UNIVERSITY OF FLORIDA | EXTENSION
Institute of Food and Agricultural Sciences

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Flatwoods Citrus

Vol. 7, No. 2 **February 2004**

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

UPCOMING EVENTS

Immokalee IFAS Center

Tuesday, February 24, 2004, 10:00 AM – 12:00 Noon
Irrigation management – Dr. Larry Parsons
Irrigation scheduling using weather and soil moisture probes – Chet Townsend
Water quality variables and importance of testing irrigation water – Dr. Sanjay Shukla
Plugging problems of microirrigation systems and solutions – Dr. Tom Obreza
1 CEU for Pesticide License Renewal, 2 CEUs for Certified Crop Advisors
Sponsor: Chet Townsend, Agrilink Florida, Inc.
To reserve a free lunch, call 863 674 4092 no later than Friday, 20 Feb 2004.

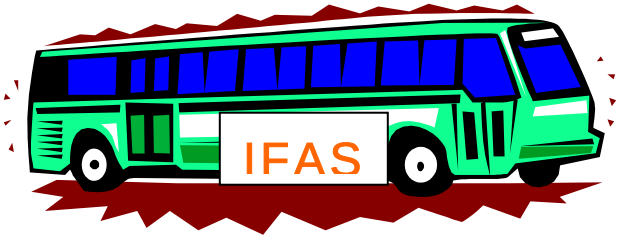
Tuesday, March 16, 2004, 10:00 AM – 12:00 Noon
Update on citrus rootstocks and new citrus cultivars – Drs. Fred Gmitter and Kim Bowman
Climate effects on fruit quality and production, and recommendations that may improve fruit production and quality – Dr. Gene Albrigo
2 CEUs for Certified Crop Advisors
Sponsor: Bobby Holland & Alex Fiore, Diamond R Fertilizer Company

If you want to print a color copy of the Flatwoods Citrus Newsletter, get to the Florida Citrus Resources Site at http://flcitrus.ifas.ufl.edu/ You can also find all you need and all links to the University of Florida Citrus Extension and the Florida Citrus Industry

Mechanical Harvesting Workshop and Field Days

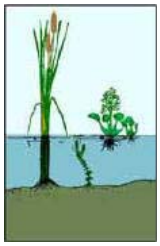
►***February 4, 2004***, Workshop at the Highlands County Extension Office, Sebring
►***February 5, 2004***, Field day in the Immokalee Area
►***February 11, 2004***, Field day in South Polk County Area
To register, call Steve Futch at 863 956 1151.

COLLIER COUNTY EXTENSION AG TOURS



Wednesday 17 March and Friday 19 March 2004
For more information, call the Collier County Extension Office at 239 353 4244

Aquatic Weed Control Short Course



www.conference.ifas.ufl.edu/aw
Date & Location: May-3-7, 2004, Fort Lauderdale Marriott North.
To qualify for the reduced, early registration fee, payment must accompany your registration on or before March 19, 2004.

CITRUS CANKER

From the Florida Department of Agriculture and Consumer Services (FDACS)
FDACS has already revised the Citrus Canker Eradication Program Compliance Agreements for 2004.
For additional information, please visit their web site at www.doacs.state.fl.us/canker/index.htm or contact their help line at 1 800 282 5153.

Special Thanks **to the following 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.**

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FERTILIZER MANAGEMENT

Fertilizer management should include calibration and adjustment of fertilizer spreaders, booms, pumps, or irrigation systems to accurately deliver fertilizer rates and place fertilizers within the tree rootzone. To improve fertilizer efficiency, soil and leaf analysis data should be studied, evaluated, and taken into consideration when generating a fertilizer program and selecting a fertilizer formulation. Fertilizer application should be split into 3 to 4 applications per year with a complete balanced fertilizer. For mature trees, the highest nutrient requirement extends from late winter through early summer. This coincides with flowering, heavy spring flush, fruit set, and fruit development and expansion. For best fresh fruit quality, nutritional requirements, particularly nitrogen (N), should decrease late in the summer and fall. Based on tree demands, 2/3 to 3/4 of the yearly fertilizer amount should be applied between February and June. In warm areas such as southwest Florida where tree growth can continue certain years during the winter, fertilizer applications should also be made in the fall to satisfy vegetative growth demand. However, fall fertilizer applications may sometimes delay fruit color development.

IFAS fertilizer guidelines for nonbearing citrus trees

Year in grove	Lb N/tree/year (range)	Lbs Fertilizer/tree/year (range)		Lower limit of application frequency	
		6-6-6	8-8-8	Dry	Fertigation
1	0.15 – 0.30	2.5-5.0	1.9-3.8	6	10
2	0.30 – 0.60	5.0-10.0	3.8-7.5	5	10
3	0.45 – 0.90	7.5-15.0	5.6-11.3	4	10

IFAS fertilizer guidelines for bearing citrus trees (4 years and older)

Oranges	Grapefruit	Other varieties	Lower limit of application frequency	
Lbs N/acre/year (range)			Dry	Fertigation
120 - 200	120 - 160	120 - 200	3	10

Rates up to 240 lbs/acre may be considered for orange groves producing over 700 boxes/acre and up to 180 lbs/acre for grapefruit groves producing over 800 boxes/acre.

Young trees planted on previously uncropped soils should receive fertilizer containing the following ratio of elements: nitrogen-1, phosphorus-1, potassium-1, magnesium-1/5, manganese-1/20, copper-1/40, and boron-1/300.

NUTRITION OF CITRUS TREES

Nitrogen (N): Nitrogen is of special importance because plants need it in rather large amounts, it is fairly expensive to supply and it is easily lost from soil. A major factor in successful farming is the grower's ability to manage N efficiently. An abundant supply of the essential N compounds is required in each plant cell for a good rate of cell division and growth. Nitrogen occurs chiefly in the young, tender parts of plant tissues, such as tips of shoots, buds, and new leaves. The N, present mostly as protein, is constantly moving and undergoing chemical changes. As new cells form, much of the protein moves from the older cells to the newer ones, especially when the total N supply of the plant is low.

The proper functioning of N in plant nutrition requires that the other essential elements, particularly phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg), be present in adequate supply. If the supply of one or more of them is inadequate, the addition of much N to most common crops may not produce optimum growth. Such plants often are susceptible to diseases, mature late, and produce poor quality fruit. But if the nutrient balance and total supply are adequate, significant growth and dark green foliage will be exhibited. More N than any other element is used by citrus trees in leaf, flower, and fruit production although Ca and K are used in amounts almost as large.

Nitrogen is the key element in citrus fertilization and has more influence on tree growth and appearance, and fruit production and quality than any other nutrient element. Nitrogen affects the absorption and distribution of practically all other elements and appears to be of particular importance to the tree at bloom time. During this period, migration of N from leaves to flowers takes place. Trees grown with limited supplies of N may appear nearly normal but are undersized. Such trees are largely unfruitful or highly erratic in bearing habit. They bloom sparsely, flush irregularly, and produce very limited twig and leaf growth. Severe N starvation causes a general yellowing of the foliage. This is particularly true of well-nourished trees that subsequently have had their N supply reduced sharply. Trees that are constantly short of N are stunted with irregular and very short growth and have a thin canopy, twig dieback and low crop. The color of the fruit peel tends to be pale and smooth, and the juice has lower soluble solids and acid contents.

While the main cause of N deficiency is simply a lack of N in the soil, there may be other causes such as heavy summer rainfall and porous soil. There might be improper nitrification due to waterlogging that can result in a temporary deficiency of N that will be relieved by dry weather. Weak and old trees deficient in N can be improved by supplying two times the recommended rate at more frequent applications. The use of low biuret urea as a foliar spray is a very efficient and rapid way to supply and correct N deficiency.

Ammonium forms of N may produce better internal fruit quality than nitrate forms of N. Ammonium forms also reduce the soil pH but increase the demand for oxygen to the roots. For bearing citrus trees, there should be adequate N in the trees just before flower initiation and at the time of flowering and fruit set. There should be also enough N for fruit development. Nitrogen application made in the summer before the end of the rainy season is undesirable because it can reduce fruit quality. For

young trees, adequate N should be supplied throughout the year to promote continuous rapid vegetative growth.

Phosphorus (P): Phosphorus is present in all living tissue. It is particularly concentrated in the younger parts of the plant, in the flowers, and in the seeds. Phosphorus is necessary for many life processes. It helps plants store and use energy from photosynthesis to develop roots. Phosphorus is also important for cell division.

Growth is reduced when the supply of P is too low. Phosphorus moves from the older tissues to the younger tissues. Therefore, deficiency symptoms appear first on older leaves, which lose their deep green color. Leaves are small and narrow with purplish or bronze, lusterless discoloration. Trees will exhibit limited flower development with reduced fruit set and fruit yield. The fruit will be coarse and rough in texture with a coarse, thick rind and a hollow core. The fruit will also have a high acidity in proportion to total soluble solids. Thus, fruit maturity will be delayed. Usually, the roots are stunted and poorly branched.

The cause of P deficiency is either a lack of P in the soil or a lack of available P. Phosphorus deficiency may occur in areas of high rainfall due to leaching and erosion. Under very acid soil conditions, P can become quickly unavailable. Phosphorus availability is also reduced in calcareous soils. Phosphorus deficiency can be corrected by applying superphosphate or any readily available source of P after confirmation of P deficiency by leaf and soil analysis.

Potassium (K): Citrus fruit remove large amounts of K as compared with other nutrients. During the time that fruit and seeds develop, K moves to them from the leaves. Potassium is necessary for several basic physiological functions such as the formation of sugars and starch, and normal cell division and growth. Potassium enhances fruit size, flavor, and color. It helps reduce influences of adverse weather conditions such as drought, cold, and flooding stresses.

Potassium is associated with almost every major plant function. Potassium helps regulate the carbon dioxide supply by control of the stomata opening. It improves the efficiency of plant use of sugars for maintenance and normal growth functions. Potassium works with P to stimulate and maintain rapid root growth.

The rate of photosynthesis drops sharply when trees are K deficient. Too much N with too little K can result in a back-up of the protein building blocks, set the stage for disease problems, reduce production of carbohydrates, reduce fruiting and increase fruit creasing, plugging and drop. Shortage of K can result in lost crop yield and quality. Moderately low levels of K will cause a general reduction in growth without visual deficiency symptoms. The onset of visual deficiency symptoms means that production has already been seriously impaired.

In Florida, low K fertilization will cause a slowing down in growth, small leaves, fine branches, compact tree appearance, an increase in susceptibility to drought and cold, reduction in fruit size, very thin peel of smooth texture, premature shedding of fruit, and lower acid levels in the fruit.

Potassium deficiency symptoms generally result from an insufficient supply of K in the soil. Potassium deficiency may occur on acid sandy soils where leaching may be considerable. Soils that have very high contents of Ca and Mg or heavy application of N may depress the immediate supply of K to plants. This is typical on some calcareous soils. Lack of soil moisture also reduces K uptake and may lead to K deficiency. If the supply of N and P is high relative to that of K, growth may be rapid at first, but the K concentration in the plant may become reduced to a deficiency level.

Addition of K would be necessary to maintain the nutrient balance required for uniform and continued growth. In situations of high available K level and low N or P supply, luxury consumption of K is to be expected.

Under most soil conditions, K deficiency can be corrected by applying sulfate or muriate of potash to the soil. However, under fine textured soils, saline conditions or soils containing high Ca and Mg in the exchange complex, K applications to the soil are sometimes ineffective or slow to correct K deficiency. Foliar application of potassium nitrate or monopotassium phosphate can be very effective and rapid for correcting K deficiency.

Calcium (Ca): Calcium occurs mainly in leaves. Calcium is an important element for root development and functioning. Calcium is a constituent of the cell walls and is required for cell division. Calcium deficiency in citrus is very rare under field conditions. Plant growth and fruit yield can be reduced by inadequate Ca supply long before deficiency symptoms become evident.

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 visicles. Fruit from Ca-deficient trees are slightly lower in juice content but higher in soluble solids and acids.

Calcium deficiency usually occurs under acidic soil conditions due to leaching of Ca. Continued use of ammonium fertilizer and particularly ammonium sulfate accelerates Ca loss from soils. Use of muriate of potash and sulfur cause similar losses of Ca from the soil. Liming the soil not only neutralizes soil acidity but also supplies available Ca. Calcium deficiency can also occur under high salinity conditions due to sodium (Na). Under such situation, gypsum can correct the deficiency and reduce the deleterious effect of Na. Calcium deficiency can also be corrected by foliar spray of calcium hydroxide or calcium nitrate.

Magnesium (Mg): Magnesium is a part of the chlorophyll molecule. It is involved in photosynthesis and carbohydrate metabolism and synthesis of nucleic acids. Magnesium is related to the movement of carbohydrates from the leaves to other parts of the trees and also stimulates P uptake and transport.

Magnesium deficiency has been a major problem on practically all citrus soils. In Florida, magnesium deficiency is commonly referred to as “bronzing”.

Trees with inadequate Mg supply may have no symptoms in the new spring flush, but leaf symptoms will develop as the leaves age and the fruit expand and mature in the summer and fall.

Magnesium deficiency symptoms occur on mature leaves following the removal of Mg to satisfy fruit requirements. During the summer, when a rapid increase in fruit size occurs, the symptoms appear on leaves close to the developing fruit. It has been shown that Mg deficiency symptoms appear as a result of translocation of Mg from the leaves to the developing fruit, although there may also be a translocation from older leaves to young developing leaves on the same shoot.

Alternate bearing is common in seedy cultivars growing under Mg-deficient conditions. The loss of wood as a result of defoliation reduces the fruit-bearing wood for the following year. Magnesium deficiency can result in a great reduction not only in fruit yield but also in fruit quality. It has been shown that fruit from Mg-deficiency trees is low in soluble solids and acids. Magnesium deficiency like other deficiencies makes trees more susceptible to cold injury than normal trees.

In Florida, Mg deficiency is caused primarily by low levels of Mg in the soil. It is particularly severe on acid light sandy soil from which Mg readily leaches. Leaching of added Mg is particularly serious and substantially rapid when the soil pH is 4.5 to 5.0. Under such conditions, the use of dolomite to bring the pH above 6.0 will furnish Mg at the same time. Soil application of Mg sulfate or oxide can be successful in correcting Mg deficiency when the soil pH is adjusted. Salinity, high potash chemical fertilizers, and manures have been shown to induce or aggravate Mg deficiency. Magnesium deficiency can also be attributed to calcareous soils relatively low in Mg or to unbalanced conditions in the soil due to excessive K or Ca.

In Florida, one foliar spray application of Mg is not always effective in correcting the deficiency when the amount of Mg needed is greater than that absorbed by the leaves. Foliar spray of Mg nitrate can be very effective when applied on the spring flush leaves when they are two-third to fully expanded but not hardened off. Leaves that have already developed the deficiency pattern will not completely recover when Mg is applied but deficiency symptoms can be prevented the following season.

Boron (B)

Boron is particularly necessary where active cell division is taking place. Boron plays an important role in flowering, pollen-tube growth, fruiting processes, nitrogen (N) metabolism, and hormone activity. Florida sandy soils are low in B, and a deficiency of this element in citrus occasionally occurs under field conditions. The deficiency may be aggravated by severe drought conditions, cool weather, heavy lime applications, or irrigation with alkaline water. Boron is very mobile in the soil profile of sandy soils and readily leaches by rainfall or excess irrigation.

The chief fruit symptoms of Boron deficiency include premature shedding of young fruits. Such fruit have brownish discoloration in the white portion of the rind (albedo), described as gum pockets or impregnations of the tissue with gum and unusually thick albedo. Older fruit are undersized, lumpy, mis-shapen with an unusually thick albedo containing gum deposits. Seed fails to develop and gum deposits are common around the axis of the fruit. The first visual symptoms of B deficiency are generally the death of the terminal growing point of the main stem. Associated with this is a premature shedding of leaves starting in the tops of the trees and soon leaving the tops almost completely defoliated. Fruit symptoms appear to be the most constant and reliable tool for diagnostic purposes.

Boron compounds can be applied either foliarly or in the fertilizer. As a maintenance program, apply B in the fertilizer at an annual rate equivalent to 1/300 of the N rate. In Florida, foliar spray applications have been found much safer and more efficient than soil application. Soil applications frequently fail to give satisfactory results during dry falls and springs and may result in toxicity problems if made during the summer rainy season. Boron solubility in the soil is reduced at soil pHs below 5 and above 7. Foliar spray may be applied during the dormant period through post bloom, but preferably during early flower development. Treating at this growth stage is important because boron does not move very readily from other parts of the tree to the buds. Applying boron at this time will assist in flower initiation and pollen production, satisfy the needs for pollen tube growth, and enhance fruit set. For maintenance spray application, 0.25 lb/acre of B (1.25 lbs of soluble borate containing 20% B) may be used. Boron levels in the leaf tissue should not drop below 40 ppm or exceed 120 ppm (dry wt basis). Where deficiency symptoms are present, double the amount suggested. Use care not to apply more than the recommended amount because it is easy to go from deficiency to excess.

Nutritional balance: Nutrient supply is closely and directly correlated with yield increases and total production. Both correct amounts and correct ratio of applied nutrients are critical to nutrient management and sustainability. Imbalance allows mining of the most deficient nutrients in the soil. If an element is below the critical level, yield production will fall even though the other elements are kept in good supply.

Nutrient balance is often confined to N, P, and K because of their need in relatively large amounts by crops. Indeed, they are most often the limiting factors in crop production. However, nutrient balance goes beyond N, P, and K and will not be achieved without adequate supply of the other nutrients. A balance of adequate levels of nutrients is a key component to profitability. Plant nutrients interact positively when properly balanced. For example, in the case of N fertilization, a shortage of another nutrient could have unused N in the soil, reduce N use efficiency and returns on investment, and increase the potential for nitrate leaching.

Balanced nutrition should be a high priority management objective for every grower. Plants require a balanced nutrition program formulated to provide specific needs for maintenance and for expected production performance. Properly nourished trees grow stronger, produce more consistently, have better disease resistance, and are more tolerant to stresses.

FLOWER BUD INDUCTION ADVISORY #12- 01/26/04

http://www.lal.ufl.edu/CRECHOME/Flowerbudinduction.htm

Gene Albrigo, Citrus Research & Education Center (CREC), Lake Alfred

We now have over 1250-1450 accumulated hours below 68 degrees F. from southern-coastal to northern districts, respectively. According to the NOAA 8 day forecast, the weather this week will provide 100 more hours of inductive temperatures with daytime highs of 80 to 73 today and tomorrow followed by 2 to 3 cool days and then back in the mid-70s for the rest of the week. This should put all areas above 1300 hours as the last potential wave of flower buds is initiated to differentiate, if any potential flower buds still remain uninitiated. The flowering model indicates that trees in all areas have started differentiation of flower buds for two waves of flowers this coming Spring. For the Immokalee area, three initiation dates are indicated with bloom dates of March 2, 13 and 22 for the three waves. In other areas from coastal southern to northern, bloom dates for the first wave of flowers are now predicted to be March 5 to 1. The second initiation wave of flower bud differentiation has projected bloom dates of March 18th to 12thfrom south to north.

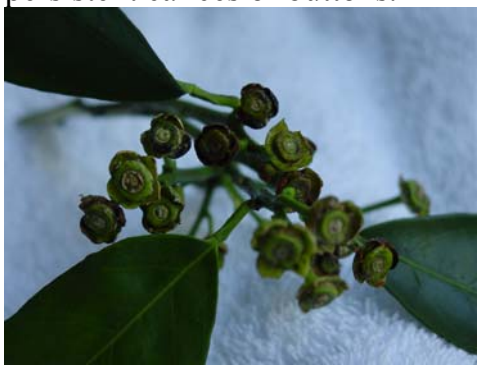
Since induction hours are now in excess of 1250 hours and warm temperatures are happening and expected to continue most of this week, we can expect that all potential flower buds are probably going to initiate growth this week. If all 3 waves occur, then we will have a prolonged bloom period through most of March. If you successfully created water stress from late December to mid-January, then you should get a peak bloom date of 22 to 25 March according to the model. We can expect a fair bloom on trees that produced a reasonable amount of new Spring and Summer flush last year. We will assess the impact of the heavy current crop on flowering and fruit set in a later advisory.

If no urea or PO3 spray was applied earlier, it is very doubtful that any benefit will come from its application now that accumulated low temperature induction levels are so high. It would be better to save any left over material for a bloom or postbloom spray. We will test this timing to see if it is correct that little benefit will come from an application this late in the flower bud induction-initiation of differentiation process.

Navel trees will have excessive flowers induced and at least 2 waves of flowers in the Spring if low soil moisture levels were not obtained during earlier warm periods. These flowers will be weak and face excessive competition from one another, plus an increased potential for post-bloom fruit drop due to multiple blooms, if Spring rains occur. If you have not done so yet, one way to minimize this effect is to apply a gibberellin (GA) spray this week while temperatures are warm enough to get good uptake (low to mid 70s or higher so avoid Tuesday or Wednesday this week) (EDIS - Enhancing Cropping of Low-Yielding, Heavily Flowering Citrus by Reducing Floral Initiation, Ed Stover and Gene Albrigo; EDIS publ. # HP 799). A spray of 20 oz. GA per acre in 125 to 150 gal/acre can be applied for decreasing flowering of navels, other seedless cultivars and poorly setting Rhode Red strains. This should block any new induction that has occurred since the last warm period earlier in January and perhaps still diminish the number of flowers in the second wave of flower induction now projected to reach full bloom in mid-March.

PFD

Postbloom fruit drop (PFD) fungal disease can attack all citrus varieties. It is more of a problem on Navels and Valencias. The fungus attacks flowers and causes the fruitlets to drop leaving persistent calices or buttons.



Millions of spores per button can survive to the next season. Most spores are produced directly on the surface of infected petals. The spores are splash-dispersed by rains to healthy flowers where they can cause infections in 24 hours. Extended bloom periods, frequent rains, and warm weather are favorable conditions for disease development. Once the bloom begins, groves with a history of PFD or with buttons from previous years should be inspected twice weekly. Apply Benlate at 2 lbs/acre or Benlate at 1.5 lbs/acre plus 5 lbs of Ferbam to reduce the risk of resistance to Benlate. Ferbam is not effective to be used alone, but can be combined with Abound, or Gem to maximize protection and reduce the risk of resistance development. Neither Abound nor Gem should be used alone more than once per season. A model has been developed and is being improved to assist growers and production managers to determine the need and timing of fungicide applications. **For more information, call the toll-free hotline sponsored by Syngenta Crop Protection (1-866-365-3017) for the latest reports on the disease.** Dr. L.W. "Pete" Timmer, Extension Plant Pathologist at the University of Florida/IFAS Citrus Research and Education Center, will provide current information on recent outbreaks, the status of the bloom and other relevant news. Information on PFD and other foliar fungal diseases is available on Timmer's citrus pathology website (http://www.crec.ifas.ufl.edu/timmer/), including the PFD-Fungicide Application Decision System (PFD-FAD) and the Alter-Rater model for scheduling fungicide applications for Alternaria brown spot.
Remember that it is advisable to remove weak and declining trees and put resets to maintain good yield per acre. Furthermore, the off-season bloom from declining trees within a block can provide a site for fungal spore buildup and can be a major contributor to PFD.

This coming season, EPA most likely will grant Florida section 18 for Topsin (Cerexagri, Inc.) fungicide on citrus. Citrus growers must have the EPA exemption letter or Cerexagri's Sec. 18 Use Directions in their possession at the time of application.