Biology and Management of Almond Brown Rot, Jacket Rot, Shot Hole, Rust, and Hull Rot

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PROJECT SUMMARY

Objectives:

- Evaluate new fungicides and organic compounds, and develop efficacy data based on spectrum of activity, systemic action, and persistence for brown rot, jacket rot, shot hole, gray mold, rust, and hull rot.
- Establish baseline sensitivities of fungal pathogen populations against new fungicides and determine shifts in fungicide sensitivity.
- Evaluate almond genotype susceptibility to foliar diseases that develop naturally in the almond variety orchard at UC Davis (UCD) under simulated rainfall.
- Seek cultural practices and fungicide treatments for reducing hull rot.

Background and Discussion:

A range of fungal pathogens infecting leaves and fruits can negatively affect tree health and/or yield of almond in California. This project is a continuing effort to develop a wide range of approaches for almond growers to control plant diseases.

We are assessing the efficacy of new and existing fungicides, as well as natural products and biocontrols. We are conducting studies on resistance development to better understand the biology of the fungi and their interactions with the trees, to improve disease prediction tools, as well as breeding almond trees with resistance to the diseases.

Highly effective single-fungicides and pre-mixtures were identified for the management of brown rot blossom blight, gray mold, shot hole, rust, and hull rot. DMIs (FRAC 3), APs (FRAC 9), SDHIs (FRAC 7), and QoIs (FRAC 11) continued to perform well against brown rot blossom blight, whereas pre-mixtures of FRAC 7+11, 3+11, or 3+9 were also very effective against shot hole. Additionally, rotation programs that include the FRAC U12 dodine reduced shot hole to very low levels.

In surveys of several orchards where AP fungicides were applied by air and disease levels were high, we found that 20% of the isolates of *Monilinia laxa* were resistant to AP fungicides such as cyprodonil and pyrimethanil. A high potential for resistance occurs with over-usage of this mode of action and therefore, resistance management approaches should be strictly followed and include rotation, mixtures, and application that does not compromise coverage and residues.

Resistance to date has not been found in almond populations of *M. laxa* (brown rot) to other fungicide classes or of *Botrytis cinerea* (gray mold), *Wilsonomyces carpophilus* (shot hole), or *Rhizopus stolonifer* (hull rot) against any class. Resistance is common in *Cladosporium carpophilum* (scab) and *Alternaria* spp. against the QoI class of fungicides and in *Alternaria* spp. against the SDHI class of fungicides.

In hull rot studies, applications with FRAC 3, 19, 3+11, 3+7, or 3+11 compounds at early suture or early hull split were more effective when the disease was caused by *R. stolonifer*. When hull rot was mostly caused by *M. fructicola*, earlier timings (i.e., early June) were more effective than timings used for Rhizopus hull rot.

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