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Institute of Food and Agricultural Sciences

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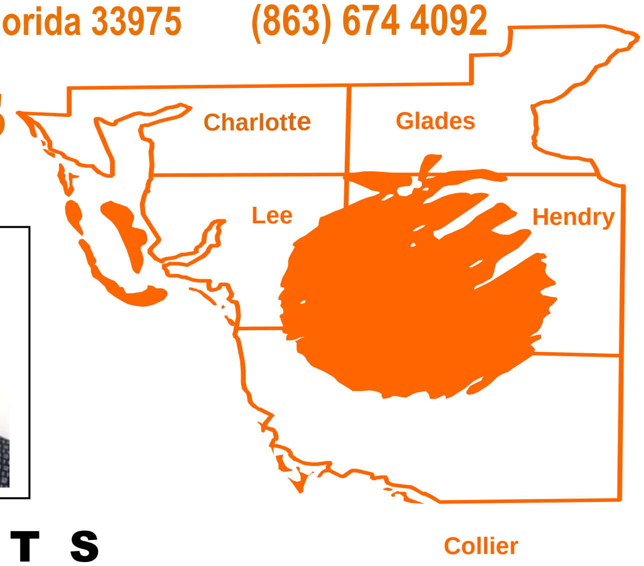
Flatwoods Citrus



Vol. 10, No. 11 November 2007

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

IDENTIFYING AND SCOUTING FOR CITRUS GREENING AND CANKER (in English & Spanish)

Date: Tuesday, November 20, 2007, 10:00 AM - 12:00 Noon
Location: Immokalee IFAS Center
Speakers: Mongi Zekri & Jamie Yates

How to collect tissue samples for citrus greening testing and how to submit samples to the lab for analysis?

Information is included in this issue. For details, get to the following webpage:
Sampling Protocol for Submission of Huanglongbing (syn= Greening or HLB) Samples to the Southern Gardens Diagnostic Laboratory
http://www.hccga.com/posgreen/061221mikeirey.pdf

If you want to see or 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

From the Florida Agricultural Statistics Service

Florida Citrus Production (Million Boxes)

	Production					Forecast
Cultivar	**1999-00**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
Early/Mid orange	134.0	126.0	79.1	75.0	65.6	**81.0**
Valencia orange	99.0	116.0	70.5	72.7	63.4	**87.0**
All oranges	233.0	242.0	149.6	147.7	129.0	**168.0**
All grapefruit	53.4	40.9	12.8	19.3	27.2	**25.0**
Temples	1.95	1.40	0.65	0.70		
Tangelos	2.2	1.00	1.55	1.40	1.25	**1.3**
All tangerines	7.0	6.5	4.45	5.5	4.6	**5.1**
Limes	0.60					
Lemons						
Total	**298.15**	**291.800**	**169.05**	**174.6**	**162.05**	**199.4**

ALL ORANGES 168.0 MILLION BOXES

The 2007-08 Florida all orange forecast released last month by the USDA Agricultural Statistics Board is 168.0 million boxes. This is 30% more than the 129.0 million boxes recorded as final production last season and 31% below the record high utilization of 244.0 million boxes (Temples not included) in the 1997-98 season. The forecast is divided into the early-midseason-Navel portion (including Temples) at 81.0 million boxes, and the Valencia portion at 87.0 million. Navel oranges account for 3.1 million boxes of the early-midseason-Navel category.

Weather conditions during the early months of 2007 were generally mild, but very dry. The bloom period was interrupted by a two week cold snap in mid-February, causing multiple blooms and resulting in later maturing fruit and smaller sizes. Warm weather and dry conditions continued throughout the summer months and into early autumn.

Bearing tree numbers have been declining since the 2002-03 season. The decline of 6.4 percent from the revised figure for 2006-07 is second only to the loss of 8.1 percent from 2004-05 to 2005-06 in recent seasons. The Southern area leads with 39 percent of the bearing trees, followed by the Central and Western.

The average pieces of fruit per tree is the highest since 2003-04 and up 59 percent from the previous season. One-third of the fruit population is located in the Southern area. The Central area is contributing 31% and 26% is coming from the Western area.

Current average fruit size is small and the projected size at harvest is below all recent non-hurricane seasons. Results of the objective surveys show that less than one percent of the fruit has dropped from selected limbs since the initial count in August. Drop is projected to be final between the minimum and average of the seasons used in the regressions (1997-98 through 2005-06 excluding hurricane seasons).

Special Thanks to all the 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.

Available for sponsorship

For more information, call Mongi at 863 674 4092 or send an e-mail to maz@ifas.ufl.edu

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Fire Ants

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

BIOLOGY

Red imported fire ants live in colonies that contain cream-colored to white immature ants, called brood. The brood is comprised of the eggs, larvae, and pupae. Also within the colonies are adult ants of different types. They include winged males and winged females, workers, and one or more queens. While thousands of winged males and females can be produced per year in large colonies, they do not sting. Newly-mated queens can fly as far as 12 miles from the nest (or even farther in the wind), but most land within a mile. New colonies do not make conspicuous mounds for several months. Once a colony is established, a single queen can lay over 2,000 eggs per day. Depending on temperature, it can take 20 to 45 days for an egg to develop into an adult worker. Workers can live as long as 9 months at 75°F, but life spans usually are between 1 and 6 months under warmer outdoor conditions. Queens live an average of 6 to 7 years.

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

CONTROL STRATEGIES AND TECHNIQUES

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

1. Broadcast Bait Applications

This strategy attempts to reduce fire ant populations by applying insecticides incorporated into an attractant or bait. Most bait products (eg. Amdro®, PT®370 Ascend™, Award® or Logic®) contain slow-acting toxicants dissolved in soybean oil, which is a food source for fire ants. The toxicant-laden oil is then absorbed into corn grits, which makes the product easier to apply and more available to the ants. The small size of the corn grit allows the ants to either carry the grit back to the colony and extract the toxic oil within the mound, or extract the toxic oil from the grit immediately and carry it back to the colony. The slow action of the toxicants allows the ants to feed the toxic oil to other members of the colony before they die. When the toxicant is fed to the queen(s), she either dies or no longer produces new workers and the colony will eventually collapse.

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

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

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

2. Individual Mound Treatments

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

Baits

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

Dusts

Dusts are dry powder insecticidal products. The dusts stick to the bodies of ants as they walk through treated soil. Ants that contact the dust will eventually die. Dusts are applied by evenly sprinkling a measured amount of dust over the mound. Avoid inhaling or touching the dust. Some dusts, such as those containing 75% acephate, should kill an entire colony within a week.

Aerosols

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

3. Combining Broadcast Baiting and Individual Mound Treatments

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

4. Barrier/Spot Treatments

Products that contain active ingredients such as acephate, bendiocarb, carbaryl, chlorpyrifos, diazinon, isofenphos, propoxur, permethrin, and resmethrin, immediately kill ants on contact. These products are usually sold as sprays or dusts. They may be applied in wide bands on and around building foundations, equipment and other areas to create barriers that exclude ants. They also may be applied to ant trails to eliminate foraging ants. Barrier and spot treatments do not eliminate colonies.

CITRUS BROWN ROT

While this disease can affect all citrus types, it is usually most severe on Hamlin and other early maturing sweet orange cultivars. Phytophthora brown rot is a localized problem associated with restricted air and/or water drainage. It commonly appears from mid-August through October following periods of extended high rainfall. It may extend to November this year because of the many rainy days we had in late October and early November. However, with the increased use of copper sprays to control citrus canker, brown rot may not be an issue. Grove inspection and monitoring is very important so that the problem can be detected and controlled as soon possible. Brown rot can be confused with fruit drop due to other causes at this time of the year. Early season inoculum production and spread of Phytophthora spp. are minimized with key modifications in cultural practices.

Skirting of the trees reduces the opportunity for soil-borne inoculum to contact fruit in the canopy. The edge of the herbicide strip should be maintained just inside of the dripline of the tree to minimize the exposure of bare soil to direct impact by rain. This will limit rain splash of soil onto the lower canopy. Boom application of herbicides and other operations dislodge low-hanging fruit. Fruit on the ground becomes infected and produces inoculum of *P. palmivora*, which can result in brown rot infection in the canopy as early as July while fruit are still green. The decay initially occurs as a light brown discoloration of the rind at any location on the fruit surface. The affected area is firm and leathery, and it retains the same degree of firmness and elevation as the adjacent healthy rind. At a later stage, a delicate white mycelium will form on the lesion surface. Fruit with brown rot have a characteristic pungent, rancid odor, which distinguishes the disease from the stem-end rots.

The beginning stages of the epidemic are very difficult to detect before the fruit are colored and showing typical symptoms. Application of residual herbicides earlier in the summer may reduce the need for post-emergence materials later and minimize fruit drop throughout this early stage of inoculum production from fallen fruit.

Usually a single application of a copper fungicide or Aliette late in August is sufficient to protect fruit through most of the normal infection period. No more than 20 lb/acre/year of Aliette should be applied for the control of all Phytophthora diseases. Aliette, a systemic fungicide at the rate of 5 lbs/acre protects against postharvest infection and provides 60-90 days control. Copper fungicides are only protective but are capable of killing sporangia on the fruit surface and thus reducing inoculum. They provide protection for 45-60 days. Use the label rate. With average quality copper products, usually 3-4 lb of metallic copper per acre are needed for the control of brown rot. When the disease has already spread, do not apply Aliette; spray copper only. Precautions should be taken during harvesting not to include brown rot-affected fruit in the field containers as this could result in rejection at the processing or packing facility.

CITRUS RESET MANAGEMENT

For maximum efficiency of a production unit or grove, it is essential that every tree location is occupied by a tree and that every tree be healthy. Prompt replacement of dead and declining trees means higher average long-term returns from the grove. If the declining trees remain in the grove, they keep getting weaker and yield less fruit each year and therefore the potential production capacity for the grove keeps declining even though production costs remain the same. It is very important to remove and replace such trees once it is clear that they are declining and they are not profitable. However, the reason for the decline should be found and the condition should be corrected so that the replacement tree does not suffer the same fate.

Replanting in a mature grove seems justified only when a minimum of 8 ft between canopy driplines, not from trunk-to-trunk, is available for canopy development of the new trees.

Caring for young citrus trees is not an easy task. Resets should be watered, protected, fertilized, and weeded regularly. Because of their frequent flushing cycles, young trees are more sensitive and more attractive to pests than mature trees. Therefore, special care is needed to have the citrus psyllid and citrus leafminer under control. A rigorous program combining systemic and contact pesticides is recommended. Resets often present an even greater problem because trees are usually scattered throughout the grove. Scattered resets frequently have serious weed problems since removal of the previous tree allows the area to receive more sunlight and provides more favorable conditions for weed growth.

Keeping weeds under control during the established period of the reset is very important. Weeds compete with young citrus trees for moisture and nutrients and they must be controlled. Weed control around a reset site should be considered at pre-plant, early post-plant, and after the tree is established. Control of weeds prior to planting should be provided. If residual herbicides are used, they should be used in greatly reduced rates and well in advance of planting so that harmful residues do not remain which might damage the reset. Contact or growth regulating herbicides are usually preferred since they do not leave residual effects.

If the grove is under a fertigation program, there is no need for special care in terms of nutrition for resets. The use of controlled-release fertilizers for resets may be a better option rather than making several trips to scattered resets throughout large blocks with soluble dry fertilizers. Young citrus trees require frequent but moderate water application for survival and proper growth. Drainage is as important as irrigation. Excess water must be removed from the rootzone.

FLOODING INJURY

Almost all citrus trees grown in southwest Florida are located on high water table, poorly drained soils. Water management on poorly drained soils is difficult and expensive because during heavy rains in the summer, excess water must be removed from the rootzone and in periods of limited rainfall, irrigation is needed. On these soils, drainage is as important as irrigation. The concept of total water management must be practiced. If either system—irrigation or drainage—is not designed, operated, and maintained properly, then the maximum profit potential of a grove cannot be achieved. Both surface and subsoil drainage is necessary to obtain adequate root systems for the trees.

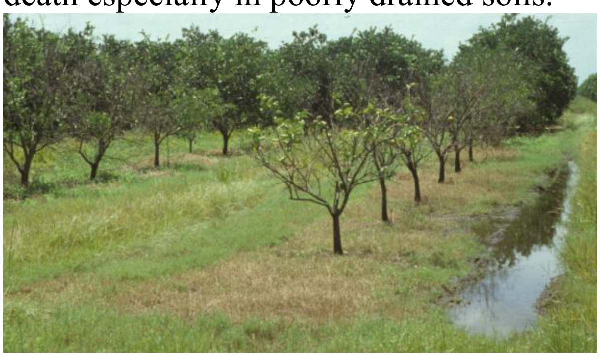
Roots, like the rest of the tree, require oxygen for respiration and growth. Soils in Florida typically contain 20-21 % oxygen. When flooding occurs, the soil oxygen is replaced by water. This condition causes tremendous changes in the types of organisms present in the soil and in the soil chemistry.

Flooding injury would be expected if the root zone were saturated for 3 days or more during extended summer rains at relatively high soil temperatures (86-95° F). Flooding during the cooler December-March period can be tolerated for several weeks at low soil temperatures (< 60° F). The rate of oxygen loss from the soil is much greater at high vs. low temperatures. The potential for damage to roots is less obvious but equally serious when the water table is just below the surface. Flooding stress is usually less when water is moving than when water is stagnant. The use of observation wells is a very reliable method for evaluating water-saturated zones in sites subject to chronic flooding injury.

Short-term estimates of flooding stress can be obtained by digging into the soil and smelling soil and root samples. Sour odors indicate an oxygen deficient environment. The presence of hydrogen sulfide (a disagreeable rotten egg odor) and sloughing roots indicate that feeder roots are dying. Under flooded conditions, root death is not exclusively associated with oxygen deficiency. Anaerobic bacteria (the kind that can grow only in the absence of oxygen) develop rapidly in flooded soils and contribute to the destruction of citrus roots. Toxic sulfides and nitrites formed by anaerobic sulfate- and nitrate-reducing bacteria are found in poorly drained groves. Sulfate-reducing bacteria require both energy and sulfates in order to change sulfates to sulfides. The best sources of energy have been found to be certain organic acids contained in citrus roots, grass roots, and buried pieces of palmetto. Thus, citrus roots can contribute to their own destruction by being an energy source for these bacteria.

Symptoms of flooding injury may occur within a few days or weeks, but usually show up after the water table has dropped and the roots become stranded in dry soils. Leaf wilting, leaf drop, dieback, and chlorosis patterns may develop and tree death may occur. Trees subjected to chronic flooding damage are stunted with sparse canopies, dull colored, small leaves and produce low yields of small fruit. New flushes of growth will have small, pale leaves due to poor nitrogen uptake by restricted root systems. Usually, the entire grove is not affected, but most likely smaller more defined areas will exhibit the symptoms. Striking differences in tree condition can appear within short distances associated with only slight changes in rooting depths. Water damage may also be recognized by a marked absence of feeder roots and root bark, which is soft and easily sloughed.

With acute water damage, foliage wilts suddenly followed by heavy leaf drop. Trees may totally defoliate and actually die, but more frequently partial defoliation is followed by some recovery. However, such trees remain in a state of decline and are very susceptible to drought when the dry season arrives because of the shallow, restricted, root systems. Moreover, waterlogged soil conditions, besides debilitating the tree, are conducive to the proliferation of soil-borne fungi such as Phytophthora root and foot rot. These organisms cause extensive tree death especially in poorly drained soils.



Water damage may usually be distinguished from other types of decline by a study of the history of soil water conditions in the affected areas. Areas showing water damage are usually localized and do not increase in size progressively as do areas of spreading decline. Foot or root rot symptoms include a pronounced chlorosis of the leaf veins caused by root damage and girdling of the trunk. Lesions also appear on the trunk usually near the soil level (foot rot) or roots die and slough-off (root rot). Flood damage does not produce lesions. Trees with blight or CTV are usually randomly distributed within the grove and diagnostic tests are available to distinguish them from water-damaged trees.

Citrus trees respond physiologically to flooding long before morphological symptoms or yield reductions appear. Photosynthesis and transpiration decrease within 24 hours of flooding and remain low as flooding persists. Water uptake is also reduced which eventually translates to decreased shoot growth and yields.

It is both difficult and costly to improve drainage in existing groves, so drainage problems should be eliminated when the grove area is prepared for planting by including a system of ditches, beds and/or tiling. Growers should not depend on the slight and often unpredictable differences in rootstock tolerance to waterlogging to enable trees to perform satisfactorily under such conditions. Trees, irrespective of scion and rootstock cultivars, should be planted under the best drainage conditions possible. Drainage ditches should be kept free of obstruction through a good maintenance program including chemical weed control. Tree recovery from temporary flooding is more likely to occur under good drainage structure maintenance conditions.

Do not disk a grove if trees were injured by flooding. Irrigation amounts should be reduced, but frequencies should be increased to adequately provide water to the depleted, shallow root systems. Soil and root conditions should be evaluated after the flooding has subsided. Potential for fungal invasion should be determined through soil sampling and propagule counts. If there is a Phytophthora problem, the use of certain fungicides can improve the situation.

PHYTOPHTHORA FOOT ROT AND ROOT ROT

Foot rot results from infection of the scion near the ground level, producing bark lesions, which extend down to the budunion on resistant rootstocks.

Crown rot results from infection of the bark below the soil line when susceptible rootstocks are used. Root rot occurs when the cortex of fibrous roots is infected, turns soft and appears water-soaked. Fibrous roots slough their cortex leaving only white thread-like stele.

When managing Phytophthora-induced diseases, consider integration of cultural practices (e.g., disease exclusion through use of Phytophthora-free planting stock, resistant rootstocks, proper irrigation practices) and chemical control methods.

Cultural practices. Field locations not previously planted with citrus are free of citrus-specific *P. nicotianae*. Planting stock should be tested free of Phytophthora in the nursery and inspected for fibrous root rot in the nursery or grove before planting. In groves with a previous history of foot rot, consider use of Swingle citrumelo for replanting. Swingle citrumelo is resistant to foot rot and roots do not support damaging populations once trees are established.

Cleopatra mandarin should be avoided because it is prone to develop foot rot when roots are infected in the nursery or when trees are planted in flatwoods situations with high or fluctuating water tables and fine-textured soils. Trees should be planted with the budunion well-above the soil line and provided with adequate soil drainage. Overwatering, especially of young trees, promotes buildup of populations in the soil and increases risk of foot rot infection. Prolonged wetting of the trunk, especially if tree wraps are used on young trees, should be avoided by using early to midday irrigation schedules. Control of fire ants prevents their nesting under wraps and causing damage to tender bark.

Sampling for *P. nicotianae*. Population densities of the fungus in grove soils should be determined to assist in decisions to treat with fungicides. Soil samples containing fibrous roots should be collected during the spring through fall (March to November) from under-canopy within the tree dripline. Individual small amounts of soil from 20 to 40 locations within a 10-acre area are composited into one resealable plastic bag to retain soil moisture. Samples must be kept cool but not refrigerated for transport to the analytical laboratory. Currently, populations in excess of 10 to 15 propagules per cm^3 soil are considered damaging. The same soil sample could be tested for populations of nematodes, to assess whether they occur at damaging levels.

Chemical control.

Use of fungicides in young groves should be based on rootstock susceptibility, likelihood of Phytophthora infestation in the nursery, and history of Phytophthora disease problems in the grove. For susceptible rootstocks, such as Cleopatra mandarin and sweet orange, fungicides may be applied to young trees on a preventive basis for foot rot. For other rootstocks, fungicide treatments should commence when foot rot lesions develop. The fungicide program for foot rot should be continued for at least one year for tolerant rootstocks, but may continue beyond for susceptible stocks.

In mature groves, the decision to apply fungicides for root rot control is based on yearly soil sampling to indicate whether damaging populations of *P. nicotianae* occur in successive growing seasons. Time applications to coincide with periods of susceptible root flushes in late spring and late summer or early fall. Soil application methods with fungicides should be targeted to under canopy areas of highest fibrous root density. To avoid leaching from the root zone, soil-applied fungicides should not be followed by excessive irrigation. Aliette and Ridomil are both effective, but alternation of the materials should be practiced to minimize the risk of the development of fungicide resistance.

Foliar spray with Aliette: It is recommended to buffer the spray solution to pH 6 or higher to avoid phytotoxicity when copper has been used prior to or with Aliette. For nonbearing trees, use 5lb/100 gal. For bearing trees, use 5 lb in 100-150 gal/acre. Soil application with Ridomil Gold 4EC: Apply 1quart/treated acre or soil drench by applying 5 gallons of solution (1 quart/100 gal) in water ring. For more details and product selection and rates, get your copy of the 2007 Florida Citrus Pest Management Guide or go to: http://edis.ifas.ufl.edu/CG009

THINK SERIOUSLY ABOUT 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 (Fig. 1). 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 was taken 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/
and the following EDIS publications:

Continuous Canopy Shake Mechanical Harvesting Systems
S.H. Futch and F.M. Roka
http://edis.ifas.ufl.edu/HS239

Trunk Shaker Mechanical Harvesting Systems
S.H. Futch and F.M. Roka
http://edis.ifas.ufl.edu/HS238

Mechanical Harvesting and Tree Health
Richard S. Buker, James P. Syvertsen, Jacqueline K. Burns, Fritz M. Roka, William M. Miller, Masoud Salyani and Galen K. Brown
http://edis.ifas.ufl.edu/HS199

SOIL ACIDITY AND LIMING

The optimum soil pH range for citrus trees is 6.0 to 7.0. Trifoliate hybrid rootstocks such as citrumelos and citranges do better at the low end of this pH range. For sandy soils, one ton of liming material such as dolomite will raise the soil pH by about one unit. Liming acidic soils is economically sound and essential for profitable crop production. Soil pH must be monitored every year through soil testing because development of soil acidity is a continuous process that requires repeated applications of liming materials. Always test your soil before liming. Do not assume that lime is needed.

Problems in very acid soils

*Aluminum (Al) toxicity to plant roots
*Copper toxicity in soils that have received repeated Cu fungicide applications
*Manganese toxicity to plants in continuously wet soils
*Calcium & magnesium deficiencies
*Molybdenum deficiency
*Phosphorus tied up by iron (Fe) & Al
*Poor bacterial growth
*Reduced conversion of ammonium to nitrate

Problems in alkaline (high pH) soils

*Iron deficiency
*Manganese deficiency
*Zinc deficiency
*Excess salts (in some soils)
*Phosphorus tied up by calcium (Ca) and magnesium (Mg)
*Bacterial diseases and disorders

Fertilizers. Both organic and non-organic fertilizers may eventually make the soil more acid. For example, transformations of ammonium- (NH_4^+) and urea-based fertilizers into nitrate (NO_3^-) release H^+ that increases soil acidity. Therefore, fertilization with materials containing ammonium or even adding large quantities of organic matter to a soil will ultimately increase the soil acidity and lower the pH.

Raising soil pH (liming acid soils). Soils are limed to reduce the harmful effects of low pH and to add calcium and magnesium to the soil. Lime reduces soil acidity (increases pH) by reducing the H^+ concentration through neutralization with carbonate (CO_3^{2-}) or hydroxide (OH^-). A Ca^{++} ion from the lime replaces two H^+ ions on the cation exchange complex. The hydrogen ions (H^+) are then reduced and changed into water (H_2O). An acid soil can become more acid as basic cations such as Ca^{2+}, Mg^{2+}, and K^+ are removed, usually by crop uptake or leaching, and replaced by H^+.

Benefits of liming to correct soil acidity

*Increased nutrient availability
*Improved fertilizer use efficiency
*Increased soil microbial activity
*Higher nitrogen fixation by legumes

*Reduced toxicity of copper
*Provision of additional amounts of calcium and magnesium
*Improved soil physical conditions
*Increased cation exchange capacity
*Improved herbicide activity
*Increased growth and crop yield

Lime placement. Since ground limestone is relatively insoluble in water, maximum contact with the soil is necessary to neutralize the soil acidity. Lime will not quickly move into the soil like water-soluble fertilizers. Even though it is usually recommended to thoroughly mix lime with the topsoil, it is not practical to incorporate it in a citrus grove. Therefore, it will take lime longer to raise soil pH in a grove compared with a field where it is incorporated. As soon as moisture is present, the lime will begin to react. Coarse lime particles react more slowly than very fine particles. Therefore, using very finely ground limestone is necessary to achieve the desired soil pH change within 4 to 6 months after application.

Overliming. While a correct liming program is beneficial for plant growth, excessive liming can be detrimental because deficiencies and imbalances of certain plant nutrients may result. The practice of estimating lime requirement without a soil test is risky because it can lead to overliming.

Liming materials. The most common liming materials are calcitic or dolomitic agricultural limestone. Calcitic limestone is mostly calcium carbonate ($CaCO_3$). Dolomitic limestone is made from rocks containing a mixture of calcium and magnesium carbonates. Dolomitic limestone also provides magnesium. Not all materials containing calcium and magnesium are capable of reducing soil acidity. Gypsum ($CaSO_4$) does not reduce soil acidity.

Lime may be applied at any time during the year to Florida citrus groves.

Calcium sources

Source	Chemical formula	Calcium carbonate equiv. (pure form)
Burned lime (Quicklime)	CaO	179
Hydrated lime (Builder's lime)	$Ca(OH)_2$	135
Dolomitic lime	$CaCO_3 \bullet MgCO_3$	109
Calcitic lime	$CaCO_3$	100
Basic slag (by-product)	$CaSiO_3$	80
Marl (soft carbonates)	$CaCO_3$	70 to 90
Gypsum	$CaSO_4$	0
Calcium nitrate	$Ca(NO_3)_2$	20
Ordinary superphosphate	$Ca(H_2PO_4)_2 + CaSO_4$	0
Concentrated superphosphate	$Ca(H_2PO_4)_2$	0

Flatwoods Citrus

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Hendry County Extension Office
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Racial-Ethnic Background

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

Gender

__Female
__Male