CITRUS GROVE PREPARATIONS FOR WINTER

Winter is the season when growers can begin to reap the rewards of their labor with the harvesting of high quality liquid Florida sunshine. It is also a time to begin preparing for next year's crop and to ensure irrigation systems are properly maintained for use during freeze events. Factors necessary for a heavy bloom and a subsequent corresponding fruit set include cultural practices and environmental conditions that occur during the winter. Considering these factors can result in a sound production program that will lay the foundation for a successful year.

COLD PROTECTION PRACTICES AND WEATHER INFORMATION

Citrus cold protection practices can be divided into two categories: passive and active. Passive practices are done in preparation for freeze events. These do not require the grower to actively participate in cold protection during a freeze event. Passive cold production practices would be site selection, cultural practices and horticultural selections. Site and horticultural selections are made prior to planting and little can be done with these factors after grove establishment.

Cultural practices can have a pronounced effect on the ability of citrus trees to survive freezing temperatures. Often, a small change in the minimum temperature can result in the difference between severe or minimal freeze damage to citrus trees. Soil moisture can influence the minimum temperature in a citrus grove. Soils with a high water content will be warmer than soils with a low water content. In years past, growers with overhead irrigation would wet the soil prior to a freeze event, increasing the capacity of the soil to store heat during the day. Conversely, lighter, drier soils can be colder in a calm freeze. Soil moisture has less of an effect on grove temperatures during windy freezes.

Clean cultivation or closely mowed turf can increase the interception and storage of solar radiation during the day.

Row middle management can affect the microclimate of a citrus grove. Cultitivated or closely mowed row middles have been shown to be slightly warmer than groves where weeds are allowed to become excessively tall. This excessive weed growth acts as an insulator, preventing sunlight from reaching the soil surface during the day. Weeds can also impede cold air drainage out of the grove during calm freezes.

Excessive weed growth can impede cold air drainage and insulate the soil surface.

Citrus nutrition can also influence a citrus tree's ability to survive freezing temperatures. Researchers have tried to isolate specific mineral nutrients and their effect on freeze damage to citrus trees. The data indicated that there is no single nutritional element that will increase the cold tolerance of citrus to freezing temperatures. However, during the winter, maintaining adequate mineral nutrition in citrus trees is extremely important. Trees that are nutrient deficient will often be more susceptible to freezing temperatures.

Citrus irrigation and tree water status may also play an important role in the susceptibility of citrus trees to freezing temperatures. Although difficult to quantify, indications are that overirrigation during the winter can result in an increase in "free water" in the tree. This "free water" between plant cells is more susceptible to freezing at temperatures closer to 32˚ F than water contained in plant cells. Reducing irrigation during the winter results in less freeze damage of trees compared with trees receiving excessive irrigation during a freeze. However, a drought-stressed tree will be more susceptible to a freeze event. Growers have little control over rainfall, but can control the amount of irrigation water applied. Irrigation should be scheduled during the winter to prevent fruit drop and severe tree water stress.

Active practices are those carried out during a freeze event. The main methods of active cold protection of citrus in Florida are microsprinkler irrigation, flood irrigation and wind machines. By far the most popular method of freeze protection is microsprinkler irrigation followed by flood irrigation. Flood irrigation is predominately used in flatwoods

Young citrus tree with microsprinkler positioned for cold protection.

citrus production areas of Florida. Wind machines are effective during calm freezes, but have limited effectiveness in windy freezes. Using microsprinkler irrigation for freeze protection requires that systems be properly designed and operated correctly. Additionally, growers require knowledge of the severity of the freeze event, the susceptibility of citrus to freeze damage, and should have a reliable source of weather forecast information.

Knowing the potential severity of a freeze event is obtained by information contained in real time weather data collected during the day prior to the freeze. The dew point is one of the most critical factors that can provide some insight into the potential severity of a particular freeze. The most devastating freezes in Florida have occurred when a cold air mass that had migrated down the peninsula had extremely low dew points. These dew points ranged from the single digits to the low to mid teens. Air masses that contain these low dew point temperatures will have the potential to cause severe crop damage if these dew points remain stable through the night. Low dew points mean that there is very little moisture in the air and temperatures can fall significantly after sunset and during the night. Since plants do not experience wind chill, the fact that the wind is blowing or calm will have little effect on the minimum temperature, but can have a significant effect on the duration of freezing temperatures and the effectiveness of microsprinkler irrigation.

Collection of accurate site specific minimum temperature data begins with a properly shielded grove thermometer. This allows growers to fine-tune minimum temperature forecasts.

The second piece of the puzzle involves knowing the approximate temperature that will damage citrus trees. This involves following citrus acclimation or cold hardiness throughout the winter. This has been and is currently done by determining the temperature at which citrus leaves will freeze (http://fawn.ifas.ufl.edu/ tools/coldp/crit_temp_select_guide_citrus.php). This critical leaf freezing temperature can be used as a minimum threshold for citrus tree cold protection. Microsprinkler irrigation will have a minimal effect on citrus canopy temperatures with rising height above the emitter. Expecting microsprinkler irrigation to provide protection to fruit in the event of a severe freeze is unrealistic. This is in large part due to the distance of the fruit from the water source and position of the majority of fruit on the outer canopy of the tree. Leaf freezing temperatures should be modified by the grower for differences in varieties, rootstocks and a safety factor based on the grower's experience.

The final piece in this cold protection puzzle involves the use of reliable weather forecast information. Two University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) citrus Extension agents (Chris Oswalt at (863) 519-8677 and Ryan Atwood at (352) 343-4101) provide weather forecast and freeze information in the Winter Weather Watch Program. The program provides forecast information along with special weather narratives to subscribers via a phone announcement system that is available 24 hours a day, seven days a week, starting about Nov. 15 and ending about March 15. You can find additional information and/or subscribe to the Winter Weather Watch by visiting the UF/IFAS Citrus Extension Agents Web site at http://citrusagents.ifas.ufl.edu/ . The Florida Automated Weather Network (FAWN) is a UF/IFAS Web-based (http://fawn.ifas.ufl.edu/) real time weather network of 35 stations located up and down the Florida peninsula. This site provides a range of weather measurements vital to the success of growers in freeze protection. These measurements are updated every 15 minutes, 24 hours a day.

CITRUS FLOWER PRODUCTION

Cold acclimation and environmental- or grower-induced citrus tree stress can enhance the formation of citrus flower bud production and potentially increase yield. Citrus in Florida benefits from a temporary rest period termed quiescence during the winter. This slowing of growth corresponds with lower air and soil temperatures experienced in the winter. These changing environmental conditions, along with a reduction in total rainfall, will stimulate an increase in the production of citrus flower buds. Mother Nature will not always cooperate, but growers can follow this process of flower bud production in the citrus flower bud induction advisories on the UF/IFAS Citrus Research and Education Center Web site at http://www.lal.ufl.edu/extension/flowerbud/index.htm

Here you can get the latest updates on seasonal flower bud induction along with information that will allow a grower to enhance induction by following the recommendations on the timing of a spray application containing urea or withholding water to artificially stress citrus trees. These activities have been shown to delay and suppress the formation of vegetative buds in favor of flowering buds.

PSYLLID MANAGEMENT

This is the most important time of the year for Asian citrus psyllid suppression and the potential for slowing down the spread of citrus greening. Research and grower observations have demonstrated the importance of timely application of an insecticide during the winter to control psyllids. This application will significantly reduce psyllid populations for an extended period of time. The timing also ensures the least amount of disruption of beneficial insects and avoids the bloom period when bees are actively foraging. The application can be made in January or February and the length of control can be extended with a subsequent

soil application of Temik (aldicarb) insecticide. The application of Temik should be timed to benefit from rainfall activation. This will ensure uptake of aldicarb by the tree. Current research on the timing of Temik applications has demonstrated an increased benefit of rainfall over microsprinkler irrigation for uptake. Beware that there are important restrictions associated with the use of Temik. Contact your local Temik sales representative or citrus Extension agent for additional guidance.

HEDGING AND TOPPING

The timing of citrus hedging has in the past been a topic of intense discussion. In today's citrus industry, the first question a grower should ask when making a decision on hedging and topping is: What will it do to psyllid populations? Pruning practices, whether hedging or topping, that stimulate a flush during a time when tree growth would not normally be occurring can result in a grove being more susceptible to cold damage and a magnet for local psyllid populations. Psyllid management must be planned and implemented prior to the arrival of the subsequent new flush of growth following hedging and topping.

SPIDER MITE MANAGEMENT

Typically, Florida winters are characterized as drier with lower relative humidity compared to other times of the year. These conditions are favorable for the development of spider mite populations. This situation may become even more problematic with the addition of certain insecticides currently recommended for psyllid control. Materials like carbaryl or Sevin have been shown to potentially stimulate spider mite populations during the winter to levels associated with defoliation or firing. At these levels, a supplemental miticide application may be necessary. Spider mite induced defoliation during the winter may also stimulate unwanted vegetative flushing of these defoliated shoots. This new flush, during the winter, may provide citrus psyllids with the capacity to complete their life cycle.

Excessive spider mite damage can result in defoliation of portions of citrus trees. This has been termed firing.

Winter is a time of the year when growers can have a significant influence on next year's crop. To this end, the effective management of citrus trees during the winter includes promoting quiescence, reducing vegetative growth and increasing cold hardiness. These practices can result in the stimulation of citrus trees to increased flower production and potential crop yields.

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