

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

**Project Leader: J. E. Adaskaveg**

Department of Plant Pathology and Microbiology, University of California, Riverside, CA 92521  
(951) 827-7577 jim.adaskaveg@ucr.edu

## PROJECT SUMMARY

### Objectives:

- Evaluate new fungicides and organic compounds 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 pathogens against new fungicides and determine shifts in fungicide sensitivity.
- Evaluate almond genotype susceptibility to foliar diseases that develop naturally in the almond variety trial at UC Davis under simulated rainfall.

### Background and Discussion:

In 2014-15, we evaluated new treatments for major foliar and fruit diseases of almond in California. We continue to identify highly effective single-fungicides and pre-mixtures. Fungicides used belong to the classes of DMI, SDHI, AP, QoI, polyoxin, phosphonate, isophthalo-nitrile, and guanidine (FRAC 3, 7, 9, 11, 19, 33, M5, U12, respectively). Additionally, new experimental single-ingredient (EXP-1) and pre-mixture (EXP-2, EXP-3) fungicides were used. No new biological natural products were available for these trials.

A major aspect of our studies always is to design disease management programs that will reduce the risk of resistance development in pathogen populations. Therefore, treatments were also evaluated in selected rotation programs. Although FRAC 7 fungicides (boscalid, isofetamid, fluopyram, fluxapyroxad, penthiopyrad) belong to three sub-groups that differ in their target binding site and are thought to exhibit reduced cross-resistance, they should still be rotated with other FRAC groups because the target site (i.e., succinate dehydrogenase) is the same. Furthermore, we continue to expand our database on baseline sensitivities and we monitor the sensitivity of pathogen populations at orchard

sites where a reduction of fungicide efficacy is reported.

For management of brown rot and gray mold, several FRAC groups, pre-mixtures, and rotation programs provided excellent disease control. Among registered compounds, FRAC 3/7 Luna Experience and FRAC 7/11 Luna Sensation were highly effective. The experimental treatments EXP-1, -2, -3 gave very promising results. The incidence of shot hole was very low at our trials sites in 2015. A new variety block was established at UC Davis for evaluation of disease susceptibility and will be available in coming years. Varieties planted correspond with those in new variety orchards established by UCCE in several counties.

With respect to hull rot, we confirmed previous studies that the disease can be managed with a single application during early hull split if *R. stolonifer* is the primary pathogen. If *Monilinia* species are also involved, applications should be done earlier (e.g., early to mid-June). Because the pathogen population causing hull rot is generally not known for a particular orchard site, a two-spray program with one treatment in early/mid-June and another one at early hull split is recommended. The most effective treatments include fungicides in FRAC 3/7, 3/9, 7/11, 3/11, and 3+19. In trials where alkalizing treatments were applied to possibly neutralize phytotoxic fumaric acid that is produced by *R. stolonifer*, lime, bicarbonate, alkaline fertilizer significantly reduced the disease, but there was no additive effect when applied together with a fungicide. For the most effective integrated management of hull rot, fungicides should be used together with proper water management (i.e., deficit irrigation) and proper, not excessive, nitrogen fertilization.

**Project Cooperators and Personnel:** D. Thompson, H. Förster, Y. Luo, S. Haack, D. Cary, UC Riverside; T. Gradziel, UC Davis; R. Duncan, UCCE - Stanislaus County; B. Holtz, UCCE - San Joaquin County; L. Wade, Arysta LifeScience

### For More Details, Visit

- Poster location 25 and 26, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2016) at [Almonds.com/ResearchDatabase](http://Almonds.com/ResearchDatabase)
- 2014 - 2015 Annual Reports CD (14-PATH4-Adaskaveg); or on the web (after January 2016) at [Almonds.com/ResearchDatabase](http://Almonds.com/ResearchDatabase)