Biology and Management of Bacterial Spot of Almond in California

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PROJECT SUMMARY

Objectives:

- Determine distribution of bacterial spot in California almond orchards and genetic variability of pathogen populations
  - Collection of almond fruit with bacterial spot from several almond growing areas
  - Isolation and identification of *Xanthomonas arboricola* pv. *pruni* (*Xap*)
  - Determination of the genetic variability by molecular methods
- Determine lab-based in vitro sensitivity of *Xap* against copper, mancozeb, antibiotics and selected biologicals
  - Selected materials will be evaluated
- Develop field management programs for bacterial spot
  - Dormant applications in late fall or winter
  - Spring-time applications with copper, antibiotics, mixtures of copper-mancozeb, and biologicals

Background and Discussion:

Bacterial spot of almond caused by *Xanthomonas arboricola* pv. *pruni* (*Xap)* is a new economically important disease in California. The bacterium requires wetness for infection, while temperature drives the rate of development. The disease has been observed mainly on cv. Fritz in many northern counties as well as in the last two seasons in Butte and Kern Co. Low levels of disease have been observed on cvs. Nonpareil, Butte, Carmel, NePlus Ultra, and Price. In 2017 with increased spring rainfall, the disease was present at numerous locations and in orchards with high-angle sprinklers. The pathogen was isolated from overwintering symptomatic fruit mummies, but also from spurs, healthy flower buds, and emerging leaves that were near mummies. Thus, mummies and spurs are the primary inoculum sources with rain splash spreading inoculum to newly emerging tissues. From Dec. 2016 to June 2017, mummies contained viable inoculum, but twig cankers have not been found. Inoculations of flowers and early- to late-fruit developmental stages indicated that all these stages are susceptible, but fruit inoculations resulted in the most disease.

Baseline sensitivity levels to a new copper enhancing product, SBH, in the presence of 10 ppm MCE was determined for 72 *Xap* strains. The average minimum inhibitory concentration (MIC) was 0.31 ppm with a range from 0.15 to 0.94 ppm. The average lowest inhibitory concentration (LIC) mean was 0.07 ppm with a range from 0.03 to 0.14 ppm. SBH by itself had a MIC >90 ppm. Sensitivities of these isolates to mancozeb, oxytetracycline, kasugamycin, and copper mixtures were previously reported, and lab-based in vitro sensitivities to the experimental bactericides ATD and ZTD are pending. No copper resistance was detected during surveys in pathogen populations from 2015 to 2017.

Field trials on the management of the disease were conducted in 2016/2017. Early and delayed dormant applications (applied in Dec. or Jan.) of copper-mancozeb resulted in a significant reduction of bacterial spot from that in the untreated control. In-season treatments, that started at full bloom or petal fall significantly, reduced the disease to low levels when timed before warm temperatures and rain. The most effective and consistent treatments included copper (e.g., Badge X2, ChampION^{++}) mixed with mancozeb, kasugamycin, copper enhancers (e.g., ZTD, SBH), or oxytetracycline. In 2017, only minor copper phytotoxicity was observed on leaves probably due to high spring rainfall that removed some of the copper residues.

In an organic product trial, Serenade Opti mixed with sugar as a nutrient source for the biocontrol agent was an effective treatment under relatively high disease pressure.

The most effective management program likely will include a delayed dormant bactericide application and at least one or two in-season applications from bloom to petal fall around rainfall events and warm temperatures to prevent new infections.

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For More Details, Visit

- Poster location 72, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at Almonds.com/ResearchDatabase
- 2016 - 2017 Annual Reports (16-PATH5-Adaskaveg) on the web at Almonds.com/ResearchDatabase