Applying an Improved Heat Ratio Method Sap Flow Sensor to Almonds to Test Variation in Water Use between Nonpareil and Pollenizers

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PROJECT SUMMARY

Objectives:

Almond water use is difficult to measure, and thus key questions remain unanswered. Do Nonpareil and pollenizers use similar amounts of water? What is the timing of almond water use after irrigation? Previously, we have developed a new sap flow probe sensor that can be used to measure water use of many trees in experimental orchards. In the current project, we are:

- Validating that the sensor works well for almonds and determining the correct installation, orientation, and depth for the sensor,
- Applying the sensor in an orchard to assess water use in response to varying irrigation, such as during harvest, and extremes in evaporative demand, such as heat waves and wind events,
- Determining if Nonpareil and pollenizers require the same irrigation timing and amount. More specifically do tall varieties such as Aldrich and Nonpareil with more exposed canopies use different amounts of water compared to short varieties such as Winters and Monterey?
- Determining how sap flow sensors relate to other industry standards such as soil moisture sensors, CIMIS ETo and stem water potentials, and
- The long term goal is to develop the sensor as a tool that stakeholders can use to evaluate for entire orchards how water use is affected by production issues.

Background and Discussion:

Sap flow has had limited adoption due to high costs and commercialized sensors have narrow ranges of operation which are unable to measure the high range of rates of sap flow found in almonds (much greater than 20 inches of upward movement per hour).

A collaborator (Tom Buckley; U. Sydney, Australia) has developed an improved heat ratio sap flow sensor that is capable of measuring high sap flow rates, and thus can be used in almonds. In the last year, we have tested these sensors on mature almonds at an orchard at Nickels Estate, Colusa County.

In April 2016 42 sap flow probe sets were installed in twelve almond trees at three sites in the Pruning Trial at Nickels Estate. A selection of Nonpareil, Aldrich, Carmel and Monterrey trees were used to assess canopy geometry effects on water use. In addition, an array of soil moisture sensors and a weather station were installed to provide comparable data to using technologies. Stem water potentials were measured weekly for the growing season until harvest. Preliminary results:

1) The sap flow sensors functioned well throughout this period with minimal maintenance once installed.
2) Depth of installation and direction of installation (N, S, E, W) had an influence on the measured sap flow rates, specific depths and orientations are recommended.
3) The new technology allowed measurements over the entire range of sap flows for almonds.
4) Periodic drought was evident in both the sap flow sensors, soil moisture sensors, and water potentials, illustrating their use to determine plant water status.

The trial is ongoing over winter and through 2017.

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Project Cooperators and Personnel: Heather Vice, Tom Buckley, University of Sydney, Franz Niederholzer, UC ANR

For More Details, Visit

- Poster location 69, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2017) at Almonds.com/ResearchDatabase
- 2015 - 2016 Annual Reports CD (15-HORT21-Gilbert); or on the web (after January 2017) at Almonds.com/ResearchDatabase
- Related projects: 16-HORT1-Gradziel; 16-HORT22-Shackel (COC)