By Tim Spann
Research Program Director

Research Reviewed

An Investment in the Future

In an ongoing effort to make sure that growers' resources are being spent wisely, the California Avocado Commission's (CAC) Production Research Committee (PRC) recommended to the Board that the two largest research programs — rootstock breeding and shot hole borer (SHB) — be reviewed by external experts. These two programs alone account for two-thirds of CAC's annual research budget so outside experts were asked to review these two programs to ensure they are meeting their goals and generating research results that benefit growers.

Rootstock Breeding Review

The rootstock breeding program was reviewed during the week of April 18. CAC invited Drs. David Kuhn, Jose Chaparro and Tom Gradziel to spend three days visiting with the UC Riverside (UCR) research team (Drs. Patricia Manosalva, Peggy Mauk and Mary Lu Arpaia) and the PRC. Kuhn is a molecular biologist and curator of the avocado germplasm collection with the USDA Agricultural Research Service lab in Miami, Florida. Chaparro is a plant breeder in the Horticultural Sciences Department at the University of Florida working on peaches, citrus and avocado. And Gradziel is the almond and peach rootstock breeder in the Plant Sciences Department at UC Davis. These three individuals were chosen for their expertise in avocado molecular biology and genetics, and traditional plant breeding.

David Kuhn
Molecular Biologist
USDA Agricultural Research Service

Patricia Manosalva took over the lead on the avocado rootstock breeding program at UCR in January 2015, after her predecessor was not granted tenure at the University. Manosalva has a strong background in molecular biology and plant pathology and was involved in rice and tomato breeding programs for disease resistance in her previous positions. However, she does not have training in classical plant breeding. Thus, the review panel was assembled with the intention of serving as both a review panel and as future mentors to help her be successful.

Jose Chaparro
Associate Professor
University of Florida

The panel did a great job of reviewing the work proposed by the UCR team and providing them with very constructive criticism. Importantly, the reviewers also helped to educate the PRC about the intricacies of being successful in the university system and how that differs from our industry's definition of success. To us, Manosalva will be successful if she produces rootstocks that are tolerant to *Phytophthora* and salinity. However, in the University's eyes she will be successful if she brings in nationally competitive grants, such as United States Department of Agriculture or National Science Foundation, and publishes peer-reviewed papers in leading scientific journals. Thus, it is important for us to recognize these two, somewhat opposing, views of success and support her so she can be successful in both systems — lest we find ourselves looking for another rootstock breeder in a few years.

The three UCR researchers are to be complimented for their participation in the review process and their openness to the reviewers' comments. The best suggestion the reviewers had was to reduce the breadth of the project proposal and focus on a few key elements early on to get the program on sound footing, rather than trying to do too much too quickly. One of these key elements was rescreening material that has been lingering in the program for many years and has never been fully tested against *Phytophthora* and salinity. Another was to develop plans to restructure the seed source blocks to include only the most *Phytophthora* and salinity tolerant mother trees to ensure that the seeds generated from those mother trees have the greatest likelihood of having the genetic combinations that will result in improved tolerance. I am happy to say that these comments were taken to heart and Manosalva and her team are working on a revised proposal for the PRC to review at an upcoming meeting.

Tom Gradziel
Professor
University of California Davis

Shot Hole Borer Review

The SHB research was reviewed during the week of April 25. CAC invited four researchers with expertise in bark and ambrosia beetle biology, beetle ecology, plant pathology and plant physiology to visit with the research team at UCR who have been the backbone of our research on SHB. The reviewers were Drs. Rich Hofstetter, Jiri Hulcr, Randy Ploetz and Mike Mickelbart.

Rich Hofstetter
Associate Professor
Northern Arizona University

Hofstetter is in the School of Forestry at Northern Arizona University and is an expert on understanding beetle ecology by looking at things such as acoustics, forest health, and chemical attractants. He is also co-editor of the recent book "Bark Beetles: Biology and Ecology of Native and Invasive Species."

Hulcr is a forest entomologist in the School of Forestry at the University of Florida who, in his words, studies "the ambrosia symbiotic complex — beetles, fungi, bacteria. I address the most fundamental questions about the evolutionary origin of this fungus-farming symbiosis, and the chemistry that makes it function, but also how the tree-killing symbiosis is impacting trees, forests, and people." He has been heavily involved with research on the red bay ambrosia beetle, the vector of laurel wilt disease of avocados and its relatives, and maintains the website www.ambrosiasymbiosis.org/.

Jiri Hulcr
Assistant Professor
University of Florida

Ploetz is a plant pathology professor at the University of Florida's Tropical Research and Education Center who has been working extensively on laurel wilt disease during the past several years. His research focuses on soil-borne and foliar diseases of tropical crops, including avocado.

Mickelbart is a plant physiologist in the Botany and Horticulture Department at Purdue University who works on understanding plant stress responses. He is a native of Southern California and received his B.S. degree from UCR. He also completed a post-doc at UCR where he gained experience working with avocado.

Randy Ploetz
Professor
University of Florida

The SHB review team started its visit with a tour of the Huntington Gardens where they were able to see the damage from the beetle first hand and learn about some of the collaborative research that has been conducted at the facility. It was a good opportunity for the group to see the varying response to the beetle by different host species, including avocados. They then spent the next two days visiting with the research team at UCR, who were also supportive of the review process, spending a couple of hours with each researcher. The review team also had the opportunity to visit an infested avocado grove near Bonsall. The group wrapped up their visit at the CAC office in Irvine for a PRC meeting.

Mike Mickelbart
Associate Professor
Purdue University

Overall, the reviewers were supportive of the work that CAC has funded to date and the progress that has been made. Some of their suggestions for future research included focusing CAC-funded research to applied projects with immediate application to growers and helping the researchers find other funding sources to support more basic work. They also suggested a prioritized list of questions to have addressed in the next round of research. The PRC will be meeting on June 29 to consider all of these suggestions and make recommendations to the CAC Board.

The timing of this review was very good. Except for two projects, all of CAC's SHB research projects are set to end on October 31 at the end of the 2015-16 fiscal year. In addition, at that time CAC will have spent more than $2.5 million on this one issue since 2012. Thus, this is a very good time at which to pause and assess the situation and carefully plan our course forward to maximize our research returns to the grower.