Grower Research REPORT
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Call for Pre-Proposals for CATP13:

CRDF announced the request for pre-proposals for the CATP 13 (Citrus Advanced Technology Program 2013) cycle of funding support for research on HLB and other diseases in August, and the deadline for submission of these project ideas has just passed. Each year, project ideas are solicited to complement the existing portfolio of one- to three-year projects. As results are reported and their use in combating HLB evaluated, this is an important time to further prior research investments and to identify new directions or approaches. The pre-proposal process has been in place since the beginning of the CATP in 2008, and provides an excellent mechanism for bringing forth both results and new ideas.

The other advantage of the CATP process is that the pre-proposal allows for the researchers to share their ideas freely and easily in the one-page pre-proposal form, avoiding the need for a lengthy full proposal document at this point in the process. Similarly, the Scientific Advisory Board, the Research Management Committee and the Board can easily review and determine which of the ideas warrant development of a full proposal and further consideration from the brief pre-proposal.

The advance of knowledge on HLB and its effects on citrus tree health points to important interactions with other factors that add to tree stress that is associated with HLB infection. CRDF has attempted to address this need in recent funding cycles by accepting proposals targeted at interactions with other stresses. Work on stress interactions has included Phytophthora root damage, Diaprepes root weevil, and nutritional deficiencies.

The submission of pre-proposals by end of September begins the process that culminates in review and approval of selected full proposals by the Board of Directors at its February 2014 meeting. Full details of this process can be found at the CRDF website citrusrdf.org.

An Outline of the Antimicrobial Strategy:

The industry, through CRDF, has been investigating solutions to HLB for 5 years now, and most recently has been provided the opportunity to invest state resources in accelerating those tools that are close to field-ready. Additional field-ready tools are needed for use in managing the HLB vector, Asian citrus psyllid, reducing or eliminating the inoculum from infected trees, and having available citrus trees and production practices that maintain health and productivity in the presence of continued HLB pressure.

We have invested heavily in nutritional treatments, both as citrus growers and in the research arena. Continuing research has two main goals, the first of which is to demonstrate the benefit of supplemental nutrient treatments and allied materials. This will help growers determine among available products, rates, timing, and potentially the return on investment of this set of tools. The second goal is mechanistic; to understand the cause/effect relationships of nutritional treatments, with an eye to reduction to those components which are most useful in the varying environments of Florida citrus groves. While use is widespread, the specific conditions under which tree health and production are maintained.

Regarding the need for near-term therapies that specifically reduce the levels of bacteria in infected citrus trees, there have been many strategies pursued that collectively address reversing disease impacts.

- We are trying to understand the effects of heat therapy in reducing HLB symptoms and reducing tree decline. On-going research is synchronized with grower innovation, and together, evidence is accumulating for how solarization within tree covers can reduce CLas titer and stimulate positive tree growth response. Research projects are designed to quantify the variables at play and to contemplate commercialization strategies (scale-up from single plants to rows and groves).
- Biological treatments are being evaluated in field research, with many potential objectives being considered. Among these are beneficial microbe products, many of which are available for use in citrus, and for which little performance evidence exists. Like the nutritional treatments, there are questions of what can be expected from their use, as well as how they can be optimized and integrated into overall citrus management in the era of HLB. Other biological approaches include the use of the CTV vector as a delivery tool and investigation of phages (viruses which affect bacteria).
- All of these tools and other approaches which involve ACP reduction or development of plant tolerance/resistance, need to be evaluated under field conditions to determine their individual and collective effects on citrus production in the current season and beyond.
- Finally these therapies and other tools must be capable of overcoming challenges of new plantings, providing growers with the confidence to move ahead with resetting and replanting.

UPCOMING MEETINGS

October 2013			
10	Governance Committee	CREC, Lake Alfred	10:00 am
14	Research Management Committee	CREC, Lake Alfred	10:00 am
18	Finance & Audit Committee	CREC, Lake Alfred	9:30 am
22	Board of Directors	CREC, Lake Alfred	9:30 am

Antimicrobial Strategy:

Since the NRC study and its publication in 2009, CRDF has backed research in antibacterial compounds including antibiotics that are used in human and animal health. Initial research focused on development of expanded screening assays, since HLB and CLas offer unique challenges to researchers. This work has yielded a reproducible citrus graft assay, and more recently, a surrogate bacterial laboratory assay using the closely related Candidatus Liberibacter crescens. This allows for high throughput evaluation of antimicrobial candidates. Finally, a soil assay also has been developed to investigate activity of soil-borne microbes or their by-products.

The InnoCentive™ promotion showed the breadth of chemical classes of compounds that have activity. The Innocentive™ Challenge was a reward-based attempt to seek solvers who had candidate antimicrobial materials that they felt might be useful against CLas. Based on screening the candidates submitted, and subsequent discussions with commercial partners, these submissions were narrowed down to 11 compounds to evaluate further. In turn, this has guided the development of 5 strategies for advancement to field trials and possible registration. Each of these strategies, referenced in the table below, face different regulatory, technical and commercial risks.

At a recent CRDF Commercial Product Delivery Committee Meeting, the following information was summarized and strategies given favorable consideration to move forward.

1) Antibiotics: Streptomycin and Oxytetracycline are considered most likely to be approved among conventional antibiotics, since there is precedence for their use in agriculture. CRDF reports that corporate research is committed to move these two antibiotics forward.

2) Agricultural Antibiotics used on food crops in other countries: These candidates offer another opportunity for therapy against CLas, while posing unique challenges, including unraveling intellectual property issues.

3) New Molecular Entities: Compounds with specificity and potency customized to treat HLB and not used for human or animal health. These might be referred to as non-antibiotics.

4) Biopesticides: One class of compounds in this category is used in agriculture but not formulated for vascular disease of trees. CRDF is in discussion with the dominant industry patent holder.

5) GRAS-like: Simple plant essential oils. Sponsored research is under way to formulate and deliver compounds that qualify for the GRAS-like status (Generally Regarded As Safe). The appeal of this category is the potential for more rapid deployment through a reduced commercialization and regulatory pathway if the laboratory evidence for efficacy of these materials is translated into the field.

In summarizing the status of this antimicrobial strategy, it is important to balance multiple dimensions of risk inherent in developing a product that is safe, effective and can be registered for agricultural use through federal and state agencies. In addition to regulatory concerns, the optimized dosages that are non-phytotoxic but still effective must be identified.

While this and other strategies for combatting ACP, CLas and the HLB disease that these organisms cause, it is **critically important that growers ONLY use materials that are labeled for use in citrus, and use them in accordance with the label.** While it should go without saying, the seriousness of possible repercussions of misuse demand that this message be communicated clearly.

LINK	TITLE	RESEARCHER
	How does infection of Asian citrus psylid with Candidatus Liberibacter asiaticus affect the behavioral response of the vector to healthy versus diseased citrus trees?	Stelinski
	Speedy evaluation of citrus germplasm for psyllid resistance	Hall
	Dissecting The Disease Complex of Citrus Huanglongbing in Florida	Duan
	Infection traits and growth of "Candidatus Liberibacter asiaticus" inside microfluidic chambers	De La Fuente
	Exploiting the Las and Lam phage for potential control of HLB	Gabriel
	Precision Foliar nutrient management using real time leafanalysis and a variable rate application technique	Ehsani
	Analysis of the colonization of citrus seed coats by 'Candidatus Liberibacter asiaticus' the causal agent of citrus huanglongbing and their use as a concentrated, pure source of bacteria for research.	Hilf
	Factors influencing acquisition and inoculation of Candidatus Liberibacter asiaticus by Diaphorina citri	Lopes
	Support for the Southern Gardens Diagnostic Laboratory	Irey