

# 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 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.

### Background and Discussion:

In 2016-17, we evaluated new treatments against major foliar and fruit diseases of almond in California in field and laboratory studies. New fungicides evaluated included two new QoI - FRAC Code (FC) 11 compounds (i.e., Intuity - mandestrobin and Aproach - picoxystrobin), the FC 7 compounds pyraziflumid and pydiflumetofen, the single-active ingredient treatment UC-1 (FC not disclosed), and the premixtures pydiflumetofen + difenoconazole, UC-2, and IL-5412. The new experimental natural product WXF-16001, two MBI formulations, as well as Botector and Fracture were also evaluated.

Fungicide stewardship is essential to maintain the effectiveness of registered products and prevent the selection and build-up of resistant pathogen populations by applying fungicides in rotation or mixture programs. Although FC 7 fungicides (e.g., boscalid, fluopyram, fluxapyroxad, isofetamid, penthiopyrad) belong to three sub-groups that differ in their binding affinity they still target the same site (i.e., succinate dehydrogenase) and should be rotated with other FCs. Furthermore, we continue to expand our database on baseline sensitivities and we monitor the sensitivity of pathogen populations in selected orchard sites. For brown rot management on cv. Drake, most of the single- and pre-mixture-fungicides and rotation programs

provided excellent disease control under high disease pressure (66 shoot infections/tree in the untreated control), Inspire, Luna products, Merivon, and the experimentals UC-2 and IL-5412 were among the best treatments. On cv. Sonora, Botector, Fracture, and MBI products were effective under lower disease pressure. On cv. Wood Colony, Botector significantly reduced brown rot from the untreated control, whereas the most effective treatment was UC-1. For gray mold, the lowest levels of disease on cv. Drake were obtained using Helmstar (tebuconazole + azoxystrobin, FC 3/11), followed by Inspire, Luna Experience, Merivon, and experimentals UC-1, UC-2, IL-5412, IL-5414, pydiflumetofen, and pydiflumetofen/difenoconazole.

Studies on the management of hull rot caused by *Rhizopus stolonifer* resulted in disease reductions of 50% to 75% on cvs. Nonpareil and Monterey with a single fungicide application at early hull split. The most effective treatments included fungicides in FC 3/7, 3/9, 7/11, 3/11, and 3+19. Fungicides or possibly K<sub>2</sub>HPO<sub>4</sub> should be used together with proper water management (i.e., deficit irrigation) and proper nitrogen fertilization (60 days prior to hull split). In baseline sensitivity studies with *R. stolonifer*, the most active fungicides were FC 11 followed by FC 3 and FC 7 which had the widest range of sensitivities. The alkaline foliar fertilizer Di-K phosphate can be as effective as fungicides in disease control without any phytotoxicity, but there was no additive effect when applied together with fungicides. These treatments neutralize fumaric acid produced by the hull rot pathogens that is considered responsible for the dieback symptoms even in the following season.

Natural host resistance data were obtained for brown rot, shot hole, and scab (pending) for 23 varieties or genotypes in the spring of 2017. The rankings are presented in the annual report.

**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 74, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at [Almonds.com/ResearchDatabase](http://Almonds.com/ResearchDatabase)
- 2016 - 2017 Annual Reports (16-PATH4-Adaskaveg) on the web at [Almonds.com/ResearchDatabase](http://Almonds.com/ResearchDatabase)