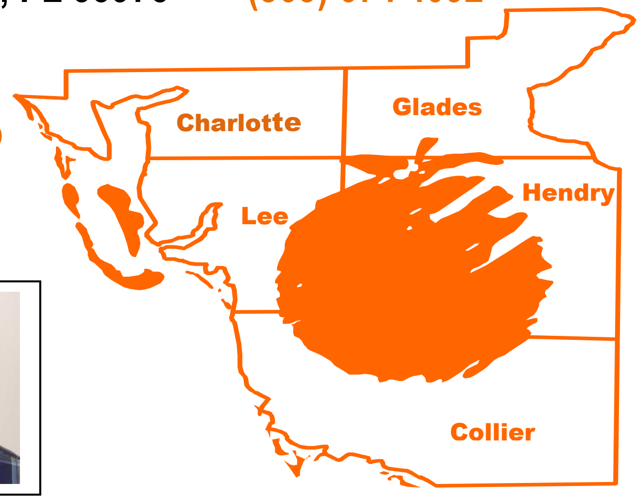
UNIVERSITY of FLORIDA
IFAS Extension

EXTENSION

Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 13, No. 2 February 2010

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

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U P C O M I N G   E V E N T S

-- Workshop for citrus growers, production managers, grove supervisors, and pest scouts on CITRUS SCOUTING AND PEST MANAGEMENT (recognition, scouting, and evaluation of psyllids, leafminers, scales, mites, thrips, and the Sri Lanka weevil)

Date: Thursday, February 18, 2010, Time: 10:00 AM – 12:00 Noon
Location: Southwest Florida REC (Immokalee)
Speakers: **Mr. Barry Kostyk & Drs. Phil Stansly, Jawwad Qureshi, and Alejandro Arevalo**
Program Sponsor: John Taylor & Cody Hoffman, Syngenta
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors (CCAs)
No registration fee and lunch is free Thanks to **John Taylor & Cody Hoffman with Syngenta**, but **RSVP is required** for planning purposes. Please call 863 674 4092 or send an e-mail to maz@ufl.edu

-- Mark your calendar for the March 2010 SQUEEZER SEMINAR
Date: Tuesday, March 16, 2010, Time: 10:00 AM – 12:00 Noon
Location: Southwest Florida REC (Immokalee)
--Dr. Robert Rouse - The importance of the nutrition program on HLB trees
--Dr. Kelly Morgan - Citrus Nutrition & Irrigation (normal vs. after a freeze)
--Dr. Jude Grosser - Genetic Engineering Approaches to Solving HLB

CERTIFIED PILE BURNER Training, 7 April 2010, Immokalee IFAS Center.
Class size is limited to the first 50 people.
See pages 13&14 for registration

For more details, check the January 2010 issue:
http://flcitrus.ifas.ufl.edu/Newsletters/Mongi%20Zekri/Flatwoods%20Citrus%20Newsletter/January-2010%20Color.pdf

or go to: http://www.fl-dof.com/calendar/cal_pdf/pile_burner_Immokalee_Apr2010.pdf

See pages 13&14 for registration

Special Thanks to the following sponsors (on pages on pages 3, 4, and 5) of the Flatwoods Citrus Newsletter for their generous contribution and support. If you would like to be among them, please contact me at
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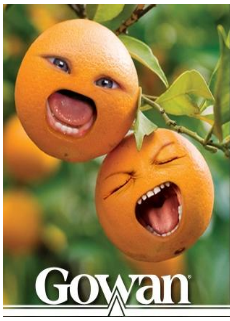

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CURRENT FLOWER BUD INDUCTION ADVISORY #7 for 2009-2010 - 01/13/2010

http://www.crec.ifas.ufl.edu/extension/flowerbud/index.htm

By Dr. Gene Albrigo, UF-IFAS, CREC

Please review Advisory #1 for this year if you have not done so. Besides background, it provides web sites to run the Flowering Monitor System on-line and other related links for weather data. I can be reached by email (see below) if you have an important question.

Freeze damage and flowering–
Ok, El Niños have lost their grip on holding off winter freezes in Florida citrus. However, considerable cold weather occurred the two weeks before the freezes, thus increasing tree cold hardiness. In Lake Alfred, there does not appear to be too much immediate leaf injury. Remember as a general rule, if leaves are injured and stick on the tree, there is usually twig damage behind those leaves. If damaged leaves easily abscise from the shoot, there is a minimum of wood damage. You can evaluate this within 7 to 10 days. If damaged leaves stick or abscise at the blade, it takes weeks to determine wood-cambial damage. The trees should have withstood the temperatures and durations reported (see FAWN station reports). Flowering will not be altered, even if many leaves fall off, unless there was twig and bud damage
Freezing temperatures could have been more severe, but the Jet Stream upper air movement is still coming across the Gulf of Mexico and most likely moderated temperatures. The troughs are now over California and the East Coast with very weak upper air movement over the Midwest. This may allow for some rapid changes, so continue monitoring upper air movement. You can easily follow the Jet Stream pattern at http://www.wunderground.com/. Usually, the freeze hazard is past by January 25th, another 2 weeks.

Current status for 2009-10 Fall-Winter –
Cool weather has been continuous for an unprecedented period of time. Currently, citrus areas have from 850 to 1400 hours of cool temperatures (below 68 degrees F) from southern to northern citrus growing areas. The next 7 days are forecast to stay cool and one week from now even the southern areas will be above 975 hours of cool temperature induction. This should be very satisfactory for good commercial flowering levels. The flowering monitor system has not indicated that flower buds have initiated growth, but it is likely they will start differentiation during the next 7 to 10 days of warmer weather from Sebring south. Temperature may remain too cool this coming week to initiate bud growth from Lake Alfred north. As of now it appears that we should have one major bloom. If bud growth does start in the next week, the earliest bloom date is probably March 10th. If temperatures are cooler than normal during the next 60 days, the bloom date should be later than mid-March.
Since 2004, citrus trees in Florida have not been responding well to cool temperature accumulations that were adequate in the past. After a slow start this year, flower bud induction temperature accumulation has been very good and normally flower enhancement sprays would not be called for, as I advised last week. But if you have experienced weak flowering the past two or three years and were planning on using a flowering enhancement spray of urea or phosphite salts, this next 7 days will be the time to apply it if you have citrus from Sebring south. Citrus trees in more northern areas are going to have exceptionally high flower bud induction levels, will not initiate bud growth until more than a week goes by and should not need a flowering enhancement spray.

If you have further questions, please contact me (albrigo@ufl.edu).

Freeze Damage to Citrus Trees

Severe freezes can damage leaves, twigs, and even kill entire trees. Freeze damage to citrus occurs when water inside the fruit, leaves, and twigs becomes ice and ruptures the cell membranes. During the fall and winter, extended periods of cool weather prior to a freeze can allow citrus trees to harden and acclimate, and therefore withstand more cold weather than non-acclimated trees. On the other hand, freeze damage is more severe when it follows a warm spell. Because new growth is more susceptible to freeze damage, do not do anything that stimulates new growth during the winter.

Symptoms of Freeze Damage

The evidence of freeze damage to citrus fruit is the presence of ice crystals in the fruit. Ice formation inside the fruit usually ruptures the juice sacs. Within several days of warm weather after a freeze, water will be lost from the fruit causing a reduction in its juice content.

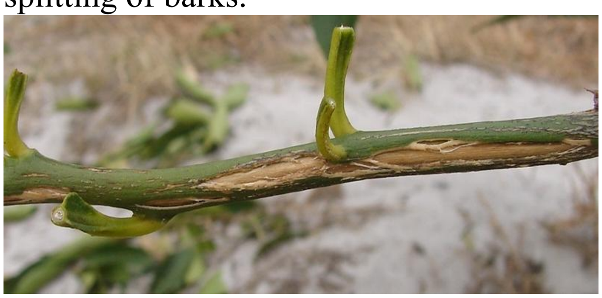
Following severe freezes, mature fruit should be harvested as soon as possible to minimize losses due to excessive fruit drop and reduction in juice content.

Freezes cause the leaves to dry out, curl, turn brown, and fall.

If twigs and wood have not been damaged severely, the leaves will rapidly shed.

If twigs or wood have been seriously damaged, the frozen leaves may remain attached on the tree for several weeks.

After a severe freeze, twig dieback can continue for a couple of years. Another sign of severe freezing damage includes splitting of barks.



The true extent of freeze damage to branches may not be clear within the first three months following a freeze. No attempt should be made to prune or even assess damage from freezes until at least the new spring flushes get fully expended and mature.

Care of Freeze-Damaged Trees

Pruning Freeze-Damaged Wood

No pruning should be done until late in the spring or the summer after a freeze. In early spring, freeze-damaged trees often produce new growth that soon dies back. Sufficient time should be given for the dying back to cease and for the new healthy growth to take place and fully expand. Experience has shown that early pruning does not promote recovery and that delaying pruning to the proper time will save money.

Irrigation & Fertilization

When leaves are lost, evaporation from the tree canopy is greatly reduced. Therefore, the amount of water required should be reduced. Over irrigation will not result in rapid recovery, but may cause root damage. Normal irrigation should be practiced when trees regain their normal foliage development and canopy density. Fertilization of freeze-damaged trees should also be reduced until the trees are back to their original size and their canopy is back to the original density.

FACTORS AFFECTING BLOOM, FRUIT PRODUCTION AND QUALITY

In subtropical regions during the winter months, the temperature normally falls below 70 °F for several months. This causes growth to cease and trees to become dormant for about 3 months. This dormancy, among other things, induces flowering when warmer temperatures in the early spring cause resumption of vegetative growth. In a tropical climate, there is no period of cold temperature to induce dormancy. However, with periods of less than ample soil moisture, flushes of bloom and vegetative growth normally follow periods of drought.

It is well known that vegetative growth is competitive with fruit growth for available nutrients such as sugars and minerals. Flushes of heavy vegetative growth will reduce the solids available to developing fruit, while a period of dormancy will increase solids. This competition for nutrients between vegetative growth and fruit development is one of the reasons reducing solids concentration often found in oranges produced in the tropics as compared with those produced in subtropical regions.

Fruit production and quality is influenced by many factors including climatic conditions and production practices. Within fairly broad parameters of adequate soil and reasonably good cultural and crop protection practices, climate is the most important component of the climate-soil-culture complex causing differences in fruit quality among commercial citrus production areas.

CLIMATE

There is considerable diversity among citrus cultivars in their response to climate, especially as regards to market quality of the fruit. For example, 'Navel' develops its best eating and eye-appeal qualities in a Mediterranean type climate with cool, wet winters and hot, dry summer. In wet, tropical regions, it tends to be large, with poorly colored rinds, and low total soluble solids and acid in the juice. However, 'Valencia' is adapted to a broad range of climates, producing excellent to acceptable fruit quality in most of the important citrus regions. Unlike 'Navel', most grapefruit cultivars develop optimum internal quality in warm climates with little winter chilling.

Cultural practices cannot completely overcome these differences. For example, there is no known cultural practice that allows California (with Mediterranean climate) to produce low-acid, thin-peel Florida world top quality grapefruit.

Worldwide, climate has a significant effect on citrus yield, growth, fruit quality, and economic returns. In growing regions where the average temperatures remain high all year, chlorophyll levels remain high for oranges and tangerines and the fruit peel stays green, while the peel color of oranges and mandarins is more intense and of greater eye-appeal at maturity in the cold-winter subtropical climates.

In lowland tropical areas, due to the high respiration rate at warm temperatures, the fruit mature fast, do not have sufficient time to accumulate high soluble solids levels and acidity declines so rapidly that the soluble solids/acid ratio increases sharply and the fruit quickly become insipid and dry. Total soluble solids (TSS) in the fruit accumulate most slowly in cool coastal areas. Maximum levels of TSS are usually attained in the mid-tropics and in humid subtropical regions with warm winters. Total acid (TA) levels are generally greatest in semiarid or arid subtropical and coastal regions and decline more slowly than in other regions. This decrease in TA is primarily a function of temperature (heat unit accumulation) and the rapid respiration of organic acids at those temperatures.

GROWTH REGULATORS

Application of plant growth regulators can provide significant economic advantages to citrus growers when used in appropriate situations. Depending on cultivar and timing, plant growth regulators may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, and reduce preharvest fruit drop.

Gibberellic acid (GA) is recommended for 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. Application of GA to citrus fruit approaching maturity enhances peel firmness and delay peel senescence.

Application of GA in the fall often increases juice extraction from sweet oranges. It is likely that GA enhances juice extraction efficiency because increased peel firmness provides better mechanical support for fruit within extraction cups.

Applied in winter during floral induction to cultivars that routinely flower heavily but set poor crops such as Navel, Ambersweet, and Ortanique, GA reduces flowering and often results in increased fruit set. A combination of GA and 2,4-D has been used in many fresh fruit growing regions to enhance peel strength and extend the harvest seasons for grapefruit and oranges.

Naphthaline acetic acid (NAA) is used to reduce the number of fruit with excessive set. The advantage of NAA thinning in heavily cropping trees is increased fruit size. The greatest response has been shown when the average fruit diameter is around half an inch, which typically occurs 6 to 8 weeks postbloom. Thinning of Murcott and Sunburst tangerine with NAA was found to increase fruit size, mean fruit weight, and percent packout through improved fruit appearance.

CULTIVAR/ROOTSTOCK

The most important determinant of fruit production and quality under the control of the grower is the selected cultivar. Under comparable conditions, ‘Hamlin’ orange always has poorer juice color and lower soluble solids than ‘Midsweet’ or ‘Valencia’ orange. On the other hand, ‘Hamlin’ produces higher, more consistent yields per acre than any other sweet orange cultivar. 'Valencia' is worldwide known to produce premium quality fruit. Its internal quality is excellent. The fruit has high sugars, superior flavor, and deep orange juice color at maturity.

Beside the cultivar, many horticultural characteristics are influenced by the rootstock including tree vigor and size, fruit yield, fruit size, maturity date, and fruit quality. One of the best known examples is the small fruit size of 'Valencia' budded on Cleopatra mandarin rootstock. Cleopatra mandarin is well suited for use with tangerines, Temple, and tangerine hybrids. Cleo is not widely used for grapefruit and 'Valencia'. Sweet orange and grapefruit cultivars on Cleo generally produce small fruit and are not precocious. Low yield results from poor fruit set and size and fruit splitting. Scions on Cleo are most productive on heavier soils.

Larger fruit with thicker, rougher peel, and lower concentrations of soluble solids and acids in the juice are generally associated with cultivars budded on fast-growing vigorous rootstocks such as rough lemon, Volkamer lemon, *Citrus macrophylla*, and Rangpur lime. However, these rootstocks impart high vigor to the scion and induce high yield. Tangerine fruit from trees grown on vigorous rootstocks tends to be puffy, hold poorly on the tree, and have high incidence of granulation.

Cultivars on slower-growing rootstocks, generally do not produce vigorous vegetative growth, but tend to produce small to medium size fruit with smooth peel texture and good quality fruit with high soluble solids and acid contents in the juice. This latter group of rootstocks includes trifoliate orange and some of its hybrids (citranges and citrumelos). Sweet oranges budded on Carrizo have been among the most profitable combinations over the long term in Florida. Planted on the right soils, trees on Swingle are very productive at high-density plantings.

IRRIGATION AND NUTRITION

Although citrus trees develop largely in response to their genetic endowment and the climate, good production practices can have favorable influences on fruit production and quality. Cultural practices that attempt to cope with climatic or weather problems include irrigation and nutrition. Irrigation is of particular importance during the spring, which coincides with the critical stages of leaf expansion, bloom, fruit set, and fruit enlargement.

Irrigation increases fruit size and weight, juice content and soluble solids-acid ratio. Soluble solids per acre may increase due to yield increase. However soluble solids per box and acid contents are reduced. Through its tendency to stimulate vegetative growth, irrigation in the dry fall and winter may reduce soluble solids in the fruit. Decline in total acid levels can also be aggravated by excessive irrigation.

Citrus trees require a good water management system and a balanced nutrition program formulated to provide specific needs for maintenance and for expected yield and fruit quality performance. Adequately watered and nourished trees grow stronger, have better tolerance to pests and stresses, yield more consistently, and produce good quality fruit. On the other hand, excessive or deficient levels of watering or fertilization will result in low fruit yield and oversize fruit with poor quality and diluted soluble solids content.

The most important nutrients influencing fruit quality are nitrogen, phosphorus, and potassium. However, when any other nutrient is deficient or in excess, fruit yield and quality are negatively altered. Nitrogen (N) increases juice content, TSS per box and per acre, and acid content. However, excessive N can induce excess vigor and promote a vegetative rather than a flowering tree and can result in lower yields with lower TSS per acre. In contrast, low N levels promote extensive flowering but fruit set and yields are poor.

Phosphorus reduces acid content, which increases soluble solids-acid ratio. Potassium (K) increases fruit production, fruit size, green fruit and peel thickness. Foliar spray of potassium nitrate or monopotassium phosphate in the spring often increases fruit size of tangerine and grapefruit, and fruit size and total pound solids of 'Valencia' orange. Foliar application (6-8 weeks before bloom) of urea can increase flowering and fruit set.

<u>SUNLIGHT AND PRUNING</u>

Even though citrus trees can tolerate shade and still flower and fruit, maximum flowering occurs when leaves are fully exposed to the sun. Therefore, pruning including topping and hedging to avoid crowding is extremely important for optimum flowering. The amount of fruit that is set has a very significant effect on fruit quality. There is a positive correlation between the number of fruit per tree and fruit quality. When the number of fruit per tree is low, the peel texture, shape of fruit, and often fruit color are poor. Quality of individual fruit varies significantly, even on the same tree. Inside heavily shaded fruit have less total soluble solid than outside exposed fruit. Insufficient light contributes to reduced total soluble solid concentration of inside fruit nourished by heavily shaded leaves.

Pruning is also an important factor affecting fruit production and quality. Crowded conditions result in poor light and reduction in fruit yield, size, and external quality. Therefore, good management dictates the need to prune before the occurrence of these undesirable effects.

It is well established that shoots with fruit do not flower the following year. A heavy fruit crop tends to deplete carbohydrates and results in a small crop and increased vegetative growth the following year. Pruning after a heavy crop additionally stimulates vegetative growth and reduces fruit yield the following year. Pruning after a light crop and before an expected heavy crop can increase fruit size and help reduce alternate bearing. Pruning or topping and hedging usually increase fruit size and packout of fresh-market fruit by reducing cropload, thus increasing net cash returns to growers.

<u>PESTS AND DISEASES</u>

The improvement in fruit quality that a grower can achieve through choice of rootstocks, irrigation/nutrition management, and other grove practices may easily be overwhelmed by pests, diseases, and other injuries. Excessive leaf loss will noticeably reduce flowering the following spring and fruit production. The primary causes of leaf loss are freeze and tropical storm injury, salt and water stress problems including drought stress and flooding injuries, mites, greasy spot, herbicides and pesticide toxicities. Excessive leaf loss in the fall and in early winter is the worst thing that can happen to citrus trees. It will reduce flowering, fruit set, and fruit yield.

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Information for the next Certified Pile Burners Course:

The Florida Division of Forestry and University of Florida Cooperative Extension Service will be conducting a Certified Pile Burners Course on Wednesday **7 April 2010**. This course will show you how to burn piles ***legally, safely and efficiently***. Most importantly, it could save a life. If you burn piles regularly, don't put off registering for this training. When the weather is dry, certified pile burners will receive priority for authorization to burn. Also, certified pile burners are allowed to burn up to two hours longer per day and get multiple day authorizations. Don't wait. The number of trainings offered and attendance at each training is LIMITED. This training will be held from 8:30 am till 4:30 pm at the South West Florida Research and Education Center located in Immokalee, Florida. Included are a registration form and program agenda. See **http://www.imok.ufl.edu/map.htm** for directions to facility.

Registration is required to attend and class size is limited. To attend please send the following information (see form on next page):

1. Your full name (as wanted on your pile burning certificate).
2. Your mailing address (where you want the certificate mailed).
3. Your Division of Forestry Customer Number (It is the number that you are required to give the DOF when you call in for your burn permits. If you do not know it please call the local DOF office and ask them for it).
4. Your email address (if you have one) and/or contact phone number.
5. A check for **$50.00** made out to **Hendry County 4-H.**

The first fifty individuals to provide these five requirements will be registered; there will be a 7-day non refundable fee limit. If you do not make the training and did not contact our office at least one week before the class, you will not receive a refund. There will be a test at the end of the session. You must receive a grade of 70% or higher on the exam and demonstrate a proper pile burn with your local DOF office to become certified. Once you are certified it will be noted with your customer number, thus it is important for us to have the proper number. If you do not have a customer number the DOF office will set one up for you. Fill out the registration form on the next page and return as directed.

Sincerely,

Dr. Mongi Zekri
Multi County Citrus Agent
Phone: 863 674 4092
Fax: 863 674 4636
maz@ifas.ufl.edu

Registration Form

Florida's Certified Pile Burner Program

April 7th, 2010

c/o Dr. Mongi Zekri

UF-IFAS Hendry County Extension Office

P.O. Box 68

LaBelle, FL 33975-0068

Please send this form and a check for $50.00, payable to Hendry County 4-H to:

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University of Florida, IFAS
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975-0068

___

Name

___

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DOF Customer Number

IMPORTANCE OF FERTILIZERS

Meeting the world's escalating food needs cannot be achieved without fertilizer input. Without fertilizer, the world would produce only about half as much food and more forested lands would have to be put into production. Inorganic commercial fertilizer plays a critical role in the world's food security and is important from both yield and food quality perspectives. Intensification of production and increasing yield on limited arable land is clearly important in securing an adequate food supply, and the role of fertilizer in this is very critical.

Intensification of production will be increasingly essential to the challenge of meeting future food demands. However, this intensification must be done so as to minimize environmental impacts. The Nutrient Stewardship Framework (right fertilizer source, right rate, right time, and right place) is therefore very important.

Let's talk about Calcium (Ca)

A deficiency of calcium in citrus is expressed as a fading of the chlorophyll along the leaf margins and between the main veins during the winter months. Small necrotic (dead) spots can develop in the faded areas. Calcium deficiency produces small, thickened leaves and causes loss of vigor, thinning of foliage and decreased fruit production. Severely deficient trees can develop twig dieback and multiple bud growth of new leaves. Trees grown under Ca deficiency produce undersized and misshapen fruit with shriveled juice vesicles. Fruit from Ca-deficient trees are slightly lower in juice content but higher in soluble solids and acids.

Calcium deficiency usually occurs on acidic soils where native Ca has leached. Continuous use of ammonium-containing fertilizer, particularly ammonium sulfate, accelerates Ca loss from soils. Use of muriate of potash and sulfur cause similar losses of soil Ca. Liming the soil not only neutralizes soil acidity but also supplies available Ca. Calcium deficiency can also occur in highly saline soils due to the excessive sodium (Na) concentration. Under such a situation, gypsum can correct the deficiency and reduce the deleterious effect of Na. Calcium deficiency can also be corrected by foliar spraying with a water-soluble Ca source.

A part of a Chapter from *Nutrition of Florida Citrus Trees, 2nd Edition* which can be downloaded into Adobe Acrobat Reader by clicking on this link: http://edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf
You can download it for free by clicking here.

Recommended Fertilizer Rates and Timing

Nitrogen

Young citrus tree care requires managing irrigation, nutrition, weeds, diseases, pests, and cold protection to stimulate rapid canopy growth. Water and N availability are the most important factors affecting growth of young trees.

Obtaining optimum growth requires substantial irrigation and N inputs, but excesses of either are non-productive, costly, and may result in loss of N by leaching or runoff.

Nitrogen fertilizer recommendations for non-bearing trees were derived from numerous young-tree fertilization studies conducted throughout Florida. These guidelines include a range of rates by tree age because a number of factors influence the N fertilizer requirement. Criteria for selecting a rate within the recommended range include:

• Soil type – Trees planted in soils high in organic matter (e.g. 2% or greater) or with a loamy texture require less fertilizer than trees on low-organic matter sandy soils.

• Land history – New plantings on land previously used for pasture or vegetable production require less fertilizer during the first 1 to 2 years compared with trees replanted in established groves due to mineralization of accumulated organic matter.

• Fertilizer source – Use of controlled-release formulations may allow a reduction in fertilizer rate.

The annual N rate applied to solid-set 2 to 3 year old trees should not exceed 200 lbs/acre.

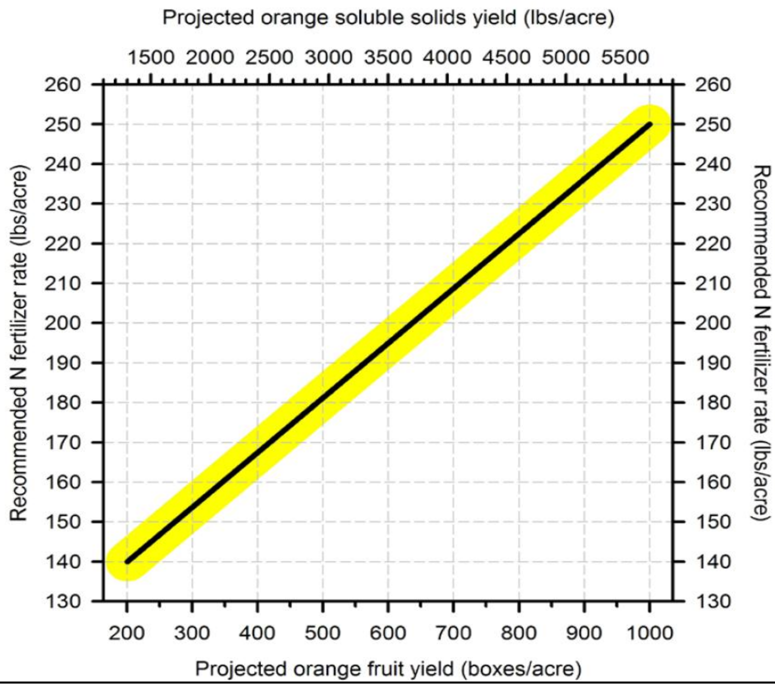
Table 8.1. Recommended N rates and minimum number of annual applications for non-bearing citrus trees.

Year in grove	lbs N/tree/year (range)	Lower limit of annual application frequency		
		Controlled-release fertilizer	Dry soluble fertilizer	Fertigation
1	0.15 – 0.30	1	6	10
2	0.30 – 0.60	1	5	10
3	0.45 – 0.90	1	4	10

Table 8.2. Recommended N rates and minimum number of annual applications for bearing citrus trees.

Year in grove	Oranges	Grapefruit	Other varieties	Lower limit of annual application frequency		
	lbs N/acre/year (range)			Controlled-release fertilizer	Dry soluble fertilizer	Fertigation
4 through 7	120 – 200	120 – 160	120 – 200	1	3	10
8 and up	140 – 250 Yield-based[1]	120 – 160[2]	120 – 300[3]	1	3	10

[1]See Fig. 8.3 for specific production-based N fertilizer rate recommendations.
[2]For grapefruit groves producing more than 800 boxes/acre, the maximum recommended N rate is 180 lbs/acre.
[3]For Orlando tangelos, the maximum recommended N rate is 250 lbs/acre. For Honey tangerines (Murcotts), the maximum recommended N rate is 300 lbs/acre.



Production-based N fertilizer rate recommendations for orange trees

Phosphorus

Before deciding to apply P fertilizer to young trees, test the soil for P and compare the results with the ranges in Tables 4.4

- If soil test P is in the high or very high range, do not apply P fertilizer.
- If soil test P is in the medium range, apply P fertilizer at a P2O5 rate equal to 50% of the N rate.
- If soil test P is in the low range, apply P fertilizer at a P2O5 rate equal to 75% of the N rate.
- If soil test P is in the very low range, apply P fertilizer at a P2O5 rate equal to the N rate.

If soil testing justifies P fertilizer application, test the soil again the following year and compare with Tables 4.4 to determine if P fertilization can be decreased or omitted. Initiate a leaf tissue testing program for P in year 3, and compare the results with the standards.

Table 4.4. Interpretation of soil analysis data for citrus using the Mehlich 1 (double-acid) extractant.

	Soil test interpretation				
Element	Very Low	Low	Medium	High	Very High
	mg/kg (ppm)[1]				
P	< 10	10 – 15	16 – 30	31 – 60	> 60
Mg[2]	---	< 15	15 – 30	> 30	---
Ca[2]			250[3]	> 250	
Cu			< 25[4]	25 – 50[5]	> 50[6]

[1]parts per million (ppm) x 2 = lbs/acre.

Potassium

Apply K fertilizer at a K2O rate equal to the N rate.

Magnesium

If soil test Mg is medium or lower, apply Mg fertilizer at a rate equal to 20% of the N rate. Curtail Mg fertilizer application if a subsequent soil test shows Mg in the high range.

Micronutrients

If trees are planted on previously cultivated land (e.g. complete grove renovation or land converted from other agricultural uses where fertilizer was applied), do not apply micronutrients unless leaf analysis indicates they are below optimum or leaf/twig/fruit deficiency symptoms appear.

If trees are planted on previously non-cultivated land, apply Mn, Cu, and B at 5%, 2.5%, and 0.33% of the N rate, respectively, until soil and leaf analysis and/or tree appearance indicate that one or more may be omitted. Boron may need to be applied every year because it leaches readily.

Do not routinely apply Zn, Fe, or Mo unless prompted by visual symptoms.

Nutrient management

Applying fertilizer in several small doses increases fertilizer efficiency because it maintains more constant N availability and reduces leaching potential. A minimum of 4 to 6 annual applications of dry fertilizer is recommended for young trees. Splitting fertigation into 10 or more yearly applications is common. The cost of liquid injection during irrigation is relatively small particularly if the injection can be automated. One or two applications of controlled release fertilizer are satisfactory because nutrients are protected from leaching. Non-bearing trees fertilized after September may be slightly less cold-hardy. However, citrus tree growth is triggered by favorable temperatures and soil moisture, not by fertilization. Omitting fertilizer in the fall will not prevent growth. Nutrient uptake is reduced at lower soil temperatures, particularly for trees on Swingle citrumelo rootstock. Trees on Swingle can become quite chlorotic during the winter months even with fall fertilization.

Irrigation management of young trees is critical because water stress can occur rapidly as the soil surrounding the limited root system dries, and because young tree growth is particularly sensitive to water stress. Instances where young tree growth improved after a grove was converted to fertigation may have been due more to improved soil water regime than nutrient delivery method. Excessive irrigation is often a problem when managing young trees. Small microsprinkler wetted patterns used to irrigate young trees apply water at high rates. Short irrigation durations of 30 minutes or less may be required to avoid nutrient loss below the root zone. Irrigation line flushing times after fertigation must also be minimized to avoid nutrient leaching.

Resets in established groves

Resets in established groves should be fertilized like solid-set non-bearing trees. Resets may not grow well if they only receive fertilizer during mature tree application because only a small amount of material may be deposited in the young tree root zone. Resets will most likely not require P fertilizer, but this can be checked with a soil test.

Controlled release materials can be applied 1 to 2 times per year without compromising tree growth in reset situations. In closely spaced groves, reset growth may be restricted due to competition from the adjacent older trees.

MICROSPRINKLER IRRIGATION & FERTIGATION

Microsprinkler irrigation is an important component of citrus production systems in Florida. Microirrigation is more desirable than other irrigation methods for several reasons. Three important advantages are: water conservation, the potential for significantly improving fertilizer management and for cold protection.

Research has shown that when properly managed (no overirrigation), water savings with microirrigation systems can amount to as much as 80% compared with subirrigation and 50% compared with overhead sprinkler irrigation.

Microirrigation provides for precise timing and application of fertilizer nutrients in citrus production. Fertilizer can be prescription-applied during the season in amounts that the tree needs and at particular times when those nutrients are needed. This capability helps growers increase the efficiency of fertilizer application and should result in reduced fertilizer applications for citrus production. Research has also shown the important advantage of microsprinklers for freeze protection of citrus.

Fertigation is the timely application of small amounts of fertilizer through irrigation systems directly to the root zone.

Some advantages of fertigation:

♦ Fertilizer is placed in the wetted area where feeder roots are extensive,

♦ Fertilizer may be applied more frequently in small amounts so that it is available when the tree needs it,

♦ Increased fertilizer application frequency can increase fertilizer efficiency and reduce leaching,

♦ Application cost is much lower than that of dry or foliar fertilizer application.

Through fertigation, comparable or better yields and quality can be produced with less fertilizer. Microirrigation systems must properly maintain to apply water and fertilizer uniformly. Growers must determine:

(1) which fertilizer formulations are most suitable for injection,

(2) the most appropriate fertilizer analysis for different age trees and specific stages of growth,

(3) the amount to apply during a given fertigation event, and

(4) the timing and frequency of applications.

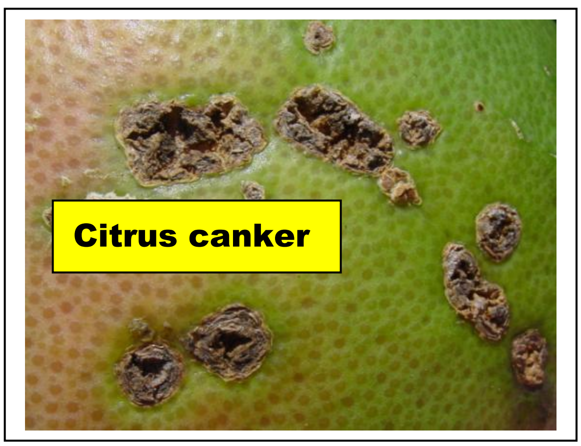
Properly managed applications of plant nutrients through irrigation systems significantly enhance fertilizer efficiency while maintaining or increasing yield. On the other hand, poorly managed fertigation may result in substantial yield losses. Fertigation involves deciding which and how much nutrients to apply, selecting the most effective formulations and scheduling injections to ensure that essential nutrients are available as needed.

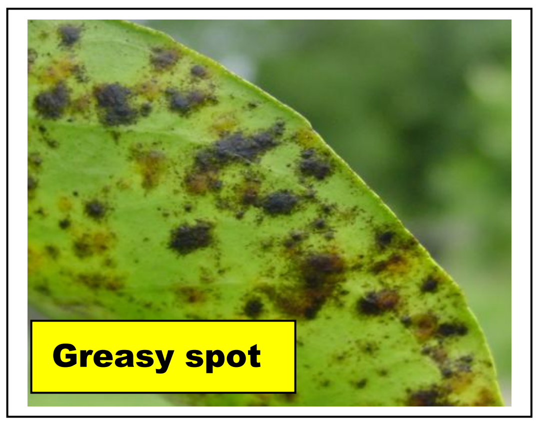
Injection Duration

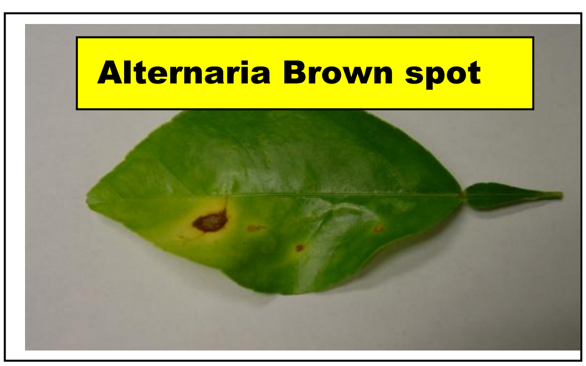
A minimum injection time of 45 to 60 minutes is recommended. This time is sufficient for uniform distribution of nutrients throughout the fertigation zone. Limit injection time to prevent the application of too much water, because excessive water leaches plant nutrients below the root zone.

Fungicide effectiveness (By Dr. Pete Timmer)

	Canker	Greasy Spot	Alternaria	Scab	Melanose
Copper	Good	Excellent	Good	Moderate	Excellent
Oil	None	Good	None	None	None
Ferbam	None	Weak	Moderate	Good	Weak
Headline	None	Good	Very good	Excellent	Good
Abound	None	Good	Very good	Excellent	Good
Gem	None	Good	Good	Excellent	Good
Enable	None	Excellent	Poor	Good	Weak







Flatwoods Citrus

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Racial-Ethnic Background

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

Gender

__Female

__Male