Developing Improved Strategies for Management of Replant Problems

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PROJECT SUMMARY

Objectives:

- Develop molecular diagnostics for prediction and characterization of RD.
- Optimize anaerobic soil disinfestation (ASD) for affordability and ease of commercial implementation.

Background and Discussion:

This project focuses on the biology and management of almond replant disease (RD), which is caused by a complex of soilborne microbes in successive plantings of *Prunus* species and can occur in the absence of plant pathogenic nematodes. RD suppresses root development, slowing tree growth, and reducing lifetime yield.

1) "*Develop molecular diagnostics for prediction and characterization of RD*", is using bioinformatic approaches to identify soil organisms that show up consistently in RD almond replant soils. Our current focus is on the identity (i.e., the "who is there") of the organisms and complexes associated with RD (can be explored in RNA and DNA samples), but we also will focus on gene expression (i.e., the "what are they doing") of the organisms and complexes associated with RD (best explored in RNA samples). We will address these "who is there" and "what are they doing" questions in root and soil samples collected from past, present, and future greenhouse and orchard replant trials. These samples include soils that reliably expressed almond RD and others that did not, and this contrast will help us employ bioinformatics approaches to identify organisms and activities that reliably correlate with RD.

2) "*Optimize anaerobic soil disinfestation (ASD) for affordability and ease of commercial implementation*" builds on previous years' research findings that ASD can be as effective as soil fumigation in preventing RD (determined in four almond replant trials at Kearney Research and Extension Center). ASD treatments involve amending soil with readily available carbon substrate(s) and keeping the soil moist while it is covered with clear plastic mulch, which raises soil temperature, retains moisture, and retards gas exchange. ASD can control populations of soilborne pathogens, but the treatments can be expensive and challenging to implement. Our research now focuses on reducing ASD expense and optimizing ASD implementation steps. This fall, with help from ABC and CDPR, we established three almond replant trials that, include: (i) tests of nine carbon substrates (rice bran, almond hull, almond shell, almond hull plus shell, grape pomace, olive pomace, tomato pomace, pistachio hull, and mustard seed meal; these substrates vary greatly in cost, and, if effective, may afford large ASD cost savings); (ii) examination of ASD treatment components (substrate, water, tarp) for relative importance in the ASD process (it may be possible to eliminate or reduce inputs of certain ASD components, and a better understanding of how the components work together is needed); and (iii) use of commercial orchard drip systems to deliver water needed for ASD (which would reduce costs and simplify ASD logistics). One of the trials, involving nine different ASD substrates, is based at Kearney Research and Extension Center, and the two remaining trials, both involving two different ASD substrates, are based in Kern County with Wonderful Orchards.

Project Cooperators and Personnel: Natalia Blackburn, Amisha Poret-Peterson, Hossein Gouran, and Holly Forbes, USDA-ARS, Davis, CA; Andreas Westphal and Tom Buzo, UC Riverside, Kearney Agricultural Center; Mohammad Yaghmour, Brent Holtz, and David Doll, UCCE

For More Details, Visit

- Poster location 85, Exhibit Hall A and B during conference; or on the web (after January 2017) at http://www.almonds.com/growers/resources/research-database
- 2015 - 2016 Annual Report CD (15-PATH1-Browne); or on the web (after January 2017) at http://www.almonds.com/growers/resources/research-database
- Related Projects: 16-AIR9-Doll; 16-AIR5-Gao/Doll; 16-HORT16-Aradhya/Ledbetter (COC); 16-PATH7-Duncan/Baumgartner (COC)