



EPIDEMIOLOGY AND MANAGEMENT OF WALNUT BLIGHT

PROJECT LEADER: Jim Adaskaveg
Department of Microbiology and Plant Pathology, UC Riverside

COLLABORATORS: H. Förster, D. Thompson, D. Cary, A. Shands, P. Brown, C. Leslie, A. Dandekar, and R. De A. B. Assis

Project status in 2024: Year 1 of 3

PROJECT OBJECTIVES:

1. Evaluate natural host resistance to walnut blight new of walnut genotypes from the UC Davis Walnut Breeding Program
2. Monitor changes in sensitivity to copper, mancozeb, and kasugamycin of walnut blight pathogen populations in commercial walnut orchards using molecular methods and culturing
3. Evaluate the effectiveness of new formulations of copper and alternative copper- and non-copper-based materials for managing walnut blight using laboratory assays and field trials in experimental and commercial orchards, including:
 - Testing new copper formulations (Cueva, MasterCop, CS-2005) in mixtures with other products.
 - Supporting the registration of oxytetracycline (e.g., FireLine)
 - Use of low rates of dodine (Syllit- 16 fl oz) in mixtures with products containing high and low concentrations of soluble and fixed coppers or other bactericides (e.g., kasugamycin, oxytetracycline)
 - Evaluation of new biologicals and natural products and develop new bactericides based on mixtures of natural products (i.e., nisin, EPL, cinnamon oil - Cinnerate, cinnamaldehyde-Seican, JAX, QAM) in conjunction with registrants such as UPL, Summit Agro, and Sym-Agro.

KEY FINDINGS

In 2024, we continued to cooperate with the UCD walnut breeding program in an effort to develop cultivars with favorable horticultural characteristics (e.g., high yield and nut quality, good tree architecture) that also are blight resistant. Eighteen genotypes that for 3 years consistently did not support the survival of Xaj in female buds in our inoculation studies and had a low incidence of fruit infections were propagated and inter-planted with the highly susceptible cultivars Vina and Ashley in a high-density orchard at the UCD Plant Pathology Field station. Overhead irrigation will be installed

in early 2025 to provide favorable disease conditions, and disease will be evaluated in the coming years.

In ongoing genetic studies, whole-genome sequencing of 120 strains of Xaj from California and population structure analyses identified high variability with six primary genetic clusters. There was no clear correlation between cluster assignment and geographic origin (i.e., county) of the strains. Genomic analyses revealed four DNA regions encoding genes related to copper-resistance, and their presence will be correlated with levels of copper resistance of each isolate.

For blight management, field studies were conducted under favorable conditions for disease (moderate rainfall, moderate temperatures) in the spring of 2024. We demonstrated again that copper use per acre can be reduced when half rates of a copper hydroxide product are mixed with a copper sulfate pentahydrate product (e.g., CS-2005, MasterCop). This mixture provides fast-acting free copper ions and a residual reservoir of fixed copper that will gradually solubilize under wet conditions. Mancozeb is facing potential MRL cancellations in some export countries, and dodine (Syllit; registered on walnut in 2021) continued to be an effective alternative in mixtures with copper even when used at only 16 fl oz. A Kasumin mixed with copper was among the best treatments at a commercial trial site, but mixtures with copper or mancozeb were also effective. The 8L formulation of Kasumin that was used in our 2024 studies possibly can be registered as an organic treatment because the formulation inert ingredients are all organically approved in contrast to the 2L formulation. Therefore, the evaluation of Kasumin 8L will be continued. Our research has indicated that Kasumin when properly mixed with other MOAs and applied, can be highly effective and will be best used in rotations. Oxytetracycline (FireLine) mixed with Syllit provided intermediate efficacy. Oxytetracycline GLP residue studies were submitted by IR-4 to the registrant for submission to EPA in 2020, and registration of FireLine is pending, with no more PRIA dates being provided since 3/2024. Thus, EPA continues to delay registrations and prioritizes Endangered Species Act issues. Among biologicals, the biocontrol Blossom Protect performed with moderate efficacy at the three trial sites, and the new YSY (a yeast biocontrol) was also effective. Efficacy of the newly formulated JAX (A+B) (EPL + cinnamaldehyde) ranged from high to moderate, and when mixed with the Acacia sp. extract QAM, efficacy was improved. Formulation of this potentially organic treatment is ongoing with the registrant and for this, consistently active source materials were identified. The experimental GWN 12116 performed moderately when used at a reduced rate in 2024, but phytotoxicity was still noticeable. Other promising treatments identified in 2024 are the bacterial metabolite RAA and the sanitizer VirusShield (chlorine dioxide). RAA is currently in the organic registration process for bacterial diseases on several crops. VirusShield is already organically approved, and the formulation is essentially odor-free, but it has a short residual activity. These results indicate that alternatives to copper are available, but it needs to be determined if commercially acceptable disease control can be consistently obtained.