Developing Improved Strategies for Management of Replant Problems

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PROJECT SUMMARY

Objectives:

- Determine the biological causes of replant disease (RD).
- Develop improved management strategies for RD and diseases caused by *Phytophthora*.

Background and Overview:

Replant disease (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 complex of soilborne microorganisms, yet it is a separate problem from root damage inflicted by nematodes and root, crown, and scion diseases incited by *Phytophthora*.

RD can be prevented by soil fumigation, but there are reasons (e.g., environmental and economic) to reduce dependence on the practice. As the almond industry explores new rootstocks, it is important to determine susceptibilities of candidate rootstocks to the RD complex, nematodes, and other important pathogens, including *Phytophthora*.

Work in 2012 has included:
1) Microbial community analyses of RD;
2) Testing contributions to RD among species of *Cylindrocarpon* (a fungus), *Thielaviopsis* (fungus), and *Pythium* (an oomycete, similar to a fungus);
3) Developing bioassay methods to determine RD potential in soil samples and identify contributing organisms at different orchard sites;
4) Evaluating resistance to RD in new rootstocks for almond and stone fruits;
5) Assessing non-fumigant approaches to managing RD.

Our 2012 microbial analyses were conducted within a new rootstock trial. The work associated many *Pythium* species and several species of true fungi (e.g., *Cylindrocarpon Fusarium*, *Macrophomina* and others) with RD. We used DNA sequencing to identify the species. In 2012 greenhouse pathogenicity tests, species of *Cylindrocarpon*, *Thielaviopsis*, and *Pythium* caused root cortex necrosis and stunting, indications of their contributions to RD.

Factors that we optimized in the RD bioassay included: 1) methods to remove RD potential from soil (pasteurization or fumigation was superior to autoclaving); 2) orchard soil sampling depth (0.5 to 1 ft or 1 to 2 ft depths effective); 3) mixing ratio of field soil to sand (3:1 to 1:1 effective, improving drainage and retaining RD potential); 4) type of bioassay plant material (young seedlings best).

In our evaluations of 22 rootstocks for resistance to RD, we continued a 2011 trial and established a 2012 repeat of the trial. In both trials, peach x almond hybrids were less suppressed than most peach rootstocks by the absence of fumigation, and hybrid rootstocks with plum parentage varied from moderately susceptible to moderately resistant to the RD complex. Repeat evaluations of resistance to *Phytophthora* will be available in 2013 (initial results were reported in 2011).

Among non-fumigant methods orchard tested to remediate RD and other replant problems, Brassica seed meal application through a tree-site auger improved growth (trunk diameter) by 27%, while augering alone without the seed meal increased growth by 12%. Pre-plant fumigation increased growth by 47%. We also continued long-term evaluation of pre-plant fumigation treatments for management of replant problems.

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For More Details, Visit

- Poster location 12, Exhibit Hall A & B during conference; or on the web (after January 2013) at www.almondboard.com/researchreports
- 2011.2012 Annual Report CD (11.PATH1.Browne); or on the web (after January 2013) at www.almondBoard.com/ResearchReports
- Related Projects: 11.HORT16.Aradhya/Ledbetter; 12.AIR9.Doll; 12.PATH7.Baumgartner