CAC Staff Visit Florida Avocado Researchers

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Jonathan Dixon and I traveled to Florida from August 4-7 to visit with several avocado and plant breeding researchers at the United States Department of Agriculture lab in Miami, and the University of Florida (UF). Our goals were to get an update on the laurel wilt situation and on the research being done in Florida, learn what's new in avocado genomics, and discuss plant breeding strategies with expert breeders and variety managers.

While at the USDA lab we primarily met with Dr. David Kuhn, a plant molecular biologist, who is an expert in avocado genetics and molecular biology. We discussed at length the potential to use knowledge from the avocado genome sequencing project in Mexico to advance avocado breeding efforts. David was careful to explain that even with this new knowledge it will not be possible to "design" a perfect rootstock or variety. Rather, this information has the potential to tell us where desired traits (e.g., salinity tolerance) lie in the genome, identify which selections possess those traits, and then use those selections as parents in a more directed breeding program. Essentially, this new knowledge is a tool that can help take some of the variability out of breeding, but it is not a solution in and of itself.

The second day of our trip we met with Dr. Jonathan Crane, professor of horticulture at UF's Tropical Research and Education Center in Homestead. Dixon assembled a small group of other UF faculty and representatives of the Florida Avocado Administrative Committee to update us on the red bay ambrosia beetle and laurel wilt situation. The disease has been decimating native laurel species along the eastern and gulf coasts of the United States. Fortunately for avocado growers, the beetle populations have been found to be much higher in the native laurel species than in cultivated avocados. They believe this has helped to slow the spread within commercial avocado groves since avocado is apparently not the beetle's preferred host. However, because of the highly systemic nature of the laurel wilt pathogen, tree-to-tree spread through root grafts is a rapid means of spread in commercial groves. They told of one example where two trees were detected in a commercial grove and the owner did not remove the affected trees. Within six months 95 trees were affected due to spread through root grafts. In other groves where the infected trees were removed immediately, including the root system, there has been little to no spread of the disease. They shared with us a recent discovery that several other beetles (both native and invasive) have been found to be able to pick up and transmit the laurel wilt fungus, but it is unknown how much this is contributing to the spread of the disease. It is important for us to keep this thought of secondary vector spread in mind as we continue to study the polyphagous shot hole borer and fusarium wilt here in California.

Our next visit was with Peter Chaires, executive director of the New Varieties Development and Management Corporation (NVDMC). The NVDMC is a relatively new organization formed by Florida citrus growers to manage releases and licensing for new citrus varieties. During the organization's development, Chaires spent nearly a year traveling the country to meet with different breeding programs to learn how they manage variety releases and licensing issues. He took what he learned and created the model that

NVDMC is now using. Although still in its infancy, NVDMC appears to be working well and is viewed favorably by university and USDA breeding programs and citrus growers alike. One of their major efforts has been a program to get new material into growers' hands sooner and allow growers to help in the evaluation process in a very formal and controlled manner. In addition, they have negotiated an agreement with the University of Florida whereby they are the exclusive licensee for UF-bred citrus varieties. This allows the Florida citrus growers, who have invested heavily in developing the varieties, to ensure that overseas competitors don't out compete them with their own product. It will be interesting to observe this program as it matures to see if it could be applied to avocados.

Our last visit was with Dr. José Chaparro, associate professor of horticulture, who is UF's breeder of stone fruits (peaches, plums) and cold hardy citrus. We discussed at length with Dr. Chaparro how he has structured the breeding program since he took it over nine years ago and developed short, mid and long term goals. As a breeder, he told us he has to have things in the pipeline to address growers' immediate needs (present to five years out), their mid-term needs (about 10 years out) and their long term needs (20 years out). The long term goals being addressed may not be things growers even realize they need, but are fundamental changes to the crop to ensure its continued relevance in the marketplace. The example he used was a pit-less peach. As seedless fruits become more desired by the consumer, peaches will lose market share unless they can adapt to this market requirement. While a pit-less avocado may not be what is needed for our industry, a dwarf tree or one with a fundamentally different architecture suited to mechanical harvesting may be what is needed to overcome future labor limitations.

Dr. Chaparro likened a breeding program to a large freighter – it is much easier to make frequent small course corrections than to make very large sudden changes. This is done through frequent communication with the commodity's leadership and developing well-defined goals and objectives that will still be relevant in 5, 10 or 20 years when the final product emerges from the breeding program.

We also discussed how new genetic tools could be used to advance plant breeding. He was quick to point out that genetic modification has only been used to introduce novel traits that don't naturally exist in a group of plants (e.g., Roundup resistance genes). For traits that exist within a group of plants and need to be moved from one variety to another, traditional breeding methods are still the accepted means (e.g., by crossing a high chill and low chill peach, Dr. Chaparro can produce a peach with intermediate chilling requirements). He also indicated that, in his opinion, marker-assisted breeding should only be used for traits that are absolutely required or must be avoided. This is because even though a plant may not be exactly what is being bred for in a program, it may still possess desirable traits and it can be useful in future crosses. Throwing out this variation based on a single trait through marker-assisted selection may actually limit a program's chances for success.

Something that both UF researchers touched on that is very important for the long term sustainability of a plant breeding program is the need to have a royalty stream that allows the program to become, at least partially, self-funded over time. This is achieved through negotiations with the owners of the intellectual property and the licensee, but it also requires a steady flow of new material from the program to continuously generate the necessary revenue. In a long-lived tree crop such as avocado, where the number of new trees sold each year is limited, it may be necessary to look at having some material flowing from the program that is more suited to overseas growers to increase income to the program.

We learned a great deal from the experts we visited on this trip. It will take some time for us to fully digest the information they shared with us and integrate it into our thinking on avocados in California. It is through these types of exchanges that new ideas for a better avocado industry are born.