is unchanged at 6.10 million boxes. Non-Valencia harvest is over for the season. The Row Count survey conducted March 29-30, 2023, showed the relatively complete harvest of early & mid-season non-Valencia rows. The Navel forecast, included in the non-Valencia portion of the forecast, is 240,000 boxes.

Valencia Oranges 10.0 Million Boxes

The forecast of Valencia orange production is 10.0 million boxes, unchanged from the previous forecast. Final fruit size is below the minimum, requiring 294 pieces to fill a 90-pound box. Final droppage, measured at 70 percent, is above the maximum and the highest in a series dating back to the 1960-1961 season. The Row Count survey conducted March 29-30, 2023, showed 61 percent of the Valencia crop harvested.

All Grapefruit 1.70 Million Boxes

The forecast of all grapefruit production is increased 100,000 boxes to 1.70 million. The Row Count survey conducted March 29-30, 2023, indicated 95 percent of red and white grapefruit rows are harvested. Certified utilization is 1.60 million boxes.

Tangerines and Tangelos 500,000 Boxes

The forecast for tangerines and tangelos is unchanged at 500,000 boxes. Certified utilization is 448,000 boxes. This forecast number includes all certified tangerine and tangelo varieties.

Reliability

To assist users in evaluating the reliability of the April 1 Florida production forecasts, the "Root Mean Square Error," a statistical measure based on past performance, is computed. The deviation between the April 1 production forecast and the final estimate is expressed as a percentage of the final estimate. The average of squared percentage deviations for the latest 20-year period is computed. The square root of the average becomes statistically the "Root Mean Square Error." Probability statements can be made concerning expected differences in the current forecast relative to the final end-of-season estimate, assuming that factors affecting this year's forecast are not different from those influencing recent years.

The "Root Mean Square Error" for the April 1 Florida all orange production forecast is 3.7 percent. If you exclude the three abnormal production seasons (three hurricane seasons), the "Root Mean Square Error" is 3.9 percent. This means chances are 2 out of 3 that the current all orange production forecast will not be above or below the final estimates by more than 3.7 percent including abnormal seasons, or 3.9 percent excluding abnormal seasons. Chances are 9 out of 10 (90 percent confidence level) that the difference will not exceed 6.3 percent including abnormal seasons, or 6.8 percent excluding abnormal seasons.

Changes between the April 1 Florida all orange forecast and the final estimates during the past 20 years have averaged 3.10 million boxes (3.25 million, excluding abnormal seasons), ranging from 0.05 million boxes to 5.7 million boxes including abnormal seasons, (1.3 to 5.7 million boxes excluding abnormal seasons). The April 1 forecast for all oranges has been below the final estimate 10 times, above 10 times, (below 9 times, above 8 times, excluding abnormal seasons). The difference does not imply that the April 1 forecasts this year are likely to understate or overstate final production.

Forecast Components, by Type – Florida: April 2023

[Survey data is considered final in December for Navels, January for early & mid-season (non-Valencia) oranges, February for grapefruit, and April for Valencia oranges]

Type	Bearing trees	Fruit per tree	Droppage	Fruit per box
	(1,000 trees)	(number)	(percent)	(number)
ORANGES				
Early & mid-season (Non-Valencia) [1]	15,841	474	76	333
Navel	653	106	69	137
Valencia	27,465	323	70	294
GRAPEFRUIT				
Red	1,574	381	45	140
White	180	448	34	112

[1] Excludes Navels.

Via Zoom Citrus Workshop
April 2023 Citrus Workshop
Date and time: Tuesday, April 25, 2023, 10:00 AM – 11:00 AM
Title: Psyllid and leafminer research and management update
Speaker: **Dr. Lukasz Stelinski**, Professor in Entomology, UF-IFAS Citrus Research & Education Center, Lake Alfred

Psyllid density is related to tree stress. As psyllid numbers increase, tree stress increases compromising tree health and yield. As the pest population continues to rise, it reaches a point where the resulting damage would justifies taking control measures. Thresholds of 0.2 – 1.0 psyllids per monitoring tap are effective thresholds to trigger management sprays. A new alternative being developed for suppressing ACP populations is the use of Bt pesticidal proteins produced by bacteria. Bt are naturally derived bacteria that produce ACP-killing proteins. We have developed both transgenic citrus that produces its own ACP-killing Bt and have delivered it into citrus phloem with citrus tristeza virus as the delivery vehicle. Both methods show promise.

For citrus leafminer, the window for spraying against is between 13-31 days after budbreak. Apply soil systemics before leaf flush (10-14 d) because it takes time for the concentration of insecticide to build up. Pheromone mating disruption interferes with leafminer mating which decreases infestation. Several formulations have been available over the years. A new and less expensive (competitive with insecticides) technology for CLM disruption is being registered. This new technology/formulation is an aerosol Puffer that can be deployed as 1 unit per four acres of citrus.

Coordinator: Dr. Mongi Zekri, UF-IFAS, maz@ufl.edu
1 CEU for pesticide license renewal
1 CEU for certified crop advisors

CEUs for pesticide license renewal

Earn CORE CEUs online through Southeast AgNet & Citrus Industry magazine

http://citrusindustry.net/ceu/

The following series of articles and quizzes are available with their expiration dates noted:

- **2023 #1:** Key Terms to Know When Using Pesticides (1/31/24)
- **2022 #4:** Making Sense of Pesticide Formulations (10/31/23)
- **2022 #3:** Agricultural Pesticide Licensing: Frequently Asked Questions (7/31/23)
- **2022 #2:** How Weather Affects Pesticide Applications (4/30/23)

Each article grants one General Standards (Core) CEU when submitted and approved toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license.

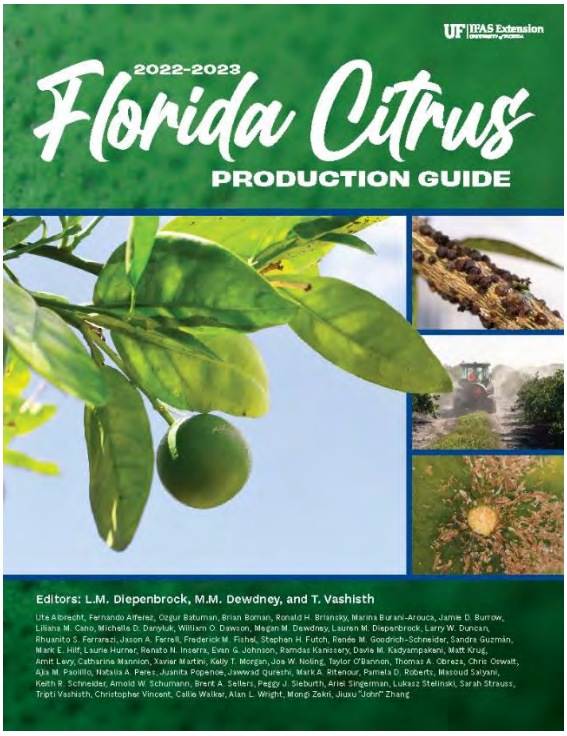
https://crec.ifas.ufl.edu/resources/production-guide/

The objective of the Florida Citrus Production Guide is to assist citrus growers in the identification of pest management options and the selection of appropriate control measures. This publication should serve as a reference once it has been determined that control measures might be warranted. It is not intended to replace pesticidal product labels which contain important usage information and should be immediately accessible for reference. Violations of directions for use printed on the label are against State and Federal laws. Care should be taken to select only those treatments best suited for control of the specific pest(s) identified as requiring suppression. Products listed in all tables have been shown to be efficacious, non-phytotoxic to citrus, and relatively safe on non-target arthropods and microorganisms when used as directed. However, it is important to realize that results may not be consistent under different environmental, application, and tank mix conditions.

PRODUCTION GUIDE MENU

If you did not pick up your hard copy of the newly updated Florida Citrus Production Guide at the Citrus Expo, you can find the electronic version online https://crec.ifas.ufl.edu/resources/production-guide/

If you need hard copies, you can get them free from your Citrus Extension Agent or from the Citrus Research & Education Center in Lake Alfred and the Southwest Florida Research and Education Center in Immokalee.



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

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

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

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

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

9 March 2023

ENSO Alert System Status: Final La Niña Advisory

Synopsis: La Niña has ended and ENSO-neutral conditions are expected to continue through the Northern Hemisphere spring and early summer 2023.

During February 2023, below-average sea surface temperatures (SSTs) weakened and currently persist only in the central Pacific Ocean [Fig. 1]. The latest weekly Niño-3.4 index value was -0.2°C [Fig. 2]. In contrast to the central Pacific, SSTs in parts of the eastern Pacific Ocean were significantly above average, with the latest Niño-1+2 index value at +1.1°C. In the last month, area-averaged subsurface temperatures became slightly above average [Fig. 3], with positive temperature anomalies spanning the Pacific, though remaining mostly at depth [Fig. 4]. The atmospheric circulation anomalies across the tropical Pacific are lagging the changes in the ocean. Low-level easterly wind anomalies continue over the central Pacific Ocean. Upper-level westerly wind anomalies were evident over most of the Pacific. Suppressed convection persisted over the central tropical Pacific, while enhanced convection was observed over Indonesia [Fig. 5]. Collectively, the coupled ocean-atmosphere system was consistent with ENSO-neutral.

The most recent IRI plume favors ENSO-neutral to continue through the spring, with El Niño forming during summer 2023 and persisting through the fall [Fig. 6]. In contrast, the forecaster consensus favors ENSO-neutral through summer 2023, with elevated chances of El Niño developing afterwards. The smaller chances of El Niño relative to the model predictions are primarily because ENSO forecasts made during the spring are less accurate, and also the tropical Pacific atmosphere is still fairly consistent with a cool/La Niña-like state. However, it is possible that strong warming near South America may portend a more rapid evolution toward El Niño and will be closely monitored. In summary, La Niña has ended and ENSO-neutral conditions are expected to continue through the Northern Hemisphere spring and early summer 2023 [Fig. 7].

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). Additional perspectives and analysis are also available in an ENSO blog. A probabilistic strength forecast is available here. The next ENSO Diagnostics Discussion is scheduled for 13 April 2023.

Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service

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 Spray Programs

Dr. Jawwad Qureshi and Dr. Phil Stansly, UF IFAS- Immokalee

Asian citrus psyllid (ACP) control has been the main objective of Florida citrus growers due to its role in the spread of huanglongbing (HLB) since 2005. While some may question the value of controlling ACP in trees with high HLB incidence, replicated field studies have shown the economic benefit of maintaining young flush pathogen free. Good ACP control starts with effective dormant sprays that will control ACP when populations are low, reduce its infestation and thus HLB infection of the all-important spring flush. Pyrethroids (e.g., Danitol, Baythroid or Mustang) and organophosphates (e.g., dimethoate or Imidan) provide great winter season control of ACP. Best not to use pyrethroids or OPs again during the year except for border sprays which will reduce the need for whole block applications. Follow up with bloom sprays of labeled products to clean up stragglers. Subsequent whole block sprays should target ACP as well as other pests like rust mites and leafminers that may be problematic.

The table below provides some examples of products for different months, depending on which pests are of major concern at the time. Neonicotinoids have not been included as spray option due to their importance for controlling ACP in young trees through soil application. Make choices based on: (1) effectiveness against ACP and other pests that may be problematic, (2) avoiding repetition of any insecticide mode of action in the interest of resistance management, and (3) rebuilding and maintaining an effective natural enemy complex in the grove. Confining the broad-spectrum insecticides (pyrethroids and organo-phosphates) to the winter season and border sprays during growing season will help conserve these products as well as populations of beneficial insects and mites.

Spray Options for Citrus Pest Management

Dormant Season — **Growing Season**

Months	Nov-Dec	Jan	Feb-Mar	Apr	May - June	July - Aug	Sep-Oct
Products *** Labeled for bloom**	OP[1] (e.g. Imidan, Dimethoate)	Pyrethroid[2] (Mustang Danitol Baythroid)	*Sivanto[3] *Movento[4] *Portal[5] *Micromite[6] Intrepid[7] Exirel[8]	Portal[5] Micromite[6] Exirel[8] Apta[9] Sivanto[3] Oil[13]	Movento[4] Delegate[11] Abamectin[12] Knack[14] Exirel[8] Apta[9] Sivanto[3] Oil[13] MinectoPro[10]	Sivanto[3] Apta[9] OP[1] MinectoPro[10] Oil[13]	Movento[4] Delegate[11] Apta[9] Sivanto[3] Oil[13]
Pests	ACP Weevils	ACP Weevils	ACP, Mites Leafminer Weevils Scales Aphids	ACP Mites Leafminer Weevils Aphids	ACP Rust mite Leafminer Scales	ACP	ACP Rustmite Leafminer

ACP[+++ 1,2,3,4,8,9,10] ACP[++ 5,11] ACP[+ 6,12, 13] Leafminer[6,7,8, 10,11,12,13] Rustmite[4, 6,12,13]
Scales[4,12,13] Aphids[3,4] Mealybugs[3,4] (+++ excellent, ++ good, + fair)

FOLIAR FEEDING OF CITRUS TREES

Foliar fertilizer application is certainly not a new concept to the citrus industry. For over five decades, foliar fertilization of citrus has been recommended to correct zinc, manganese, boron, copper, and magnesium deficiencies. It is now common knowledge in agriculture that properly nourished crops may tolerate insect pests and diseases. Traditionally citrus growers try to achieve optimum nutrition through direct soil management. Currently with the introduction of citrus greening in Florida, many growers and production managers consider foliar fertilization a key factor to stimulate the natural defense mechanisms of their trees, to induce pest and disease tolerance, and to improve fruit yield and fruit quality.

In Florida, foliar nutrition programs are becoming very common and extensively used to deliver all of the essential nutrient elements to citrus trees. Furthermore, economic and environmental considerations require the utilization of more efficient methods for nutrient applications. Foliar application of fertilizers is more efficient than traditional soil application because of better, faster nutrient uptake and reduced losses. Although field research has shown that supplemental foliar feeding can increase yield by 10-25% compared with conventional soil fertilization, foliar fertilization should not be considered a substitute for a sound soil-fertility program.

Foliar fertilizer application is highly efficient because the materials are targeted to areas where they can be directly absorbed into the plant. However, nutrients foliarly applied prior to a rainfall are subject to being washed off the leaves and onto the soil. Foliar fertilizer application also provides a more timely and immediate method for delivery of specific nutrients at critical stages of plant growth. Foliar nutrition programs are therefore valuable supplements to soil applications. As indicated previously, foliar feeding is not intended to replace soil-applied fertilization of the macronutrients (nitrogen, potassium, and phosphorus). Foliar applications of macronutrients can however be alternatively applied in sufficient quantities to influence both yield and fruit quality. Citrus trees can have a large part of the annual nitrogen requirements met through foliar applications. Foliar applications of other macronutrients (calcium, magnesium, and sulfur) and micronutrients (zinc, manganese, copper, boron, and molybdenum) have proven to be an excellent means for satisfying citrus tree requirements.

Because fertilizer applications to the soil can be subjected to undesirable processes such as leaching, runoff, and being tied up in the soil in unavailable forms, foliar applications of nutrients have been designed to be an integral component of overall tree nutrition programs. It is used in other situations to help trees through short, but critical periods of nutrient demand, such as vegetative growth, bud differentiation, fruit set and fruit growth. Foliar application of nutrients is of great importance when the root system is unable to keep up with crop demand or when the soil has a history of problems that inhibit normal nutrient uptake. Foliar nutrition is proven to be useful under prolonged periods of wet conditions, droughty conditions,

calcareous soil, cold weather or any other condition that decreases the tree's ability to take up nutrients when there is a demand. Foliar feeding may be effectively utilized when a nutritional deficiency is diagnosed. Foliar application is absolutely the quickest method of getting the most nutrients into plants. However, if the deficiency can be observed on the tree, the crop has already lost some potential yield.

While foliar feeding has many advantages, it can burn leaves at certain rates under certain environmental conditions. It is important, therefore, to foliar feed within some established guidelines. There are a number of plant, soil, and environmental conditions that can increase the chances of causing foliar burn to foliar fertilizer application. For example, a tree under stress is generally more susceptible to damage. Stressful conditions include drying winds, disease infection, and unfavorable soil conditions. The environmental conditions at the time of application are also important factors. Applications when the weather is hot (above 80^0F) should be avoided. This means that during warm seasons, applications should be made in the morning or evening when the temperature is right, wind is minimal, and the stomates on citrus leaves are open, allowing leaves to efficiently exchange water and air.

Nutrient absorption is increased when spray coverage reaches the undersides of the leaves where the stomates are located. Favorable results from foliar feeding are most likely to occur when the total leaf area is large. Foliar applications of micronutrients with the exception of iron are more effective and efficient when the spring, summer, and fall new flush leaves are about fully expanded. Additionally, applications should be at least two-week apart to give the tree sufficient time to metabolize the nutrients and deal with the added osmotic stress. To be efficient and to avoid crop damage, dilute solutions of nutrient formulations are recommended. Highly concentrated sprays, especially those including salt-based fertilizers, have the potential to cause leaf burn and/or drop.

Another important factor when applying nutrients foliarly is to ensure that the pH of the spray solution is in the proper range (between 5.5 and 6.5). This is particularly important in areas where water quality is poor. In order to enhance uptake and thus the effectiveness of any foliar application, nitrogen should be added to the solution. 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, potassium nitrate, calcium nitrate, and ammonium thiosulfate. These sources, when utilized at low rates of foliar application, are excellent supplemental nitrogen carriers with 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.

The use of a combination of poly and ortho-phosphates has been shown to lessen leaf burn and aid in leaf phosphate absorption. Phosphites have also been found useful, safe, and not phytotoxic as foliar sprays on citrus trees. Potassium polyphosphates, potassium hydroxide, potassium nitrate and potassium thiosulfate sources combine both low salt index and high solubility characteristics. Foliar application of calcium, magnesium, sulfur, zinc, manganese, copper, boron and molybdenum can be highly effective to satisfy nutrient requirements. However, there can be difficulties associated with leaf tissue absorption and translocation of calcium, magnesium, boron and molybdenum. Choosing the correct fertilizer sources for these nutrients can be critical.

Be careful about possible chemical interactions among foliar fertilizers. Some materials are incompatible and should not be mixed together. They may create precipitates that tie up and make some nutrients unavailable and/or clog spray nozzles. Many product labels warn of such incompatibilities. If there is no specific packaging information, small quantities of the materials should be mixed with water in a jar and shaken. If there is no precipitate, there should be no problem. Foliar fertilization can sometimes be combined with pesticide application. However, timing conflicts and material incompatibilities can sometimes make combining such sprays unwise. Be sure to read all product labels and do the jar's test if uncertain.

Foliar applications of low biuret urea at 12-14 gallons or at 53-60 lbs (24-28 lbs N) per acre or phosphite (PO_3) at 3 pints (60% P) to 2 quarts (26% P) per acre in late December-early January (6 to 8 weeks before bloom) have been demonstrated to increase flowering, fruit set, and fruit production. Postbloom foliar applications of potassium nitrate or mono-potassium phosphate at 8 lbs K_2O per acre have also been found to increase yield and fruit size. Foliar spray applications of 3-5 lbs/acre of magnesium, manganese, zinc, and copper, and 0.25-0.50 lb/acre of boron and molybdenum are also recommended on each of the 3 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.

Conclusion. Today, foliar feeding is playing an important role in Florida citrus production. It is rapidly gaining ground as a nutritional supplement to soil-applied fertilizers to improve yield and fruit quality, particularly in the face of HLB (citrus greening). Foliar nutrition is also a very important and effective way of addressing diagnosed problems with specific deficiencies observed within the grove and a best management strategy for supplying micronutrients with the exception of iron. The concept that foliar sprays should be applied only after the appearance of a deficiency is unsound since reductions in yield and quality usually precede the appearance of visual symptoms. Foliar sprays of nutrients should be used with the objective of maintaining citrus trees health at an optimal level. However, foliar fertilization should be considered a supplement, not a substitute for a sound soil-fertility program.

Citrus tree performance under soil-applied fertilizer program supplemented with foliar nutrition.

2023 Atlantic Hurricane Season Outlook: A Developing El Niño Vs. Warm Atlantic Ocean

By Jonathan Erdman

At a Glance

- **The Weather Company and Colorado State University have issued their outlooks for the season.**
- **The 2023 hurricane season outlook is more challenging than usual.**
- **That's because there are a couple of conflicting signals.**
- **First, an El Niño is increasingly likely, which tends to tamp down the number of storms.**
- **However, Atlantic Ocean water is very warm in most areas, which could enhance storms.**

The 2023 Atlantic hurricane season has more uncertainty than usual due to a couple of key factors, according to a just-released outlook.

The Weather Company, an IBM Business, and Atmospheric G2 are forecasting 15 named storms, seven of which will become hurricanes and three of which will reach Category 3 status or stronger, in their initial outlook for 2023 released Thursday.

That matches the 30-year average tally for hurricanes and is close to the average number of named storms in a hurricane season.

Colorado State University also issued its April outlook Thursday morning. They forecast 13 named storms, six hurricanes and two major hurricanes. These are slightly reduced numbers compared to both the 30-year average and the forecast from The Weather Company.

A "near-average" hurricane season might not grab your attention, but there are two competing factors that may battle for control this year, as Todd Crawford, Ed Vallee and James Caron of AG2 put it.

If one of those factors dominates, the hurricane season could look quite different than average.

A Developing El Niño

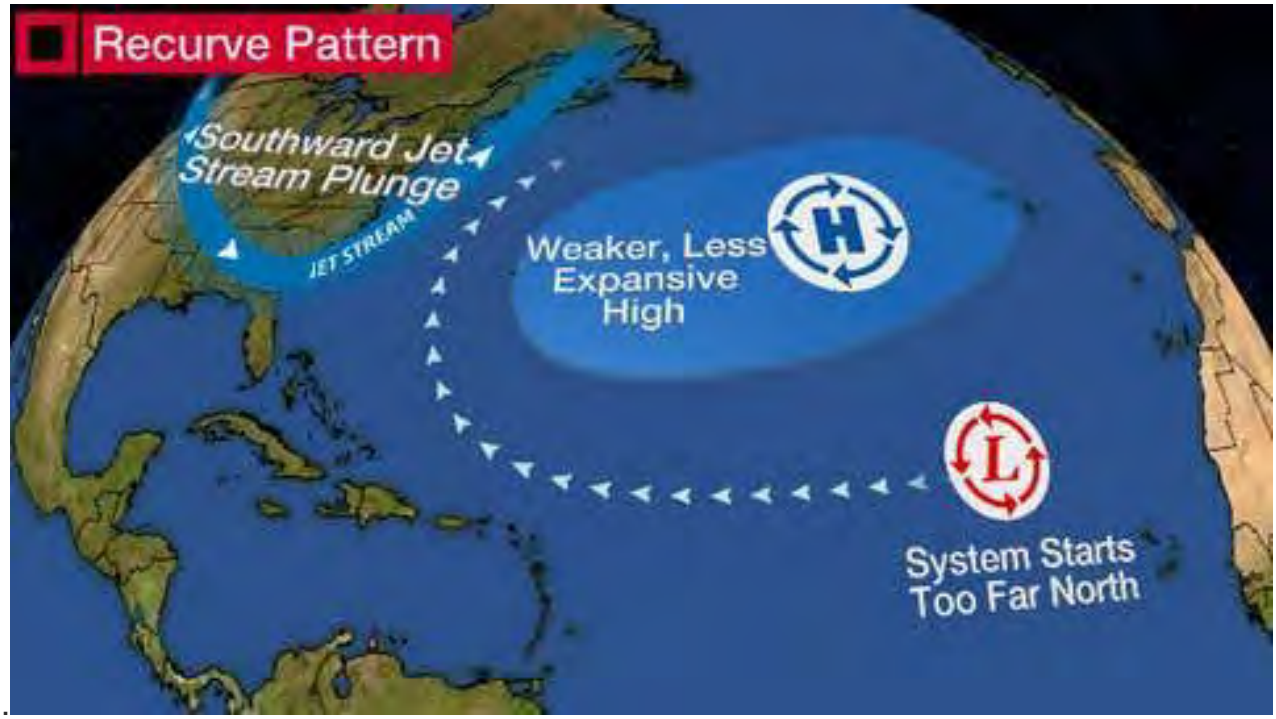
The first signal we're watching isn't in the Atlantic Ocean, but rather the waters near the equator in the Pacific Ocean.

During the past three hurricane seasons, these Pacific equatorial waters were cooler than average – a condition known as La Niña. But that long-lasting La Niña finally disappeared, and this patch of water is now warming toward its counterpart, El Niño.

As of mid-April, a large majority of forecast models suggested an El Niño is likely to develop, possibly as soon as this summer. NOAA's Climate Prediction Center assigned a 61% chance that an El Niño will be in place by August through October, the heart of the Atlantic hurricane season.

The reason this strip of water far from the Atlantic Basin matters is that it's one of the strongest influences on hurricane season activity.

In El Niño hurricane seasons, stronger shearing winds often occur over at least the Caribbean Sea and some adjacent parts of the Atlantic Basin. This tends to limit the number and intensity of storms and hurricanes, especially if the El Niño is stronger, as we investigated in a March article.



A typical "recurve" pattern that can be in place in hurricane season.

The AG2 forecast team also noted a tendency in El Niño hurricane seasons for fewer Gulf of Mexico storms and more storms to either curl north, then northeast out into the open Atlantic Ocean or to impact parts of the East Coast.

That's because the Bermuda high tends to be weaker, and it's also due to a more persistent dip in the upper-level winds in the southeastern U.S. during El Niños, according to AG2.

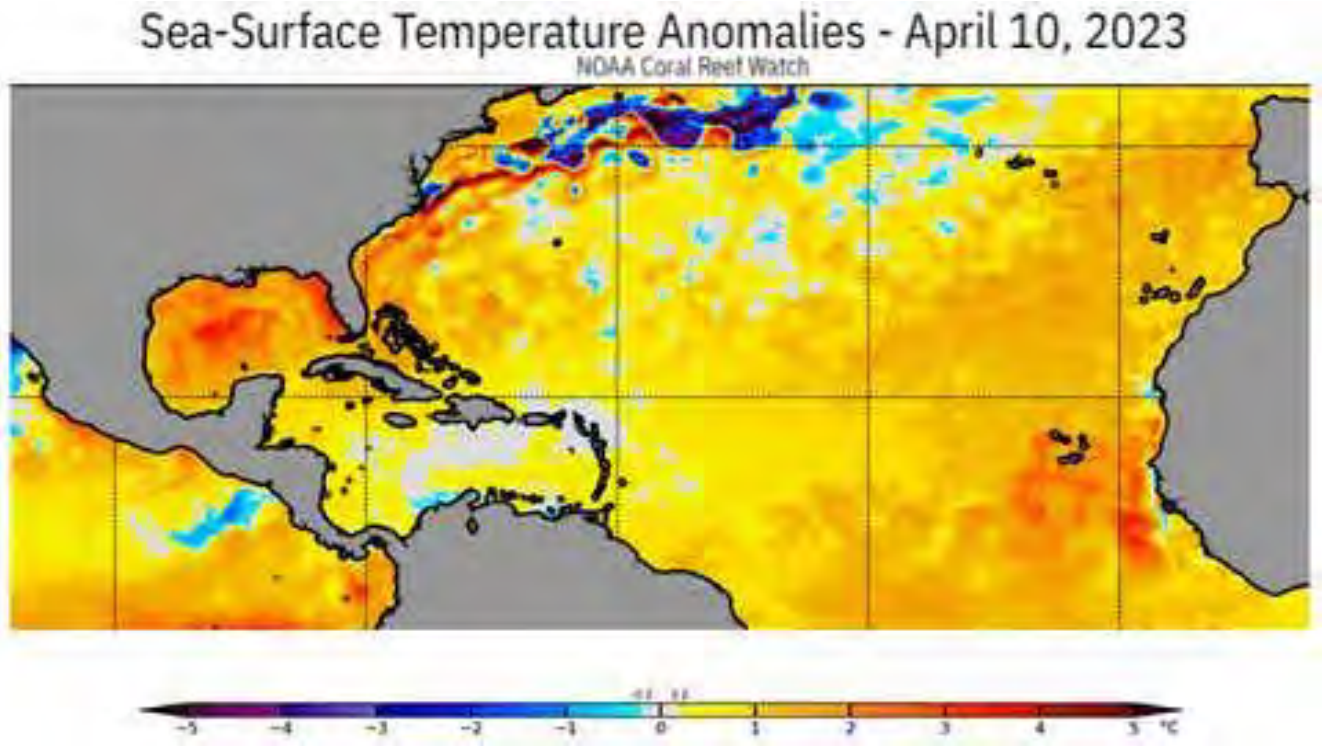
The Atlantic Ocean Is Very Warm

Another factor in this outlook might have the opposite effect of El Niño in 2023.

Hurricane season generally begins when water temperatures reach the rough threshold of 80 degrees, which usually occurs between June 1 and Nov. 30. If other factors are equal, the deeper and warmer ocean water is, the stronger a hurricane can become.

But, according to the AG2 forecast team, Atlantic Basin water temperatures in early spring correlate well to a hurricane season's activity.

And much of the Atlantic Basin is warmer than usual for spring, particularly in the Gulf of Mexico, off the Southeast U.S. coast and in the eastern Atlantic.



This map shows how far above (yellow, orange and red contours) and below (blue and purple contours) average the Atlantic Ocean was on April 10, 2023.
(NOAA Coral Reef Watch)

What grabbed the AG2 team's attention was how close the overall warmth is right now compared to spring anomalies prior to the prolific 2020 hurricane season.

"(It) certainly gives one pause when relying on the potential El Niño event to keep the season quiet," wrote Crawford and the AG2 team.

Klotzbach notes that the forecast from Colorado State University would have been lower if water temperatures were closer to average due to El Niño.

Prepare The Same Every Hurricane Season

What these outlooks cannot tell you is whether or not your area will get struck this season and when that might happen.

A season with fewer storms or hurricanes can still deliver the one storm that makes a season destructive or devastating.

In 2015, one of the strongest El Niños on record reduced the hurricane tally to four that season. However, one of those was Joaquin, which devastated the central Bahamas.

In this aerial photo, homes are seen under the floodwaters caused by Hurricane Joaquin in the Southern area of Long Island, Bahamas, Monday, Oct. 5, 2015. (AP Photo/Tim Aylen)

And it doesn't take a hurricane to be impactful, especially regarding rainfall flooding.

Also in the 2015 season, Tropical Storm Erika was ripped apart by wind shear and dry air near the Dominican Republic. But before that happened, it triggered deadly and destructive flooding in Dominica.

These outlooks serve as a reminder that the time to be ready for hurricanes is now.

Information about hurricane preparedness can be found here.

Flatwoods Citrus newsletter by regular mail stopped last year. You will receive your copy only through e-mail or through the following link:

https://citrusagents.ifas.ufl.edu/newsletters/

☐ If you did not receive the ***Flatwoods Citrus*** newsletter and would like to be on our e-mailing list, please check this box and complete the information requested below.

☐ If you wish to be removed from our e-mailing list, please check this box and complete the information requested below.

Please send: Dr. Mongi Zekri
Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975
or E-mail: maz@ufl.edu

Subscriber's Name:_____

Company:_____

Phone:_____

E-mail:_____

Racial-Ethnic Background

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

Gender

__Female __Male