Preliminary Studies of Adding Almond Hulls to a Producing Almond Orchard: Feasibility and Soil Health Impacts

Project Leader: David Doll
University of California Cooperative Extension – Merced County, 2145 Wardrobe Ave., Merced, CA 95341
(209) 385-7403, dadoll@ucdavis.edu

PROJECT SUMMARY

Objectives for current year:

1. Determine if almond hulls can be re-applied to orchard floors without impacting production practices,
2. Compare benefit of adding almond hulls to soils on soil health compared to other organic amendments (e.g. humic acids, liquid compost, gypsum, biochar).

Background and Discussion:

In 2015, the California almond industry produced approximately 1.872 billion pounds of almond kernels on an estimated 890,000 bearing acres of land (USDA-NASS, 2015). By-products from processing this crop include the hull and shell and account for 50% and 25% of the total fruit weight. When taken into account for total biomass removed from almond fields for the 1.872 billion pound crop of 2015, these percentages total an approximate 3.75 billion pounds of hulls and 1.872 billion pounds of almond shells. Common practice for almond hull use is to sell them to the dairy industry for feed. Based on crop production estimates, however, hull supply will outgrow dairy demand unless the dairy industry continues to grow within California. There are alternative uses of almond hulls. These include the use as a source for pyrolysis into biochar, co-generation of energy, source of sugar extract for ethanol production, and human food consumption. Each of these has their respective challenges, but it is unclear if any of them are economically feasible.

This study aims to explore how hulls interact with soils and determine the feasibility of application to an orchard as a soil amendment. This process of "in-field composting" could reduce nutrient loss that occurs during the composting process as well as increase organic matter.

Two trial locations were established in mature almond orchards in 2016: a micro-sprinkler irrigated clay-loam soil located near Le Grand and a single line drip irrigated sandy soil near Livingston. Six treatments were applied in the last week of April, including almond hulls chipped to 1/2", biochar, and compost blend, gypsum, two treatments of humic acid applied at 2 or 4 gallons/treated acre, and an untreated control. Hulls, gypsum, and biochar were applied once in late April. Humic acids were applied three times once every two weeks starting in late April. Every two weeks' soil infiltration, aggregate stability, microbial communities, and bulk density were sampled. At weeks five and ten soil samples were collected. Almond leaf tissue was collected in mid-July following the standard protocol.

Almond hulls applied in late April were degraded by harvest at both plots and did not impede operations. The Le Grand site had a more complete breakdown due to the larger irrigation wetting pattern. Leaf nutrient status did not differ across any of the treatments. Soil nutrient data is still being analyzed.

Results for the soil physical and microbial components are pending. Initial analysis found that total microbial activity within the hull treatment was higher at all sampling points at both locations in comparison to the control. Other treatments weren't as consistent. Other microbial nutrient cycling assays are still being processed.

Project Cooperators and Personnel:
Vivian Lopez and Andrew Ray, UCCE Merced; Amélie Gaudin, UC Davis

For More Details, Visit

- Poster location 56, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2017) at Almonds.com/ResearchDatabase
- Related project: 16-PREC-Brown