



INSIDE THIS ISSUE

Leafroll Virus and Vine Mealybug: Research, Resistance and a Roadmap

Grapevine leafroll disease is one of the most prevalent and costly virus problems in California vineyards. The disease is caused by a group of viruses, with grapevine leafroll-associated virus 3 (GLRaV-3) responsible for most infections.

Leafroll disease weakens vines, lowers yields and reduces fruit quality. Infected vines often ripen later and have trouble building sugar and color, leading to lower wine quality. Once a vine is infected, it cannot be cured.

The virus spreads in two main ways: it can enter a vineyard through infected planting material, or it can be spread vine to vine by insects. The vine mealybug is the main culprit in the spread of leafroll, along with other mealybugs and soft scales. Because vine mealybug populations grow quickly and can spread the virus rapidly, controlling this pest is critical.

FEATURED RESEARCH: REDUCING VINE MEALYBUG FEEDING

One research project funded by the Pierce's Disease and Glassy-Winged Sharpshooter (PD/GWSS) Board is examining long-term strategies to slow the spread of leafroll disease by focusing on the vine mealybug.



A grapevine showing symptoms of grapevine leafroll disease.

Photo credit: Ed Hellman, Texas AgriLife Extension

The research is led by Dr. Luis Diaz-Garcia of the University of California, Davis, and Dr. Sumaira Riaz of the United States Department of Agriculture.

The research team is studying different grapevine cultivars to determine whether some plants are less attractive to vine mealybugs. In greenhouse trials, they are testing grape species, hybrids and rootstocks to measure how well mealybugs survive and grow after feeding. Early results show clear differences among plants. On some grape types, mealybugs grow poorly or fail to survive. This suggests those plants may have natural traits that make it harder for the insect to feed and reproduce.

PAGE 2

Leafroll and Vine Mealybug Management – Key Takeaways for Growers

PAGE 3

On the Research Front

- Development and Validation of HiPlex Assays for Improved Detection of GLRaVs and GRBV in Grapes
- Advancing Biopesticides for Management of Pierce's Disease
- Investigating the Relationship Between GRBV Levels, Years of Infection and Symptom Expression

PAGE 4

Thanking Dr. David Morgan for Over Two Decades of Leadership in Biocontrol

continued on page 2

The long-term research goal is to identify the genes linked to these traits and use them in grape breeding programs. While resistant varieties are still years away, this work helps build future tools that could reduce vine mealybug populations in the vineyard. This could translate into reduced insecticide use and slower virus spread.

HOW RESEARCH IS SHAPING LEAFROLL MANAGEMENT

This vine mealybug research supports recommendations from the *Advancing Vineyard Health* report, developed for the Board by the National Academies of Sciences. The report identified key research priorities to curb the spread of these viruses and lessen their economic impact. Read the report online at bit.ly/43leCBt.

The report notes that leafroll disease can be hard to detect. Visual scouting is often unreliable, especially in white-fruited varieties, where symptoms may be mild or mistaken for nutrient problems. The presence of multiple virus types also makes diagnosis more difficult. In addition, there is still much to learn about how insects spread the virus.

To address these challenges, the report calls for better diagnostic tools, more research on insect vectors and long-term investment in plant resistance. These priorities now help guide the Board's research funding.

KEY TAKEAWAYS FOR GROWERS

Ways to reduce leafroll risk:

- **Start with clean plants.** Certified planting material helps prevent the introduction of viruses.
- **Control vine mealybug.** Managing this pest is key to slowing the spread of the virus.
- **Don't rely on visual symptoms alone.** Lab testing is essential for early detection.
- **Plan for the long term.** Leafroll management works best with a combined approach that includes sanitation, pest control and careful replanting decisions.



The grapevine leafroll virus spreads in two main ways: it can enter a vineyard through infected planting material, or it can be spread vine to vine by insects, especially mealybugs as pictured above.

CURRENT PD/GWSS BOARD RESEARCH

In addition to resistance research, the Board continues to fund studies on leafroll virus spread, insect vectors and improved testing methods. Learn more about the following projects in the *Annual Research Project Reports*, online at bit.ly/PD-Board-research-projects.

- Development and validation of HiPlex assays for improved detection of GLRaVs and GRBV in grapes, *Al Rwahnih*
- Epidemiology of grapevine leafroll-associated virus 3 and RNA interference against the virus and its major mealybug vectors, *Fuchs*
- Grape germplasm evaluation to identify potential host plant resistance for vine mealybug, *Riaz / Diaz-Garcia*
- Plant-level early and autonomous field-detection of virus infections in white and black grape vines, *Brillante*
- Propagation and testing of vital material for indoor foundation grapevine collection, *Al Rwahnih*
- Virus-based delivery of interfering RNAs targeting grapevine leafroll-associated virus(es) and grapevine red blotch virus, *Kuo, Y-W.*

Together, these efforts support practical solutions today while building better tools for the future. Leafroll disease remains a complex challenge, but steady progress is being made through targeted research. The Board continues to invest in science that helps growers reduce risk now while laying the groundwork for more sustainable solutions ahead. By pairing immediate management strategies with long-term research, this work supports healthier vineyards, stronger decision-making and a more resilient winegrape industry.



Grapevine showing symptoms of grapevine leafroll disease.

Development and Validation of HiPlex Assays for Improved Detection of GLRaVs and GRBV in Grapes

Project Leaders: Maher Al Rwahnih, Raied Abou Kubaa and Kristian Stevens, Foundation Plant Services, University of California, Davis

The team confirmed that the HiPlex PCR assay can reliably detect grapevine leafroll-associated virus 3 (GLRaV-3) and grapevine red blotch virus (GRBV) across a wide range of grapevine samples. Results showed clear separation between infected and non-infected vines, with findings that matched current laboratory tests used to detect leafroll virus and were confirmed by clean controls. For growers, this means the potential for faster, scalable and cost-effective virus detection to support replanting decisions and disease management. Next, the team will refine primer design, address performance challenges for GRBV and further strengthen the assay's accuracy and reliability for routine use.

Advancing Biopesticides for Management of Pierce's Disease

Project Leader: Akif Eskalen, University of California, Davis

This project is evaluating biological products as new tools to help manage Pierce's disease (PD). Across three years of field trials, biopesticide treatments consistently reduced PD symptoms, with some products showing stronger results when used in combination, though performance varied by season and environmental conditions. These findings suggest biopesticides could play an important role in preventing and managing PD as part of an integrated approach, rather than a standalone solution. Next, the team will continue multi-location testing to refine application strategies and gather data for regulatory approval and broader commercial use.



Dr. Kinkhabwala applies a biological treatment under study to control Pierce's disease.



A Cabernet franc vine displaying typical red blotch disease symptoms. *Photo credit: M. Fuchs.*

Investigating the Relationship Between GRBV Levels, Years of Infection and Symptom Expression

Project Leader: Ben Montpetit (on behalf of Dr. Anita Obersholster), University of California, Davis

This project studies how grapevine red blotch virus (GRBV) levels and the duration of infection affect disease symptoms and fruit quality. Researchers have confirmed that GRBV delays ripening and reduces sugar, color, aroma, and tannin development in grapes, with additional changes to berry skins that may influence wine quality. Early genetic analyses show clear differences tied to infection status, symptom severity, and vine development stage. Ongoing work will link these changes to key aroma compounds, helping growers better understand how long-term infections impact vineyard performance and management decisions.

Thanking Dr. David Morgan for Over Two Decades of Leadership in Biocontrol

Dr. David Morgan is retiring after 25 years as the California Department of Food and Agriculture's leading expert in biological control.

As head of CDFA's biological control group, Dr. Morgan has been at the center of statewide efforts to use beneficial insects to manage the glassy-winged sharpshooter (GWSS) and Asian citrus psyllid. He played a key role in establishing the state's biological control production facilities, which produce, release and evaluate biological control agents used against GWSS. Under Dr. Morgan's leadership, CDFA expanded biological control releases across California and strengthened breeding and monitoring techniques.

Since 2001, the Pierce's Disease Control Program (PDCP) has released more than 2.93 million parasitic wasps in 19 California counties as part of its GWSS management strategy. These releases are a critical part of integrated pest management efforts, lowering pest pressure and protecting vineyard health over time.

"Throughout his tenure at CDFA, Dr. Morgan provided steady leadership and deep expertise in biological control, advancing sustainable pest management strategies that minimize the impact of invasive pests on California agriculture," said Karen Ross, Secretary of Agriculture. "His advocacy for biological control has made a lasting contribution to protecting the state's grape and citrus industries and strengthening California's long-term approach to pest management."



Joseph Damiano (left), PDCP Statewide Coordinator, congratulated Dr. David Morgan on his accomplished career and lasting legacy.

Colleagues recognized Dr. Morgan's influence on the program and its early success, noting that his expertise was essential during the Board's formative years and in the development of its research and response efforts.

The PDCP and grower community thank Dr. Morgan for his years of commitment, innovation and collaboration and wish him all the best in his next chapter. With Dr. Buddhi Achhami serving as interim lead of the biological control group, the PDCP remains well-positioned to continue this important work to protect the state's vineyards.

80,575
BIOCONTROL
INSECTS
released in 2025

5,186
GWSS TRAPS
monitored in the
Area-Wide Treatment
Program in 2025

6,092
ACRES TREATED
for GWSS in Area-
Wide Treatment
Program in 2025