January 30, 2018

2017 IAB Newsletter

California Fruit Tree, Nut Tree, and Grapevine Improvement Advisory Board

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE REGISTRATION AND CERTIFICATION SERVICES

In order to provide extra assurance to growers that specific types of nursery stock are meeting a higher standard of pest and disease cleanliness, CDFA's Nursery Services Program coordinates Registration and/or Certification programs for six different types of nursery stock. These Registration and Certification Programs are funded by fees paid by program participants.

The Nursery, Seed, and Cotton Program provides voluntary registration and certification services for the following: avocado, deciduous fruit and nut tress, grapevine, pome fruit trees, seed garlic, and strawberry nursery stock.

PROGRAMS SUPPORTED BY THE IAB

DECIDUOUS FRUIT & NUT TREE REGISTRATION & CERTIFICATION

Deciduous fruit and nut trees may be registered for the purpose of providing rootstock and scion sources for the propagation of certified nursery stock when inspected and tested for regulated diseases, such as *Prune dwarf virus* and *Prunus necrotic ringspot virus*.

POME FRUIT TREE REGISTRATION AND CERTIFICATION

Pome fruit trees may be registered for the purpose of providing rootstock and scion sources for the propagation of certified nursery stock when inspected and tested for specific virus diseases and other pests.

GRAPEVINE REGISTRATION & CERTIFICATION

The Grapevine Registration & Certification Program provides for the testing of source vines for significant grape pathogens, such as *Grapevine fanleaf virus, Grapevine leafroll viruses*, *Grapevine red blotch virus* and *tomato ringstpot virus*. Registered sources and certified nursery stock are inspected by CDFA staff and maintained by the participant in a manner to protect them from exposure to regulated diseases.

In This Issue

For information on Board Member's representative use link below.

https://www.cdfa.ca.gov/plant/pe/nsc/docs/iab/IAB_Board_Members.pdf

California Fruit Tree, Nut Tree and Grapevine Improvement Advisory Board

FAC§ 6988. The secretary, upon consultation with the pome and stone fruit tree, nut tree, olive tree, and grapevine nursery industry, shall appoint a board to assist and advise him or her concerning the implementation of this article.

Membership on the board shall consist of 11 representatives, a majority of whom are licensed producers of pome, stone, nut, olive, and grape nursery stock, but also users and a public member as follows:

(1) Two each from the stone fruit (including almonds) and nut (other than almond) industries.
(2) Four from the grape industry.
(3) One each from the pome fruit and olive industries.
(4) One public representative.

Board members shall represent all areas of the state involved in the production of pome and stone fruit trees, nut trees, olive trees, and grapevines.

The members of the board shall serve for fixed terms of up to two years. The secretary, upon nomination by the industry, may appoint a member for three consecutive terms. The secretary shall reappoint no more than eight of the then-current members of the board within a two-year period.

The board shall meet at least twice a year. The chair or the secretary may call any other meeting when it is deemed necessary by one or both of them. Each member shall be allowed per diem and mileage in accordance with Department of Human Resources rules for attending any meeting of the board.

The board shall review and make recommendations to the secretary concerning the ongoing operations of the department and the University of California pertaining to this article. This shall include advice on fiscal expenditure, assessments needed to cover costs, and proposals concerning the development of planting materials.

Board Members:

Nicholas Podsakoff, Chair
(661) 758-4777
Grapevine

Clifford Little, Vice-Chair
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Olive

Cliff Beumel
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Tree

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Denise Moore
916-995-8385
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Sean Dayyani
IAB Manager
(916) 654-0435

<u>Who Pays the Nursery Stock Assessment and How is it Used?</u>

The California Fruit Tree, Nut Tree, and Grapevine Improvement Advisory Board (IAB) was established in 1988 to promote production of high quality tree and grapevine nursery stock, and to help develop and promote consumer education. The IAB is funded through a 1% annual assessment on gross sales paid by producers of deciduous pome and stone fruit tree, nut tree, and grapevine nursery stock.

Section 44 of the Food and Agricultural Code (FAC) defines sell to include, "offer for sale, expose for sale, possess for sale, exchange, barter, or trade." Therefore, the assessment is required for any qualifying nursery stock disposed of by any of these means. The IAB uses these funds to support Foundation Plant Services (FPS), to subsidize *Prunus necrotic ringspot virus* and *Prunus dwarf virus* testing in registered trees, virus testing and clean-up of new fruit and nut tree varieties, testing of registered grapevines for *Grapevine fan-leaf virus*, *Grapevine leafroll-associated viruses*, *Grapevine red blotch virus* and *Tomato ringspot virus*, vine mealybug trapping in grapevines, and to support research into disease and pest resistant varieties and alternatives to fumigants currently in use.

IAB Assessments Collected 2012-2016

Year	Fruit Trees	Nut Trees	Olives	Grapevines
2012	$ 682,467.00	$ 273,781.00		$ 771,339.00
2013	$ 677,737.00	$ 347,828.00	$ 12,755.00	$ 1,060,720.00
2014	$ 878,810.00	$ 385,443.00	$ 26,618.00	$ 1,070,107.00
2015	$ 1,145,829.00	$ 532,519.00	$ 23,297.00	$ 940,448.00
2016	$ 1,527,683.00	$ 217,351.00	$ 35,306.00	$ 1,023,165.00

RESEARCH AND SERVICE PROJECTS FUNDED BY IAB IN FISCAL YEAR 2017-18 BUDGET APPROVAL MAY 17, 2017		
FPS	Support to foundation Plant Services	$842,657
CDFA	Support to R & C Programs at CDFA	$291,064
BOSTOCK	Integrated Management of Fusarium Canker in Bare root and Container-Propagated Stone Fruit Seedling	$43,877
GOLINO	Study of the Effects of Red Blotch Disease on Different Grapevine Rootstocks and Different Vitis Vinifera Plants	$110,141
GOLINO	Optimization of Meristem-tip Culture Methodologies for Virus Elimination for Prunus Cultivars.	$87,325
GRADZIEL	Rootstock Breeding, Hybrid-Vigor, Tolerance to Disease, Salinity & Environmental Stresses	$30,190
HARPER	Development of an ELISA Assay for the Rapid Screening of Cherry for Little Cherry Virus 2	$9,163
HARPER	Heat Therapy and Indexing of Stone and Pome Fruit Cultivars	$30,000
AL RWAHNIH	Study of the Effects of Little Cherry Virus -1 and Little Cherry Virus –2 on Different Cherry Rootstocks	$81,581
SHACKEL	Managing the Water Relations of Bare Root Nursery Stock to Improve Establishment, Performance, and Disease Resistance	$40,377
SUDARSHANA	Etiology of Red Canopy Disorder of Cabernet Sauvignon Grapevines on Rootstocks with Vitis Rupestri Parentage in the North Coast Vineyards	$49,416
SUDARSHANA	Genomic Approaches to Understand Non-infectious Bud Failure Syndrome in Almonds	$58,731
WALKER	Development of Next Generation Rootstocks for California Vineyards	$57,500
WELLS	Methyl Bromide CUE	$10,000
WESTPHAL	Evaluating Novel Nematicidal Chemistry for Usefulness in the Nursery Industry	$76,851
	TOTAL RESEARCH & SERVICES PROJECTS FUNDED:	**$1,818,873**

2017 FUNDING DISTRIBUTIONS

In May of 2017, the IAB approved funding for 15 research/service projects totaling $1,818,873 including funding for Foundation Plant Services (FPS) in the amount of $842,657 and payments to the Nursery Services Program to subvent Registration and Certification (R&C) program activities in the amount $291,064 with the remaining amount of $685,152 for research. By adding the CDFA administrative costs and laboratory testing costs, the total budget approved was $2,429,849.

Evaluating Novel Nematicidal Chemistry for Usefulness in the Nursery Industry

Andreas Westphal, UC Riverside

Second year: Initial screening for effectiveness against perennial crop-typical nematodes in microplots

Based on information gathered in the first year of the study, products and rates will be chosen for larger area applications. A field with natural infestations of *P. vulnus* and other plant-parasitic nematodes will be chosen for small plot work. The materials advantageous in the first year of the project will be applied at the predetermined rates and with the suitable application method. If necessary, preparations will be made to allow for multiple applications in the second year of growth. Soil (and root) samples for nematode extraction will be taken at planting and at ½-year increments (or more frequently depending on the experience of the first year). This procedure will allow for determining if treatments were effective, and if this effectiveness was sufficient to maintain freedom of nematode infection. Two rows spaced 2 ft apart will be planted in each plot. Plants of one of these rows will be excavated after at the necessary intervals for growth and root evaluations, and the second one will be maintained until harvest maturity of the planting stock after approximately 15 months.

Field plots will be established during the summer, and treatments timed to allow for a fall planting of nursery stock. The one-year data will provide important predictive power of which treatments may require in post plant treatments with the tested nematicides.

Project tasks	FY2015				FY2016				FY2017			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Year one												
Greenhouse and lab evaluations	■											
Microplot establishment		■										
Plant growth measurements			■									
Root evaluations for nematode infection				M1								
Year two												
Plots established and treated at KAC					■							
Planting of new nursery material						■						
Plant growth measurements							■				■	
Soil sampling for nematodes							■					
Root evaluations for nematode infection								M2				M3
Year three												
Establishment of plots at nurseries									■			
Plant growth measurements										■		
Harvesting stock at KAC (start year 2)											■	
Root evaluations at nurseries												M3

Study of the Effects of Red Blotch Disease on Different Grapevine Rootstocks and Different *Vitis vinifera* Plants

Adib Rowhani, UC Davis

Forth year : Evaluate the effects of Red Blotch disease in popular grapevine and different rootstocks.

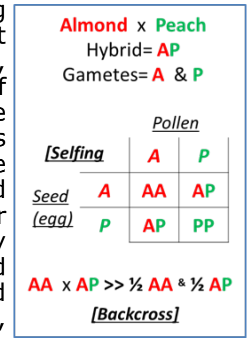
To date more than 75 different graft-transmissible agents including viruses have been reported in grapevine. More recently a new virus, named Grapevine red blotch associated virus (GRBaV) was found in grapevine and as its name indicates this virus was found to be associated with a red blotch type symptoms in red grape varieties. The virus also has been reported in white grape varieties with undefined leaf symptoms. The virus likely can be found in all types of grape cultivars and hybrids including: rootstocks, wine grapes, table- and raisin grapes. However, the associated virus has been sequenced and its genome has been characterized. How and to what extent the red blotch disease affects the performance of vines propagated on different rootstocks and on different grapevine scion varieties is not clear yet and much needed information is missing. This project is planned to study the effects of GRBaV on different rootstocks, on plants propagated on different rootstocks and also on different scion varieties (*Vitis vinifera*). In this project we have inoculated the GRBaV onto 7 different rootstocks, onto Cabernet Sauvignon plants on 9 different rootstocks and onto 12 different scion varieties each on two different rootstocks. Due to the lack of enough virus-infected material from a single source plant for inoculation, we used the inoculum from two different sources of Orange Muscat 02 (OM 02) and Chardonnay 41 (Ch. 41) to inoculate the plants. All the Cab. Sauv. plants on 9 different rootstocks and the 12 scion varieties (total of 1052 plants) were planted in the field in 2015. All these plants were tested by real time PCR (qPCR) for GRBaV to check the movement of the virus to the plants. We found that 94% of the plants inoculated from the OM 02 virus source were positive while only 64% of the plants inoculated from Ch. 41 source. The high throughput sequencing analysis (HTS) of the virus sources showed that the OM 02 source was co-infected with *Grapevine syrah virus 1* (GSyV-1). However, it is not clear yet whether GSyV-1 has any role in GRBaV movement. The symptom expression on the leaves were also evaluated and recorded. It was shown that the characteristic red blotch symptoms on Cabernet franc was very clear and more severe compared to other cultivars in the experiment. Symptoms on Cab. Sauv. were more confusing and less characteristic to typical red blotch symptoms. Trunk diameter measurements did not show any significant differences between the treated and untreated vines. The experiment on 7 different rootstocks was added to the project in 2015 and the plants in this group are ready for plantation in May-June 2017.

Molecular marker validation of interspecific breeding germplasm for rootstock development.

Tom Gradziel, UC Davis

Final year

Traits are controlled by genes where the required information is coded by specific sequences of DNA. Rootstock breeding, like variety breeding, essentially involves selecting for desirable genes while selecting against undesirable genes. Some traits, such as nematode resistance, are controlled by major single genes while others such as vigor result from the small individual affects of a large number of genes. While we cannot yet identify most important genes by their DNA sequence, by statistically comparing large populations segregating for targeted traits, we can use the association of known molecular markers with the trait of interest as markers for that trait. This is because the marker is located on the DNA close enough to the trait of interest that, on average, they are inherited together. Because we know the DNA sequence of the marker, we now have a powerful tool to select for that trait even at the seedling stage. Molecular markers tend to be filler-DNA so that the DNA sequence does not have to be precise and so may change over time. Because of this, markers developed for one species, such as peach, may or may not be useful for even closely related species, such as almond, because of the large amount of time separating their evolution from a common ancestor. Normally this is not a problem because most crop breeding involves only the single ancestral species. In rootstock breeding, however, interspecies hybrids are common because they tend to be very vigorous and tolerant of wider environmental differences. This research evaluates the applicability of the large number of molecular markers being developed for peach, to almond and wild relatives currently used in rootstock breeding. The Materials and Methods section characterizes the extensive trait variability in this germplasm and the opportunities for capturing desired traits in rootstock breeding. This is followed by a series of marker inheritance studies for different rootstock-species crosses. While genomic studies tend to be complex and highly statistical, marker inheritance studies are relatively straightforward since it is expected that each species parent will have a marker distinguishable in the hybrid, which should then be inherited in the expected (¼ AA, ½ AP, ¼ PP) ratio for selfed progeny and (½ AA, ½ AP) in backcross progeny (see diagram).



Results show that the utility of markers developed primarily in peach can vary considerably, even in advanced interspecies backcross populations. This inconsistency in marker value was even found within the more closely related wild peach species as well as within different germplasm sources for the same species, suggesting that inconsistencies would continue even when individual species specific markers were developed (owing to the complex multi-species origins of most rootstocks). The hybrid vigor of many rootstocks was also found to be due to a synergistic mechanism rather than the usual additive affect of individual genes for which markers are designed. While individual marker performance proved inconsistent, useful information such as the probable parentage of promising rootstocks could often be predicted by evaluating inheritance trends for a large number of markers.

1) **Integrated management of Fusarium canker in bareroot nursery stock and container-propagated stone fruit trees (Richard Bostock, Lead PI, UC Davis)**

2) **Managing the water relations of bareroot nursery stock to improve establishment, performance, and disease resistance (Kenneth Shackel, Lead PI, UC Davis)**

First year : This is a joint report for two related and collaborative projects

The overall focus of these related projects concerns the health of bareroot nursery trees during cold-storage and after planting. Our research seeks to clarify the relationship between tree water status and development of a fungal canker disease that primarily occurs in bareroot stone fruit trees. Related research within these projects seeks to identify management options that can be implemented by the California fruit and nut tree nursery industry. Nurseries have experienced sporadic losses to a canker disease caused by opportunistic fungi that attack young trees weakened by stress. The disease can occur in dormant bareroot trees maintained in cold storage in refrigerated warehouses, with disease signs and symptoms developing during storage or soon after planting. Diseased trees display molds growing on the bark and roots, and necroses of the inner bark, cambium and sapwood, which girdle and kill the trees. Weak establishment in new plantings also may be associated with the presence of these pathogenic fungi on roots, and infected but non-symptomatic dormant trees can develop symptoms later and collapse in the field. Our previous research demonstrated the involvement of four opportunistic fungal pathogens: *Fusarium avenaceum*, *Fusarium acuminatum*, *Cylindrocarpon obtusiusculum*, and *Ilyonectria robusta*. Loss of bark turgidity in almond stem segments due to desiccation stress correlates with significantly increased susceptibility. In addition, pathogenic *Fusarium spp.* can be isolated from every aspect of the production system including symptomatic and non-symptomatic almond bareroot trees, budwood, wheat rotation cover crops and residues in nursery fields, cold storage facility air and surfaces, and nursery equipment. In two nurseries, genetic testing confirmed that isolates from the various sources were highly genetically similar, suggesting these materials are potential inoculum sources. The overall objective of this research is to implement an integrated disease management plan based on our findings. Our collaboration also seeks to determine more precisely water status of bareroot trees during processing and storage, and the relationship to tree establishment, performance and disease.

NURSERY SERVICES PROGRAM
DISTRICT MAP

NORTHERN DISTRICT

Joseph Ravito, ES

SACRAMENTO HQ

Joshua Kress, Program Supervisor

Sean Dayyani, SES

Erin Lovig, SES

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Dave Marion, SES

Kristina Weber, ES

Brenda Lainini, ES

Alex Ballesteros, APCS

YunPing Zhang, Senior Plant Pathologist

Alemeh Chaharsoughi, ES

CENTRAL DISTRICT

Heather Emino, ES

Joel Kipper, ES

Tanya Goodson, ES

SOUTHERN DISTRICT

Ruben Arias, ES

Leo Cortez, ES

CALL FOR RESEARCH PROPOSALS FY 2018-19

Categories:
Virus elimination research; developing new or improving existing detection methods for viruses and virus-like diseases; other research on diseases and genetic disorders affecting fruit trees, nut trees, and grapevines.

RFP Instructions:
https://www.cdfa.ca.gov/plant/pe/nsc/docs/iab/RFP_instructions_18-19.pdf

Submit your proposal(s) to:

Address or email below

California Department of Food and Agriculture
Nursery, Seed, and Cotton Program
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Sacramento, CA 95814

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IAB MISSION STATEMENT:

"Enable production of the highest possible quality grapevine and deciduous fruit and ornamental nursery stock and to help develop and promote consumer education"

FOR MORE INFORMATION ABOUT OUR PROGRAMS. VISIT US ONLINE AT:

CALIFORNIA FRUIT TREE, NUT TREE AND GRAPEVINE IMPROVEMENT ADVISORY BOARD

https://www.cdfa.ca.gov/plant/PE/nsc/iab/index.html

NURSERY STOCK REGISTRATION AND CERTIFICATION SERVICES

https://www.cdfa.ca.gov/plant/pe/nsc/nursery/regcert.html

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