

Drought Survival Strategies for Established Almond Orchards on Shallow Soil

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PROJECT SUMMARY

Objectives:

- Determine the second year carryover effects on almond production and tree survival at various levels of restricted irrigation. These include 0" (rainfed), 5" and 10" of water applied compared with fully irrigated control trees.
- Determine the second year carryover effects on almond production and tree survival of either reducing the tree canopy by 50% or treating it with kaolin (Surround) spray. Both treatments were done under non-irrigated (rainfed) conditions and kaolin sprays were also applied to treatments receiving 5" and 10" of water.
- Relate shoot growth and spur survival patterns in the different treatments to the carryover effects observed.

Background and Discussion:

California almond growers have been forced to contend with serious water shortages in the past, and future shortages are almost certain. Regulated water allocations remain contentious, and the state's collective thirst continues to mount.

This multiyear research project at the Nickels Soil Laboratory was designed to test various alternative strategies likely to enable established orchards situated on shallow soil to survive a one year drought, which was imposed in 2009. The trees were mature (19 years in 2009), and only irrigated with a single line drip system on a low water holding capacity soil for the life of the orchard. Hence, it was anticipated that this would represent an extreme drought stress experience.

"Survival" is the operative phrase, not just for the trees, but also for the grower's business. Previous almond research has focused on

almond production under various levels of irrigation, but not on what growers can do when faced with a single year of severe drought. The key questions being asked in this project were: 1) how severe does stress need to be to cause tree death/decline, 2) is tree survival improved by distributing a small amount of water over the season, 3) how long do yield carry-over effects last, and 4) do severe pruning and/or kaolin sprays in the drought year reduce the negative effects of drought?

In 2009, drought treatments ranged from no irrigation to normal irrigation. Accounting for water used from soil reserves, non-irrigated trees were able to survive on a total of 7.6" water, with some canopy dieback expressed over the following 3 years. However, the degree of canopy dieback in the most severe cases was less than 20%; hence the 50% reduction to tree canopy imposed by pruning was not an effective strategy. Soil moisture measurements showed water uptake to a depth of 10' during the drought year, indicating that even single line drip irrigated trees may establish a very deep root zone. Drought effects were reduced by even small amounts of seasonal applied water (3.6") applied gradually over the season, indicating that this is a reasonable approach to lessen the impacts of drought. Yield was more severely reduced by carryover effects (reduced bloom and set) in the year following drought, than effects in the drought year itself (reduced nut size and number). Yield substantially recovered in the second and third year following the drought, although a trend for lower yield with stress still remained.

Project Cooperators and Personnel: John Edstrom and Franz Niederholzer, UCCE - Colusa County; Allan Fulton, UCCE - Tehama County; Bruce Lampinen, UC Davis; Larry Schwankl, UC Kearney Agricultural Center; Carolyn DeBuse, UCCE - Solano and Yolo Counties

For More Details, Visit

- 2012.2013 Annual Report CD (12-HORT8-Shackel); or on the web (after January 2014) at www.almondboard.com/researchreports