

Developing Improved Strategies for Management of Replant Problems

Project Leader: Greg Browne

USDA/ARS, Department of Plant Pathology, University of California, Davis, One Shields Ave, Davis, CA 95616, (530) 204-7281 gtbrowne@ucdavis.edu

PROJECT SUMMARY

Objectives:

- Determine the specific causal agents of Replant Disease (RD) and recent tree losses caused by *Phytophthora*
- Identify rootstocks with tolerance or resistance to RD and *Phytophthora*.
- Support approaches for managing RD without soil fumigation.

Background and Discussion:

This project addresses two key soilborne disease problems, replant disease (RD) and *Phytophthora* crown and root rot. RD commonly occurs when an almond orchard is replanted in loamy or sandy soil used previously for production of almonds or other stone fruits. The disease suppresses root development on young trees and thereby reduces the rate of canopy development and cumulative crop yield. RD is apparently caused by a poorly defined complex of soilborne microorganisms, and it is a separate and more widespread problem than root damage inflicted by nematodes. *Phytophthora* crown and root rot also affects many young orchards, but it can kill almond trees of any age. Species of *Phytophthora* inhabit the soil and can be carried on nursery stock and in rivers and canals.

RD can be prevented by soil fumigation, yet there are many environmental and economic reasons to reduce reliance on this practice. Developing non-fumigant approaches for RD management will require a relatively complete understanding of RD causes.

We are identifying causal agents of RD by collecting them from affected trees in replant soils and then testing them, individually and in combinations, for ability to reproduce the disease. This approach has implicated several species of *Pythium* (a fungus-like "watermold") and

Cylindrocarpon (a fungus) as RD pathogens in at least some almond replant soils. With help from the California Department of Pesticide Regulation (DPR) as well as the Almond Board, we are determining how widespread these and other RD pathogens are among almond replant soils.

Along with RD pathogens, we are testing *Trichoderma*, a fungus found abundantly on roots of healthy trees in fumigated plots, for its ability to suppress RD pathogens; this work is in early stages.

In the long-term, we think that rootstock improvement will provide the best foundation for control of the RD complex and *Phytophthora*. Among 22 commercially available rootstocks that we tested, peach x almond selections and some plum hybrids were more tolerant of the RD complex than peach selections; whereas only rootstocks with plum in their genetic background had good resistance to *Phytophthora*. We are broadening our rootstock evaluations in collaboration with geneticists C. Ledbetter and M. Aradhya.

In addition to our long-term work with RD etiology and rootstock testing, we are evaluating: 1) greenhouse-based RD bioassays for prediction of the need to fumigate before replanting; 2) anaerobic soil disinfestation (ASD), a promising pre-plant alternative to fumigation; and factorial combinations of deep soil ripping and sudan grass rotation for control of RD. Please visit with us for more information.

Growers that would like to partner in: 1) testing the RD prediction bioassay; 2) hosting a fumigation trial (both sponsored in large part by DPR); or 3) monitoring Phytophthora in almond are encouraged to contact their UC Farm Advisor and the principal investigator.

Project Cooperators and Personnel: Leigh Schmidt, USDA-ARS, Davis, CA; Mike Devengenzo and Ravi Bhat, University of California, Davis; and David Doll, UCCE - Merced County

For More Details, Visit

- Poster location 64, Exhibit Hall A and B during conference; or on the web (after January 2014) at www.almondboard.com/researchreports
- 2012.2013 Annual Report CD (12-PATH1-Browne); or on the web (after January 2014) at www.almondBoard.com/ResearchReports
- Related Projects: 12-HORT16-Aradhya/Ledbetter; 13-AIR9-Doll; 13-PATH7-Baumgartner