CALIFORNIA PD/GWSS BOARD
Partnership for Winegrape Pest Solutions

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cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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Pierce's Disease-Resistant Vines Get Put to Work

While researchers continue to field trial several promising treatments for Pierce's disease (PD), growers facing disease pressure in riparian areas and places with high populations of the glassy-winged sharpshooter (GWSS) already have a powerful tool at their disposal: PD-resistant winegrapes.

Pierce's disease-resistant Errante Noir.
Photo credit: Novavine Grapevine Nursery

"The creation of PD-resistant grapevines that produce quality wine is a huge accomplishment," said Dr. Kristin Lowe, Pierce's Disease/Glassy-winged Sharpshooter Board research coordinator, who hopes to see more people using them. "I encourage growers to talk to colleagues using the vines in their vineyards and their wine portfolio so they can overcome any hesitations they might have about planting them."

The PD-resistant grapevines, three red and two white varieties, were developed by Dr. Andrew Walker at the University of California, Davis through traditional breeding methods over the past 20 years with funding from the PD/GWSS Board. The grapevines were created for growers experiencing PD pressure, giving growers an option for establishing healthy, long-term blocks in problem areas. The varieties were meticulously selected with high wine quality in mind but could also serve as blending varietals if name recognition is an important marketing factor. For profiles of the PD-resistant grapevines, visit bit.ly/3DptVsk.

Novavine Grapevine Nursery, one of several nurseries selling the PD-resistant grapevines, is selling out of their stock of the vines every year, with about 90 percent going to growers in Texas and 10 percent going to growers in California. Jeff Wheeler, Novavine Grapevine Nursery's agronomist, expects interest to increase in California as more growers become familiar with the vines and their selling points, and taste the wine. Not only do the vines stay alive, but they don't act as a reservoir for PD which keeps the deadly disease from spreading in vineyards.

"I tell all the growers I talk to about these PD-resistant vines that they look like, act like, and taste like *Vitis vinifera*. For growers looking to keep land super productive in the face

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of PD pressures, planting these PD-resistant winegrapes is the most sustainable option for how they're going to do it," said Wheeler.

Cain Vineyard and Winery on Spring Mountain in St. Helena fits just that bill. Vineyard Manager Ashley Anderson Bennett was dismayed to see PD spread more in their hillside in the early 2010s. At this site, proximity to a riparian area was not to blame, as vines in the middle of the blocks showed PD symptoms. Another oddity was the absence of blue-green sharpshooters in traps. After some serious bug hunting and thorough studies, researchers confirmed Anderson Bennett's suspicion that spittlebugs were the culprit. The research teams also investigated different control and treatment options, with the removal of all spittlebug host plants outside and inside the vineyard being the best option for the organic vineyard. But this strategy isn't feasible for the terraced hillside vineyard, so Anderson Bennett turned to PD-resistant vines.

"I was very excited about these vines because we must live with PD, especially with spittlebug being our problem," said Anderson Bennett. "Cain focuses on red blends, so they make sense for a program like ours." In 2017, Anderson Bennett removed a 2 ½ acre block of PD-infected vines and replaced them with rootstock budded to a few different PD-resistant options, including four rows with two different selections.

While they did have a small amount of wine from the PD-resistant vines in 2019 and 2020, most of the vineyard and vintages were destroyed in the 2020 Glass Fire. Anderson Bennett said the Cain winemakers didn't have much time to play around with the wine, but she would like to plant more of the vines in the future and hopes other growers in the area will too.

"I've been hearing about more PD in our area in the past few years and I wonder why people aren't planting these PD-resistant vines," said Anderson Bennett. Vineyards along riparian areas that see PD in vines along the vineyard edges have a few options – leave the infected vines and risk PD spreading to the rest of the vineyard, spray lots of insecticides, or not plant in that area. For Anderson Bennett, planting PD-resistant vines is the option that makes the most sense.

"Why not plant PD-resistant vines and use the grapes for blending? It's a good way to use those spaces in your vineyard where you know you're going to have problems with PD," said Anderson Bennett. She also thinks that now is the time for growers to prepare for the future by experimenting with non-traditional varietals. "We need to look beyond our regular varieties as we face change due to climate, disease, and insects."

The research team at UC Davis continues to expand the PD-resistance breeding program, focusing on broadening the *Vitis vinifera* background, stacking PD-resistance genes from multiple sources, adding powdery mildew resistance, and breeding to adapt to a changing climate. Read more about their work at bit.ly/3GCZJvG.

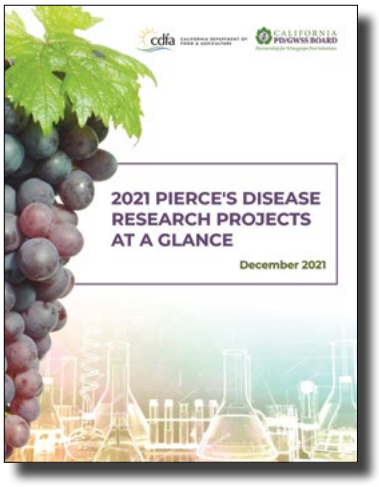
Now Online: 2021 Research Project Reports

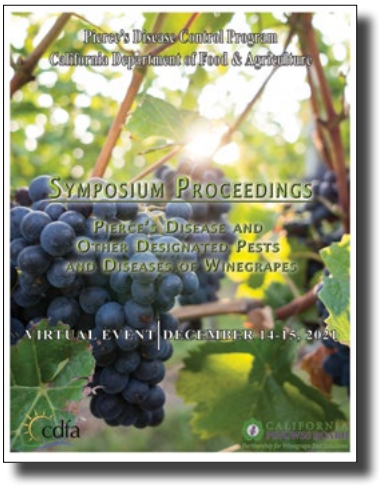
Thank you to all the researchers, growers, and industry colleagues for participating in the 2021 Pierce's Disease Research Symposium, to share and discuss recent advances and discoveries for pests and diseases of winegrapes.

We are pleased to share the following resources online at bit.ly/PD-research:

- 2021 Pierce's Disease Research Projects at a Glance
- 2021 Pierce's Disease Research Symposium Proceedings

Recordings of selected research presentations will be available soon on the PD/GWSS YouTube channel at bit.ly/3JxHyKd.





on the RESEARCH FRONT

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Examples of the mosaic eye and orange eye phenotypes in genome-edited glassy-winged sharpshooter.

CRISPR-mediated Genome Modification of *Homalodisca vitripennis* for the Genetic Control of Pierce's Disease

Project Leaders and Cooperators: Peter W. Atkinson, Richard A. Redak, Linda L. Walling, and Jason E. Stajich, University of California, Riverside and Rodrigo P. P. Almeida, University of California, Berkeley

The team is using CRISPR-based technology in a proof-of-concept strategy to show that it is possible to insert a gene into the glassy-winged sharpshooter (GWSS) genome. They developed genome-edited GWSS strains, with eye color mutations that were inherited for multiple generations, using two distinct CRISPR-based technologies. With their technical breakthrough of high-frequency editing of GWSS, they are setting the foundations to generate and test, for the first time, genetic control strategies of GWSS. Learn more at bit.ly/3oUeFiX.

Resistance to Grapevine Leafroll Virus 3 And its Major Mealybug Vectors

Project Leaders and Collaborators: Marc Fuchs and Greg Loeb, Cornell University and Deborah Golino, Foundation Plant Services, University of California, Davis

The team's goal is to develop grapevines resistant to grapevine leafroll-associated virus 3, grape mealybug and vine mealybug, using RNA interference (RNAi). RNAi is the biological process of mRNA degradation induced by complementary sequences of double-stranded (ds) small interfering RNAs (siRNA) and suppression of target gene expression. The team's efforts to produce grape plants stably transformed with RNAi constructs against the virus and of the two insect vectors is progressing well. Learn more at bit.ly/3m3cBmM.

Close-up of mealybug adults feeding on an excised leaf.

Testing an antibacterial chemical treatment for *Xylella fastidiosa.*

Systemic Formulations of Antibacterial Nanoparticles for Pierce's Disease Management

Project leader: Project Leaders and Cooperators: Leonardo De La Fuente and Deepak Shantharaj, Auburn University; Lindsey Burbank, United States Department of Agriculture, Agricultural Research Service; Swadeshmukul Santra and Jorge Pereira, University of Central Florida; and Evan Johnson, University of Florida

The team has successfully tested an antibacterial chemical treatment ("Zinkicide®") that has effectively reduced symptoms of a different bacterial disease, Huanglongbing, in citrus in a field trial over the last five years. Greenhouse tests using Zinkicide® with blueberries and tobacco infected with *Xylella fastidiosa (Xf)* showed significantly reduced pathogen populations and symptoms. Next the team will modify the formulation to improve performance at lower doses and test it in grapes. Learn more at bit.ly/3yoB2W2.

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.

Improved Decision-making for Grapevine Diseases

Best practices for reducing spread of grapevine leafroll and grapevine red blotch (GRBD) disease include sourcing virus-screen plant material, removing diseased vines individually (roguing), redeveloping high-incidence blocks, and reducing vector populations.

Successful roguing requires accurate identification of diseased vines, which can be challenging when symptoms are confusing, asynchronous, or even absent, such as in white-berried cultivars. A research team, led by Monica Cooper and Jennifer Rohrs with University of California Cooperative Extension, Napa County, is developing tools to improve users' ability to identify and remove infected vines to reduce virus sources in commercial vineyards.

To develop artificial intelligence for the rapid vision-based identification of diseased vines, the team is compiling a robust collection of validated photographs of diseased and healthy vines, especially those depicting vines with visual symptoms associated with confirmed grapevine leafroll associated virus-3 and grapevine red blotch virus infections. They plan to release a beta version of the application to California winegrape growers by fall 2022.

The LAMP (loop mediated isothermal amplification) method is a point-of-use, DNA-based assay that does not require special facilities, expensive equipment, or highly trained laboratory personnel. It offers a unique, "in-house" testing alternative to the current industry practice of sampling and sending plant material to commercial testing labs using polymerase chain reaction (PCR) assays. The LAMP assay is 10,000 times more sensitive than PCR, requires an initial investment of $4,000, and subsequent costs are $3-$5 per sample. Using this tool, growers would be able to assay large numbers of samples and quickly generate results.

To view the LAMP Assay instructional video, click on the image above or visit the project website.

The team is also using grower-collected data to gain a better understanding of GRBD. UCCE-Napa scientists and growers are monitoring 23 unique, commercial vineyard blocks over the three-year project period. Data on insect populations, disease incidence, vine removal and vineyard floor management will be collected. Spatial and temporal trends in the measured variables will be explored and used to develop management guidelines. Learn more at bit.ly/ucce-red-blotch.