# **Citrus production practices** for fa By Gary England, Mongi Zekri, Steve Futch, Chris Oswalt,

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s summer winds down and the citrus harvest approaches, it is time to plan grove management practices that will take place from late summer into early fall/winter. Production managers want to take the steps necessary to maximize the crop that will be harvested, while also optimizing tree health going into the winter. There are numerous routine grove care operations occurring in the fall along with others directed toward critical issues which may have arisen in the grove. The bulk of these grove-care operations deal with crop nutrition, pest management, irrigation and other horticultural practices.

#### NUTRITION

Many citrus professionals will probably agree with the statement that the "the best fertilizer is their footsteps in the grove." Routine surveys of tree health are helpful in identifying potential problems and incorporating them into the grove-care schedule.

Historically, the recommendation has been to maintain a soil pH of 6.0 to 6.5 in groves, as this is the range where many of the essential nutrients for growth and development of citrus trees are readily available. A recent Citrus Industry article by Jim Graham and others stated that a survey of 37 blocks on Carrizo or Swingle rootstocks in Highlands and Desoto counties indicated HLB-infected blocks had significantly reduced fibrous root density where soil pH was greater than 6.2 and well water pH was greater than 6.5, caused by high levels of bicarbonates. The article indicated that treating high bicarbonate irrigation water (> 100 ppm) could help improve tree fibrous root health and availability of nutrients such as Ca, Mg and K. Addition of elemental sulfur to the soil within the pattern of the irrigation system can also help to overcome "bicarbonate stress," but growers should be aware that repeated applications may be necessary to keep the pH in the acceptable range.

Fertilizer management should include calibration and adjustment of fertilizer spreaders, booms, pumps and irrigation systems to accurately deliver fertilizer rates and place nutrients within the tree rootzone. To increase fertilizer efficiency, soil and leaf analysis data should be studied and taken into consideration when generating a nutritional program and selecting a fertilizer formulation. Dry fertilizer application should be split into three to four applications per year with a complete balanced fertilizer. For best fresh fruit quality, nutritional requirements - particularly nitrogen (N) — should decrease late in the summer and fall. Based on tree demands, two-thirds of the yearly fertilizer amount should be applied between January and May.

In warm areas such as Southwest Florida where tree growth can continue during the winter in some years, fertilizer applications should also be made in the fall to satisfy vegetative growth demand. However, fall fertilizer applications may sometimes delay fruit color development and fruit maturity for early and mid-season cultivars. For more information, go to "Nutrition of Florida Citrus Trees, 2nd Edition" by Thomas A. Obreza and Kelly T. Morgan (http:// edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf).

### PEST MANAGEMENT

Weed pressure in the grove can compete with citrus trees

for soil moisture and nutrients. Weeds can also interfere with microsprinkler patterns and applications of agro-chemicals applied to the soil. Harvesting operations function much more efficiently when weeds are appropriately managed. As the potential for freezing temperatures increases toward the end of the year, it is important to know that weedy groves may be several degrees colder than those where grove floor vegetation is managed properly.

Most citrus growers utilize a combination of pre- and post-emergence residual herbicides in their weed management programs throughout the season. Typically, a residual herbicide (often with a post-emergence herbicide) is applied in the late summer/early fall to maintain a relatively weedfree grove through harvest. Fruit drop has been observed when late summer/early fall applications of various postemergence herbicides come into contact with low-hanging fruit. It is important to make sure the herbicide boom shield is functioning properly and the off-center nozzle at the end of the boom is set to keep the spray mixture from contacting the lower portion of the canopy. For more information about how the position of the off-center nozzle impacts spray distance, refer to an article published in the January 2012 issue of Citrus Industry.

Additional information about weed management in citrus is available by visiting http://edis.ifas.ufl.edu/cg013 or in the 2014 Florida Citrus Pest Management Guide.

Insect and mite management has been a consideration for citrus growers in the fall, especially those producing fresh fruit for the packinghouse. With the introduction of citrus greening or huanglongbing (HLB), insect management — specifically the Asian citrus psyllid (ACP) which is the vector of HLB — has become one of the most important considerations for producing citrus.

One of the most successful strategies for reducing ACP populations is coordinated insecticide applications within citrus health management areas (CHMAs). In CHMAs, where coordinated applications of insecticides are applied over a relatively short period of time in a vast majority of the blocks, scouting cycles made every three weeks throughout the year indicate relatively low ACP populations.

Most CHMAs around the state will have one to two coordinated applications in the late summer/fall time frame. It is important for growers to participate in scheduled applications for their CHMAs to maintain low ACP populations. See http://www.crec.ifas.ufl.edu/extension/chmas/index. shtml for information about CHMAs, including results of scouting cycle data.

Spider mites feed primarily on mature leaves and differ from rust mites by feeding beneath the epidermal layer of cells. They are capable of removing cellular contents, causing cell destruction and reducing photosynthesis. Mesophyll collapse and leaf drop can result when trees are stressed by high spider mite infestations in combination with sustained dry, windy conditions that may occur in the late fall, winter or early spring months. When populations of Texas citrus mite or citrus red mites are high, they will also feed on developing fruit. Spider mites prefer dry weather and low relative humidities in the range of 30 percent to 60 percent

and generally do not pose a sustained problem in the higher humidity conditions that occur between June and September. Populations of Texas citrus and citrus red mites aggregate among leaves within and between citrus trees.

Spider mites are suppressed to low densities by several species of predacious mites, insects and entomopathogens in some groves. However, when populations averaging five to 10 motile spider mites per leaf develop between September and May, it would be reasonable to apply a miticide, especially if the trees are stressed. However, infestations comprised predominantly of adult males should be considered in decline and thus would not require control. Need for controlling spider mites is based on temperature and humidity conditions, spider mite population levels, tree vigor and time of the year. Petroleum oil provides some ovicidal activity against spider mite eggs. To avoid developing resistance, be sure to rotate miticide modes of action. Go to http:// www.crec.ifas.ufl.edu/extension/pest/ PDF/2014/Rust%20Mites.pdf for more information.

**Management of brown rot** is needed on both processing and fresh market fruit. While the disease can





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Phytophthora brown rot is a localized problem usually associated with restricted air and/or water drainage. It commonly appears from mid-August through October following periods of extended high rainfall. It can be confused with fruit drop due to other causes at that time of the year. 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 practice limits 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* that can result in brown rot infection in the canopy as early as July while fruit are still green. 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 Aliette, Phostrol or ProPhyt before the first signs of brown rot appear in late July is sufficient to protect fruit through most of the normal infection period. Copper fungicides are primarily protective, but are capable of killing sporangia on the fruit surface and thus reducing inoculum. They may be applied in August before or after brown rot appearance. If the rainy season is prolonged into the fall, a follow-up application of either systemic fungicides at one-half of the label rate, or copper in October, may be warranted. For more information, go to Florida Citrus Pest Management Guide: Brown Rot of Fruit (http://edis.ifas.ufl.edu/pdffiles/ CG/CG02200.pdf).

### **IRRIGATION**

Water stress is the physiological condition to which a plant is subjected whenever the rate of water loss from the leaves by transpiration exceeds the rate at which water is absorbed by the root system. Water stress can be the result of excessive transpiration due to hot weather or slow absorption from dry soil, flooded soil or saline conditions. Any degree of water imbalance can produce a deleterious change in physiological activity of growth and reproduction. Short-term drought often reduces production and prolonged drought can cause total crop failure. Severe drought in the fall can reduce fruit growth and cause fruit drop.

Extension growth in shoots and roots and leaf expansion are all negatively correlated with water stress. Trees subjected to water stress are generally reduced in size. Vegetative growth is particularly sensitive to water deficit. Growth is closely related to turgor and the loss of turgidity reduces photosynthesis, leaf and fruit enlargement, juice content and yield, and increases wilting and leaf and premature fruit drop.

Growers cannot afford water stress or water restrictions during critical periods. Irrigation is not only essential during the springtime, but it is also important during dry falls to minimize premature fruit drop. Additional information and citrus irrigation resources are available on the Florida Automated Weather Network (FAWN) website (http://fawn.ifas.ufl.edu).

### TREE CANOPY MANAGEMENT

Hedging and topping is an important cultural grove practice during late fall and winter. In general, tree response to hedging and topping depends on several factors including variety, tree age, vigor, growing conditions and production practices. No one system or set of rules is adequate for the numerous situations encountered in the field.

Hedging should be started before canopy crowding becomes a problem. Removal of a significant portion of the tree will result in excessive vegetative growth and a drastic reduction in subsequent yield, where regular maintenance hedging typically removes smaller size branches and has less impact on yield.

Topping should be done before trees have become excessively tall and should be an integral part of a tree-size-maintenance program. Long intervals between toppings increase the cost of the operation due to heavy cutting and more brush disposal. Excessively tall trees are more difficult and expensive to harvest and spray. Topping trees will increase fruit quality and size.

Excessive nitrogen after severe hedging or topping will produce vigorous vegetative growth at the expense of fruit production. Therefore, nitrogen applications should be adjusted to the severity of hedging and/or topping. Reducing nitrogen applications avoids an imbalance when heavy pruning is done. Reducing or omitting a nitrogen application before and possibly after heavy hedging will reduce both costs and excessive vegetative growth. However, light maintenance hedging should not affect fertilizer requirements.

Pruning after a light crop and before an expected heavy crop is recommended because it can help reduce alternate bearing, which can be a significant problem in Valencia and Murcott production. Pruning could begin as early as November in warmer areas. Valencia trees may be hedged in the late fall with only minimal crop reduction when the hedging process removes only a small amount of vegetative growth.

In the presence of citrus greening disease, selecting the best time for hedging and topping is becoming more complicated. New growth flushes promoted by hedging and topping during the summer and early fall can increase the population of psyllids and aggravate the spread of citrus greening.

**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. 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 including systemic and contact pesticides is recommended.

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.

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 not be allowed to accumulate within the rootzone.

Gary England, Mongi Zekri, Steve Futch, Chris Oswalt, Cami Esmel McAvoy, Parker Platts and Laurie Hurner are all University of Florida-IFAS Extension agents.

### CORRECTION

The following acknowledgement was inadvertently omitted from Larry Duncan's article, "Can Diaprepes root weevil be managed with physical barriers?" in the June issue of Citrus Industry: The research reviewed in this paper was conducted by the author, Cindy McKenzie, Steven LaPointe and Robin Stuart and was published in Florida Entomologist. Ongoing research also involves Raquel Campos-Herrera, **Fahiem El-Borai and Arnold** Schumann. I thank Fred Gmitter, John Strang and the late Drew Kelly for their important collaboration in the research.

