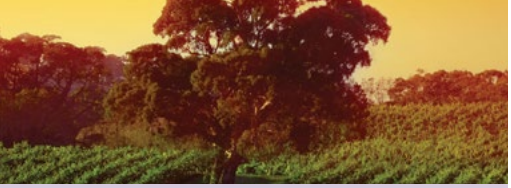

CALIFORNIA
PD/GWSS BOARD
Partnership for Winegrape Pest Solutions

SPRING 2021

bulletin

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

INSIDE THIS ISSUE

Field Trials Show Promising Results for Three Solutions to Pierce's Disease

Extensive research efforts supported by the Pierce's Disease and Glassy-winged Sharpshooter (PD/GWSS) Board have delivered many potential solutions to PD that have moved from laboratory to field trials. The three different projects highlighted below may lead to commercial applications that could ease the statewide threat of PD.

"When we launched this research program, we dreamed of the day that Pierce's disease didn't mean a death sentence for grapevines," said Steve McIntyre, research screening committee chair for the PD/GWSS Board. "It's exciting that we have not one, but many different techniques to fight PD showing impressive results outside of the laboratory and are that much closer to growers' hands."

A yearly spray application of *Paraburkholderia phytofirmans* should provide substantial protection against Pierce's disease

Using a Bacterium for Biological Control

Project leader: Steve Lindow, UC Berkeley

A biological control agent, a strain of the bacterium *Paraburkholderia phytofirmans*, clears *Xylella fastidiosa (Xf)* from grapevines when applied before or after infection. Field studies show that a spray application is more effective than direct inoculation. Findings suggest that a yearly spray application early in the growing season, about four weeks after leaf emergence, should provide substantial protection against PD. The product registration and commercialization process are expected to take a few years.

Watch a video about the project at bit.ly/3a6LD7X.

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Five Pierce's disease-resistant winegrapes, developed by Dr. Walker, are available for purchase

Breeding PD-resistant Winegrapes

Project leader: Andrew Walker, UC Davis

Techniques to expedite the traditional breeding process have produced four backcross generations with *Vitis vinifera* winegrape cultivars in 10 years and over 2,000 PD-resistant progeny that are 97% *V. vinifera*. The best of these have been field tested with commercial-scale wine production and show no sign of PD in any of the vineyards. To date 20 scion and five rootstocks have been advanced to Foundation Plant Services for certification. There are five selections available for purchase, with 19,500 vines sold in 2020. Visit fps.ucdavis.edu for purchasing information. Selections resistant to both PD and powdery mildew are also being developed.

Field trial of Chardonnay scions grafted onto Pierce's disease-resistant modified rootstocks

Cross-graft Protection with Transgenic Grape Rootstocks

Project leader: David Gilchrist, UC Davis

Earlier experiments yielded five different DNA constructs, referred to as stacked genes, that protect grapevines against PD. This current field experiment is testing potential cross-graft protection of PD-susceptible Chardonnay scions grafted to two modified rootstocks (1103 and 101-14) that expressed paired combinations of the five transgenes. Plants are managed to commercial standards and have been inoculated with *Xf,* and PD symptoms, bacterial movement, and fruit yield are evaluated annually.

*Research reports for projects funded by the PD/*GWSS *Board, including the field trials highlighted in this article, are available online at piercesdisease.cdfa.ca.gov.*

PD/GWSS Board Welcomes New Members

The PD/GWSS Board, made up of 15 representatives from the winegrape industry around the state, provides the California Department of Food and Agriculture with an important perspective on the use of funds collected under the PD/GWSS winegrape assessment.

Two new members joined the Board in 2021:

- Kendall Hoxsey-Onysko, Yount Mill Vineyards, representing the North Coast
- Seth Schwebs, Constellation Brands, representing the Central Valley

The term for the Board's current slate of officers has been extended through January 2022:

- Chair: Domonic Rossini, Fratello Farming, representing the Central Valley
- Vice Chair: William Drayton, Treasury Wine Estates, representing the North Coast
- Treasurer: Randy Heinzen, Vineyard Professional Services, representing the Central Coast

View the full member roster at bit.ly/3daBvwU.

on the RESEARCH FRONT

CALIFORNIA PD/GWSS BOARD

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New plants received from Duarte Nurseries for inclusion in the study

Geographic Distribution of Isolate Virulence in *Xylella fastidiosa (Xf)* Collected from Grape in California and its Effect on Host Resistance

Project leaders: Rachel P. Naegele, USDA, ARS and Leonardo De La Fuente, Auburn University

This project looks at the virulence difference among strains of *Xf* in California to aid breeders in developing resistant cultivars. Virulence diversity among *Xf* strains is evident in both tobacco and grape. Based on the team's grape greenhouse study, it appears that some sources of resistance (8909-08 from *Vitis arizonica*) are durable to multiple strains of *Xf*. Other varieties, IAC572 and Tampa (from *V. aestivalus* and *V. carabeae*, respectively), appear to be more variable in their response to *Xf* and should be used in breeding to buffer resistance, but not as a sole source. Read more at bit.ly/3cQFCg5.

Effect of Grapevine Red Blotch Disease on Flavor and Flavor Precursor Formation in the Grape and on Wine Quality

Project leaders: Michael Qian and Alexander D. Levin, Oregon State University

Berry maturity parameters, wine anthocyanins, phenolics, and flavor profiles are being investigated. So far, red blotch infected grapes have had lower levels of total soluble solids, and wines showed lower total phenolic content compared to wine from non-infected grapes. Most volatile compounds of wines from red blotch positive and red blotch negative grapes were not significantly different. Irrigation treatments did impact wine aroma, as well as anthocyanin and phenolic compounds. Wines from the wet treatment had higher concentrations of isoamyl acetate than those from the dry treatment. Read more at bit.ly/38UsiWP.

Symptoms of grapevine red blotch disease

Symptoms of grapevine leafroll-associated viruses

A Study on the Impact of Individual and Mixed Leafroll Infections on the Metabolism of Ripening Winegrape Berries

Project leaders: Dario Cantu, Maher Al Rwahnih, Susan Ebeler, and Deborah Golino, UC Davis

The team is investigating the impact of individual and combinations of Grapevine Leafroll-associated Viruses (GLRaVs) on ripening in Cabernet Franc grapevines to help develop mitigation strategies. Different virus combinations and rootstocks were used because infections have shown a wide range of symptoms of varying severities. Significant differences in sugar accumulation, hormone abundance, gene expression, and gene co-expression have been observed. Read more at bit.ly/3vGBcRG.

The CDFA PD/GWSS Board partners with other organizations to leverage funding for research and outreach projects. Funding partners include the American Vineyard Foundation, the Consolidated Central Valley Table Grape Pest and Disease Control District, the USDA Agricultural Research Service, and other organizations.

Is Insecticide Resistance Growing Among Glassy-Winged Sharpshooters?

Systemic imidacloprid treatments have been central to management of GWSS in citrus, grapes, and commercial nursery operations. Staying ahead of shifts in GWSS insecticide resistance is crucial to protecting the region's agriculture.

Spraying at a nursery in Riverside

Researchers from UC Riverside, led by Richard Redak, Bradley White, and Frank Byrne, investigated insecticide resistance in GWSS to chemicals in the neonicotinoid, pyrethroid, and carbamate classes of insecticides. They also evaluated resistance in various GWSS populations that have undergone different levels of chemical control in grapes, citrus, commercial nursery, and urban environments.

The area-wide treatment program's combination of seasonal foliar pyrethroid or carbamate treatments with systemic imidacloprid (neonicotinoid) treatments has effectively managed GWSS populations in Kern County throughout most of the 2000s. But populations have been steadily increasing over the last 10 years, with dramatic upticks over the last two years.

Substantial differences in response to imidacloprid were seen between populations collected in citrus groves in Kern, Tulare and Riverside counties. Imidacloprid resistance is widespread in areas east of Bakersfield and increasing in Tulare, while GWSS in Temecula remain susceptible. Data suggest that imidacloprid resistance confers cross resistance to acetamiprid (neonicotinoid) and mild cross resistance to fenpropathrin (pyrethroid), while thiamethoxam (neonicotinoid) remains effective. Fenpropathrin remains effective against GWSS in General Beale, while the population has shown a modest shift in susceptibility to flupyradifurone.

Historically, imidacloprid resistance appears to be directly related to usage, with the highest levels of resistance occurring in populations receiving conventional insecticide treatments. GWSS populations collected from organic citrus are also showing resistance to imidacloprid, indicating movement of resistant insects from conventional groves. With fewer products available for organic citrus pest management, this could have a serious impact on pest management in organic orchards.

Monitoring insecticide resistance among GWSS populations for any shifts in tolerance is essential.