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Flatwoods Citrus

Vol. 14, No. 3 **March 2011**

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Multi-County Citrus Agent, SW Florida

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

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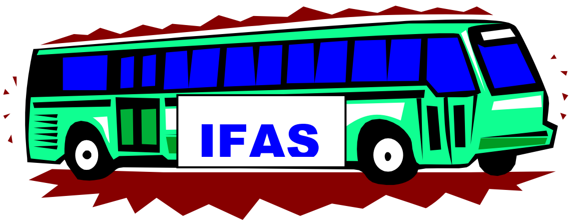
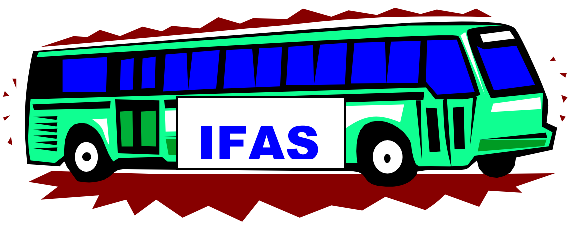
IMPORTANT EVENTS

COLLIER COUNTY EXTENSION AG TOUR



Wednesday, 16 March 2011
For more information or to sign up, call
Robert Halman at 239-353-4244

THIRD HENDRY COUNTY EXTENSION AG TOUR IN 2011



Friday, 18 March 2011
For more information or to sign up, call
Debra at 863-674-4092

MARCH 2011 SQUEEZER SEMINAR

Date: Wednesday, 23 March 2011, Time: 10:00 AM – 12:00 Noon
Topics: Foliar nutrition to improve tree health, Advanced Production System and Open Hydroponics System for new citrus plantings
Speakers: Drs. Bob Rouse, Arnold Schumann, and Kelly Morgan
RSVP is required for planning purposes. Please call 863 674 4092 or send an e-mail to maz@ufl.edu

ANNUAL FLORIDA CITRUS GROWERS' INSTITUTE

Date & Time: Wednesday, 6 April 2011, 8:00 AM – 3:30 PM
Location: Avon Park Campus of South Florida Community College
Pre-registration or RSVP is required.
Please contact Jane Wilson at 863 956 1151 or mjw@crec.ifas.ufl.edu

ANNUAL CITRUS MECHANICAL HARVESTING & ABSCISSION FIELD DAY AND WORKSHOP

"Getting Ready for Mechanical Harvesting With Abscission"
Wednesday, April 20, 2011, 7:30 AM – 2:00 PM, Immokalee IFAS Center
A sponsored lunch will be provided. Pre-registration or RSVP is required.
Please contact Barbara Hyman at (239) 658-3461 or hymanb@ufl.edu

See enclosed details.

Special Thanks to sponsors of the "Flatwoods Citrus" newsletter for their generous contribution and support. If you would like to be among them, please contact me at 863 674 4092 or maz@ufl.edu

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Summarized from
http://edis.ifas.ufl.edu/pdffiles/AA/AA09200.pdf

Pollination of Citrus by Honey Bees

By ***Malcolm T. Sanford, UF-IFAS***

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.

Summarized from

http://edis.ifas.ufl.edu/pdffiles/AA/AA14500.pdf **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.

Tree Health Study Update

Jim Syvertsen, plant physiologist at CREC and the Tree Health project leader, conducted trials during three consecutive seasons (2007-2009) to determine if winter drought stress could delay flowering and fruit development of immature 'Valencia' sweet orange. Their objective was to determine if the bloom period could be delayed by a few weeks without negative effects on the quality of the current season's crop. The trials were conducted during the months of December–March and after resuming normal well-irrigated conditions in the spring, there was shown to be little or no measurable physiological effects and no differences in current fruit yield, fruit size and percentage of juice or juice quality. Check out this and the other Tree Health studies under "Tree Health".

Abscission

Many factors affect performance of mechanical harvesting technologies; however, fruit removal efficiency with these machines can be improved with abscission materials. In 1998, a team of researchers from the Citrus Research and Education Center, University of Florida, was asked to initiate a comprehensive program to determine if a suitable abscission material could be found for the Florida citrus industry. The abscission program has both applied and basic components. We have put the highest priority on using information gained to identify abscission materials for the Florida citrus industry, and once found, identify the most efficient application method(s).

Processing Issues

With an increased interest in citrus mechanical harvesting, citrus processors are becoming concerned about issues that could have a direct impact on their operations. Food Safety related to fruit picked off the ground, Trailer Debris, and daily trailer allocations are issues of concern to processors, and without adequate resolution possibly could become impediments to the adoption of mechanical harvesting.

Food safety addresses the effects of mechanical harvesting on fruit microflora. An investigation of whether mechanically harvesting with a ground fruit machine increases bacteria on the peel and in the juice. Further examination is being done at the increased amount of sand present in mechanically harvested fruit picked up off the ground.

A trailer debris study addresses the amount of trash (stems, branches, twigs and leaves) being deposited into a trailer of mechanically harvested fruit. At the very least, unwanted debris increases waste handling costs. At the worst, debris could damage processing machinery.

Grove Design

Generally, citrus groves in Florida were not designed and planted with mechanical harvesting in mind. Therefore, in order to gain the efficiencies provided by mechanical harvesting, changes to tree shape and grove architecture must occur. We have two paths to follow:

1. begin planting new groves designed for mechanical harvesting, and
2. retrofit existing groves that are suitable for mechanical harvesting.

SAVE MONEY BY ADAPTING MECHANICAL HARVESTING

Change has kept the Florida citrus industry competitive during the last century. It is a general consensus among industry leaders that efficiencies in harvesting offer the greatest potential to reduce costs and keep our juice industry economically viable.

Generally, citrus groves in Florida were not designed and planted with mechanical harvesting in mind. Therefore, in order to gain the efficiencies necessary, changes to tree shape and grove architecture must occur. There are two paths to follow: 1) begin planting new groves designed for mechanical harvesting, and 2) retrofit existing groves that are suitable for mechanical harvesting.

How Do We Start Preparing Groves for Mechanical Harvesting?

The first change is to begin planting all new trees, both new and resets in groves suitable for conversion to mechanical harvesting, with high-headed trees. High-headed trees have longer than normal (16-inch) trunks, with the scaffold branching beginning at about 30 inches. These high-headed trees are suited to accommodate mechanical harvesting by having higher tree skirts as well as providing greater trunk length to allow for trunk shaker attachment as well as having additional horticultural and practical advantages in the grove. Regardless of the harvesting machine utilized, a catch frame must fit under the tree to capture fruit for maximum cost efficiency. The second objective is to reshape existing trees to accommodate existing mechanical harvesting equipment. The important point to consider is that not all groves may be good candidates for mechanical harvesting and the first criteria should be to determine where mechanical harvesting may be utilized to obtain maximum harvesting efficiency. Groves determined not to be candidates for mechanical harvesting will have to be hand harvested until a decision is made to remove the grove and replant with an architecture that maximizes mechanical harvesting efficiency.

New plantings should be designed along the following criteria:

●High-headed trees should be planted with scaffold branching starting at 30 inches and skirting maintained at the drip line at 36 inches.

●In-row spacing should be 10 to 15 feet and 22 to 24 feet between rows.
Hedging down the row needs to maintain 8-foot width for passage of equipment.

●Tree heights limited to 16 feet with either flat or roof-top.

●Irrigation emitters need to be equal distance between trees in the row.

●Efficiency of machine is enhanced with longer rows.

●Turn space is need at end of row to accommodate large machines.

●In bedded groves, furrows must not be steep and must be suitable to accommodate heavy equipment.

What are the Horticultural Advantages of High-Headed Trees?

In addition to preparing for the future of mechanical harvesting and improving the recovery of fruit, there are many horticultural advantages to high-headed trees:

●Reduced herbicide damage to the tree without contact to low hanging foliage;
●Less exposure to brown rot and greasy spot with improved air drainage under the canopy;
●Reduce severity and frequency for mechanical skirting;
●More uniform wetting pattern of irrigation emitters with fewer obstacles from low hanging limbs;
●Irrigation emitters are visible for checking proper operation and maintenance;
●Fruit production will start sooner after planting because an older tree is planted.

This is not to suggest that high-headed trees won't require some change in attitude and adjustment in cultural practices. The following issues need to be addressed:

●Need a rigid nursery tree to withstand wind, mechanical, and pest pressure;
●Taller tree wraps will be needed and longer stakes if staking is necessary to support the tree at planting time;
●Taller wraps will house insects that attract predators that can pull over and break the tree;
●Initial tree cost may be $0.50 to $1.00 more but production starts sooner.

What About Converting My Existing Grove to Mechanical Harvesting?

Not all groves are suitable for conversion to mechanical harvesting. It must be determined whether existing tree and grove structure (straight trunk and size, high scaffolds, tree health, age, grove layout, missing trees, grove size, etc.) would be cost effective to change. Additional costs will be incurred if irrigation emitters need to be relocated. If the trees can be skirted, hedged and topped, and meet the criteria of a grove design discussed above, it may be a good candidate. Skirting has been shown in several studies to only reduce yield a minimal amount the year skirting is done. Where mechanical harvesting has been used the past 10 years, no negative long-term effects have been observed. Limb breakage the first year is usually interior dead wood and live wood is no more than usually experienced with harvesting ladders. Any root damage is quickly recovered with no affects on yield.

This information is from the following EDIS publication:
Start Now to Design Citrus Groves for Mechanical Harvesting
Bob Rouse and Steve Futch
http://edis.ifas.ufl.edu/HS219

For more information on citrus mechanical harvesting check the Citrus mechanical harvesting website at: http://citrusmh.ifas.ufl.edu/

FLOWER BUD INDUCTION ADVISORY # 7 for 2010-2011 - 02/15/2011

Gene Albrigo, Horticulturist Emeritus, Lake Alfred CREC

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

This is a fortnightly service to our citrus growers posted on the CREC website. The internet Expert System on intensity and time of bloom is not functioning due to loss of the server on which it was housed. If it becomes accessible it should be available at: http://orb.at.ufl.edu/DISC/bloom

Current Status: According to the Flowering Monitor Model there has been no change in the predicted bloom dates. An earlier warm period was off-set by a cooler than normal period according to the model. The inductive cool hours were 800 to 940 in southern areas and 1000 to 1250 in central and northern areas of Florida's citrus industry for the first wave of growth. The second wave of flower buds had growth initiated after 1030 to 1220 hours below 68 o F. The full bloom dates projected were about February 18 to 27 in locations from Sebring south including the flatwoods. Central and northern areas had full bloom projected for March 3 to 7. The second wave was projected to bloom about March 1st to 9th, 2 or 3 days earlier than the model projected in January.

Observations in the field indicate that the projected bloom dates are too early as the most advanced buds still have a few tight white flowers, but most are still pin-head or smaller. The Ft. Pierce and Immokalee projections were for full bloom in 2 to 3 days, which can't happen at the present stage of bloom. The weather service is projecting a warmer 7 days, which should accelerate flower development. Full bloom in some areas could be late February or early March, but not this week.

Flower buds are now inflorescences with many new stems of 2 to 3 cm length. In trees observed locally, pin-head flowers, usually with leaves, were observed at 4 to 6 nodes. Some of the inflorescences had as many as 5 flowers and leaves. Developing leaves associated with the flowers indicates a better chance for set. In judging how good a bloom will occur on your trees, remember that in most years at least 80 % of the flowers occur in the first 4 buds of Hamlin or Valencia orange trees. If you find on average that 6 or more leaf axial buds are flowering, then you can expect a better than average flowering intensity.

If you have any questions, please contact Dr. Gene Albrigo (albrigo@ufl.edu)

IRRIGATION

Irrigation is of particular importance during the dry period (February-May), which coincides with the critical stages of leaf expansion, bloom, fruit set, and fruit enlargement. Proper irrigation scheduling is defined as the application of water when needed and in the amounts needed. Citrus production managers should accurately determine when and for how long to irrigate. With proper irrigation scheduling, tree growth and fruit yield will not be limited by water stress or water excess. Over-watering will waste water and pumping energy, will leach nutrients and other chemicals below the rootzone, and will contribute to contamination of the groundwater.

Because of the high water table in southwest Florida, citrus trees have over 90% of their feeder roots within the top foot of soil. For this situation, irrigating for long duration can lead to loss of water below the rootzone. Therefore, it is recommended to increase the frequency and reduce the length or duration of irrigation. Irrigating every other day is better than irrigating once or twice a week.

Good water management practices should include precise irrigation scheduling and well-designed, uniform irrigation systems to minimize waste. Non-uniform irrigation will cause excess water to be applied in some areas while other areas will not get enough. Production managers should not only be aware of the losses resulting from irrigation systems that apply water and chemicals non-uniformly, but should adopt the recommended ways to minimize these losses.

BASIC IRRIGATION SCHEDULING

Proper irrigation scheduling is the application of water to crops only when needed and only in the amounts needed; that is, determining when to irrigate and how much water to apply. With proper irrigation scheduling, crop yields will not be limited by water stress from droughts, and the waste of water and energy used in pumping will be minimized. Other benefits include reduced loss of nutrients from leaching as a result of excess water applications, and reduced pollution of groundwater or surface waters from the leaching of nutrients.

Determining when to irrigate

One indicator of plant water stress is the visual appearance of the plant. However, yield reduction has already occurred by the time crops show wilt symptoms. Growth ceases in many crops before visual wilting occurs, and yield reduction may have occurred for some time before wilting is seen.

When to irrigate can also be determined by calendar methods (for example every 3 days), by crop growth stage (for example, every 4 days during early vegetative growth stage, and every other day during peak growth stage), or by similar methods based on long-term average irrigation requirements. However, these methods fail to consider the effects of climatic variability on daily crop water use. Therefore, the use of long-term average values may not be adequate during periods of hot, dry days, while over-irrigation may occur during periods of cool, overcast days, especially if rainfall is not considered. Day-to-day climatic conditions are highly variable during much of the year because of cloud cover and the random nature of rainfall.

Irrigations are most often scheduled based on the soil water status. Three procedures may be used: 1) a water balance procedure based on the estimated crop water use rate and soil water storage, 2) a direct measurement procedure based on instrumentation to measure the soil water status, and 3) a combination of the above two methods in which soil water status instrumentation is used with a water balance procedure. These procedures require knowledge of the crop water requirements, effective root-zone, soil water-holding capacity, and irrigation system capabilities in order to schedule irrigations effectively.

Once available water content (AWC) is known, the total depth of water available (AW), and thus the capacity of the soil-water reservoir, can be obtained by multiplying AWC by the crop effective root zone depth. For layered soils, AW is calculated by adding the multiples of AWC and depths of all soil layers contained in the crop root zone.

Soil-moisture indicators for irrigation scheduling

Devices for monitoring soil moisture have been available for many years. Among them, are tensiometers and capacitance probes. When placed in the plant root zone, they indicate the soil water status that the plants are experiencing. Disadvantages of soil moisture sensors include their cost, labor requirements for reading and servicing, and the need for periodic calibration. They also measure soil water status at a point rather than for the whole field, thus many instruments or sensors may need to be installed to accurately represent a given field.

Fresh vs. processed fruit

MANAGEMENT DECISIONS

Basic horticultural input to increase production efficiency and maximize profits includes optimization of fertilization, irrigation, weed control, and pest management. Florida citrus is marketed either for the fresh market or processed market. Irrigation, fertilizer and pest management strategies employed by growers for fruit destined for these different markets must differ. It is a waste of money to seek to achieve fresh market fruit quality in a processing fruit production operation.

In the production of fresh market fruit, good fruit size and a high level of control of external blemishes are needed to achieve maximum profitability. A great input of pesticides and a high level of pest scouting can be economically justified. If pest or windscar damage occurs early in the season, the grove can be switched to a processing program without suffering severe economic losses.

Grapefruit, navel oranges, tangerines, and tangerine hybrids have high values as fresh fruit and relatively low value for processing. These varieties are also more severely affected by diseases such as scab, melanose, Alternaria brown spot, and greasy spot rind blotch than are sweet orange cultivars. They must be monitored closely and timely applications must be made to control rust mites and fruit blemishing fungal diseases. If a high degree of control is not achieved and the fruit must be processed, the producer will experience a loss.

In the production of fruit for processing, yields and internal quality must be maintained with minimal input. Irrigation, fertilizer, and weed control should be maintained but control of foliar fungal diseases and arthropod pests should be reduced or omitted. When the protection of foliage and fruit are considered, only a few diseases and pests are of primary importance, namely greasy spot fungus on foliage.

Close observations, informed decision-making, and pesticide application only on an as-needed basis should reduce the level of input and associated costs in most seasons.

EFFECT OF WATER pH ON PEST-CONTROL MATERIALS

A possible reason for lack of control of a pesticide material may have to do with the pH of the spray solution. The pH scale ranges from 0 to 14. A pH value below 7 is acidic, whereas a pH value above 7 is basic, or alkaline. A pH of 7 is considered neutral.

Many common insecticides and miticides are susceptible to breakdown if the pH of the water is not within an acceptable range. When the pH is greater than 7, a process known as alkaline hydrolysis occurs. Alkaline hydrolysis is a degradation process in which the alkaline water breaks apart insecticide or miticide molecules, which may then reassemble with other ions. These new combinations may not have any insecticidal or miticidal properties.

Insecticides and miticides are more susceptible to alkaline hydrolysis than fungicides and herbicides. Many insecticides and miticides degrade under alkaline conditions. For example, Malathion and Kelthane are very sensitive, degenerating within a few hours after being diluted in alkaline water. In general, the carbamate and organophosphate chemical classes (for example, Sevin and Lorsban) are more susceptible than chlorinated hydrocarbons or pyrethroids (for example, Lindane or Talstar, respectively).

Higher temperatures can increase the rate of insecticide degradation. Alkaline hydrolysis occurs more rapidly when temperatures are high.

The ways to avoid water pH problems include:

1. Follow manufacturer directions on the desired water pH. The ideal pH range for most insecticides and miticides is between 5.5 and 6.0.

2. Regularly test the pH of water because it can change from season to season.

3. Apply insecticides and miticides as soon as possible after mixing.

4. Don’t leave insecticides or miticides sitting in a spray tank for an extended period of time.

5. Adjust water pH with buffers or water-conditioning agents. Buffers or water-conditioning agents are compounds that reduce alkaline hydrolysis, and adjust the pH of the spray solution to maintain it within a safe and efficient pH range.

WATER QUALITY AFFECTS HERBICIDE EFFICACY

Water is the primary carrier for pesticide applications. The chemistry of water added to the spray tank greatly impacts herbicide effectiveness.

Weak acids. Acids are compounds that release H^+ ions when dissolved in water. Weak acids are compounds that release H^+ ions, but just slightly. Postemergence herbicides that are weak acids include: Glyphosate, Paraquat (Gramoxone), Sethoxydim (Poast), and 2,4-D. Herbicides that are weak acids partially dissociate (split into pieces) when mixed in water. The major portion, which does not dissociate is more readily absorbed by plant foliage than the portion that dissociate. How much the herbicide dissociates depends primarily on pH of water in the spray tank. Dissociated herbicide molecules have a negative charge. After being dissociated, herbicides might remain as negatively charged molecules, or they might bind with other positively charged cations.

Water pH. Water pH for Florida water is alkaline or basic (pH 7.3 to 8.0). Acidic conditions (pH 3 to 6) are most suitable for mixing postemergence herbicides classified as weak acids. When water pH exceeds 7, consider adding adjuvants to lower the pH. Weak acids dissociate less under acid conditions where H^+ ion concentration is high. Dissociated herbicides are absorbed more slowly across plant cell membranes. Ideally, spray water pH should be low such that herbicides do not dissociate, or dissociate at low levels. Avoiding herbicide dissociation is the primary reason that water used in herbicide mixing should be acidic.

Alkalinity. Under conditions of low pH (less than 6.0), hard water has no substantial effect on these products. Low pH likely prevents the herbicide molecules from dissociating. When pH is higher than 7, hard water can interfere with herbicide activity. Higher pH allows the herbicide molecules to dissociate, after which they are quickly bound to free cations. Herbicides containing 2,4-D are available in two broad categories, ester and amine formulations. Many growers prefer the amine formulation because it is less volatile and less prone to drift off target and injure other crops. However, amine formulations are more sensitive to poor water quality than esters.

Hard water. Hard water contains high levels of calcium (Ca), magnesium (Mg), sodium (Na), or iron (Fe). Other cations can cause hard water, but these are the usual suspects. These positively charged ions attach to negatively charged herbicide molecules. Often, the association between herbicides and these cations renders the herbicide ineffective. High pH and hard water act together to reduce herbicide effectiveness. High pH causes more of the herbicide to dissociate while high concentrations of cations bind with the dissociated herbicide to reduce its effectiveness. Because the pH of Florida water supply is alkaline, growers should take corrective action. The use of adjuvants to lower pH in spray tanks is important. When labels permit, additions of ammonium sulfate to the spray tank overcome many interactions with herbicides and cations.

Prioritizing Citrus Nutrient Management Decisions

http://edis.ifas.ufl.edu/SS418

By ***Tom Obreza,*** UF-IFAS

Introduction

Citrus nutrient management can be divided into four components: Monitoring, program development, application, and evaluation. **Monitoring** can be qualitative (visual observations of tree performance), or quantitative (laboratory analysis of soil and/or leaf tissue samples). In **program development**, the grove manager decides what type of fertilizer sources will be used, and the rate, timing, and frequency at which nutrients will be applied. The **application** phase centers on methods used to place the nutrients (e.g. spreading dry fertilizer, applying suspension fertilizers with a herbicide boom, injecting solution fertilizers into the irrigation system, or spraying soluble nutrients on leaves). Following fertilizer application, the **evaluation** step determines whether the desired crop response was achieved, usually by evaluating tree growth, fruit yield, and fruit quality.

Ideally, a citrus nutrient management plan will provide maximum citrus yield and quality while minimizing the potential for water quality impairment. Nutrient management can become a complex task as a citrus grove manager considers the many factors that affect the choices of nutrient rate, source, placement, form, and application timing.

Citrus Sensitivity to Individual Nutrients

Citrus tree sensitivity to shortages or excesses of individual nutrients differs depending on the nutrient. For example, observations of mature citrus trees in the field tell us that manganese deficiency does not affect production nearly as much as nitrogen deficiency. Similarly, an excess of boron affects fruit quality more than an excess of magnesium.

In the 1960s, Dr. R. C. J. Koo and Dr. R. L. Reese of the UF-IFAS Citrus Research and Education Center in Lake Alfred grew Pineapple orange trees on a previously non-fertilized deep sandy soil and implemented a set of treatments where they omitted single essential mineral nutrients from the fertilizer program. The twelve nutrients they studied were macronutrients nitrogen (N), phosphorus (P), and potassium (K); secondary nutrients calcium (Ca), magnesium (Mg), and sulfur (S); and micronutrients manganese (Mn), zinc (Zn), copper (Cu), boron (B), and molybdenum (Mo). The N omission treatment was not zero N, but was half of full N fertilization. They found that citrus yield was most sensitive to omission of N, P, and K, and least sensitive to omission of micronutrients (Figure 1).

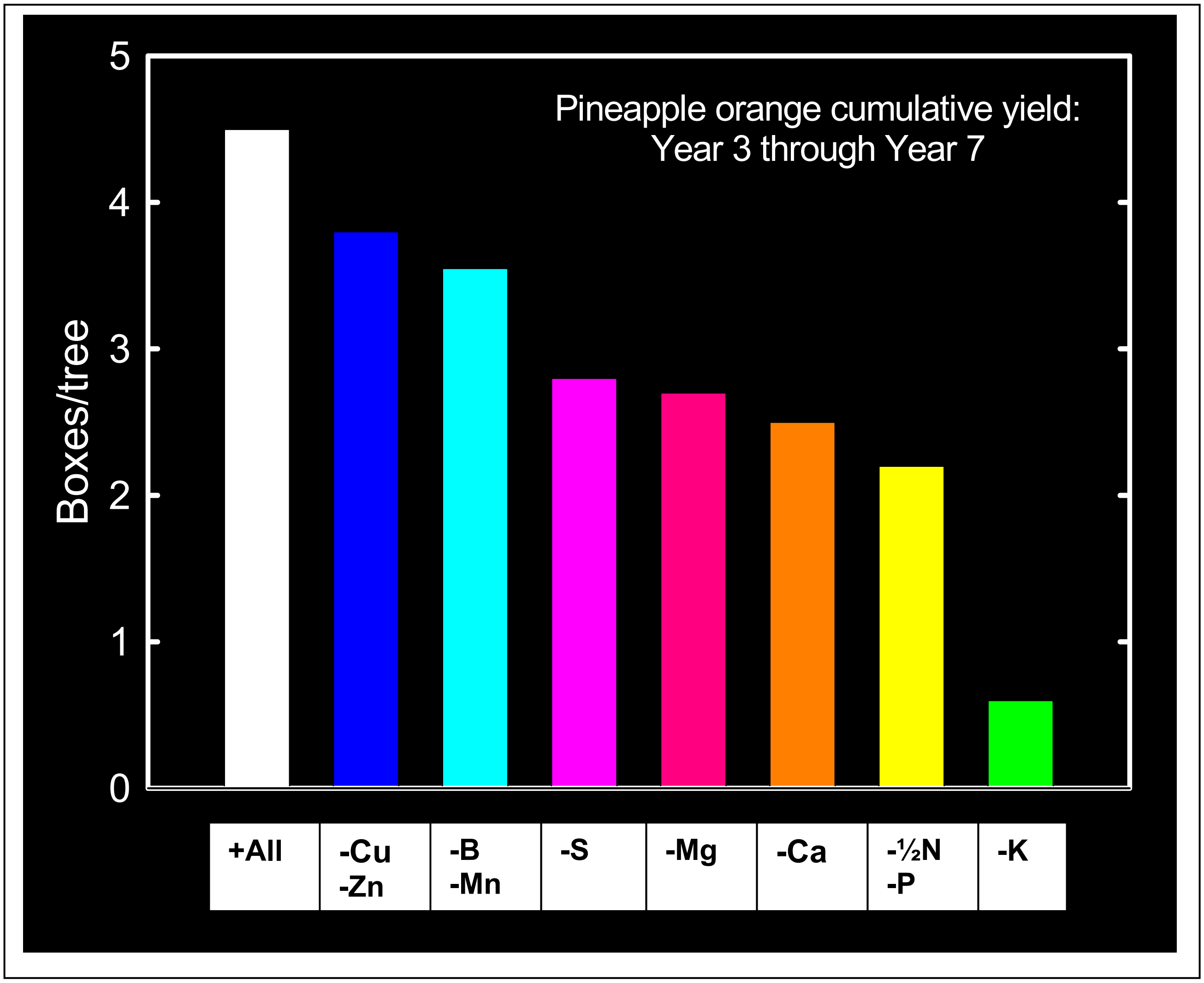

Figure 1. ***Sensitivity of pineapple orange trees planted on a native ridge sand to omission of single nutrient elements. The "+All" treatment received all essential nutrients; the N omission treatment was half of the N applied in the "+All" treatment. (From Koo and Reese, Proc. Fla. State Hort. Soc., 1971).***

Nutrient Accumulation and Loss

As a young citrus grove gets older, some nutrients applied in fertilizers and soil amendments will tend to accumulate in the soil, while others will mostly leach out of the root zone with rain or irrigation water if not taken up by the trees. The extent to which soil nutrient accumulation takes place will depend on the nutrient, its application rate, and the characteristics of the soil. For sandy Florida soils, the following are rules of thumb regarding nutrient accumulation or leaching:

- Cu, Zn, and Mn will accumulate in the root zone as a result of fertilizers applied to the soil or tree foliage. Soil accumulation of Cu resulting from frequent Cu-based fungicide applications can be particularly high.

- Ca and Mg will accumulate in the root zone as a result of calcitic or dolomitic limestone applications, or soil-applied fertilizers.
- As the amount of organic matter or clay in the soil increases, the accumulation of S applied as a component of many fertilizers will increase.
- P will normally accumulate in the root zone unless the soil is extremely sandy and low in organic matter.
- N, K, and B are nutrients that are poorly held by sandy soils and will be leached by rainfall or excessive irrigation. Thus, they usually must be applied as fertilizer every year.

Nutrient accumulation in the soil is one of several factors that determine the availability of nutrients to plants. Just because the concentration of a nutrient has increased in the soil does not mean that its availability has concurrently increased. Other factors including soil pH, water management, and root system health can significantly influence plant nutrient uptake.

Fertilization Experiments in the Flatwoods

During the last decade, fertilization experiments with mature flatwoods citrus trees that were well fertilized in their non-bearing years showed that good water management alone provided about 30% to 40% of maximum yield. When sufficient amounts of N and K fertilizer were combined with good water management, production reached or surpassed 90% of its maximum. Thus, the remaining 10% or less of a grove's yield potential was attributed to the combined effect of the remaining essential elements. It is important to reiterate that the groves where N and K experiments were conducted had lime, P, and micronutrient fertilizers applied to them when the trees were young.

Prioritizing Decision-Making

If citrus is most sensitive to water, N, and K, then nutrient management decisions should concentrate on improving their management before considering other factors. For example, if a grove is watered using a micro-irrigation system, how uniform is the water distribution from emitter to emitter? Are there any plugged sprinklers or drippers? If a grove manager chooses to fertigate a significant portion of the N and K (typically considered as a Best Management Practice for nutrients), it is important to frequently check the irrigation system for water distribution uniformity. The Mobile Irrigation Laboratories operated by the USDA-NRCS can measure irrigation system performance. If the system tests below 80% emission uniformity, corrective action should be implemented to even out and improve the nutrient distribution.

Summary

When prioritizing nutrient management decisions, grove managers should recognize the relative sensitivity of citrus to various nutritional factors in their groves and concentrate on improving the most sensitive ones first. Doing so will allow more time to deal with other citrus management issues.

Citrus Mechanical Harvesting

UF | UNIVERSITY of FLORIDA IFAS

Citrus Mechanical Harvesting Field Day and Workshop:
GETTING READY FOR ABSCISSION

Wednesday, April 20, 2011
University of Florida, Southwest FL Research and Education Center
2685 State Road 29 North
Immokalee, FL 34142

Agenda

7:30 Registration, coffee and refreshments

8:00 Welcome and program outline

8:15 **UF/IFAS Projects in Citrus Mechanical Harvesting & Abscission**

8:30 **Travel to SWFREC Concept Grove**

- Over the Row Mechanical Harvester Demonstration
- CMNP Sprayer Demonstration
- Abscission Pull-Force Demonstration
- Tree Mapping Technology

10:15 Return to SWFREC Main Building

10:30 **What Do We Know About CMNP and What We Hope to Learn From the EUP**

11:30 **Canopy Uniformity, Fruit Recovery, and CMNP Value**

12:30 Lunch

2:00 Adjourn

To RSVP or further information contact:

Barbara Hyman- hymanb@ufl.edu or (239) 658-3461

Citrus Greening Scouting Companies

Updated September 2010

Disclaimer: *The listing in this publication does not indicate general or specific endorsement or exclusion of product or service, nor does it indicate approval by the University of Florida, the Institute of Food and Agricultural Sciences, or the Florida Cooperative Extension Service.*

If you would like your company information to be added to this list, please contact Jamie Yates, jdyates@ufl.edu or 863-956-1151.

Citrus Solutions, LLC
PO Box 1341, Zolfo Springs, Florida 33890
Contact: Matt Moye
Cell: 863-990-0071
Fax: 863-491-7295
Email: moyeboy2@hotmail.com
Method: Walking
Counties: All Florida counties

Lennon Grove Service
2701 Dean Ridge Road, Orlando, Florida 32825
Contact: Bill Lennon
Office: 407-384-1411
Cell: 407-719-5496
Fax: 407-384-9678
Email: lgscitrus@aol.com
Method: ATV
Counties: Brevard, Lake, Marion, Orange, Osceola, Polk, Seminole, Volusia

Murphy's Horticultural Services
4117 Santa Barbara Drive, Sebring, Florida 33875
Contact: Joe Murphy
Cell: 863-446-0146
Email: murph2255@embarqmail.com
Methods: Walking, ATV
Counties: All Florida counties

Nuvee Enterprises, Inc.
8501 SW 10th Lane, Okeechobee, Florida 34974
Contact: Bruce Sutton
Cell: 863-697-8840
Fax: 863-357-7763
Email: nuveeinc@yahoo.com
Website: www.nuveeinc.com
Methods: Walking, Elevated Platform
Counties: Collier, Desoto, Hendry, Highlands, Indian River, Okeechobee, Manatee, Martin, Palm Beach, Polk, St. Lucie

Pest and Disease Management, LLC (dba PDM Scouting Service)
PO Box 1669, Avon Park, Florida 33826
Contact: Holly L. Chamberlain
Office: 863-453-3040
Cell: 863-257-3506
Fax: 863-453-0564
Nextel: 158*11977*6
Email: HLChamberlain@embarqmail.com
Website: http://pdmscoutingservice.com/
Methods: Walking, ATV, Elevated Platform
Counties: All Florida counties

Standard Citrus Scouting, LLP
PO Box 970, Dundee, Florida 33838
Contact: Todd Holtsberry
Cell: 407-729-9068
Fax: 863-419-0533
Email: toddscs@tampabay.rr.com
Methods: ATV, Elevated Platform
Counties: All Florida counties

Updike Citrus
PO Box 9, Alturas, Florida 33820
Contact: Clint Updike or Tim Woods
Cell: 863-559-8970 (Clint); 863-512-4042 (Tim)
Office: 863-537-5121
Fax: 863-537-5103
Email: clintupdike@msn.com
Methods: Walking, ATV, Elevated Platform
Counties: All Florida counties

For more information, please contact your local multi-county citrus extension agent http://citrusagents.ifas.ufl.edu

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Flatwoods Citrus

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Multi-County Citrus Agent
Hendry County Extension Office
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LaBelle, FL 33975

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Phone:________________________

Fax:__________________________

E-mail:____

Racial-Ethnic Background

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

Gender

__Female

__Male