



National Academy of Sciences to Review Research Portfolio

Over the next six months, the National Academy of Sciences (NAS) will conduct a thorough review of the CRDF’s HLB research portfolio to determine whether scientists are on the right path toward providing growers with short, medium and long term solutions.

The report will come seven years after the NAS’ National Research Council (NRC) issued its initial research framework to the Florida citrus industry when HLB was in its nascent stages. The follow up is a necessary process, said Dr. Harold Browning, chief operating officer of the CRDF.

“There has been seven years of intensive funding for HLB in Florida, and 2 years of federal support through USDA, NIFA, SCRI and APHIS HLB MAC,” Browning said. “It is time to conduct an in-depth analysis of the gains in knowledge, understanding, and advancement of practices and tools to combat HLB. While this is done in an ongoing manner within CRDF and with our Scientific Advisory Board, an independent view is being organized to accomplish the following objectives, not just for CRDF, but also to guide future directions of the MAC and NIFA-SCRI programs.”

The NRC will examine the portfolio of research projects supported by CRDF to determine:

- if the research efforts are in line with the original research and technology recommendations
- research areas where progress has been achieved/ not achieved
- research areas where efforts should be continued/ discontinued
- research areas where more focus is needed or in which efforts need to be expanded and intensified
- research areas where efforts need to be integrated
- other promising research avenues

Upcoming Board & Committee Meetings

Most meetings are held in the Ben Hill Griffin Hall at the UF-IFAS, CREC campus in Lake Alfred, Florida.

01/13/2017	Commercial Product Delivery Comm.	9:30 am
01/19/2017	Industry Research Coordinating Comm.	9:30 am
01/23/2017	Governance Committee	1:30 pm
01/23/2017	Finance & Audit Committee	3:00 pm
01/24/2017	Board of Directors	9:30 am

The committee will also look at research efforts funded by the California Citrus Research Board and federal agencies to examine opportunities for synergy. The committee will prepare a report describing what is currently known about citrus greening – the disease, its causal organism, its vector, and the vector-pathogen-plant relationship; what knowledge is needed to improve disease control; and the committee’s conclusions with respect to viable research strategies going forward.

Project Manager Reports are Available on CRDF Website

Below are highlights from two quarterly Project Manager reports to CRDF regarding thermal therapy and tolerant rootstocks/scions. The full schedule of reports for the recent quarter can be found on the CRDF webpage citrusrdf.org

1. Thermal therapy – A project jointly funded by CRDF and the USDA, APHIS HLB MAC

The innovation regarding thermal therapy for HLB-infected trees in Florida is being driven by many separate groups, and with varying funding support, and there is significant progress being demonstrated on several fronts. Many participants have revised designs in response to early evaluation results, and have deployed next generation machines during the 2016 season.

The 14 sites being evaluated by CRDF for perfor-

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mance in restoring tree health all are ongoing thermotherapy projects where tree responses to different conditions are being monitored. Some treated trees displayed previous short-term responses that have since disappeared. The different sites are of various aged trees and varieties. Most projects have recent post-treatment leaf samples awaiting PCR analyses. All data and observations should be considered preliminary, as monitoring tree status and data analysis are continuing.

While summaries of data to date are provided below, please note the following scheduling plans:

- Fall/Winter PCR testing has proven to be the most reliable, with less random variation than during other times of year. Thus, during the next few months, additional PCR tests will be conducted.
- Fruit drop, fruit harvest and fruit quality data will be forthcoming as citrus harvest began in November and continue into spring, 2017. This will provide measures that matter most to citrus growers as they evaluate the value of thermal therapy.

2. Deployment of Disease Resistant or Tolerant Citrus Rootstocks and Scions

The CRDF project to deliver HLB resistance and tolerance has many facets. This program is being overseen by Dr. Catherine Hatcher, who joined CRDF in July 2016. The CRDF staff has identified the following five objectives for the program:

Objective 1 - Track ongoing research projects evaluating emerging scion and rootstock genotypes for tolerance or resistance to HLB, citrus canker and other diseases.

Tracking of research projects evaluating scion and rootstock genotypes for tolerance or resistance to HLB focused on research programs in Florida. CRDF staff met with individual researchers and with teams in the IFAS and USDA-ARS units to gather information regarding their ongoing research towards HLB resistant/tolerant genotypes. Projects were divided into two categories based on general approaches to generation of potentially HLB resistant/tolerant genotypes:

1. Conventional Breeding projects:

Biological challenges of conventional breeding in citrus have been expressed by all researchers involved in plant improvement. The differences in how the breeding for resistance to HLB are evident among the various programs. During this quarter the following were identified:

There are different philosophies towards breeding of citrus

- Multiple programs have overlapping goals yet work independently
- Definitions and evaluations of important traits differ by researcher and use different protocols
- HLB tolerance/resistance is not clearly defined, which complicates determination of success

2. Biotechnology projects:

Biotechnological approaches in citrus are relatively new areas of research as compared to other crops, and that presents unique challenges. Regulatory agencies in government provide guidance in the management of materials which can further add to the complexity working with these materials. Researchers need support to navigate the Biotechnology Regulatory Service, FDA, EPA and others to stay in compliance. CRDF is working to provide workshops and other mechanisms to fill this gap.

Project proposals in CRDF's portfolio reveal some overlap of project goals which has led to multiple researchers working on the same genes of interest. At this stage, CRDF staff are working to understand the status of the projects and what progress has been made towards HLB solutions. CRDF staff will continue to work with researchers to provide information regarding regulatory issues and encourage collaboration to establish common molecular and phenotypic characterization protocols.

Objective 2 - Cooperate in in-depth evaluation and

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planning exercises related to Florida (and US) citrus breeding to better focus on HLB solutions and rapid evaluation and deployment of rootstocks and scions. Discussions are ongoing with researchers regarding evaluation and planning in individual programs and collaborative efforts.

Objective 3 - Develop and implement plans for expanded management of tolerant and resistant citrus. Pipelines to create a common platform to evaluate, identify and advance the best performing HLB tolerant/resistant scion and rootstock candidates are being developed.

Objective 4 - Facilitate identification of best-performing candidate rootstocks and scions that appear to have HLB tolerance or resistance from Florida (and other) breeding programs. CRDF staff meetings with researchers in Florida to gain an understanding of current and planned field trials for evaluation of HLB tolerant/resistant rootstocks are ongoing. Thus far, we have learned that there are many field trials with mixed goals and in varying stages of data collection. There are differing views among researchers about the extent of data collection, and when/if data should be collected and protocols used to evaluate traits. Planning and resources for data collection in planned and newly planted large-scale field trials are lacking in some cases. CRDF staff will continue discussions with researchers to define work plans for data collection and evaluation of ongoing field trials for experimental materials in current and future field trials.

Objective 5 - Implement and evaluate Phase I and II grower field trials of most promising candidate HLB tolerant rootstocks using standard varieties as scions.

Phase I field trials:

Planting of CRDF rootstock trials at the three sites: Southwest Florida (Duda, LaBelle) site, Ridge site 1. (Peace River, Babson Park), and at the 2nd ridge site (Ben Hill Griffin, Venus) was completed in the Spring of 2016. Standardized CRDF protocols for data collection on horticultural traits have been developed and are in use for horticultural evaluation for HLB disease index (DI), PCR for *Candidatus Liberibacter asiaticus* bacterial titer, tree height, trunk cross-sectional area, canopy volume as well as leaf sampling, dry weight, and leaf area for nutritional analyses.

During this quarter horticultural trait data were collected and analyzed statistically within each site. Preliminary statistical analyses of horticultural data reveal some differences in rootstock performance within sites, the significance of which may become more apparent as the trials continue. Comparison of rootstock performance among sites at this stage has confounding effects due to different completion dates of planting of some rootstock entries at the two ridge sites (Peace River and Ben Hill Griffin). Horticultural performance data including HLB disease incidence and severity will be collected in each quarter as the trees mature. These data may further the understanding of the impact of HLB infection on new plantings as well as the degree of tolerance or resistance to HLB of these selected rootstocks. Leaf nutrition data is in the process of being analyzed and will be reported in the next report.

CRDF to Hold Biotechnology Workshop in Late January

The Citrus Research and Development Foundation (CRDF) will host a biotechnology workshop on January 24 to inform scientists and other interested parties about data requirements to advance HLB solutions through regulatory review. The agenda is currently being compiled and will be published sometime after January 3, 2017 on the CRDF's website – www.citrusrdf.org

Save the Date



March 15-17, 2017
Caribe Royale Hotel & Convention Center
Orlando, FL