Cooperative Nursery Program Is Key to Preventing the Spread of GWSS

Nursery stock is a high-risk commodity for spreading the glassy-winged sharpshooter (GWSS). Approximately 53 percent of California's 13,000 licensed nurseries are located in GWSS-infested counties. Many of these nurseries ship to the non-infested areas of the state.

The CDFA's Pierce's Disease (PD) Control Program coordinates county activities throughout the state to mitigate the risk of moving the GWSS on nursery stock. These activities include:

- Inspection of nursery stock in infested areas before shipping to non-infested areas
- Treatment of nursery stock when necessary
- Certification of shipments
- Inspection of nursery stock at receiving nurseries before sale
- Trapping in and near nurseries in infested and non-infested areas

A county inspector in Southern California looking for GWSS eggs on a tree before loading it for shipment.

In 2017, there were 36,700 shipments of nursery stock from infested areas to non-infested areas. Viable life stages of GWSS were discovered at destination in only six of these shipments. Origin county inspectors stopped 108 egg masses, nine nymphs, and six adult GWSS from moving in nursery stock shipments.

"The outstanding success of the nursery program is a testament to the hard work of the nursery industry and county agriculture departments," said Senior Environmental Scientist Stacie Oswalt of the CDFA's PD Control Program. "Preventing the spread of GWSS to new areas has spared winegrape growers in much of the state from the disruption and losses that occur when GWSS gets into viticultural areas, and saved the Program the costs and challenges associated with having to eradicate new infestations."

Nursery Regulatory Program Update for 2018

During the first four months of 2018, there were 12,490 nursery stock shipments from the GWSS generally-infested areas to non-infested areas of the state. Shipments were down by 1,174 compared to the first four months of 2017. No regulatory actions have been necessary year to date. During the same period last year, two regulatory actions were taken. Since January 1, 2018, inspectors at origin have stopped 23 egg masses from moving in nursery stock shipments.

Nursery Stock Approved Treatment Program (ATP) Update for 2018

From January 1, 2018, through April 30, 2018, there were 4,704 ATP shipments consisting of 1,295,944 plants. ATP shipments and number of plants for the same time frame in 2017 were 4,408 and 1,425,792, respectively. No regulatory actions have been necessary this year.

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CALIFORNIA PD/GWSS BOARD
Partnership for Winegrape Pest Solutions

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SUMMER 2018

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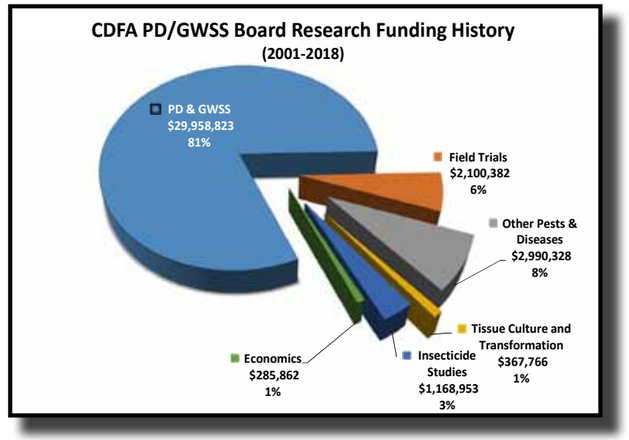
cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

PD/GWSS Board Funds 15 Research Projects

At its April 23, 2018 meeting, the PD/GWSS Board recommended funding six research projects dealing with Pierce's disease and nine projects dealing with other pests & diseases of winegrapes. The total amount of funding recommended was $3.4 million, which was approved by the Secretary on April 25. This brings the total amount of research funded since the founding of the PD/GWSS Board in 2001 to just over $37.8 million.

Chair of the Board's Research Screening Committee Steve McIntyre, of Monterey Pacific Vineyards, said, "The research sponsored by the Board has built a strong foundation of new knowledge from which solutions to PD, and other pests and diseases are being developed. This whole process accelerates the pace of discovery."



"The list of breakthroughs and advances from Board-funded research is impressive," said Environmental Program Manager Tom Esser of the CDFA's PD Control Program. "It includes discovering genes and mechanisms of resistance to PD and using them to develop PD-resistant grapevines, finding microbes, microbial products, and other materials that show promise for protecting grapevines against PD, and studying the epidemiology of PD outbreaks."

The Board received a total of 27 proposals this year. After a careful review of all the projects, the Board's Research Screening Committee recommended funding 15 of them.

> "Research sponsored by the Board has built a strong foundation of new knowledge from which solutions to PD, and other pests and diseases are being developed." *Steve McIntyre*

Since 2010 the PD/GWSS Board has had the option of using winegrape assessment funds for research and outreach on other pests and diseases of winegrapes designated by the Board as serious threats to California winegrapes. To date the Board has designated the European grapevine moth (eradicated from California), red blotch virus, leafroll virus, fanleaf virus, mealybug pests of winegrapes, and the brown marmorated stink bug.

See a complete list of the projects funded this year on page two.

INSIDE THIS ISSUE

A Few Past and Current Research Projects

Over the years the PD/GWSS Board has funded a wide range of research projects. From left to right, a tasting of wines made from PD-resistant winegrapes, injecting a benign strain of the *Xylella fastidiosa* bacterium to protect grapevines from PD, investigating how GWSS feed on vines, and the use of modified rootstocks to protect winegrape scions are just a small sample of all the projects funded.

CDFA PD/GWSS BOARD - Research Projects Approved for Funding in April 2018

Topic	Principal Investigator	Title	Approved Funding Amount			
			FY 2018-19	FY 2019-20	FY 2020-21	Total
Pierce's Disease	Andrew Walker (UC Davis)	Breeding Pierce's disease resistant winegrapes	$283,383	$0	$0	$283,383
Pierce's Disease	Andrew Walker (UC Davis)	Molecular breeding support for the development of Pierce's disease-resistant winegrapes	$300,148	$0	$0	$300,148
Pierce's Disease	Caroline Roper (UC Riverside)	Characterization of the lipopolysaccharide-mediated response to *Xylella fastidiosa* infections in grapevines	$183,500	$0	$0	$183,500
Pierce's Disease	David Gilchrist (UC Davis)	Transgenic rootstock-mediated protection of grapevine scion by single and stacked DNA constructs	$212,504	$206,329	$0	$418,833
Pierce's Disease	Rachel Naegele (USDA ARS, Parlier)	Geographic distribution of isolated virulence in *Xylella fastidiosa* collected from grapes in California and its effect on host resistance	$83,783	$84,244	$84,709	$252,736
Pierce's Disease	Rodrigo Almeida (UC Berkeley)	*Addressing knowledge gaps in Pierce's disease epidemiology: Underappreciated vectors, genotypes, and patterns of spread*	$289,630	$267,741	$0	$557,371
Leafroll & Mealybug	Marc Fuchs (Cornell)	Resistance to grapevine leafroll-associated virus 3 and the grape mealybug	$375,482	$0	$0	$375,482
Mealybug	Rachel Naegele (USDA ARS, Parlier)	Identification of grape cultivars and rootstocks with resistance to vine mealybug	$17,322	$0	$0	$17,322
Red Blotch	Anita Oberholster (UC Davis)	Investigation of the impact of grapevine red blotch virus on grape ripening and metabolism	$111,573	$0	$0	$111,573
Red Blotch	Chris Rock (Texas Tech)	Structure-function studies on grapevine red blotch virus to elucidate disease etiology	$119,339	$0	$0	$119,339
Red Blotch	Frank Zalom (UC Davis)	Biology and role of treehoppers in grapevine red blotch disease	$119,900	$124,900	$0	$244,800
Red Blotch	Kent Daane (UC Berkeley)	Seasonal ecology and transmission efficiency of three-cornered alfalfa hopper and other novel insect vectors of grapevine red blotch associated virus	$112,880	$116,501	$0	$229,381
Red Blotch	Marc Fuchs (Cornell)	Ecology of grapevine red blotch virus	$221,106	$0	$0	$221,106
Red Blotch	Patricia Skinkis (Oregon State Univ., Corvallis)	Understanding symptomology and physiological effects of red blotch disease on vineyards in Oregon's Willamette Valley	$29,173	$30,160	$0	$59,333
Viruses	Stephanie Bolton (Lodi Winegrape Comm.)	Grapevine virus management in Lodi: A collaborative research and integrated outreach effort to help solve a statewide challenge	$33,202	$0	$0	$33,202
		TOTAL:	**$2,492,925**	**$829,875**	**$84,709**	**$3,407,509**

A GWSS feeding on a grapevine.

Mapping Pierce's Disease and Vector Populations in the Southern San Joaquin Valley and Developing a Dynamic Model to Assess Management Strategies

Principal Investigator: Neil McRoberts, Dept. of Plant Pathology, UC Davis

Researchers are developing statistical descriptions and mathematical models of the long-term glassy-winged sharpshooter and Pierce's disease situation in the southern San Joaquin Valley, using the annual data collected by the GWSS area-wide control program and the annual UCCE survey of PD in grapes. The statistical analysis to date has indicated that the GWSS population in the region has localized hotspots that are relatively stable over time, and there is a more diffuse population, which spreads out from and recedes into those hotspots on an annual basis. The analyses completed to date have been mostly descriptive, but the researchers are now moving on to a more quantitative phase. To complement the statistical analyses, the researchers are building a set of mathematical models of PD/GWSS dynamics for the area that will allow PD risk to be assessed more completely than was possible before. An initial, simple phenology model based on degree day accumulation has been implemented, pending construction of the more complex numerical simulation model.

Quantifying Vine Mealybug Spatiotemporal Dynamics: Assessing Invasion Risk to Refine Management Strategies

Principal Investigator: Matt Daugherty, Dept. of Entomology, UC Riverside

The ongoing expansion of vine mealybug in California and the continued risk of its introduction into new areas dictates the need for a better understanding of the factors driving its spread. Researchers used vine mealybug occurrence data from 2012 to 2016 to characterize the factors associated with vine mealybug establishment and spread in Napa County, California. This work will also identify factors underlying hotspots in vine mealybug activity, quantify the natural patterns in vine mealybug occurrence, and clarify pathways that contribute to vine mealybug spread. Ultimately, the results of this investigation can improve our understanding of the educational and regulatory steps needed to mitigate vine mealybug spread.

Vine mealybugs have managed to spread to many of California's winegrape growing regions.

A Cabernet Franc vine rooted on 101-14 and infected with grapevine leafroll (GLRaV1 and GLRaV2).

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

Principal Investigator: Dario Cantu, Dept. of Viticulture & Enology, UC Davis

Grapevine leafroll-associated viruses (GLRaVs) are the most widespread and economically damaging viruses affecting viticulture. GLRaVs are sometimes present as mixed infections with other viruses. The severity of GLRaV symptoms is influenced by host genotype, which virus or combination of viruses is present, scion-rootstock pairings, and environmental factors. The effects of GLRaVs can include poor color development in red grapes, non-uniform or delayed ripening, reduced sugar content in berries, curling leaves, reddening or chlorotic interveinal areas, and high crop loss. The purpose of these experiments is to determine the effects of individual and dual GLRaV infections on ripening in Cabernet Franc vines grafted to different rootstocks. This information could be used to develop vineyard management strategies to improve berry quality despite viral infection.

The CDFA PD/GWSS Board partners with other organizations to leverage funding for research projects. Research 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.