

## Enhancement of Avocado Productivity II. Tree Phenology, Carbohydrate Cycling and Canopy Management

Continuing Project; Year 7 of 12

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### **Benefit to the Industry**

This project will supply the avocado industry with the necessary information to understand the growth and flowering behavior of the 'Hass' avocado under California conditions. The data generated from this project will aid the California grower in planning management strategies to maximize fruit productivity and help researchers examining the biology of the avocado. It is likely that an understanding of the carbohydrate status of 'Hass' avocado trees during successive seasons will lead to strategies for the control of alternate bearing. We are committed to making the data from this project available to the industry in a timely manner. Any data collected from this project will be available through the avocado home page (being developed through the breeding program) and other appropriate means.

### **Objectives**

- A. To collect information on root and shoot growth, flowering and fruit set, yield; and carbohydrate partitioning for 'Hass' on selected clonal rootstocks at the University of California (UC) South Coast Research and Extension Center (REC) in Irvine CA. This information will be correlated with meteorological data.
- B. To establish additional research sites throughout the California avocado industry to collect data pertaining to shoot and root growth, flowering, yield and carbohydrate cycling. Meteorological data will also be collected (air and soil temperature) and

correlated to the timing of phenological events.

- C. To collect comparative data on 'Lamb Hass' as compared to 'Hass' on Duke 7 with relation to phenological events and carbohydrate cycling at the UC South Coast REC. Expand this to include additional varieties if necessary.
- D. To collect comparative data on stumped (rejuvenated) 'Hass' trees as compared to non-stumped 'Hass' trees on Toro Canyon with relation to phenological events and carbohydrate cycling at the UC South Coast REC.
- E. To establish a girdling project in a commercial grove that can be examined over multiple years.
- F. To establish a program to examine the relationship of canopy management - light distribution and microclimate effects within an avocado tree to long term effects on productivity.

### Summary

- A. To collect information on root and shoot growth, flowering and fruit set, yield; and carbohydrate partitioning for 'Hass' on selected clonal rootstocks at the University of California (UC) South Coast Research and Extension Center (REC) in Irvine CA. This information will be correlated with meteorological data.**

We are working to summarize the data collected from 1992 through 1996 with the goal of incorporating an analysis of climactic data in the results from the original phenology site. The hope is that by factoring in minimum and maximum air and soil temperatures in conjunction with tree yield we may be able to more accurately interpret the data set. Once analyzed in a meaningful manner this information will be disseminated to the CA avocado community. Dr. Heinrich Schweitzer (Dept. of Entomology) is working on this aspect of the project and he has made some progress in developing a degree day model to predict the timing of peak bloom and the first vegetative flush.

We are continuing to work with Dr. Madore (using her laboratory facilities at UCR) to elucidate the pathways of synthesis and metabolism of D-mannoheptulose and perseitol. We are pursuing alternative funding sources to more adequately support this more basic research. Two manuscripts outlining the cycling of carbohydrates on a seasonal basis and during fruit development and ripening have recently been accepted by the Journal of the American Society for Horticultural Science.

- B. To establish additional research sites throughout the California avocado industry to collect data pertaining to shoot and root growth, flowering, yield and carbohydrate cycling. Meteorological data will also be collected (air and soil temperature) and correlated to the timing of phenological events.**

The project underwent a major restructuring during 1997. We expanded our area of study; growers throughout the state have given us permission to install satellite

phenology sites in 'Hass' groves in Temecula, Saticoy, Ojai, Carpinteria, Goleta, and Exeter. All sites with the exception of the Exeter and Goleta sites are 'Hass' on Duke 7. The Exeter site is 'Hass' on seedling Mexican rootstock. The Goleta site is 'Hass' on G6. There are a total of 30 rhizotrons at SCREC and 30 at the outlying sites. At all sites we are collecting data tri-weekly. Using a bloom developmental rating scale developed by Dr. Samuel Salazar-Garcia (student of Dr. Lovatt) we are tracking bloom at each site. We are also measuring shoot extension and periodically taking samples for carbohydrate analysis. Data on root extension, fruit growth, yield and tree size are also being collected. We have installed small weather stations at all sites. We are collecting data on air and soil temperature, relative humidity and solar radiation.

**C. To collect comparative data on 'Lamb Hass' as compared to 'Hass' on Duke 7 with relation to phenological events and carbohydrate cycling at the UC South Coast REC. Expand this to include additional varieties if necessary.**

In Field 42 at SCREC, 'Hass' on Duke 7 and 'Lamb Hass' on Duke 7 have been selected for comparison. As noted in the breeding program discussion we are initiating comparative physiology studies on these two cultivars. Dr. Liu is currently analyzing these samples.

**D. To collect comparative data on stumped (rejuvenated) 'Hass' trees as compared to non-stumped 'Hass' trees on Toro Canyon with relation to phenological events and carbohydrate cycling at the UC South Coast REC.**

We are using 'Hass' on Toro Canyon rootstock for this portion of the study. Ten rhizotrons have been installed, 5 each on rejuvenated and non-rejuvenated trees. As above, tree events are monitored in an effort to determine the effect that rejuvenation might have on root growth throughout the year. We will be terminating this objective in Spring 1999 and will be summarizing the data.

**E. To establish a girdling project in a commercial grove that can be examined over multiple years.**

We have established 2 girdling plots in a grove in De Luz Canyon. One plot consists of trees which were stumped in Winter/Spring 1997. The other plot consists of large 'Hass' trees that have not been pruned. Rather all trees were girdled in October 1997.

**F. To establish a program to examine the relationship of canopy management - light distribution and micro-climate effects within an avocado tree to long term effects on productivity.**

This portion of the project has been delayed due to equipment availability. We are continuing to collect net photosynthesis data of 'Hass' avocado under varying conditions. We will continue with this portion of the project as the proper equipment comes available.