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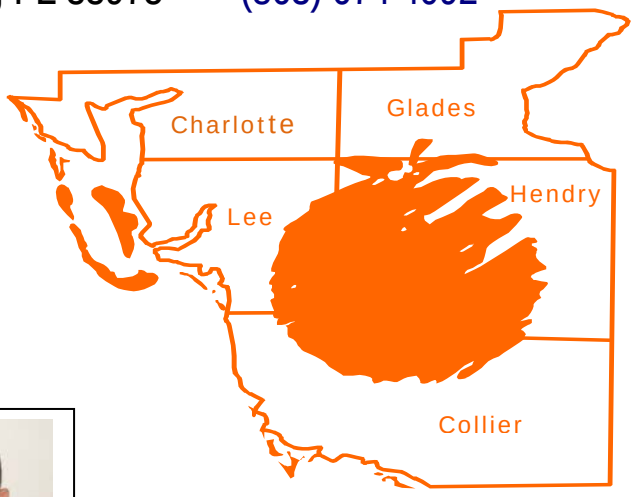
Flatwoods Citrus



Vol. 23, No. 4 **April 2020**

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Table of Contents

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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

9 April 2020

ENSO Alert System Status: Not Active

Synopsis: ENSO-neutral is favored for the Northern Hemisphere summer 2020 (~60% chance), remaining the most likely outcome through autumn.

During March 2020, above-average sea surface temperatures (SSTs) were observed across most of the tropical Pacific Ocean (Fig. 1). The latest weekly Niño-3.4 and Niño-3 indices were slightly elevated (+0.6°C), while the Niño-4 and Niño-1+2 index values were +0.7°C and +0.8°C, respectively (Fig. 2). Equatorial subsurface temperatures (averaged across 180°-100°W) remained above average overall, but the anomalies decreased during the month (Fig. 3) due to the expansion of below-average temperatures into the central Pacific at depth (Fig. 4). Also during the month, low-level wind anomalies were easterly in the eastern Pacific, while upper-level wind anomalies were westerly over the central and eastern portions of the basin. Tropical convection was near average around the Date Line, and slightly suppressed over parts of Indonesia (Fig. 5). Overall, the combined oceanic and atmospheric system remained consistent with ENSO-neutral.

The majority of models in the IRI/CPC plume (Fig. 6) favor ENSO-neutral (Niño-3.4 index between -0.5°C and +0.5°C) through the Northern Hemisphere autumn. While the Niño 3.4 index values remained elevated during March, the consensus of forecasters expects these values to decrease between the spring and summer. In summary, ENSO-neutral is favored for the Northern Hemisphere summer 2020 (~60% chance), remaining the most likely outcome through autumn (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts are also updated monthly in the Forecast Forum of CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 14 May 2020. 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

Forecasters predict a very active 2020 Atlantic hurricane season

Warmer ocean temperatures in the tropical Atlantic could fuel stronger storms

https://www.sciencenews.org/article/weather-forecasters-predict-very-active-2020-atlantic-hurricane-season

By Carolyn Gramling

The Atlantic hurricane season is likely to be very active, fueled by very warm ocean temperatures in the tropics, according to several forecasts including a report released April 16 by The Weather Channel.

A total of 18 named storms — nine of them hurricanes — are predicted in the season starting June 1, according to the Atlanta-based weather forecasting company, which is owned by IBM. That's higher than the seasonal average of 12 named storms, including six hurricanes, determined by the U.S. National Oceanographic and Atmospheric Administration.

Four of the hurricanes forecast by the Weather Channel are expected to be "major hurricanes" of Category 3 or higher, with sustained winds of at least 178 kilometers per hour (111 miles per hour).

Other researchers have also predicted above-normal activity for the year, including forecasters at Colorado State University in Fort Collins and the University of Arizona in Tucson, as well as a consortium of risk experts known as *Tropical Storm Risk* at University College London.

All of these groups cited very high sea-surface temperatures, or SST, in the tropical Atlantic Ocean as a key reason for the expected activity (*SN: 9/28/18*). Warm moist air evaporating from the ocean acts as fuel for hurricanes, pumping water into the atmosphere that then gets carried higher by converging winds until it rains out, releasing more heat and driving the cycle forward.

"Atlantic SST is forecasted to be one of the warmest since 1993," researchers with the University of Arizona noted April 13. It was the first time the team released its forecast in April, rather than June.

Several analyses, including the Weather Channel's, also suggest that a La Niña weather pattern may develop by late summer. La Niña, the flipside of El Niño, is a cyclical phenomenon that brings cooler waters to the tropical Pacific Ocean and changes wind patterns over the Atlantic in ways that can help strengthen hurricanes.

2020 Atlantic Hurricane Season Expected to Be More Active Than Usual, The Weather Company Outlook Says

https://weather.com/storms/hurricane/news/2020-04-15-atlantic-hurricane-season-april-outlook-the-weather-company-ibm

By Brian Donegan and Jonathan Belles

At a Glance
--Eighteen named storms, nine hurricanes and four major hurricanes are expected this season.
--The 30-year normalized average is 13 named storms, seven hurricanes and three major hurricanes.
--The forecast was released Thursday by The Weather Company, an IBM Business.

The 2020 Atlantic hurricane season is predicted to be more active than usual, according to an outlook released Thursday by The Weather Company, an IBM Business.

The outlook created by Dr. Todd Crawford, chief meteorologist at The Weather Company, calls for 18 named storms, nine hurricanes and four major hurricanes – one that is Category 3 or higher (115-plus-mph winds) on the Saffir-Simpson Hurricane Wind Scale.

This forecast is significantly above the 30-year (1981-2010) normalized average of 13 named storms, seven hurricanes and three major hurricanes.

Numbers of Atlantic Basin named storms (those that attain at least tropical or subtropical storm strength), hurricanes and hurricanes of Category 3 or higher intensity forecast by The Weather Company, an IBM Business, and Colorado State University compared to the 30-year average (1981 to 2010) and totals from the 2019 season.

Though the official Atlantic hurricane season runs from June through November, storms can occasionally develop outside those months, as was the case in the previous three seasons with Subtropical Storm Andrea in May 2019, Tropical Storm Alberto in May 2018 and Tropical Storm Arlene in April 2017.

(MORE: 2020 Atlantic Hurricane Season Names)

The Weather Company outlook is based on a number of factors, including Atlantic Ocean sea-surface temperatures, La Niña and other teleconnections, computer model forecast guidance and past hurricane seasons exhibiting similar atmospheric conditions.

"Weighing all of the factors, we have started the bidding at 18 named storms, nine hurricanes and four major hurricanes for the 2020 North Atlantic tropical season," Crawford said. "However, we think there is still some upside to these numbers, and that a 'hyperactive season' like we had in 2010 and 2017 is still in play."

2010 tied for the third-most-active Atlantic hurricane season on record for named storms, with 19, 12 of which became hurricanes. 2017 was the fifth-most-active season, with 17 named storms and 10 hurricanes, including major hurricanes Harvey, Irma and Maria.

Here are some questions and answers about what this outlook means.

What Does This Mean for the United States?

There is no strong correlation between the number of storms or hurricanes and U.S. landfalls in any given season. One or more of the 18 named storms predicted to develop this season could hit the U.S. or none at all. That's why residents of the coastal U.S. should prepare each year no matter the forecast.

A couple of examples of why you need to be prepared each year occurred in 1992 and 1983.

The 1992 season produced only six named storms and one subtropical storm. However, one of those was Hurricane Andrew, which devastated South Florida as a Category 5 hurricane.

In 1983, there were only four named storms, but one was Alicia. The Category 3 hurricane hit the Houston-Galveston area and caused almost as many direct fatalities there as Andrew did in South Florida.

In contrast, the 2010 Atlantic season was quite active, with 19 named storms and 12 hurricanes. Despite the high number of storms that year, no hurricanes and only one tropical storm made landfall in the U.S.

In other words, a season can deliver many storms but have little impact, or deliver few storms and have one or more hitting the U.S. coast with major impact.

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 Black Spot

Monthly fungicide applications of copper, strobilurins (Abound, Gem, or Headline), and/or Amistar Top, Enable, Pristine will be needed from early May to mid-September to control black spot.

Fruit Symptoms

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

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

Leaf and Stem Symptoms

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

Regulations

Stipulations for Movement of Citrus Fruit from EAN Regulated Areas for Citrus Black Spot PDF
More information will be added as it becomes available. However, for most up-to-date information from regulatory agencies, please contact the Florida Division of Plant Industry 863-298-7777.

Spread

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

Diagnostics

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

Management

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

Links

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

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

Resources

If you would like to obtain laminated identification sheets or copies of the other various educational materials, please contact your citrus extension agent or Jamie Yates, 863-956-1151 ext. 1302 or jdyates@crec.ifas.ufl.edu.
Citrus Black Spot ID Sheet PDF
Citrus Black Spot Management Timing Schedule PDF
Citrus Black Spot Poster for Growers (18 x 27) PDF
Citrus Black Spot Poster for Packinghouses (32 x 26) PDF

Recommended Chemical Controls

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

READ THE LABEL. See Table 1.

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

TABLE 1. Recommended Chemical Controls for Citrus Black Spot

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

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

[2] Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2016. Refer to ENY624, Pesticide Resistance Management, in the 2018-2019 Florida Citrus Productio n Guide for more details.

[3] Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides (FRAC MOA 11).

[4] Do not make more than 4 applications of Pristine or Amistar Top/season. Do not make more than 2 sequential applications of Pristine or Amistar Top before alternating to a non-strobilurin, SDHI (FRAC MOA 7) or DMI (FRAC MOA 3)

https://edis.ifas.ufl.edu/pdffiles/CG/CG08800.pdf

CITRUS CANKER

Start early: At least 3 applications at a 21-day interval should be scheduled: in mid-April (fruit at 0.25 to 0.5-inch stage), in early/mid-May, and late May/early June.

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 April.

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.

Tables

Table 1.

Recommended chemical controls for citrus canker.

Pesticide	FRAC MOA[1]	Mature Trees Rate/Acre[2]
Blockade 50WG (formally Actigard)	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 2019–2020 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 Blockade 50WG/100 trees.

Number of Applications/Year[1]	Tree Age and Rate[2,4] (oz)/Application			
	< 1 year[3]	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 and overcome transplant shock, and initiate treatment at 0.125 oz/100 trees.

[4] As tree size increases during the season, dosages should be adjusted toward the upper end of the recommended rate range.

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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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Hendry County Extension Office
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Racial-Ethnic Background

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

Gender

__Female __Male