

IFAS Citrus Initiative

Annual Research and Extension Final Progress Report 2009-10

Investigator:

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Objective(s) Pursued (Priority Topics):

Priority topic studied in this project is affect of mechanical harvesting on tree health.

The objectives of this multi-year project are to determine the affect of tree condition prior to harvest and harvest method on measures of short-term and long-term tree health of water stressed trees. The goal of the research is the documentation of short-term and long-term impacts of mechanical harvesting on trees of selected levels of initial tree heath and tree water stress compared with hand harvested trees over a three year period.

Detailed Accomplishments in 2009-10:

Trees in the Ranch One grove managed by CPI were selected by tree condition on soils with similar characteristics (Malabar fine sand) and in similar landscape positions. Three tree condition categories (i.e. poor, moderate and excellent) were determined based on general tree appearance, leaf color and size, canopy density and fruit load. Leaf area index (LAI) was used to quantify initial tree condition prior to harvest and to determine effect of harvest method on tree canopy. LAI was significantly different by tree condition prior to harvest. When measured after harvest, LAI within each tree condition category was not significantly different by harvest method when compared with measurements by tree condition category prior to harvest. Irrigation was either applied the day before harvest or withheld for a period of 5 to 7 days prior to harvest. Pull force (i.e. energy required to detach fruit from the tree) and stem water potential (i.e. water tension of leaf equilibrated to tension in the stem) were determined the day of harvest and day prior to harvest, respectively, as a measure of irrigation treatment affect on tree water status. No significant differences in pull force and stem water potential were found among irrigation treatments. Sap flow flux (i.e. flow of water per unit branch cross-sectional area in response to evapotranspiration) in upper canopy branches was used as a measure of tree health. Prior to harvest, differences among tree condition categories were found with poorer trees generally using less water than the excellent trees, but no significant differences in sap flow was found among irrigation treatments within tree condition. After harvesting, half of the six trees in each plot were irrigated the day after harvest and irrigation was withheld from the other half of the trees for a period of five to eight days after harvest. As with irrigation treatments prior to harvest, no significant differences in sap flow flux was measured by irrigation treatment.

Areas where progress exceeded expectations:

Location of trees of three tree condition categories within the same grove block on the same soil series was critical to the long-term objective of this project. With all trees located in the same block and under the same management, equal inputs can be assumed.

Areas where progress didn't meet expectations:

The timing of harvest for this project was April and early May. Typically, these months of the year are very dry with daily evapotranspiration (ET) exceeding rainfall. Unfortunately for the objective of this project, April and early May of 2010 were cooler and wetter than normal, lowering daily ET and causing a higher than normal water table (as indicated by water in perimeter ditches at 0.5 meters or less). Both the lower ET and higher water table resulted in little or no tree stress from withholding irrigation prior to or after harvest. Thus, the results of this year's project resulted in the production of a baseline for tree condition under non-water stressed conditions but no measured effect of water stress.

Impact of accomplishments towards overall goals of funding:

As stated above, the major accomplishment of this year's funding was the quantification of no affect of mechanical harvesting when the trees are well watered and/or when low ET conditions exist. These results serve as a baseline for future water stress/tree condition experiments, both short-term and long-term, on mechanical harvesting affects on tree health. This information is very important to growers currently mechanically harvesting there fruit or considering the use of mechanical harvesting. The implication is that no short term damage is done to mechanically harvested trees that are well watered.

Presentations associated with 2009-10 efforts:

None

Publications from 2009-10 efforts:

Refereed: None

Non-refereed: None

Next steps:

This project was intended to be a test of mechanical citrus harvesting on short-term and long-term tree health. Growers have voiced concern for tree health when trees are not well watered prior to harvest. The first year indicated no adverse affect of mechanical harvesting of well watered tree and can be used as a baseline for future short- and long-term studies under higher ET and lower rainfall. This project should be continued for the next three to five years to address the impact of water stress on tree health of mechanically harvested trees.