



GROWER RESEARCH REPORT

DECEMBER 2020

Goal to Make Greening Functionally Irrelevant

by Rick Dantzler, COO of CRDF

Make no mistake about it, my goal for CRDF is to eradicate HLB or make it functionally irrelevant. Either through base hits that lead to runs or all at once with a homerun, one way or another we will eradicate greening or make it functionally irrelevant. Below are six ways we're working toward that goal.

#1: DEVELOPING HLB-TOLERANT ROOTSTOCK AND SCIONS

One of the most common questions growers ask in the HLB era is, "What should I plant?"

Three CRDF rootstock trials have helped many growers answer that question. The results from these trials are on the CRDF website, which I commend to you if you have not already seen them. You would find the data quite educational.

Given the success of these trials, the CRDF board, with initial encouragement from our president David Howard, has decided to conduct more trials of the latest and most promising rootstocks. The goal is to include up to 20 rootstocks grown on three industry-standard scions - Valencia, Vernia and Hamlin. These three scions were the top three budded scions in 2019-2020. And with Hamlin, by being particularly susceptible to HLB it will give a quick indication of HLB tolerance in the rootstock.

I have visited many of the trial sites of our breeders and there are many rootstocks from which to choose. Robust trees with good fruit, few thorns, and very low titer counts lead me to believe we are close to having new and better orange cultivars that can be grown profitably even when growers aren't receiving premium prices for their fruit. In other words, trees that make HLB functionally irrelevant. If there are rootstocks you would like us to consider for the trial, please let us know!

These rootstock trials will require grower-cooperators. If you are interested in hosting one of these trials, please contact us. CRDF will pay for the trees, planting costs and tree wraps.

The details of the trials are being developed by the CRDF Select Committee on Plant Improvement, chaired by John Gose. Few growers have more practical knowledge of rootstocks and scions than John, and he will be working with a committee membership comprised of leaders from all facets of the industry.

Overseeing these trials will be CRDF's Brandon Page, a highly motivated and dedicated employee who understands the last stage of field trials as well as anybody. I am excited about these trials and the work that is to come from the Select Committee.

A thought that has surfaced is that a scion trial could be just as valuable as a rootstock trial. My sense is the Select Committee could very well turn its attention to scions after completing its review of rootstocks, so don't be surprised if CRDF embarks upon a scion trial in the relatively near future.

#2: FULLY FUNDING THE FUTURE OF THE CRAFT PROGRAM

Of the \$8 million dollar appropriation CRDF received from the Legislature last session, we were directed to spend \$3 million of it on large-scale field trials. We promulgated and advertised a Request for Proposals and ultimately selected CRAFT as the recipient.

When the negative fiscal impact to the state caused by COVID-19 struck, all state agencies were required to hold back 8.5 percent of its spending of state funds, which amounted to \$680,000 for CRDF, \$255,000 of which would have been withheld from CRAFT if reductions had been taken across the board. However, the CRDF board understands the popularity of CRAFT and supports its objective of getting 5,000 new acres planted in ways that will allow practical production data to result, so it made the decision to make up the \$255,000 elsewhere and give CRAFT the entire \$3 million so long as there are \$3 million dollars of qualified projects as identified by the CRAFT Technical Working Group (TWG) and board (in other words, if 3,000 acres of meritorious projects are approved since \$1,000/program acre is paid by CRDF). Having listened in on deliberations of the TWG, I am impressed by the quality of projects and predict the program will be a smashing success.

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#3: PEPTIDES SHOWING PROMISE

Another focus for CRDF for the new year in the fight against HLB will be peptides. We all got excited when we read of Dr. Hailing Jin's work at the University of California Riverside with a peptide from finger lime that was showing early success against HLB. Since the announcement, I have had four conference calls with her, trying to determine if there is anything CRDF can do to get to the bottom line of her research as quickly as possible.

But Dr. Jin's peptide is not the only one showing promise. Several companies in Florida are working with peptides. It was why CRDF was proud to team up with Florida Citrus Mutual to host a morning-long educational seminar on peptides. Mutual had made it clear to me that finding out the state of the marketplace was one of the things growers wanted to learn, so our presenters were from industry as well as a presenter from the EPA so that we could learn where things stood in the process towards commercialization and the steps necessary to bring peptide products to market. I am convinced that peptides will be part of our solution.

#4: CRDF WORKS WITH PARTNERS TO SECURE FUNDING FOR CONCLUSION OF BAYER PROJECT

As you have perhaps heard, we were successful in securing federal funding for the Bayer project, which will allow it to be brought in for its natural conclusion.

Jointly funded by CRDF, PepsiCo and Coca-Cola, the Bayer project is the most expensive in CRDF's history at \$12,610,000. However, it had gotten to where CRDF was simply not going to be able to continue putting money into it despite its promising results, so funding partners CRDF, PepsiCo, Coca-Cola and the California Citrus Research Board came together to provide bridge funding while pursuing a USDA NIFA grant in concert with research partners Bayer Crop Science, the University of Florida, Texas A&M, and the University of California Davis.

The strategy worked. We received the federal grant and funding began on September 1st.

The project has three objectives.

One, to construct a high-throughput screening cascade, which has been done, to test antibacterial microbes for their ability to kill liberibacter. This process involves Bayer, Texas A&M and UF/IFAS and is available to all credentialed researchers.

Two, to find an antibacterial microbe that kills liberibacter. Bayer has a library of 150,000 microbial strains. Early screening narrows the list considerably. From this narrowed list, approximately 500 are put through high throughput screening each quarter. Two-thousand five hundred (2,500) microbes have been tested so far, 49 of which showed enough promise to be sent to Texas A&M to be subjected to the hairy root assay, perhaps the world's best rapid testing mechanism for in planta screening. From these, four were promising enough to be shipped to Florida for real-world testing in UF/IFAS' citrus greenhouse assay and for three field trials set up for the Bayer project.

Three, to develop a plant defense modulator (PDM) to cause the plant's natural defenses to fight HLB. This work is done in France. Bayer has already screened 200,000 compounds (100,000/year). From these screenings there were 3,000 hits involving 72 clusters. Bayer is so confident of one cluster that it is already developing analogs (specific variations for maximum efficacy against HLB) and engaging the company's regulatory persons for toxicology screening to make commercialization occur as quickly as possible.

A new element of the project has been added as part of the NIFA grant: metabolomics. Metabolomics is the science of metabolites. A metabolite is the end product of metabolism, and these end products have qualities that can be measured. For example, and I must confess I did not know this, plants have smells that are detectable. For our purpose, a healthy tree smells one way but its smell changes when it becomes affected by HLB. Who knew? Scientists can now detect these differences, a skill that has been added to the project because it allows us to determine earlier if a therapy is working.

The federal grant is for two years with a third following if success is achieved. I am confident that several new products, which will be identified by the end of the project, will result. The bad news is the regulatory process will almost certainly take several more years beyond that, but at least more arrows in the quiver will be on the way.

"There seems to be with orange growers a considerable interest manifested in the Parson Brown orange, and as I once owned the tree that produced this now famous orange, and was the first orange grower who brought this fine fruit to the notice of the Northern public, I will, with your permission, give your readers a short history of this tree," said Capt. J.L. Carney in a 1896 letter to Florida Farmer & Fruit Grower.

What follows in the letter is a history of the establishment of the Parson Brown orange and how the first buds were taken from a tree owned by Uncle Brown, a Methodist minister (hence the name). He was reputed to have the best tree of this genotype.

#5: PARSON BROWN ORANGES: MAKING THE OLD, NEW AGAIN

Parson Brown oranges have good flavor and color and are an early season variety, but they fell into disfavor because they are seedy and have more peel oil than Hamlin, its primary competitor. Still, it hung on, and more than a few growers continued to grow it.

When HLB hit, it was noticed that Parson Browns seemed to be faring better than other genotypes. In fact, one grower claims to continue to pick upwards of 600 boxes per acre from his Parson Brown grove. This caught the attention of University of Florida Institute of Food and Agricultural Sciences emeritus Extension agent Gary England. He aims to document the true status of Parson Brown and determine which clones are best.

England is working with CRDF's Brandon Page and Manjul Dutt of UF/IFAS, who presented CRDF with a research proposal to determine why Parson Browns seem to stand up to HLB better than many cultivars. It is suspected that Parson Browns have higher levels of the PR1 and PR2 defense genes, which are the molecular markers of systemic acquired resistance, than Hamlin. The research project will determine if this is the case.

But what about the high peel oil and seed content that caused Parson Browns to fall into disfavor with processors? With an orange crop estimate of 56 million boxes in Florida, processors are in need of fruit - especially early season oranges not particularly affected by HLB from a quality standpoint - so such factors are of lesser concern. And plant breeders have indicated an ability to breed the less desirable characteristics out of the fruit over time.

Some of the earlier and perhaps best Parson Brown clones are few in number, so a priority is to preserve the gene sequence for those that are considered the best. That work, perhaps with the assistance of PepsiCo, may be considered, as well.

Wouldn't it be something if part of the solution to HLB has been with us all along, and the good ol' Parson Brown is part of the answer? We will find out.

#6: THE MOTHER OF ALL CULTURING EXPERIMENTS

A vexing problem in HLB research is the inability to grow liberibacter in a culture. For those like me who are not scientists, think of growing bacteria in agar in Petri dishes in high school biology or chemistry; that's what we can't do with liberibacter.

This inability to "culture" liberibacter is an issue because it limits the ability to get rapid feedback on treatment therapies. If we could grow liberibacter in a Petri dish, we could, for example, put a bactericide in with the bacteria and find out within days if the bacteria were affected, not months as required with other assays.

We all remember the news splash from a year ago about research from Washington State University where researchers claimed to have grown liberibacter, albeit in a biofilm (with other kinds of bacteria). I recently called the lead researcher to find out the status of this and learned that not much had happened since then because the grant had run out. I asked him to please remember CRDF, so he sent a proposal for us to consider.

Over the course of our evaluation of this proposal we realized we needed outside help to understand the state of culturing, so we convened a blue-ribbon panel of experts from across the country, which led to the idea of all the researchers coming together as a team for the "Mother of All Culturing Experiments" (my phrase) to get to the bottom of this once and for all.

This would not be the first time a few of these researchers have worked together. The framework for a project has been drafted and a couple of them are communicating, so let's see where this goes.

I must confess that I wonder if growing liberibacter robustly enough to be of much good is even possible because it must be dependably reproducible. Some experts say it is not, but I never cease to be amazed at what the researchers we fund can do. Still, such difficulties must be considered when evaluating if the juice is worth the squeeze for the money it would cost CRDF and the time it would take. Also, with the advent and acceptance of the hairy root assay by Dr. Mandadi at Texas A&M University, an assay which grows roots infected with HLB and that is completely realistic to HLB in the wild, the need for culturing is not as urgent. The only negative thing about the hairy root assay is it takes several months to determine how effective the treatment compound is in affecting liberibacter.

My hope for this effort is that the research team will come up with a unique approach and form an alliance that maximizes the strengths of each researcher. If it does, the most likely funding sources would be federal because of the time and expense required, and CRDF would certainly be supportive.

WHAT'S NEXT?

What should be CRDF's next RFP? The new year is right around the corner and we are looking at ideas for the next RFP. What do you believe our priorities should be? We work for you, so we want to make sure we are hitting the subjects you believe need addressing. Unconventional or outside-the-box ideas are especially welcomed.

Feel free to go to the "Grower Forum" on our website and let us know. I'd like nothing more than for growers to comment back and forth as they discuss what they believe we should fund.

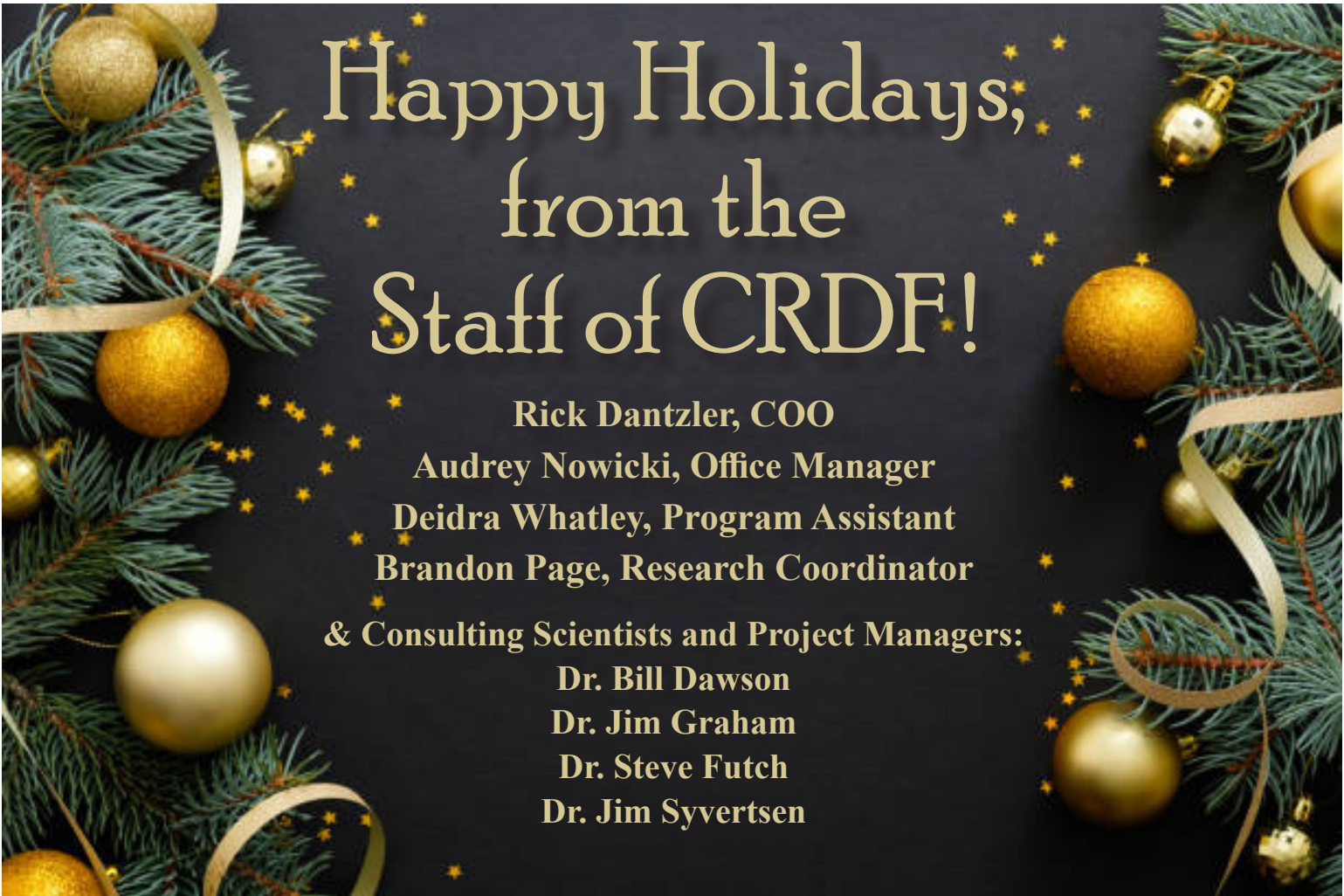
WRAPPING UP 2020...

Great things are going to happen in 2021. The year 2020 was a lost year in some ways, but it will soon be behind us. Within months most of us will have had the coronavirus vaccine and things will have begun returning to a sense of normalcy. And won't it be nice to be able to be together again?

At CRDF, we are going to provide you with answers. I feel it in my bones that we are getting closer to having this awful disease in the rearview mirror. There is simply no way that all the knowledge we have gained is going to result in HLB not being eradicated or made functionally irrelevant. You can mark my words.



For more information and updates from CRDF, [visit citrusrdf.org](http://citrusrdf.org).



Happy Holidays, from the Staff of CRDF!

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