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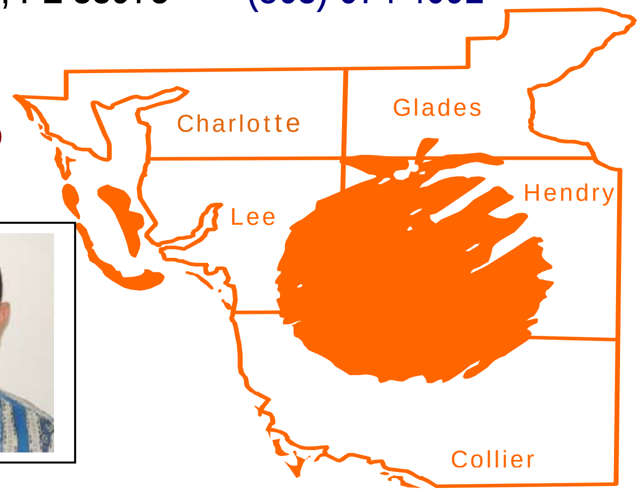
Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 17, No. 3 **March 2014**

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

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Previous issues of the Flatwoods Citrus newsletter can be found at:
http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm
http://irrec.ifas.ufl.edu/flcitrus/

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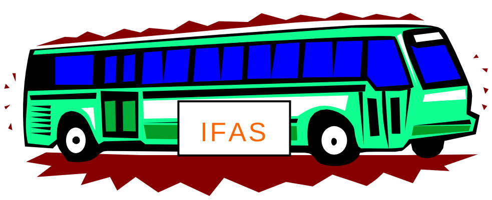
IMPORTANT EVENTS

Seminar – Citrus Exotic Diseases

Date & time: Thursday, March 20, 2014, 10:00 AM – 12:10 PM
Location: UF-IFAS Southwest Florida Research and Education Center
Program Coordinator: Dr. Mongi Zekri, UF-IFAS
Program Sponsor: Ed Early, DuPont Ag Products
10:00 AM – 11:10
--Update on Citrus Leprosis and Citrus Variegated Chlorosis - **Dr. Ron Brlansky, UF-IFAS**
--Research & Recent Results on the Possible Causal Agent of Citrus Blight - **Dr. Ron Brlansky, UF-IFAS**
11:10 AM – 11:20 AM Break
11:20 AM – 12:10 PM --Breeding for HLB Tolerance - **Dr. Jude Grosser, UF-IFAS**
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors (CCAs)
Pre-registration is required. No registration fee and lunch is free Thanks to **Ed Early with DuPont Ag Products.** To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu

COLLIER COUNTY EXTENSION AG TOUR



Wednesday, 19 March 2014
For more information or to sign up, call Robert Halman at 239 353 4244

2014 ANNUAL FLORIDA CITRUS GROWERS' INSTITUTE

Date & Time: Tuesday, 8 April 2014, 8:00 AM – 3:45 PM
Location: Avon Park Campus of South Florida Community College
Coordinators: Citrus Extension Agents, UF-IFAS

2014 ANNUAL FARM SAFETY DAY in SW Florida

Date & Time: Saturday 17 May 2014, 7:30 AM – 1:00 PM
Location: Immokalee IFAS Center
Coordinator: Mongi Zekri, Citrus Extension Agent, UF-IFAS

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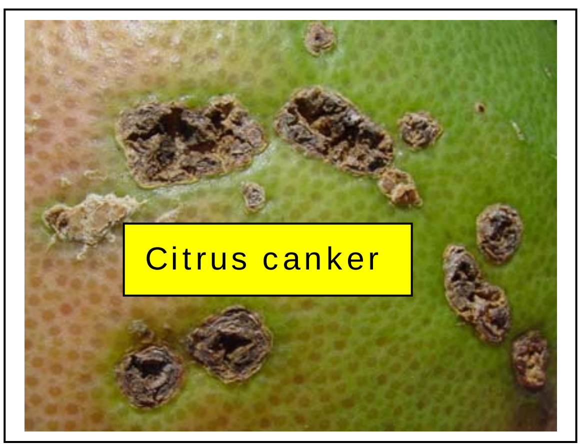
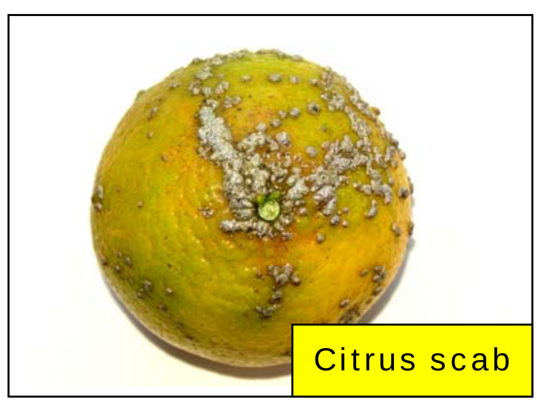
Fungicide effectiveness-Newly revised

Products	Canker	Greasy Spot	Alternaria	Scab	Melanose
Copper	**Good**	**Good**	**Good**	Moderate	**Good**
Oil	None	**Good**	None	None	None
Ferbam	None	Weak	Moderate	Moderate	Weak
Headline	None	**Good**	**Good**	**Good**	**Good**
Abound	None	**Good**	**Good**	**Good**	**Good**
Gem	None	**Good**	**Good**	**Good**	**Good**
Pristine	None	**Good**	**Good**	**Good**	**Good**
Quadris Top	None	**Good**	**Good**	**Good**	**Good**
Enable	None	Moderate	Poor	Moderate	Weak





DROUGHT

Water stress is the physiological condition to which a plant is subjected whenever the rate of water loss from the leaves by transpiration exceeds the rate at which water is absorbed by the root system. Water stress can be the result of excessive transpiration or slow absorption from a dry soil or a combination of these two factors. Any degree of water imbalance can produce a deleterious change in physiological activity of growth and reproduction. Short-term drought often reduces production and prolonged drought can cause total crop failure. Severe drought between March and July can reduce fruit set, fruit development and fruit growth. The number of fruit, fruit size, and tree canopy are reduced with water stress. Extension growth in shoots and roots, and leaf expansion are all negatively correlated with water status. Trees subjected to water stress are generally reduced in size. Vegetative growth is particularly sensitive to water deficit. Growth is closely related to turgor and the loss of turgidity reduces photosynthesis, leaf and fruit enlargement, juice content and yield, and increases wilting and leaf and premature fruit drop. Growers cannot afford water stress or water restrictions during this critical period. Irrigation is of particular importance during the springtime, which coincides with the important stages of leaf expansion, bloom, fruit set, and fruit enlargement.

PLANT GROWTH REGULATORS (PGRs)

Plant growth regulator sprays can provide significant economic advantages to citrus growers when used in appropriate situations. Many citrus growers routinely use PGRs to enhance crop profitability. Depending on variety and timing, PGRs may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, and reduce preharvest fruit drop. Excessive rates, improper timings, untested surfactants or tank mixes, and inappropriate environmental conditions can result in phytotoxicity, erratic results, and/or greatly reduced cropping. Growers are urged to become familiar with PGRs through application to small plots before treating significant acreage. To avoid drift onto susceptible crops in surrounding areas, products containing 2,4-D (2,4-Dichlorophenoxyacetic acid) have stringent requirements for application conditions. READ THE LABEL. Consult with your County Extension Office.

Since PGRs function by directly influencing plant metabolism, plant response can vary considerably with concentration, making sprayer calibration and accurate material measurement especially important. Studies show that variability in spray deposition increases as spray volume is reduced below 250 gallons/acre in mature citrus groves. At lower water rates, canopy closest to the sprayer manifold tends to retain much more material than other plant surfaces. Because material concentration is especially important in PGR use, water volumes below 125 gallons/acre are not generally recommended.

Unlike most agrichemicals applied to crop, efficacy of PGRs depends on entry of materials into plant tissues. Uptake is influenced by a number of factors: amount of PGR applied, concentration of PGR, presence of surfactants, solution pH, environmental conditions during and after application, foliage condition, and plant stress level. Application of PGRs is recommended only on healthy citrus blocks. Even when properly applied, some PGRs may cause leaf curling, especially when sprayed on young leaves.

GIBBERELLIC ACID (GA_3) is recommended to be used on citrus hybrids that are weakly parthenocarpic and without sufficient cross-pollination to improve fruit set. Applied from full bloom to two-third petal fall, GA can effectively set and produce an excellent crop of seedless Robinson, Nova, Orlando, Minneola, or other self incompatible mandarin hybrids. Use Gibeerellic acid (GA_3, 4.0% liquid concentrate) at the rate of 10-20 oz/acre. Products marketed include: Pro-Gibb, GibGro, and Gibbex. Because material concentration is important in plant growth regulators, water volumes below 125 gallons/acre are not recommended. Do not use in water above pH 7.5 because uptake will be reduced. Care should also be exercised in not exceeding the recommended GA dosage or concentration because it can cause severe leaf drop.
READ THE LABEL

Chemical thinning of tangerines with NAA to increase fruit size and reduce branch breakage and alternate bearing

NAA (naphthalene acetic acid) encourages greater physiological-drop (usually in May for Florida citrus). Sunburst and Murcott are especially likely to benefit from judicious use of NAA. READ THE LABEL

NAA rate

Since concentration is so important, growth regulator treatments are usually expressed on a concentration basis (part per million or ppm) rather than ounces per acre. Rates of 250-500 ppm NAA have been most effective in thinning citrus varieties. For mature groves of large trees, 125-150 gallons per acre is probably adequate and lower volumes should be used for smaller trees by turning off some sprayer nozzles. Growers uncomfortable with calculations on a ppm basis can use the ounces of NAA/125 gallons, at appropriate ppm, as a rate per acre when applying at 125 gallons/acre. All NAA applications should include a surfactant at 0.05% and should not be tank mixed with other materials, unless you confirm that it is compatible with NAA.

For most healthy, unstressed groves, NAA should be applied at 120 ounces Fruit Fix 200 (or similar product, NOT Citrus Fix, which is 2,4-D rather than NAA plus 6.5 ounces of surfactant per 100 gallons, at 125 gallons per acre. Murcott should receive a lower rate 60-96 oz NAA/100 gallons.
READ THE LABEL

Timing

NAA should be applied near the beginning of physiological drop, when most fruitlets are about 1/2 inch in diameter, which typically occurs 6 to 8 weeks postbloom**. Rain within six hours of treatment, drought stress, or very hot or cool conditions may affect response.**

Environmental conditions can greatly influence uptake and activity of NAA. Higher temperatures and delayed drying of spray solution both contribute to greater thinning action. Best results are likely to occur when applied between 75° and 85° F. Higher temperatures may cause excessive thinning. Since uptake continues for several hours after the spray dries, heavy rain within six hours of application may significantly reduce NAA action.

PLANT GROWTH REGULATORS FOR CITRUS IN CALIFORNIA

The plant growth regulators 2,4-dichlorophenoxyacetic acid (2,4-D), gibberellic acid (GA_3) are registered for preharvest use on California citrus crops. 2,4-D is used mainly to delay and reduce unwanted fruit abscission (fruit drop), GA_3 is used mainly to delay senescence (overripening).

In order to be effective, plant growth regulators must be absorbed by plant tissue. Good spray coverage is essential and climatic conditions that favor absorption are therefore desirable.

Both 2,4-D and GA_3 seem to be compatible with urea, potassium foliar sprays, zinc and manganese micronutrient sprays, and neutral copper sprays, but the timing of growth regulator applications may not coincide with the best time for nutrient sprays.

2,4-dichlorophenoxyacetic acid (2,4-D). 2,4-D is used to control preharvest fruit drop, increase fruit size (oranges, grapefruit, mandarin, and mandarin hybrids), and to control leaf and fruit drop following an oil spray. When you use 2,4-D to reduce drop of mature fruit, apply the compound before (preferably *shortly* before) fruit drop becomes a problem, but far enough ahead of flowering to minimize undesirable effects that 2,4-D would otherwise have on the spring cycle of growth. For navel oranges, October through December sprays are common. October, however, may be too early to effectively reduce fruit drop if conditions favor it (e.g., warm winter, protracted harvest). January sprays may be somewhat risky, especially when environmental factors favor an earlier-than-usual spring flush of growth.

For mature grapefruit and 'Valencia' orange trees, 2,4-D can be applied to control drop of mature fruit or as a dual-purpose spray (to control mature fruit drop and to improve fruit size for the next year's crop). Fruit-sizing sprays require excellent coverage. In general, 'Valencia' orange is more responsive than grapefruit to fruit-sizing sprays. For mandarin and mandarin hybrids, 2,4-D fruit sizing sprays are applied 21 to 35 days after 75% petal fall.

Gibberellic acid (GA_3). The purpose of applying GA_3 to citrus trees in California is to delay fruit senescence. Make applications while the fruit are still physiologically young, but are approaching maturity. GA_3 can have a negative effect on flowering and thus on production for the following year, especially if it is applied much later than specified on the current label or in these guidelines. It delays changes in rind color, an effect that can be considered either desirable or undesirable. For example, if you apply GA_3 to navel orange trees while the fruit still have green rinds, delayed coloring will have a negative effect on your ability to harvest and market the fruit early in the season. In contrast, this effect is desirable for late-harvested fruit because it delays rind senescence, which results in fruit that are paler in color than the deeper-colored fruit from untreated trees. GA_3 applications amplify the re-greening of "Valencia" oranges. This is considered undesirable and can be minimized if you apply the compound no later than the date specified on the label or in these guidelines. GA_3 application may result in leaf drop, which can be severe, especially when it is applied to navel orange trees that are under heat or water stress. When this happens, the tree may also suffer twig dieback. By including 2,4-D in the GA_3 spray, you may be able to reduce this kind of damage.

C. J. Lovatt, Botany and Plant Sciences, UC Riverside
C. W. Coggins, Jr., Botany and Plant Sciences, UC Riverside

PLANT GROWTH REGULATORS IN FLORIDA

By Davies, Ismail, Stover, and Wheaton, UF-IFAS

Plant growth regulator (PGR) sprays can provide significant economic advantages to citrus growers when used in appropriate situations. Many citrus growers routinely use PGRs to enhance crop profitability. Depending on variety and timing, PGRs may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, reduce preharvest fruit drop, or reduce hand-suckering by controlling trunk sprout growth in young citrus trees. Excessive rates, improper timings, untested surfactants or tank mixes and inappropriate environmental conditions can result in phytotoxicity, erratic results and/or greatly reduced cropping. Growers are urged to become familiar with PGRs through application to small plots before treating significant acreage. To avoid drift onto susceptible crops in surrounding areas, products containing 2,4-D (2,4-Dichlorophenoxyacetic acid) have stringent requirements for application conditions.

Importance of material concentration and spray volume

Most registered pesticides are effective over a fairly broad concentration range with little likelihood of phytotoxicity. Since PGRs function by directly influencing plant metabolism, plant response can vary considerably with concentration, making sprayer calibration and accurate material measurement especially important. Studies show that variability in spray deposition increases as spray volume is reduced below 250 gallons/acre in mature citrus groves. At lower water rates, canopy surfaces closest to the sprayer manifold tend to retain much more material than other plant surfaces. Because material concentration is especially important in PGR use, water volumes below 250 gallons/acre are not recommended.

PGR uptake

Unlike most agrichemicals applied to crop plants, efficacy of PGRs depends on entry of materials into plant tissues. Uptake is influenced by a number of factors: amount of PGR applied, concentration of PGR, presence of surfactants, after application, and plant stress level.

Effect of surfactants and tank mixes

Surfactants and other spray adjuvants can affect uptake in several ways. Surfactants and oils spread spray materials over leaf surfaces, and increase uptake by enhancing the total area contacted by spray solution. Many surfactants, urea, ammonium salts and oils can also directly enhance uptake by helping materials penetrate the plant cuticle. Organosilicone surfactants and some oils can result in very rapid uptake by carrying material through plant pores known as stomates. Surfactants can significantly enhance entry of PGRs into plant tissues, however, most PGR studies in citrus were conducted without surfactants or with less effective surfactants than many currently available. Use of untested surfactants may significantly enhance uptake, resulting in excessive plant response and/or phytotoxicity. Tank mixing with other spray materials may influence PGR uptake through surfactants or oils in material formulation or may bind PGR molecules rendering them ineffective.

Importance of weather conditions

Studies with other crops have shown that weather conditions greatly influence PGR uptake. Uptake generally increases with both temperature and duration of spray drying. Application at night or in early morning often enhances uptake because greater drying time more than compensates for somewhat lower temperature.

Dew following application is likely to enhance PGR uptake by prolonging drying. Considerable uptake often occurs after spray has dried, therefore, rain within a few hours of application may significantly reduce PGR effectiveness. Many PGRs degrade rapidly in sunlight. Growers should consider the likely influence of environmental factors in timing PGR sprays. It is illegal to apply 2,4-D when wind speed is above 10 miles/hour and distance to susceptible crops downwind is specified at lower wind speeds.

Influence of plant stress

Trees under significant drought, cold, or pest stress may respond excessively to PGR treatments. Therefore, application of PGRs is recommended only to healthy citrus trees.

Leaf curling

Even when properly applied, some PGRs may cause leaf curling, especially when sprayed on young leaves.

Recommended Chemical Controls

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 Plant Growth Regulators.

Growth Regulator	Rate/Acre[1]	Variety and Activity	Time of Application/Cautions
Fruit Fix K-Salt **200** (Naphthaleneacetic acid, NAA, 200 g/gal liquid formulation)	8-20 pt. Use lower rates on Murcotts.	Tangerines, Murcotts, & Tangelos. Fruit thinning to increase fruit size and reduce alternate bearing.	May/June drop, typically mid-May. Activity is temperature dependent. Severe overthinning may result from applications made to trees of low vigor and/or under stress conditions. Heavy rain within several hours of application may reduce activity.

[1]Rates are based on application in 250 gallons per acre to mature trees. Proportional reduction in water and material rates is desirable for smaller trees. Application of Pro-Gibb at full rate to juice oranges in 125-150 gallons per acre to mature trees has been effective. The effects of applications in concentrate sprays are unknown.

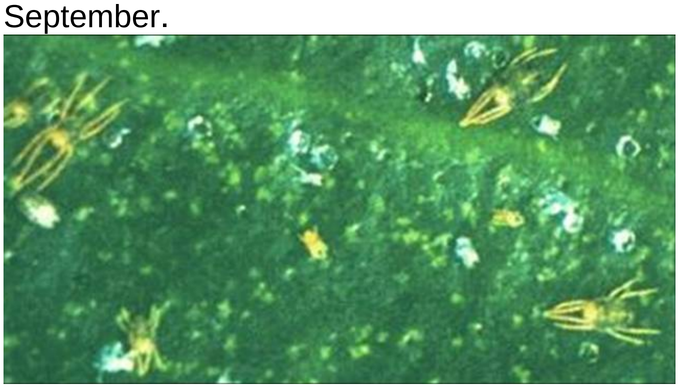
[2]Greater uptake at lower spray solution pH. Do not use in water above pH 8.

Table 1. Recommended Plant Growth Regulators.

Growth Regulator	Rate/Acre[1]	Variety and Activity	Time of Application/Cautions
Citrus Fix (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.36 lb/gal)	3.2 oz	Orange, Temple and grapefruit. Reduction of preharvest drop.	Nov-Dec. Do not apply during periods of leaf flush. Observe restrictions to avoid drift.
Citrus Fix (2,4-Dichlorophenoxyacetic acid isopropyl ester 3.36 lb/gal)	2.4 oz	Navel orange. Reduction of summer and fall drop.	6-8 wks after bloom for summer drop or Aug-Sept for fall drop. Do not apply fall spray when fruit is to be harvested early. Do not apply during periods of leaf flush. Observe restrictions to avoid drift.
Pro-Gibb (Gibberellic acid, GA_3, 4.0% liquid concentrate)[2]	20 oz	Seedless grapefruit. Delay of rind aging process and peel color development. Combine with Citrus Fix for fruit drop control.	Nov-Dec. Greater response prior to colorbreak but early harvest is disrupted by delayed coloring and irregular green spotting may develop. Surfactants increase activity but may cause fruit marking, so use is not recommended. Application within 6 weeks of copper or oil may increase rind marking. Application in Dec may reduce subsequent crop and regreen fruit.
Pro-Gibb (Gibberellic acid, GA_3, 4.0% liquid concentrate)[2]	10-20 oz	Tangelo. Improvement of fruit set. Can result in small fruit size from excessive cropping and/or leaf drop.	Full bloom. Surfactants not recommended.
Pro-Gibb (Gibberellic acid, GA_3, 4.0% liquid concentrate)[2]	20 oz	Minneola tangelo. Delay of stem rind deterioration.	Apply 2 weeks before aniticipated colorbreak. Application after or during coloring may cause rind staining or blotchy color development.
Pro-Gibb (Gibberellic acid, GA3, 4.0% liquid concentrate)2	18 oz	Oranges for processing. Delay of rind aging process and peel color development. Delays decline in peel firmness and increases juice extraction weight during processing.	Apply at or near colorbreak. Application may delay bloom the following year. Do not apply after December 1.
Tre-Hold (Naphthaleneacetic acid, NAA, 1.0% liquid concentrate)	Apply undiluted to trunk only as thorough spray or light brush application.	Nonbearing citrus. Inhibition of trunk sprout growth.	Prior to sprout growth. Caution-may inhibit sprouting desired for tree recovery following freeze. Excessive heavy application may result in tree damage. Do not apply after Sept 1.

Spider Mites

The Texas citrus mite is the predominant species in most citrus groves throughout the state. The citrus red mite is usually second in abundance, but in some nursery operations it is the predominant species. The Texas citrus and citrus red mites occur on citrus throughout the year and usually are most abundant in groves during the dry season. They are found most commonly on the upper leaf surface of recently mature flush, and all stages of the mites orient along the mid-vein. As populations increase, they move to leaf margins and fruit. Spider mites feed primarily on mature leaves and differ from rust mites by feeding beneath the epidermal layer of cells. They are capable of removing cellular contents, causing cell destruction and reducing photosynthesis. Mesophyll collapse and leaf drop can result when trees are stressed by high spider mite infestations in combination with sustained dry, windy conditions that may occur in the late fall, winter or early spring months. When populations of Texas citrus mite or citrus red mites are high, they will also feed on developing fruit. Spider mites prefer dry weather and low relative humidities in the range of 30 to 60% and generally do not pose a sustained problem in the higher humidity conditions that occur between June and September.



Populations of Texas citrus and citrus red mites aggregate among leaves within and between citrus trees.

Spider mites are suppressed to low densities by several species of predacious mites, insects, and entomopathogens in some groves. However, when populations averaging 5 to 10 motile spider mites per leaf develop between September and May, it would be reasonable to apply a miticide, especially if the trees are stressed. However, infestations comprised predominantly of adults, particularly males, are in decline and would not require control. Adult mites are recognized by their large size relative to immatures and females distinguished by their round shape and shorter legs compared to males.

Need for controlling spider mites is based on temperature and humidity conditions, spider mite population levels, tree vigor, and time of the year. Petroleum oil provides some ovicidal activity against spider mite eggs. None of the other miticides provide ovicidal activity, and their residual activity must be sufficiently long-lasting to kill subsequently emerging larvae.

Application of Miticides

Selection of a miticide should be based on the target pests to be controlled, avoiding risks of phytotoxicity, products that will be tank mixed, the time of year, treatment to harvest interval, and prior use of a product. All miticides except petroleum oil should be used only once a year to minimize resistance development. For example, dicofol can be effectively used for spider mite or rust mite control during the supplemental early spring or postbloom intervals. The product is most effective when applied at ONE of these times. Conversely, Comite would be recommended in the fall or supplemental late fall intervals. Vendex is effective in one of the following four periods: supplemental spring, postbloom, fall, or supplemental fall periods. Petroleum oil spray applications can be effectively applied during the postbloom, summer, or fall intervals. Sulfur is included since it has a short treatment to harvest interval and provides a highly effective means of cleaning up rust mite infestations prior to harvest when needed. Use of sulfur should be minimized given its toxic effects on several beneficial arthropods.

Recommended Chemical Controls

READ THE LABEL.
TO MINIMIZE RISK OF RESISTANCE, DO NOT APPLY A SPECIFIC MITICIDE MORE THAN ONCE PER ACRE PER SEASON OTHER THAN PETROLEUM OIL.

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

TABLE 2. CITRUS MITICIDE SELECTION.*

Supplemental (early Spring)	Post Bloom	Summer	Fall	Supplemental Fall
--	--	Agri-mek + oil	--	--
--	--	--	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.

For more information and details, go to:

Florida Citrus Pest Management Guide: Rust Mites, Spider Mites, and Other Phytophagous Mites at:
http://www.crec.ifas.ufl.edu/extension/pest/PDF/2014/Rust%20Mites.pdf

Management of Citrus Black Spot

Citrus black spot is a fungal disease that causes fruit blemishes and significant yield losses, especially on sweet oranges. Black spot can affect all commercial citrus species and cultivars commonly grown in Florida. **Lemons are the most susceptible, but sweet oranges—especially mid-late maturing types such as 'Valencia'—are also highly susceptible to this disease.** 'Hamlin' sweet oranges, grapefruit, and tangerine/mandarin types are moderately susceptible.

Hard spot is the most diagnostic symptom of black spot. The 3–10 mm diameter lesions are depressed and nearly circular, with gray necrotic tissue at the middle that has a brick-red to black margin that can be cracked around the edges. Structures that produce the asexual spores (pycnidia) are often present in the center of lesions and resemble slightly elevated black dots. Hard spot appears as the fruit begins to color before harvest. Lesions first occur on the side of the fruit with the greatest light exposure. False melanose symptoms appear on green fruit early in the season and do not contain pycnidia. The slightly raised lesions are 1–3 mm in diameter and can vary in color from tan to chocolate brown. Under favorable infection conditions, false melanose can resemble the mudcake symptoms of authentic melanose, but are very dark brown rather than rust red. False melanose symptoms can develop into hard spot as the season progresses. Cracked spot is a symptom that has only been observed in the Americas and is reported to be an interaction between rust mites and *G. citricarpa*. Cracked spots are large, diffuse, smooth lesions that form raised cracks around the center. Hard spots can form in the center of these lesions. The most concerning black spot symptom is virulent spot. Early virulent spot (freckle spot) lesions start as irregularly shaped, sunken lesions with a reddish color. Early virulent spot can either coalesce to cover a large portion of the fruit surface or become hard spot. When spots coalesce, they turn from brown to black, and the older lesion surface becomes leathery. Many pycnidia can be found in early and expanded lesions. Virulent spot occurs on mature, severely infected fruit at the end of the season. Virulent spot symptoms can appear in post-harvest on apparently symptomless fruit, sometimes in transit to markets. Despite the unsightliness of black spot lesions, they rarely cause internal fruit rot so those fruit that have not fallen off the tree are still suitable for processing. Significant fruit drop is a common symptom in heavily infected groves.

Airborne ascospores produced in decomposing leaf litter on the grove floor and blown into the canopy by the wind are the primary inoculum for black spot. These spores germinate and directly infect the leaves and fruit. There is a long latent period for this disease, which means that most symptoms do not appear for several months, usually not until the fruit begins to ripen. The fungus requires a long wetting period of 24–48 hours to infect, and the disease is favored by warm, humid weather such as occurs during the summer months. **Major ascospore release usually occurs from April to early September**, with favorable infection conditions from May through September. Fruit remains susceptible most of the growing season. It is unknown how long leaves may remain susceptible. The asexual spores (conidia) are formed in fruit lesions, and to a lesser extent in leaf litter and twigs. Conidia spread by rain splash and can infect fruit and leaves.

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. **Fungicide applications in April are advised if there is substantial rainfall that month.** Our fungicide recommendations are based on efficacy data from trials in other countries with black spot and products registered for use on citrus in Florida. Since only four strobilurin fungicide applications can be used in a season for any purpose, it is recommended to reserve strobilurin fungicides for times when phytotoxicity from copper applications is a concern (temperatures >94°F). This is especially important for fresh fruit. It is recommended that strobilurin fungicides not be applied in two consecutive sprays to manage pathogen resistance. Currently, there are no other rotational fungicides for resistance management. **In addition to chemical control measures, practices to accelerate leaf litter decomposition beneath the trees to reduce the ascospore inoculum may be beneficial**. Enhancing leaf litter degradation should commence in mid-March. There are three methods that have reduced the ascospore inoculum of *Mycosphaerella citri*, the fungus that causes greasy spot. The first is to increase microsprinkler irrigation to at least 5 times a week for approximately a ½ hour per irrigation period for 1.5 months. The leaf litter decomposition will be greater compared to that with the traditional irrigation frequency. One drawback is that leaf litter reduction will be confined to the areas where the microsprinklers reach. A second method is to apply urea (187 lb/treated acre) or ammonium sulfate (561 lb/acre) to the leaf litter. Nitrate-based fertilizers are ineffective. The final method is to apply dolomitic lime or calcium carbonate (2,226 lb/treated acre) to the leaf litter.

There are several cultural practices that will aid control and help restrict further spread of black spot. It is essential to minimize plant trash movement among groves and even among blocks within groves. While there are generally few symptoms on leaves, the ascospores, which are the main inoculum, are formed within the leaves. As leaf litter decomposes, the spores form and are forcibly ejected. This is the basis of the tarping requirement from quarantine areas, but any grove equipment or vehicle can move leaf litter or trash from one location to another.

Where possible, open the tree canopy by skirting to reduce the leaf wetness periods. The fungus requires between 24-48 hours of leaf wetness to infect. It is also important to minimize dead wood in the canopy. **Like the melanose pathogen, black spot fungus can colonize and reproduce in dead twigs. Canopies with significant numbers of dead twigs will have more problems with black spot than those without.**

Recommended Chemical Controls

READ THE LABEL.

Recommended Chemical Controls for Citrus Black Spot

Pesticide	**FRAC MOA**[2]	**Mature Trees Rate/Acre**[1]
copper fungicide	M1	Use label rate.
Abound 2.08F[3]	11	12.4-15.4 fl oz. Do not apply more than 92.3 fl oz/acre/season for all uses. Best applied with petroleum oil.
Gem 25WG[3]	11	4.0-8.0 oz. Do not apply more than 32 oz/acre/season for all uses.
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.
Headline SC[3]	11	9-12 fl oz. Do not apply more than 54 fl oz/acre/season for all uses. Best applied with petroleum oil.
[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) 2011[1]. Refer to ENY-624, "Pesticide Resistance and Resistance Management," in the *2012 Florida Citrus Pest Management 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.		

For more information and more details go to: Florida Citrus Pest Management Guide: Citrus Black Spot at: http://edis.ifas.ufl.edu/cg088

Pollination of Citrus by Honey Bees

Pollination in most citrus is not really required.

1. Citrus flowers are perfect, having both sexes on the same blossom so that self-pollination takes place regardless of pollinators. But bees (pollinators) are distributed throughout citrus groves in any case.
2. Female-sterile varieties are not benefited by pollinators.
3. Some seedless varieties may benefit, but evidence is lacking.

This by no means indicates pollination is not necessary in citrus.

1. There is a growing number of citrus varieties which require cross pollination because they are self-incompatible.
2. A positive linear relationship between fruit size and number of seeds per fruit exists.
3. Where cross pollination is required, use of honey bees remains the most consistent, effective and economical means of ensuring adequate yields.

Grapefruit: Although consensus suggests pollination is not required, there is evidence that open pollination benefited at least one variety (Marsh) by setting four times the fruit which had twice the number of seeds.

Pummelo: This variety appears to be grown commercially only in the Orient and is self-incompatible. Evidence suggests that pollinating by bees is important whether the plant is self-fertile or self-sterile.

Lemons: Most studies indicated the value to be minimal. However, there is evidence that seedlessness can result from self pollination, and that seedlessness may contribute to a reduction in fruit set.

Limes: Few studies have been done. One suggests limited pollination benefit from bees on Tahiti lime which is strongly parthenocarpic. Another suggested sweet limes would benefit from pollination by setting up to twenty percent more fruit.

Oranges: A large variation between cultivars exists in oranges making any sort of general statement difficult. Studies on certain varieties, however, have been accomplished:

- **Washington Navel**: Although it has been suggested that cross pollination on Washington Navels is not required to increase yield, there is evidence to show that pollination by bees may contribute to less fruit drop.
- **Valencias**: Most investigators contend that this variety benefits little from pollination by bees. One study, however, indicates fruit size was increased as the seed number increased.
- **Other sweet oranges**: Not much study has been done on these, but there is some indication that pollination is beneficial. It has also been suggested that reduced fruit set in so-called "off years" may be offset by honey bee pollination.

Mandarin and Mandarin-Hybrid Complex: Many varieties of this complex are self-incompatible and require pollination.

In summary it may be concluded that honey bees are unquestionably important in the pollination of citrus, though some varieties benefit more than others. In addition, there is the belief that ample quantities of bees are always present in groves because of their rich nectar resources.

Protecting bees from pesticides

Most major bee poisoning incidents occur when plants are in bloom. However, bees can be affected in other circumstances as well. Keep the following suggestions in mind when applying pesticides.

Use pesticides only when needed: Foraging honey bees, other pollinators, and insect predators are a natural resource and their intrinsic value must be taken into consideration. Vegetable, fruit, and seed crop yields in nearby fields can be adversely affected by reducing the population of pollinating insects and beneficial insect predators. It is always a good idea to check the field to be treated for populations of both harmful and beneficial insects.

Do not apply pesticides while crops are in bloom: Insecticide should be applied only while target plants are in the bud stage or just after the petals have dropped.

Apply pesticide when bees are not flying: Bees fly when the air temperature is above 55-60°F and are most active from 8 a.m. to 5 p.m. Always check a field for bee activity immediately before application. Pesticides hazardous to honey bees must be applied to blooming plants when bees are not working, preferably in the early evening. Evening application allows time for these chemicals to partially or totally decompose during the night.

Do not contaminate water: Bees require water to cool the hive and feed the brood. Never contaminate standing water with pesticides or drain spray tank contents onto the ground, creating puddles.

Use less toxic compounds: Some pest control situations allow the grower-applicator a choice of compounds to use. Those hazardous to honey bees must state so on the label. **Use less toxic formulations:** Not all insecticides have the same effects when prepared in different formulations. Research and experience indicate:

- New microencapsulated insecticides are much more toxic to honey bees than any formulation so far developed. Because of their size, these capsules are carried back to the colony. These insecticides should never be used if there is any chance bees might collect the microcapsules. Always consider using another formulation first.
- Dusts are more hazardous than liquid formulations.
- Emulsifiable concentrates are less hazardous than wettable powders.
- Ultra-low-volume (ULV) formulations are usually more hazardous than other liquid formulations.

Identify attractive blooms: Before treating a field with pesticides, it is a good idea to check for the presence of other blooming plants and weeds which might attract bees.

United States Department of Agriculture
National Agricultural Statistics Service

CITRUS
MARCH FORECAST
MATURITY TEST RESULTS AND FRUIT SIZE

Cooperating with the Florida Department of Agriculture & Consumer Services
2290 Lucien Way, Suite 300, Maitland, FL 32751-7057
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March 10, 2014

Florida All Orange Production Down 1 Percent
Florida Non-Valencia Orange Production Down 2 Percent
Florida Valencia Orange Production Unchanged
Florida All Grapefruit Production Down 6 Percent
Florida All Tangerine Production Down 7 Percent
Florida Tangelo Production Up 13 Percent
Florida FCOJ Yield 1.61 Gallons per Box (42° Brix)

FORECAST DATES – 2013-2014 SEASON	
[Release time 12:00 p.m. EDT]	
April 9, 2014	May 9, 2014
June 11, 2014	July 11, 2014

Citrus Production by Type and State – United States

Crop and State	Production [1]			2013-2014 Forecasted Production [1]	
	2010-2011	2011-2012	2012-2013	February	March
	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)	(1,000 boxes)
Non-Valencia Oranges [2]					
Florida	**70,300**	**74,200**	**67,100**	**54,000**	**53,000**
California [3]	48,000	45,500	44,000	42,000	42,000
Texas [3]	1,700	1,108	1,499	1,455	1,455
United States	120,000	120,808	112,599	97,455	96,455
Valencia Oranges					
Florida	**70,200**	**72,500**	**66,500**	**61,000**	**61,000**
California	14,500	12,500	12,500	11,500	12,000
Texas [3]	249	311	289	370	370
United States	84,949	85,311	79,289	72,870	73,370
All Oranges					
Florida	**140,500**	**146,700**	**133,600**	**115,000**	**114,000**
California	62,500	58,500	56,500	53,500	54,000
Texas [3]	1,949	1,419	1,788	1,825	1,825
United States	204,949	206,119	191,888	170,325	169,825
Grapefruit					
Florida-All	**19,750**	**18,850**	**18,350**	**17,000**	**16,000**
White	**5,850**	**5,350**	**5,250**	**4,500**	**4,000**
Colored	**13,900**	**13,500**	**13,100**	**12,500**	**12,000**
California [3]	4,310	4,000	4,000	4,000	4,000
Texas [3]	6,300	4,800	6,100	5,370	5,370
United States	30,360	27,650	28,450	26,370	25,370
Lemons					
California [3]	20,500	20,500	21,000	20,000	20,000
Arizona [3]	2,500	750	1,800	1,785	1,785
United States	23,000	21,250	22,800	21,785	21,785
Tangelos					
Florida	**1,150**	**1,150**	**1,000**	**800**	**900**
Tangerines					
Florida-All	**4,650**	**4,290**	**3,280**	**3,500**	**3,250**
Early [4]	**2,600**	**2,330**	**1,910**	**1,800**	**1,750**
Honey	**2,050**	**1,960**	**1,370**	**1,700**	**1,500**
California [3 5]	10,600	10,800	13,000	13,200	13,200
Arizona [3 5]	300	200	200	200	200
United States	15,550	15,290	16,480	16,900	16,650

[1] Net pounds per box: oranges in California-80, Florida-90, Texas-85; grapefruit in California-80, Florida-85, Texas-80; lemons-80; tangelos-90; tangerines and mandarins in Arizona and California-80, Florida-95.
[2] Navel and miscellaneous varieties in California. Early (including Navel) and midseason varieties in Florida and Texas. Includes small quantities of tangerines in Texas and Temples in Florida.
[3] Estimates carried forward from January forecast.
[4] Fallglo and Sunburst varieties.
[5] Includes tangelos and tangors.

All Oranges 114.0 Million Boxes

The 2013-2014 Florida all orange forecast released today by the USDA Agricultural Statistics Board is 114.0 million boxes, down 1.0 million boxes from February and 15 percent less than last season's production. The total includes 53.0 million boxes of non-Valencia oranges (early, midseason, Navel, and Temple varieties) and 61.0 million boxes of Valencia oranges. The hurricane seasons of 2004-2005 and 2005-2006 have been excluded from the usual 10-year regression, and from comparisons of the current season to previous seasons, unless otherwise noted. For those previous 8 seasons, the March forecast has deviated from final production by an average of 2 percent with 3 seasons below and 5 above, with differences ranging from 3 percent below to 4 percent above. All references to "average", "minimum", or "maximum" refer to the previous 8 non-hurricane seasons unless noted.

Non-Valencia Oranges 53.0 Million Boxes

The forecast of non-Valencia orange production is decreased by 1.0 million boxes to 53.0 million boxes, based on utilization to the 1st of the month. The Row Count survey conducted February 25-26 showed 98 percent of the rows have been harvested. The Navel portion of the non-Valencia forecast is final at 1.95 million boxes, 4 percent of the total.

Valencia Oranges 61.0 Million Boxes

The forecast of Valencia production remains at 61.0 million boxes. Limited harvest has begun. Fruit size is projected to be below the minimum, requiring 242 pieces of fruit to fill a 90-pound box. The projection of 26 percent droppage is above the maximum.

All Grapefruit 16.0 Million Boxes

The forecast of all grapefruit production is lowered by 1.0 million boxes to 16.0 million boxes. Both the white and colored components are reduced by 500 thousand boxes, resulting in forecasts of 4.0 million boxes of white and 12.0 million boxes of colored grapefruit. Although size and drop components were final last month, a follow-up survey was conducted in February, which shows white grapefruit size continues near the minimum, and colored grapefruit size is the smallest in the series dating back to the 1968-1969 season. Results of this survey show both colored grapefruit and white grapefruit droppage is the highest of any non-hurricane season. The Row Count survey indicated 52 percent of the white grapefruit and 62 percent of the colored grapefruit rows have been harvested.

All Tangerines 3.25 Million Boxes

The forecast of all tangerine production is lowered by 250 thousand boxes to 3.25 million boxes. The early tangerine forecast (Fallglo and Sunburst) is adjusted from 1.80 to 1.75 million boxes, with the harvest season complete for those varieties. The forecast of the later maturing Honey variety is reduced 200 thousand boxes to 1.5 million boxes. The Row Count survey showed 45 percent of the Honey tangerine rows have been harvested.

Tangelos 900 Thousand Boxes

The forecast of tangelo production is raised 100,000 boxes to 900,000 boxes, including an allocation of 100,000 boxes for non-certified use. Estimated utilization for the week ending March 2, as reported by the Citrus Administrative Committee, is 12,000 boxes. The Row Count survey conducted February 25-26 showed 92 percent of the rows have been harvested.

FCOJ Yield 1.61 Gallons per Box

The projection for frozen concentrated orange juice (FCOJ) remains at 1.61 gallons per box of 42° Brix concentrate. The yield projection for the non-Valencia oranges is lowered to 1.52 gallons per box while the projection for Valencia oranges continues at 1.69 gallons per box. Last season's final yield for all oranges was 1.587680 gallons per box, as reported by the Florida Department of Citrus. Last season's final yield for the components were 1.508465 for non-Valencia oranges and 1.692050 for Valencia oranges.

Flatwoods Citrus

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Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975

Subscriber's Name:_______________________________________

Company:____

Address:____

City:______________________State:___________Zip:__________

Phone:_________________________

Fax:___________________________

E-mail:____

Racial-Ethnic Background

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

Gender

__Female __Male