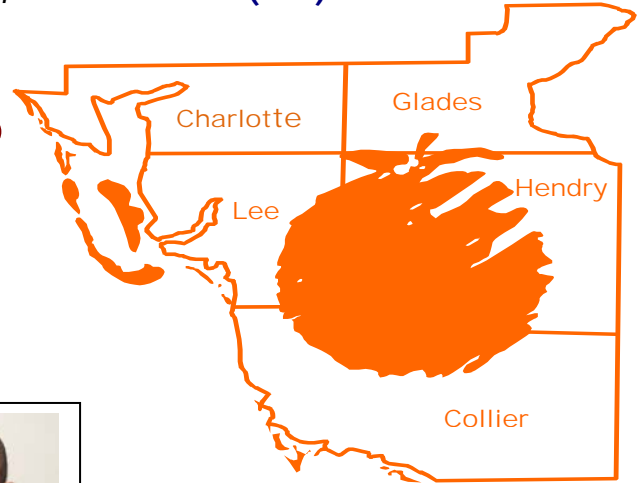


Hendry County Extension, P.O. Box 68, LaBelle, FL 33975 (863) 674 4092

Flatwoods Citrus



Vol. 22, No. 5

May 2019

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



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CITRUS FARM FIELD DAY “RISKS IN TECHNOLOGY ADOPTION”
UF / IFAS Southwest Florida Research & Education Center (SWFREC)
Thursday, May 16, 2019, 8:30 a.m.

Pre-registration is required. No registration fee and lunch is free. To reserve a seat, call Jennifer Derleth at 239 658 3415, or send an e-mail to jderleth@ufl.edu

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8:30 a.m. Registration & Welcome			
9:15 a.m.	Demonstration: Influence of Irrigation and Nutrients on Growth Nutrient Acquisition and Water Relations in High-Density Young Planting and HLB Affected Trees	Description: The current project aims to determine 1) water requirements for young citrus trees at higher planting densities and 2) evaluate the effect of soil and /or foliar applied nutrients on leaf nutrient concentrations and water uptake of HLB affected trees. Both studies evaluate the effect water scheduling and nutrient applications on measuring, soil moisture, tree growth, and leaf nutrition.	Presenters: Dr. Said Hamido Mr. Ali Atta
9:25 a.m.	Demonstration: Citrus Weed Management	Description: Attendees will have the opportunity to see on-going research trials evaluating the effects of various pre-emergent herbicides and their combinations for long-term and crop-safe weed control in citrus groves. Additionally, an update on observations from the previous trials will be presented.	Presenter: Dr. Ramdas Kannisery
9:35 a.m.	Demonstration: Needle Assisted Trunk Infusion of Therapeutic Material	Description: The new USDA-NIFA supported project will be introduced to our stakeholders. Furthermore, we will demonstrate and discuss the potential of our new technique being developed for delivering bactericides to citrus vasculature to control Asian citrus psyllid and HLB.	Presenter: Dr. Ozgur Batuman

BREAK

10:15 a.m.	Workshop: Effective, Long-term and Crop-safe Weed Management in Citrus	Description: This workshop will describe the aspects of improving citrus weed control efficacy while reducing the impacts on tree health and productivity. Strategies to prevent and manage the risks and adverse effects from the herbicide application will also be discussed.	Presenter: Dr. Ramdas Kannisery
10:30 a.m.	Workshop: Managing Risks in Technology Adoption	Description: This workshop will highlight the tradeoffs between machines and labor, input cost savings, and potential environmental benefits.	Presenter: Dr. Tara Wade
10:45 a.m.	Workshop: Vision-Based Technologies for Citrus and Strawberry	Description: This talk will present and discuss citrus fruit counting and strawberry flower detection using color and thermal imaging.	Presenter: Dr. Won Suk Lee

	Yield Mapping		
11:05 a.m.	Workshop: Precision Agriculture Technologies and UAV Applications in Citrus	Description: This talk will present and discuss new smart technologies for precision citrus management (e.g. automated system for ACP detection in the field), including UAV applications for high throughput phenotyping and individual tree health status assessment.	Presenter: Dr. Yiannis Ampatzidis
11:25 a.m.	Workshop: Maximizing the Probability of New Technology Adoption Success	Description: "Drop-in" technologies (e.g., hybrid seeds or automated steering) have faster adoption rates and more chances of success than "system" (e.g., tractorization or yield-based fertilization) technologies. It is also seen that complex technologies may be adopted more successfully by starting with simple technologies and evolving them to more complex states. Some of the factors influencing success, including support structures, interconnectedness, and modification flexibility, are discussed with examples. Identifying potential failure modes and preparing mitigation strategies is emphasized. Speculation is forwarded about implications for some current new technologies.	Presenter: Dr. John Schueller
11:45 a.m.	Workshop: Payment for Water-Related Services Program for Citrus and Vegetable	Description: The talk will cover water recycling and other practices to increase water and nutrient retention on citrus farms. It will include results from past payment for water storage and treatment programs and some new win-win ideas for citrus growers.	Presenter: Dr. Sanjay Shukla
12:00 p.m.	Workshop: Influence of Irrigation and Nutrients on Growth Nutrient Acquisition and Water Relations in High-Density Young Planting and HLB Affected Trees	Description: The current project aims to determine 1) water requirements for young citrus trees at higher planting densities and 2) evaluate the effect of soil and /or foliar applied nutrients on leaf nutrient concentrations and water uptake of HLB affected trees. Both studies evaluate the effect water scheduling and nutrient applications on measuring, soil moisture, tree growth, and leaf nutrition.	Presenters: Dr. Said Hamido Mr. Ali Atta
12:20 p.m.	Questions & Answers		
12:30 p.m.	Closing Remarks		

LUNCH

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
11 April 2019

ENSO Alert System Status: El Niño Advisory

Synopsis: A weak El Niño is likely to continue through the Northern Hemisphere summer 2019 (65% chance) and possibly fall (50-55% chance).

El Niño continued during March 2019, as above-average sea surface temperatures (SSTs) persisted across the equatorial Pacific Ocean (Fig. 1). The latest weekly values of the Niño3 and Niño4 indices were +0.8°C, while the Niño3.4 value was +0.9°C (Fig. 2). The anomalous upper-ocean heat content (averaged across 180°-100°W) decreased during March but remained well above average (Fig. 3), as the above-average temperatures at depth peaked in early March in association with a downwelling equatorial oceanic Kelvin wave (Fig. 4). Enhanced equatorial convection was observed near the Date Line and in the western Pacific, while suppressed convection prevailed over western Indonesia (Fig. 5). Low-level wind anomalies were westerly in the western Pacific Ocean during March. Meanwhile, upper-level winds were mostly near average. The equatorial and traditional Southern Oscillation Index values were negative. Overall, these features are consistent with a weak El Niño.

The majority of models in the IRI/CPC plume predict a Niño 3.4 index of +0.5°C or greater through the remainder of 2019 (Fig. 6). Most forecasters expect SST anomalies in the Niño 3.4 region to remain between +0.5°C and +1.0°C for at least the next several seasons, indicating a weak El Niño. However, because forecasts made during spring tend to be less accurate, the predicted chance that El Niño will persist through fall is currently 50-55%. In summary, a weak El Niño is likely to continue through the Northern Hemisphere summer 2019 (65% chance) and possibly fall (50-55% 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 CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an [ENSO blog](#). The next ENSO Diagnostics Discussion is scheduled for 9 May 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

Neutralizing Excess Bicarbonates from Irrigation Water in Florida

By Gerald Kidder and Ed Hanlon, UF-IFAS



Many sources of irrigation water in Florida contain dissolved bicarbonates. Irrigation with such water can cause adverse plant growth by excessively raising the pH of the soil. The magnitude of the effect depends on the concentration of the bicarbonates in the water, the amount of the water applied, the buffering capacity of the soil, and the sensitivity of the citrus variety/rootstock being grown.

This publication addresses this important water quality problem and suggests management practices to minimize adverse effects on citrus tree growth and production.

1. Where in Florida is the problem most likely to occur?

The problem of high dissolved bicarbonates is likely to occur wherever water comes from a limestone aquifer, such as the Floridan or Biscayne, or from lakes or canals that cut into limestone. Thus, this is a potential problem in most of Florida.

2. How can I find out if I have high-bicarbonate water?

A water test is the surest means of determining if a problem exists.

3. Isn't it sufficient to just measure the water's pH?

If the pH of your irrigation water is below 7.0, then we may safely assume that it will not be a significant source of liming materials. However, if the pH is above 7.0, we know that the water contains bases but we don't know how much. For example, one water source may have a relatively high pH of 8 and yet contain a very low level of bicarbonates. Another water source, with the same pH, may have a very high bicarbonate level.

4. How are Ca and Mg analyses useful?

Multiplication of parts per million (ppm) Ca by 0.05 and ppm Mg by 0.083, and summing the two products, will give the milliequivalents of those cations per liter (me/L) of water. In many cases, Ca and Mg will be associated with bicarbonate and carbonate salts. Under those conditions, the me/L of Ca plus Mg will be a good estimate of the me/L of associated bases. However, if other non-basic ions such as sulfate are present, the calculation would overestimate the base content of the water. Thus, Ca and Mg analyses may be useful in estimating base content but should be used with caution.

5. In which crop situations am I likely to have a problem with high pH water?

Trifoliolate and most trifoliolate hybrid rootstocks are particularly sensitive to high pH soil, are trees budded onto them usually exhibit ill effects of high bicarbonate water through micronutrient deficiency symptoms. Trees budded on Swingle rootstock are well-known for their sensitivity to pH-induced iron chlorosis. Trees budded on citrange rootstocks have shown manganese and zinc deficiencies when the soil pH has been raised by heavy or prolonged use of "hard" water (i.e., water with lots of Ca and Mg bicarbonates).

6. Which irrigation situations are most problematic?

Heavy irrigations applied to soils of low buffering capacity will present the most problems to citrus trees.

7. What can I do to minimize the adverse effects of high-bicarbonate water?

Be careful not to over-irrigate. Know the water holding capacity of your soil and apply only enough water without exceeding the root zone water-holding capacity. Over-irrigation is costly in many ways -- the cost of pumping, of leached nutrients, of wasted water resources and, in this case, of accelerating the increase in soil pH. Avoid these with good irrigation management.

Apply acids or acid-forming materials to the soil to counteract the bases applied in the water.

Neutralize the liming effect of the water by adding acid to the water before it is applied to the trees.

8. What can be done if the trees are already suffering from water-induced high pH?

Where high levels of bicarbonates in the water have caused soil to be too high for proper tree performance, it may be necessary to lower the soil pH. This may be accomplished by addition of extra acid in the irrigation water, use of acid-forming fertilizer in certain cases, or application of elemental sulfur to the soil.

It is important to note that the acid-producing effect of sulfur comes from the formation of sulfuric acid when soil bacteria act on the elemental sulfur. The sulfate form of sulfur applied in fertilizers such as potassium sulfate, magnesium sulfate, or gypsum (calcium sulfate) does not have the acid-producing effect of elemental sulfur.

Sulfur application rates of 300 to 500 pounds per acre should not be exceeded. This rate is equivalent to between 0.7 and 1.1 lbs/100 square feet of treated surface area. Over-application of sulfur or acid can cause damage to trees, an effect you

certainly want to avoid. Monitor changes carefully.

Remember the pH will increase again as you continue to irrigate with high bicarbonate water. Water or soil acidification will be a continuing effort.

9. Can acid-forming fertilizers keep the soil pH from getting too high?

Under many circumstances, the quantity of bases that is being supplied in the irrigation water far exceeds the quantity of acid formed by addition of fertilizers. Under those conditions acid-forming fertilizer will not control the problem of increasing soil pH.

10. How can I neutralize the bicarbonates in my irrigation water?

Injection of acid into the irrigation water is a direct way of neutralizing the bases present. Acid may be injected in much the same way as fertilizer. You must take precautions to avoid injuring yourself and your trees and to avoid contamination of the aquifer. These points are discussed below.



11. How much acid should I apply?

The amount of acid that you mix with the irrigation water will depend on the quantity of bases your water contains and on the strength of the acid you use. The base content of the water is determined in the water test and the strength of the acid is given on the container. One milliequivalent (me) of acid completely neutralizes one milliequivalent of base. For example, if an irrigation water contains 5.2 me of bases per liter, it would take 5.2 me of acid to completely neutralize the liter of water. Neutralization of 80 to 90% of the bases in water is a

reasonable goal for most irrigation situations.

Multiply the factor by the milliequivalents of base per liter (me/L) which your water contains. This value is determined in the laboratory test of your water or is estimated from its Ca and Mg contents. The result is the milliliters of your acid which you should apply to each 100 gallons of your water. The factor is calculated to neutralize 80% of the bases in the water. There are 29.6 ml in one U.S. fluid ounce. Divide the number of ml by 29.6 to convert to U.S. fluid ounces.

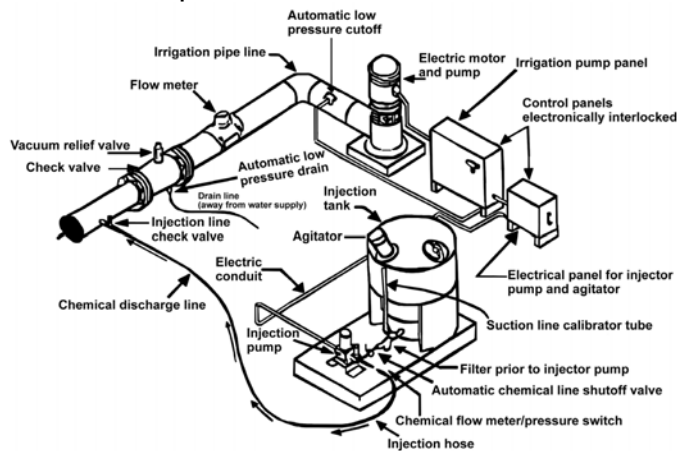
$$80\% \times \frac{\text{me base}}{\text{L water}} \times \frac{378 \text{ L}}{\text{to be neutralized}} \times \frac{1}{34.7 \text{ N acid}} = 8.7 \times \frac{\text{me base}}{\text{L water}}$$

NOTE: When calculating your rates for larger volumes, be careful not to round off too soon when making conversions.

12. Why not neutralize 100 percent of the bases?

Some of the reasons for not attempting to neutralize 100% of the bases are:

It is not necessary to neutralize all of the bases in order to reduce the problem to insignificant levels. Not trying for 100% neutralization allows some room for error in acid application rates, variability in water, etc. The risk of over-acidifying is not worth the benefit of neutralizing the last 10 or 20 % of the bases. It is poor management to spend money and effort creating new problems by over-reacting to the initial problem.



13. In what kind of irrigation system can I practically inject acid?

Neutralization is relatively easy to accomplish in microirrigation systems.

The system must allow careful addition of known volumes of acid to known volumes of water. Since acids can be quite corrosive to metals, the system must be able to withstand this possible adverse effect.

NOTE: It is illegal to inject any chemicals into irrigation systems without appropriate safety devices which will automatically prevent the backflow of water and chemicals to the water supply. This is done to protect our water resources.



14. What kind of acid can I use?

The most commonly used acids are sulfuric, hydrochloric, and phosphoric acid. Other acids could be used but cost and availability usually limit the choices to these three. Phosphoric and sulfuric acids may have some nutritional value but this should be a minor consideration in choosing an acid for water neutralization.

15. What are the dangers of using acids for water neutralization?

Hydrochloric, sulfuric and phosphoric acids are highly toxic materials irritating to the skin, eyes, nose, throat, lungs, and digestive tract. Always wear goggles and chemical resistant (rubber, neoprene, vinyl, etc.) gloves, apron and boots whenever handling these acids. **Acid must be poured into water, never vice versa, and should be done in a well-ventilated area.**

Should a spill or splash occur, remove all clothing and shower immediately.

Immediately irrigate eyes with large quantities of water. Seek immediate medical attention.

It is generally advisable to dilute concentrated acid in a nonmetal mixing tank prior to injection into the irrigation system, rather than injecting concentrated acid directly. Most metal fittings, tanks, and other parts of the irrigation system will be damaged by acid, so proper precautions must be taken. Flushing the system after application is frequently sufficient to avoid significant damage. In addition to the dangers involved with handling strong acids there is also the danger of over-application of acid. Excess acid addition could result in injury to tree parts, which come in direct contact with the water, such as leaves. Also, an excessive acidification of the soil could result in tree injury or death. These problems can be avoided by (1) determining the proper amount of acid to apply and (2) monitoring the irrigation system to ensure that the correct amount is applied.

16. How can I assure that I'm adding the correct amount of acid to my water?

Monitoring the pH of the acid-treated water is one way of checking on a daily operational basis. You can do this with a pH meter. Add acid to bring the water pH to between 4.5 and 5.0. Because the neutralization reaction continues slowly over a period of a day or two, the measured pH of the water immediately after acid addition will usually be lower than that measured once the reaction is complete. For monitoring purposes during acid additions, use the pH measured immediately after acid addition as a guide to avoid over-acidifying.

If the pH after treatment is very different from that calculated from the chemical analysis, you may want to have another water sample analyzed.

Summary

1. Have your irrigation water tested.
2. Select an acid of known strength.
3. Determine how much of your acid is needed to neutralize 80% of the bases in your water.
4. Add the calculated amount of acid to your water.
5. Measure the pH of the water as it comes out of the irrigation line.
6. If the pH is not between 4.5 and 5.0, increase or decrease the amount of acid.
7. If the amount of adjustment in Step 6 is more than 15 to 20% of the calculated value, consult a specialist before extended use of the system.
8. Retest the well water and irrigated soil about once a year and keep a record of the test results.



CITRUS RUST MITES



The citrus rust mite (CRM) is an important pest of fruit grown for the fresh market. On some specialty varieties (such as Sunburst tangerine), damage may be particularly severe on stems and foliage, causing leaf injury and possible abscission. Fruit damage is the main concern with other varieties. CRM feeds on green stems, leaves, and fruit. Egg deposition begins within 2 days after the female reaches sexual maturity and continues throughout her life of 14 to 20 days. The female lays one to two spherical transparent eggs per day and as many as 30 during her lifetime. Eggs hatch in about 3 days at 81°F. The newly hatched larva resembles the adult, changing in color from clear to lemon yellow (CRM). After about 2 days at 81°F, molting occurs. The first nymphal stage resembles the larval and requires about 2 days to molt to an adult at the above temperature. The CRM adult has an elongated, wedge-shaped body about three times longer (0.15 mm) than wide. CRM usually is straw to yellow in color. CRM population densities increase in May-July and then decline in late August, but can increase again in late October or early November. Mite densities in the fall rarely approach those early in the summer. During the summer, CRM are more abundant on fruit and foliage on the outer margins of the tree

canopy. Generally, the north bottom of the tree canopy is preferred and supports the highest mite populations. The least favorable conditions for CRM increase are found in the south top of the tree canopy.

Visible characteristics of injury differ according to variety and fruit maturity. When rust mite injury occurs on fruit during exponential growth, before fruit maturity (April to September), epidermal cells are destroyed resulting in smaller fruit. Early season rust mite injury is called "russeting." Rust mite injury to mature fruit (after September) differs significantly from early "russeting." Unlike "russeting" on fruit, fall damaged fruit will polish since the natural cuticle and wax layer remain intact. This condition is known as "bronzing." While the primary effect of fruit damage caused by rust mites appears to be a reduction in grade, other conditions have been associated with severe fruit injury that include reduced size, increased water loss, and increased drop.

Leaf injury caused by feeding of CRM exhibits many symptoms on the upper or lower leaf epidermis. When injury is severe, the upper cuticle can lose its glossy character, taking on a dull, bronze-like color, and/or exhibit patchy yellowish cells in areas of "russeting" that have been degreened by ethylene release during the wounding process. Lower leaf surfaces often show "mesophyll collapse" appearing first as yellow degreened patches (collapsed spongy mesophyll cells) and later as necrotic spots. With the exception of upper leaf epidermal injury to some specialty varieties, such as Ambersweet, Fallglo, and Sunburst, defoliation caused by CRM is rarely severe.

The need for chemical treatments to control rust mites is dictated by numerous biological attributes of the mites, marketing objectives for the fruit, and horticultural practices. These key biological factors include: 1) inherent ability of mites to quickly increase to injurious densities on fruit and sustain the potential for reproductive increase over time; and 2) small size, which makes it difficult to monitor population densities in the field and detect injurious levels until visible injury has

occurred on the fruit. The marketing objective for fruit is particularly important. Cosmetic appearance is a priority for fruit grown for the fresh market. Fruit growth and abscission are not affected until 50% to 75% of the surface has been injured. Thus, there is reduced justification for chemical control of rust mites on fruit grown for processing. Citrus groves producing fruit designated for the fresh market may receive three or four miticides per year, typically during April, June, August, and October. In contrast, groves producing fruit designated for processing receive zero to two treatments per year. Miticides applied for the control of rust mites on fresh fruit varieties are often combined with compatible fungicides in the spring and summer. An alternative approach is using FC 435-66, FC 455-88, or 470 petroleum oil as a fungicide for greasy spot control and to suppress pest mites. From a horticultural perspective, canopy density has an effect on rust mite populations and their ability to increase over a short period of time. The denser the canopy, the less favorable conditions are for a rapid rust mite increase. Since most registered miticides have no ovicidal activity and short residual activity on fruit and foliage, residual control is generally better if the miticide is applied when rust mite adult and egg population densities are low for fresh market varieties. Since external blemishes caused by rust mites, fungal diseases, and wind are less important when fruit are grown for processing, the chemical control strategy for rust mites can be modified significantly. A summer spray is often required for greasy spot control. Use of petroleum oil in place of copper will reduce the likelihood of requiring a subsequent miticide treatment. Further miticide treatment may be unnecessary. However, a second petroleum oil application may be required for greasy spot control on summer flush. Many scientific methods for sampling or scouting rust mite populations have been described. Of these, three general approaches are in widespread use: 1) determining the percentage of fruit and/or leaves infested with rust mites, 2) qualitative rating scales and 3) individual adult mite

counts taken from fruit on randomly selected trees. These sampling approaches are similar in that they are designed to avoid bias by randomly selecting different representative areas within a grove for sampling, avoiding border rows, and selecting fruit and/or leaves within a tree randomly.

One sampling method based on rust mite density (rust mites/square centimeter [cm^2]) is described.

Processed Fruit: Initiate rust mite monitoring in April on leaves and fruit through casual observations and continue every 2 to 3 weeks throughout the fruit season. Select trees at random and within uniformly distributed areas throughout a 10- to 40-acre block representing a single variety with uniform horticultural practices. Avoid sampling adjacent trees. Fruit should be sampled at random representing the four quadrants of the tree and taken midway in the canopy (between interior and exterior). One fruit surface area should be examined midway between the sun and shade areas. The number of rust mites per cm^2 should be recorded and averaged for the 10 acres, represented by 20 trees with four fruit per tree or 80 readings per 10 acres. Six rust mites/ cm^2 would be a planning threshold where pesticide intervention may be required within 10 to 14 days. Ten rust mites/ cm^2 would be an action threshold where treatment would be required as soon as possible.

Fresh Fruit: Similar to above except monitor every 10 to 14 days with an average of 2 CRM/ cm^2 as an action threshold.

For more information, go to:

<https://crec.ifas.ufl.edu/media/crecifasufledu/extension/plant-pathology-/florida-citrus-production-guide/pdf/Rust-Mites.pdf>

TABLE 1. Control Thresholds and Appropriate Sample Sizes for 10 Acres

If the control threshold is:	Sample size (Sample trees should be uniformly scattered across a 10-acre block. Do not sample adjacent trees.)
5 mites/leaf	Examine 4 leaves/tree from 6 trees/area from 4 areas/10 acres = 96 leaves on 24 trees/10 acres
8 mites/leaf	Examine 4 leaves/tree from 6 trees/area from 3 areas/10 acres = 72 leaves on 18 trees/10 acres
10 mites/leaf	Examine 4 leaves/tree from 5 trees/area from 2 areas/10 acres = 40 leaves on 10 trees/10 acres
15 mites/leaf	Examine 4 leaves/tree from 4 trees/area from 2 areas/10 acres = 32 leaves on 8 trees/10 acres

TABLE 2. Citrus Miticide Selection*

Supplemental (early Spring)	Post Bloom	Summer	Fall	Supplemental Fall
--	--	Agri-mek + oil	--	--
Apta	Apta	--	Apta	Apta
--	--	--	Comite	Comite
Envidor	Envidor	Envidor	Envidor	Envidor
--	Petroleum oil	Petroleum oil	Petroleum oil	--
--	--	--	Sulfur	Sulfur
--	--	Micromite	Micromite	--
--	--	--	Nexter	Nexter
Movento	Movento	Movento	--	--
Vendex	Vendex	--	Vendex	Vendex

*Except for petroleum oil, do not use the same miticide chemistry more than once a year.

GREASY SPOT FUNGAL DISEASE

Management of greasy spot must be considered in groves intended for processing and fresh market fruit. Greasy spot is usually more severe on leaves of grapefruit, pineapples, Hamlins, and tangelos than on Valencias, Temples, Murcotts, and most tangerines and their hybrids.

Greasy spot spores germinate on the underside of the leaves and the fungus penetrates through the stomates (natural openings on lower leaf surface). Warm humid nights and high rainfall, typical of Florida summers, favor infection and disease development.



On processing Valencias, a single spray of oil (5-10 gal/acre) or copper + oil (5 gal/acre) should provide acceptable control when applied from mid-May to June. With average quality copper products, 2 lb of metallic copper per acre usually provide adequate control. The strobilurin fungicides (Abound, Gem, Headline or Quadris), as well as Enable 2F, are also suitable with or without petroleum oil. On early and mid-season oranges and grapefruit for processing, two sprays may be needed especially in the southern part of the state where summer flushes constitute a large portion of the foliage. Two applications also may be needed where severe defoliation from greasy spot occurred in the previous year. In those cases, the first spray should be applied from mid-May to June and the second soon after the major summer flush has expanded. Copper fungicides provide a high degree of control more consistently than oil sprays. Control of greasy spot on late summer flushes is less important than on the spring and early summer growth flushes since the disease develops slowly and defoliation will not occur until after the next year's spring flush. Thorough coverage of the underside of leaves is necessary for maximum control of greasy spot, and higher spray volumes and slower tractor speeds may be needed than for control of other pests and diseases.



The program is essentially the same for fresh fruit. That is, a fungicide application in May-June and a second in July should provide control of rind blotch.

A third application in August may be needed if rind blotch has been severe in the grove. Petroleum oil alone is less effective than other fungicides for control of greasy spot rind blotch (GSRB). Heavier oils (455 or 470) are more effective for rind blotch control than are lighter oils (435).

Copper fungicides are effective for control of GSRB, but may result in fruit spotting especially if applied at high rates in hot, dry weather or if applied with petroleum oil. If copper fungicides are applied in summer, they should be applied when temperatures are moderate, at rates no more than 2 lb of metallic copper per acre, without petroleum oil or other additives, and using spray volumes of at least 125 gal/acre. Enable 2F can be applied for greasy spot control at any time but is especially indicated in mid to late summer for rind blotch control.

The strobilurin fungicides (Abound, Gem, Headline, Pristine or Quadris Top) or Enable 2F can be applied at any time to all citrus and provide effective control of the disease on leaves or fruit. Use of a strobilurin (Abound, Gem, Headline, Pristine or Quadris Top) is especially indicated in late May and early June since it will control both melanose and greasy spot and avoids potential fruit damage from the copper fungicides at that time of year. A strobilurin fungicide should not be applied

more than once a year for greasy spot control. Addition of petroleum oil increases the efficacy of these products.

•Processed fruit

May-June

- Petroleum oil (455, 470) 5-10 gal
- Cu fungicides 2-4 lb metal
- Abound, Gem, Headline + 5 gal oil
- Pristine
- Amistar Top
- Enable

July

- Petroleum oil (455, 470) 5-10 gal
- Cu fungicides 2-4 lb metal
- Abound, Gem, Headline + 5 gal oil
- Pristine
- Amistar Top
- Enable

•Fresh fruit

May-June

- Petroleum oil (455, 470) 10 gal
- Cu fungicides < 2 lb metal, No oil
- Abound, Gem, Headline + 5 gal oil
- Pristine
- Amistar Top
- Enable

July

- Petroleum oil (455, 470) 10 gal
- Cu fungicides < 2 lb metal
- Abound, Gem, Headline + 5 gal oil
- Pristine
- Amistar Top
- Enable 8 oz

For more information on greasy spot, go to:

<https://crec.ifas.ufl.edu/media/crecifasufledu/extension/plant-pathology-/florida-citrus-production-guide/pdf/Greasy-Spot.pdf>

FIRE ANTS



Imported fire ants are reddish brown to black and are 1/8 to 1/4 in long. These ants are aggressive and notorious for their painful, burning sting that results in a pustule and intense itching, which may persist for a week. Some people have allergic reactions to fire ant stings that range from rashes and swelling to paralysis or even death. In addition to stinging humans, imported fire ants can sting pets, livestock, and wildlife. Crop losses are also reported due to fire ants feeding on plants and even citrus trees. Fire ants may damage young citrus by building nests at the trunk bases. The ants feed on the bark and cambium to obtain sap, often girdling and killing young citrus trees. Fire ants also chew off new growth at the tips of branches and feed on flowers and developing fruit. In groves infested with ants, harvesting crews may not be willing to work and may request a higher fee to do their job. The ants are also known to cause extensive damage to irrigation lines and plug emitters. They aggregate near electrical fields where they can cause short circuits or interfere with switches and equipment such as water pumps, computers and air conditioners.

BIOLOGY

Red imported fire ants live in colonies that contain cream-colored to white immature ants, called brood. The brood is comprised of the eggs, larvae, and pupae. Also within the colonies are adult ants of different types. They include winged males and winged females, workers, and one or more queens. While thousands of winged males and females can be produced per year in large colonies, they do not sting. Newly-mated queens can fly as far as 12 miles from the nest (or even

farther in the wind), but most land within a mile. New colonies do not make conspicuous mounds for several months. Once a colony is established, a single queen can lay over 2,000 eggs per day. Depending on temperature, it can take 20 to 45 days for an egg to develop into an adult worker. Workers can live as long as 9 months at 75°F, but life spans usually are between 1 and 6 months under warmer outdoor conditions. Queens live an average of 6 to 7 years.

Fire ants are omnivorous feeders. Workers will forage for food more than 100 feet from the nest. They can forage during both the day and the night, generally when air temperatures are between 70° and 90°F. When a large food source is found, fire ants recruit other workers to help take the food back to the colony. Liquids are ingested at the food source, and stored within the ants until they are regurgitated to other ants within the colony. Liquids from solid foods are extracted at the source, or are carried back as solid particles. Large solids may be cut into smaller pieces so they can be carried back to the colony. There are two types of fire ant colonies: single-queen, and multiple-queen colonies. A colony may contain as many as 100,000 to 500,000 workers.

CONTROL STRATEGIES AND TECHNIQUES

Numerous methods have been developed to control fire ants. Unfortunately, there are no control methods that will permanently eliminate fire ants. Four strategies are currently being used to control fire ants: broadcast bait applications, individual mound treatments, a combination of broadcast baiting and individual mound treatments, and barrier/spot treatments.

1. Broadcast Bait Applications

This strategy attempts to reduce fire ant populations by applying insecticides incorporated into an attractant or bait. The ants carry the bait to the colony. The slow action of the toxicant allows the ants to feed it to other members of the colony before they die. When the toxicant is fed to the queen(s), she either dies or no longer produces new workers and the colony will eventually collapse.

● **Keep baits dry.** Wet baits are not attractive to fire ants. Apply baits when the grass and ground are dry or drying, and rain is not expected, preferably for the next 24 hours.

● **Apply baits when fire ants are actively foraging.** During hot, summer weather, apply baits in the late afternoon or evening because fire ants will forage at night under these conditions.

● **Follow the directions on the label.** It is against the law to apply baits in areas not listed on the label.

2. Individual Mound Treatments

This strategy attempts to eliminate colonies of fire ants by treating mounds individually. Individual mound treatments are time consuming and labor intensive. However, colonies treated individually may be eliminated faster than colonies treated with broadcast bait applications.

Baits

Bait products used for broadcast bait applications can be applied to individual mounds. Sprinkle the recommended amount of bait around the base of the mound up to three feet away. In addition, follow the Guidelines for Effective Bait Applications given previously. As with broadcast bait applications, the use of baits for individual mound treatments may take one to several weeks to eliminate colonies.

Dusts

Dusts are dry powder insecticidal products. The dusts stick to the bodies of ants as they walk through treated soil. Ants that contact the dust will eventually die. Dusts are applied by evenly sprinkling a measured amount of dust over the

mound. Avoid inhaling or touching the dust. Some dusts, such as those containing 75% acephate, should kill an entire colony within a week.

Aerosols

Some products are available in aerosol cans equipped with a probe, and contain insecticides that quickly immobilize and kill ants on contact. As the probe is inserted into a mound, the insecticide should be injected into the mound for a specified amount of time. Similar to other individual mound treatments, application on cool, sunny mornings will help maximize contact with the colony.

3. Combining Broadcast Baiting and Individual Mound Treatments

This strategy utilizes the efficiency of broadcast baiting and the fast action of individual mound treatments. Baits must be broadcast first to efficiently reduce fire ant populations. Wait a minimum of 3 days after broadcasting to allow fire ants to forage and distribute the bait before individually treating mounds. Treat mounds preferably with a dust, granular, or aerosol insecticide specifically labeled for fire ant control.

4. Barrier/Spot Treatments

These products are usually sold as sprays or dusts. They may be applied in wide bands on and around building foundations, equipment and other areas to create barriers that exclude ants. They also may be applied to ant trails to eliminate foraging ants. Barrier and spot treatments do not eliminate colonies.

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LOVEBUGS

Dr. Norman C. Leppa, professor, Entomology and Nematology Department, Institute of Food and Agricultural Sciences, University of Florida



Lovebugs characteristically appear in excessive abundance throughout Florida as male-female pairs for only a few weeks every April-May and August-September. Although they exist over the entire state during these months, they can reach outbreak levels in some areas and be absent in others. They are a nuisance pest, as opposed to destructive or dangerous, in areas where they accumulate in large numbers.

Lovebug Description and Biology

An individual female deposits an average of 350 eggs under decaying vegetation in a grassy or weedy area with adequate moisture. The larvae feed on decomposing leaves and grass until they pupate. In nature, the adults live just long

enough to mate, feed, disperse and deposit a batch of eggs, about 3-4 days. Lovebugs do not fly during the night. After a pair disperses, the male dies and the female deposits as many as 600 eggs under decaying leaves or grass before also dying.

Lovebugs are attracted to automobiles. After mating, lovebugs disperse as coupled pairs, presumably flying in search of nectar on which to feed and suitable oviposition sites. Mated females are attracted to sandy sites with adequate moisture, dead leaves, grass clippings, cow manure, and other decomposing organic debris. Lovebugs are attracted to anethole, an essential oil found in plants that also attracts bees. Additionally, female lovebugs are attracted to UV irradiated aldehydes, a major component of automobile exhaust fumes. They may confuse these chemicals with the odors emitted from decaying organic matter at typical oviposition sites. Heat has also been shown to attract lovebugs and contribute to their abundance on highways. Additionally, lovebugs seem to collect on light-colored buildings, especially when freshly painted. Many kinds of flies are attracted to light-colored and shiny surfaces, although the physiological or behavioral mechanisms are unknown. Thus, lovebugs apparently accumulate in relatively warm, humid, sunny areas with food and chemicals in the atmosphere that mimic oviposition sites.



The body fluids of lovebugs are acidic and immediately dissolve automobile paint.

When numerous lovebugs are smashed on the front of a vehicle, the contents of their bodies, especially eggs, coat the painted surface. No permanent damage is caused, however, if the surface is cleaned before the coating is baked by the sun for a day or two. Macerated lovebugs are about neutral with a pH of 6.5 but become acidic at 4.25 within 24 hours. Yet, automobile paint was not damaged after being coated with macerated lovebugs and held in a humid indoor environment for 21 days. A lovebug-coated surface exposed to the sun for an extended period of time, however, may be damaged by the insects and their removal. The front of a vehicle can be protected by coating it with “car wax” and removing the lovebugs within 24 hours.

Lovebugs have no significant natural enemies. No parasites have emerged from lovebug larvae or adults held in the laboratory, and few cases of predation have been observed in nature over the years. Apparently lovebugs adults are avoided by red imported fire ants and other predators but one periodically eaten by spiders, dragonflies, and birds. They have aposematic coloration that implies defensive mimicry but have not been chemically analyzed or tested as food for predators. Bee keepers report anecdotally that honeybees do not visit flowers infested with lovebugs. Fungal pathogens have been identified by screening, six from larvae and one from adults that could be limiting lovebug populations. These fungi include the well-known insect pathogenic genera, *Metarhizium*, *Beauveria* and *Conidiobolus*. Although not yet studied, lovebug eggs may be subjected to predation or parasitism.

Lovebugs and People

It is possible but usually not necessary to avoid lovebugs and the problems they cause. Unlike some of their close relatives, lovebugs do not bite, sting, or transmit diseases and are not poisonous. Lovebugs are only active in the daylight and are much less mobile during the early and late daytime hours. Typically, the pairs fly across the wind during their dispersal flights and are blown against obstacles, especially vehicles traveling at high speeds. Their remains can be removed from surfaces easily if not left to bake in the sun. Lovebugs are poor fliers that can be kept out of a building by creating positive pressure with an air-conditioning fan. If a few lovebugs enter, a vacuum cleaner can be used to remove them. Screens can be added to windows and doors, particularly on the prevailing windward side of a building, and placed over decks and swimming pools. A fan can be used outside near work or recreational areas to keep lovebugs away. Due to their abundance and mobility, lovebugs cannot be controlled effectively with poisons or repellents. Some people consider the lovebug to be among the peskiest alien invasive species to become established in the Gulf States. On the contrary, these potentially annoying flies are actually beneficial as larvae because they help to decompose dead plant material. People would also appreciate esthetic aspects of the adults, if these insects were not such a nuisance. Like cute little migratory birds, lovebugs signal changes in the seasons from spring to summer and again from summer to fall.

Flatwoods Citrus

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__ White, non-Hispanic

__ Black, non-Hispanic

Gender

__ Female

__ Male