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\$3.2 Million Approved for Research and Outreach Projects

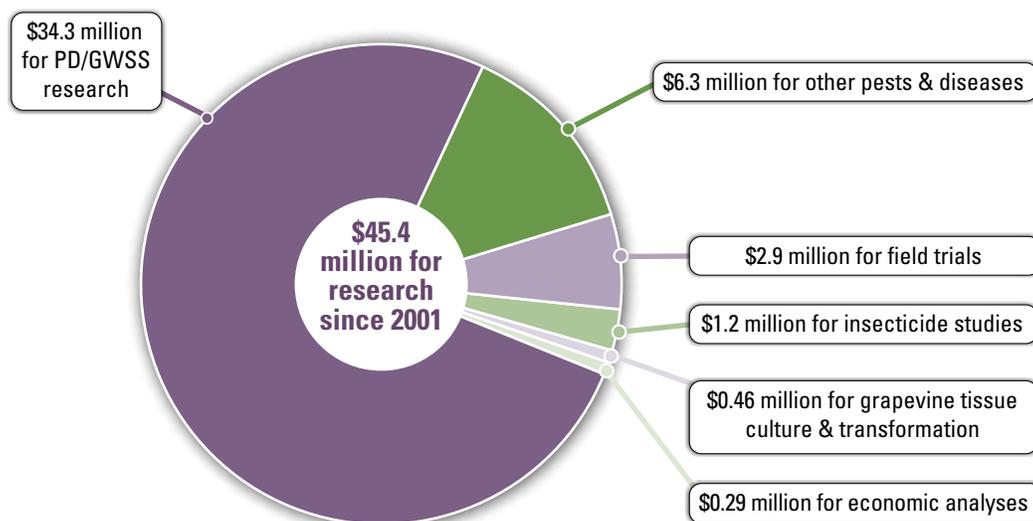
The PD/GWSS Board approved \$3.2 million to fund 16 research and outreach projects related to Pierce's disease, glassy-winged sharpshooter, and other designated pests and diseases of winegrapes at its recent meetings. The Board has funded over \$45 million in research and outreach to address these serious threats to California's wine industry since it was founded in 2001.

After a rigorous review by the Board's Research Screening Committee of the 23 proposals submitted for consideration, the Board approved funding 16 of the projects. Nine projects were funded for one year, five projects for two years, and two projects for three years ([see next page for list of projects](#)). The recommendation was then sent to and approved by California Department of Food and Agriculture Secretary Karen Ross.

Since 2010, the Board has had the authority to use funds collected through the California winegrape grower assessment for research and outreach on other winegrape pests and diseases. Projects funded in this cycle on other designated pests and diseases includes research and outreach on grapevine red blotch virus, grapevine leafroll disease, and mealybug pests of winegrapes.

Also funded are 12 continuing multi-year research projects approved by the board in previous funding cycles, totaling \$989,000. These projects include field trials to test PD-resistant plant materials and technologies, four red blotch projects, one leafroll project, one virus-related project, and one GWSS insecticide resistance project.

A collection of year-end research progress reports is prepared annually and shared at the research symposium. The reports are also available online at: www.cdffa.ca.gov/pdcp/research.html.



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Research Proposals Funded Recently

- PD/GWSS Board funds 16 projects addressing PD/GWSS, grapevine red blotch virus, grapevine leafroll disease, and mealybugs

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On the Research Front

- Integrating PdR1 resistant grapevines into Pierce's disease management strategies
- Evaluating which grape rootstocks have the greatest tolerance to vine mealybug
- The role the three-cornered alfalfa hopper plays in spreading grapevine red blotch virus

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Practical Tips for Managing Vine Mealybug & Viruses

- Rogue, rogue, rogue,
- Your neighbor's mealybugs are your mealybugs, and your neighbor's viruses are your viruses
- Start with high quality plant material
- There is hope

Recently Funded Research Proposals

Topic	Title	Project Leader	Total Funding
Pierce's disease	Breeding PD-resistant wine grapes	Andrew Walker, UC Davis	\$575,335
Pierce's disease	Molecular breeding support for the development of PD-resistant wine grapes	Andrew Walker, UC Davis	\$637,868
Pierce's disease	Generating PD-resistant grapevines using CRISPR/Cas9 and traditional transgenic approaches	Caroline Roper, UC Riverside	\$124,510
Pierce's disease	Field evaluation of cross-graft protection effective against PD by dual DNA constructs expressed in transgenic grape rootstocks	David Gilchrist, UC Davis	\$90,209
Pierce's disease	Testing of grapevines designed to block vector transmission of <i>Xylella fastidiosa</i>	Rodrigo Almeida, UC Berkeley	\$99,676
Pierce's disease	Optimizing biological control of PD with <i>Paraburkholderia phytofirmans</i>	Steve Lindow, UC Berkeley	\$295,893
Insects	Identification of grape cultivars and rootstocks with resistance to vine mealybug	Rachel P. Naegele, USDA ARS, Parlier	\$17,698
Viruses	Structure-function studies on grapevine red blotch virus to elucidate disease etiology	Chris Rock, Texas Tech University	\$105,000
Viruses	Ecology of grapevine red blotch virus	Marc Fuchs, Cornell University	\$239,979
Viruses	Effects of grapevine red blotch disease on flavor and flavor precursor formation in the grape and on wine quality	Michael Qian, Oregon State University	\$109,512
Viruses	Improving extension outcomes: Identifying drivers and barriers to adoption of management practices using leafroll and red blotch disease as model systems	Monica Cooper, University of California Cooperative Extension	\$163,700
Viruses	Education and outreach for the Grapevine Certification and Registration Program, and an assessment of recently established production blocks	Neil McRoberts, UC Davis	\$59,726
Viruses	Grapevine virus management in Lodi: a collaborative research and integrated outreach effort to help solve a statewide challenge	Stephanie Bolton, Lodi Winegrape Commission	\$39,000
Viruses	Improved understanding of virus transmission and management of key vector(s) associated with grapevine red blotch virus	Vaughn Walton, Oregon State University	\$47,000
Viruses & Insects	Resistance to grapevine leafroll-associated virus 3 and the grape mealybug	Marc Fuchs, Cornell University	\$360,649
Viruses & Insects	Virus-based delivery of interfering RNAs targeting grapevine leafroll-associated virus(es) and associated mealybugs	Yen-Wen Kuo, UC Davis	\$264,783

On the RESEARCH FRONT



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Partnership for Winegrape Pest Solutions



Comparison between healthy and infected grapevines early in the growing season

The Epidemiology of Novel Pdr1 Resistant Grapevines: Epidemic and Vector Movement Models to Support Integrated Disease Management

Principal Researcher: Rodrigo Almeida, UC Berkeley

The research team found that while Pdr1 resistant grapevines provide promising resistance to *Xylella fastidiosa* (Xf), they observed greater transmission rates from Pdr1 resistant vines than from susceptible vines, under some conditions. This may be caused by an interaction between the resistance trait and vector feeding preference. These results, while preliminary, complicate integration of Pdr1 grapevines into Pierce's disease management strategies for growers. Moreover, growers may be able to benefit from Pdr1 resistant cultivars without planting all their acreage with them. The team is exploring tradeoffs between disease resistance and economic profit of Pdr1 plants through bio-economic modeling, with the goal of developing management recommendations for the optimal planting of Pdr1 grapevines.

Identification of Grape Cultivars and Rootstocks with Resistance to Vine Mealybug

Principal Researcher: Rachel P. Naegele, USDA Agricultural Research Service, Parlier

Vine mealybug (VMB) is a major pest to the California grape industry and with insecticide sprays providing inconsistent control, developing other control methods is essential. Resistant grape cultivars are not currently available and could take more than a decade to breed. In the interim, rootstocks tolerant to VMB could provide enough control either alone or in combination with insecticides. The research team evaluated six grape cultivars for susceptibility to VMB. They found rootstocks RS-3, IAC 572, and 10-17A have greater tolerance to VMB than scion cultivars and may be useful within a breeding program to incorporate insect tolerance. These materials are currently available to nurseries, researchers, and grape breeders through Foundation Plant Services at UC Davis.



Vine mealybug and ants on a susceptible scion



Plants caged with 3CAH in a greenhouse preference study

Biology and Role of Treehoppers in Grapevine Red Blotch Disease

Principal Researchers: Frank Zalom and Mysore R. Sudarshana, UC Davis, and Kent Daane, UC Berkeley

The research team learned more about the role the three-cornered alfalfa hopper (3CAH) plays in spreading grapevine red blotch virus (GRBV). One component of the project was determining the feeding and reproduction host status of common vineyard weeds and cover crops. This work expands the confirmed list of hosts and is the first study evaluating cover crops and weeds in California vineyards. Plant species in the families Asteracea, Convolvulaceae, Fabacea, and Poaceae can serve as hosts for 3CAH, with 3CAH preferring plants of the family Fabacea.

Practical Tips for Managing Vine Mealybugs & Viruses

By Stephanie Bolton, PhD, Lodi Winegrape Commission, PI for “Grapevine virus management in Lodi: A collaborative research and integrated outreach effort to solve a statewide challenge”

Researchers, winegrape growers, industry representatives, and pest control advisors gathered to discuss strategies to reduce viruses and vectors in vineyards at the Mealybug & Virus Outreach Meeting in April.

The workshop, hosted by the Lodi Winegrape Commission with funding from the PD/GWSS Board and American Vineyard Foundation (AVF), provided timely, relevant information on nursery ordering, the California Department of Food and Agriculture’s Grapevine Registration & Certification Program, red blotch virus, leafroll virus, rogueing, sampling and testing, vine mealybug (VMB) and ant control, and replanting after a virus infection.

Speakers included Dr. Kent Daane (University of California Cooperative Extension; vine mealybug expert), Dr. Marc Fuchs (Cornell University; red blotch expert), Prof. Gerhard Pietersen (South Africa; leafroll virus expert), and Dr. James Stamp (Stamp Associates; plant material expert). Roundtable discussions were also held for nurseries, laboratories, and extension personnel to discuss short- and long-term strategies for virus reduction in California.

The presentations, which include specific, practical strategies for the recommendations listed to the right, are available at lodigrowers.com/growereducation/viruses thanks to funding from the PD/GWSS Board and AVF. To learn about future events, sign up for the new grapevine virus email list-serv by emailing stephanie@lodiwine.com.

RECOMMENDATIONS TO REDUCE FINANCIAL LOSSES DUE TO VIRUSES

- 1. Rogue, rogue, rogue:** The most important thing the industry can do right now is to get virus-infected vines out of vineyards, starting as early as possible in the vineyard’s life. Once virus inoculum levels are lowered, VMB becomes less of an issue and can be managed more sustainably.
- 2. Your neighbor’s mealybugs are your mealybugs, and your neighbor’s viruses are your viruses:** Vector and virus reduction in California will be more effective and will happen faster if growers work together using area-wide approaches, as well as doing their part in the vineyards under their control.
- 3. Start with high quality planting material:** Spending the time and money up front to plant a new vineyard with the cleanest material available and managing VMB and viruses from day one saves dollars in the long run.
- 4. There is hope:** South Africa’s Vergelegen Wine Estate moved from a high level of leafroll virus infection (up to 100 percent in some blocks) to a very low, manageable level of infection by implementing a long-term management strategy which included rogueing in phases, a fallowing period before replanting, and VMB control. In New Zealand, a group of 30 growers spanning an entire appellation worked together to successfully reduce leafroll virus infections.