Epidemiology and Management of Phytophthora Root and Crown Rot of Almond in California

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PROJECT SUMMARY

Objectives:

- Evaluate the-based in vitro toxicity of new fungicides against *P. cactorum* and *P. niederhauseri*
- Evaluate new fungicides for the management of almond root health in greenhouse and field studies and compare to the registered mefenoxam and potassium phosphite.
- Evaluate for phytotoxicity and plant growth improvement

Background and Discussion:

Phytophthora root rot and crown rot of almond can be caused by several species of *Phytophthora* including *P. cactorum, P. cryptogea*, *P. megasperma*, and the recently described *P. niederhauseri* that is present at high incidence at some locations. The disease is widely distributed and may cause high losses in newly planted orchards. The severity and rate of disease development depends in part on the rootstock and the species of *Phytophthora* involved, but the disease is most severe in soils with poor drainage that are waterlogged. Depending on the species, *Phytophthora* spp. survive as oospores, chlamydospores, and/or hyphae in plant debris in the soil. Under proper conditions, hyphae start growing or chlamydospores and oospores germinate to produce sporangia that contain zoospores - the main infective propagules. The zoospores are motile in water, they are attracted by plant exudates, and infect feeder roots and crown tissues.

Management of Phytophthora diseases includes the use of tolerant rootstocks, irrigation management, and the use of mefenoxam or phosphonate (e.g., potassium phosphite, fosetyl-Al) fungicides. Several new fungicides including mandipropamid (Revus), fluopicolide (Presidio), ethaboxam, and oxathiapiprolin (Orondis) with high activity against *Phytophthora* species have recently become available. These fungicides all have different modes of action (belong to different FRAC Codes), and their potential usage on almond will allow for possibly better disease control and fungicide resistance management. Respective registrants support registration on almond. The effectiveness of these fungicides for the management of Phytophthora diseases of almond is being evaluated in comparison to mefenoxam and potassium phosphite in greenhouse and field studies.

In initial lab-based in vitro assays, activity of the new fungicides against Phytophthora species was generally much higher as compared to the previously registered mefenoxam and phosphonate (e.g., fosetyl-al, potassium phosphite) fungicides. Oxathiapiprolin has high activity at extremely low usage rates. In field studies in an experimental orchard planted in 2016, the incidence of crown rot in the untreated control was 16.3% after the first year. Trees showed typical symptoms with profuse gumming at the base of the trunks and showed reduced vigor or even died. The incidence of disease for the Ridomil Gold (1 pt/A) and Presidio treatments was not significantly different from the untreated control. Ethaboxam, Prophyt, and Revus treatments were intermediate in their performance, whereas Presidio+Ethaboxam and all Orondis treatments showed the highest efficacy. Both Orondis rates had 0% incidence of crown rot.

In other crops, phosphonate resistance has been reported to *Phytophthora* species. With widespread and in discriminant usage of phosphite products (fungicides and fertilizer blends), resistance may also develop in *Phytophthora* populations on almond. Furthermore, phosphite residues may remain a problem with some trading partners because of potentially high residues from over-usage. Although phosphite is exempt from tolerance in the US, maximum residue limits (MRLs) have been or will be established by other international regulatory agencies. The new fungicides under evaluation in this study will have international MRLs established and should be commercially available in 2019, as well, tree nut MRLs should be available then for phosphonates.

Project Cooperators and Personnel: H. Förster, D. Thompson, W. Hao, and D. Cary, UC Riverside, F. Trouillas (UC-KARE), and D. Doll (UCCE Merced Co.).

For More Details, Visit

- Poster location 71, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at Almonds.com/Research Database
- 2016 - 2017 Annual Reports (16-PATH15-Adaskaveg-Browne) on the web at Almonds.com/Research Database