Determination of Root Distribution and Physiological Parameters of Nitrogen Uptake in Almonds to Optimize Fertigation Practices

Project Leader: Patrick Brown
Department of Plant Sciences, University of California, Davis, One Shields Ave., Davis, CA 95616
(530)752-0929; phbrown@ucdavis.edu

PROJECT SUMMARY

Objectives for current year:

- Determine almond root growth and phenology and characterize root distribution and activity as influenced by soil and tree nitrogen status.
- Determine almond root growth and phenology at sites representing a range of Californian almond growing conditions.
- Determination of the patterns and biological dynamics (K_m, V_{max}, C_{min}) of root nitrogen uptake and the relationship to tree phenology and demand.

Background and Discussion:

To optimize nutrient use efficiency in fertigated almond orchards it is essential that fertilizers injected into irrigation system are provided at the optimal concentration, time, and place to ensure that deposition patterns coincide with maximal root nutrient uptake. In order to optimize fertigation practices, information on the spatiotemporal distribution and activity of nutrients and roots in the soil profile, and knowledge of seasonal crop nutrient demand patterns is required. The overall goal is to use information derived from this project (root phenology and root uptake), with information from associated projects (tree demand and N movement in soils) to improve the design of fertigation systems and to optimize the application (volume, distribution pattern, rate, timing etc) of fertilizers.

The orchard is a high producing 13 year-old Nonpareil/Monterey planting located near McKittrick in Kern County. The existing experiments provide four years of individual tree data on yield, soil and plant water status, plant nutrient status, tree nutrient demand, and Et_0. The ongoing project has already established very clear differences in crop yield and nitrogen demand under different N rates, and represents an ideal field site for this root project.

The effect of N treatment on root growth and nitrogen uptake will be determined in trees which were placed under four N rate treatments in 2008.

The effect of fertigation technique (pulsed, continuous, drip, microjet) will be examined in a subset of trees which were placed under two fertilization techniques (main plot) and two irrigation methods (subplot) in 2010. In both experiments the effect of each treatment on root physiology, phenology and distribution is being determined using different root observation methods, such as minirhizotron images, in-growth core bags, coring samples, among others.

Project Cooperators and Personnel: Andres Olivos, UC Davis; Blake Sanden, UCCE - Kern County; Paramount Farming Company

For More Details, Visit

- Poster location 14, Session 2; or on the web (after January 2012) at AlmondBoard.com/AICposters
- Related projects: 11-HORT2-Brown; 11-HORT11/11A-Shackel/Sanden; 11-HORT13-Lampinen; 11-AIR2-Smart; 11-HORT15-Hopmans