Development of a Nutrient-Budget Approach and Optimization of Fertilizer Management in Almond

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PROJECT SUMMARY

Objectives:
- Determine how leaf-nutrient status varies across a range of representative orchards and environments.
- Determine how leaf-nutrient status varies within the canopy and within the year.
- Develop a phenology and yield-based nutrient model for almond.
- Develop fertilizer-response curves based on yield data and nutrient levels, and assess nutrient-use efficiency.
- Determine nutrient-use efficiency of selected commercially important fertilizer sources of nitrogen and potassium.
- Develop and promote new best management practices for nutrient use in almond.

Background and Discussion:
Optimal nutrition is essential to maintain the competitiveness of California's orchards and lies at the heart of a critical challenge for growers, in that successful and cost-effective fertilization entails both maximizing production and also meeting myriad environmental regulations.

In a 2007 survey conducted by the project researchers' growers indicated that the standard procedure of using July leaf sampling plus the University of California's "critical values" guidelines may not provide adequate guidance on nutrient management. That finding was the impetus for this multiyear, multidisciplinary, and multi-location project.

One of this project's principal goals is the systematic reexamination of both current leaf-sampling protocols and the application and interpretation of UC critical values. The other principal goal is to determine the response of almond to application rates, seasonal timing, and fertilizer sources of nitrogen and potassium. This will support the development of a phenology and yield-based nutrient model.

Data from 2008, 2009 and 2010 illustrate that nutrient concentrations and their variability depend on the nutrient sampled, sample type and sampling time. The patterns of nutrient change and accumulation, however, are sufficiently consistent to allow for July leaf N content (and likely other nutrients) to be well predicted with an April sampling. To validate and refine this new approach, we invite growers who have multiple samples in a single season to share their data with us.

The development of nutrient budget for California Almond is underway. Data clearly shows that 80% of the total N and 70% of the total K is accumulated in fruit by mid June. Yield and N concentration determine N demand which varies from 54- 70lb N in fruit for every 1000lb kernel yield. Mean fruit K removal is 80lb for 1000lb kernel yield.

A nitrogen use efficiency (NUE) of 75% has been achieved in these trials from an N rate of 275lb/ac in a 4000 lb orchard, representing one of the highest NUE's recorded in tree production. N losses through leaching and gaseous emission are very low in this orchard.

The results of these research activities will be incorporated into a nutrient-budget approach to develop an integrated set of science-based, sustainable and yield-oriented best management practices for nutrient management in almond.

For More Details, Visit
- Poster location 15, Exhibit Hall, Session 2; or on the web (after January 2012) at AlmondBoard.com/AICposters
- 2011 - 2012 Annual Report CD (10-PREC2-Brown); or on the web (after January 2012) at AlmondBoard.com/ResearchReports
- Related projects: 11-HORT11/11A-Shackel/Sanden; 11-HORT13-Lampinen; 11-AIR2-Smart; 11-HORT15-Hopmans ; 11-PREC5-Brown