The HLB pathogen: The challenges of finding solutions

By Harold Browning

In recent months, we have provided updates on research directed at finding solutions to HLB for the Florida citrus industry. One article discussed approaches to attacking the psyllid vector and the range of research efforts that address reducing psyllid populations. More recently, we discussed CRDF-funded research areas that focus on the plant, including approaches taken by growers to overcome nutritional deficiencies in groves. This month we will focus on the bacterial pathogen itself, Candidatus Liberibacter asiaticus (CLas).

The multitude of challenges in conducting research with this pathogen remain unresolved in many cases, causing researchers to seek alternative tools and approaches to gain understanding, and to develop and test hypotheses about the pathogen, how it infects both the psyllid and citrus plants, and how the effects can be minimized or reversed. With that in mind, the research efforts on the pathogen side of the HLB disease triangle really focus on how infection of trees occurs, and once infected, how CLas moves within plants. We are gaining a better understanding of how CLas infection induces plant responses, which result in the expression of symptoms. Knowing how the plant processes are disrupted by presence of the bacterium is a step toward understanding how to counteract the disease.

Substantial progress is occurring in this area of the research. With the recent completion of the CLas genome, paired with the recent completion of the citrus genome, a number of labs are now able to evaluate the nature of the interaction between the bacterium and plant and how the plant responds to CLas' presence. Details of the genetic basis for this pathogen/plant interaction are providing researchers with clues that may lead to solutions. Knowing which plant processes are altered, and how the HLB bacterium is avoiding normal plant defenses, could lead to manipulations that turn around the plant's defense or activate another defense pathway. Likewise, plant breeders can use this information to screen new germplasm for the presence of traits that might combat HLB. Ultimately, a resistant plant may be derived based on this understanding.

While there are no management strategies currently in use to reduce the pathogen titer in the plant or to reduce CLas titer in the psyllid, both of these areas are targets for research. The testing of a broad array of antibiotic candidates continues in Florida, using a standardized assay that allows direct comparisons between individual candidate antibiotics and combinations. The best performers among the candidate antibiotics will move to more advanced testing, and ultimately will be evaluated for their likelihood of being approved for field use in agriculture. The CRDF Commercial Product Development Committee is keeping pace with progress in the laboratories so that they can facilitate the next steps toward further evaluation.

Another focus of research on the bacterium that has been a roadblock to research advances is the effort to culture CLas. CRDF has sponsored a number of projects to unravel the requirements needed by the bacterium to survive and reproduce apart from the host plant — more specifically, in a controlled laboratory environment. Plans are in development to conduct an assessment of progress to date among all of these efforts and to encourage cooperation among the researchers to complete this important milestone. Success here would open up significant new avenues of research to understand and counteract the pathogen.

Harold Browning is Chief Operations Officer of CRDF. The foundation is charged with funding citrus research and getting the results of that research to use in the grove.

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