

RIVER RAMBLINGS

The newsletter of the
Indian River Citrus League

MAY 2014

HLB Thermal Therapy Field Day April 30, 2014 Shows Promise

Harold Browning, COO, Citrus Research and Development Foundation



A field day on April 30 in the Indian River citrus growing area of Florida demonstrated ongoing work to evaluate the value of applied heat in treating trees affected by Huanglongbing (HLB). More than 175 growers and other interested parties participated in this day-long event organized by Mr. Parker Platts, Multi-County Extension Agent, Fruit Crops and the other UF, IFAS Citrus Multi-County Extension Agents and sponsored by CRDF. The event highlighted research that is evaluating use of tree covers to trap solar heat and several methods that are being developed to speed up the process of treating trees by application supplemental heat. The event was hosted by USDA, ARS at their U.S. Horticultural Research Laboratory in Ft. Pierce, and included opening presentation overviews, a visit to the ARS research farm to see application methods and to view trees which had previously been treated with heat, and to a grower site where thermal therapy has been used to nearly three years. The challenge is to provide adequate temperature and duration conditions to reduce the titer of *Candidatus Liberibacter asiaticus* bacteria, the causal agent for HLB, while not causing heat injury to the trees.



Participants in the April 30 thermal therapy field day departing from the introductory session and observing one of many demonstrations at the USDA, ARS Picos Road Farm.

The field day began at the ARS facility with welcome and introductions, and proceeded through four brief presentations that set the stage for the rest of the day. Parker Platts provided an overview of the topic and showed photographs of a number of different designs for single-tree covers that are in use for accumulating solar heat in the airspace around infected trees. Many growers are beginning to test single tree covers, with varying success, and these designs represent efforts to produce effective, simple and economical tree covers

that can stand up to field conditions. Following his introduction and overview of the day, a number of presentations were made by the research teams who have been investigating thermal therapy. The topics and approaches presented were:

How to Live with HLB? Yongping Duan and Melissa Doud, USDA ARS USHRL, Fort Pierce, FL

Drs. Duan and Doud reported on laboratory, greenhouse and field research to date conducted by their program to establish the proof of concept that heat can differentially reduce bacterial levels within citrus trees with minimal damage to the tree itself. The presentations focused on the science behind this finding, and discussed the possible mechanisms involved in this reduction in bacteria; population and how it might be used to improve effectiveness.

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Dr. Doud also presented results of the field evaluation of heat treatment using tree enclosures. A number of cycles of treatment have been imposed, allowing a sequence of tree comparisons at various intervals after treatment. Photographic comparisons of trees that were treated with those nearby in the same plots that were not treated demonstrated the change in growth and visible recovery following treatment.

SHORT TIME THERMOTHERAPY USING SUPPLEMENTARY HEAT.

Dr. Reza Ehsani, UF IFAS Citrus Research and Education Center, Lake Alfred.

The next overview focused on the use of supplemental heat application to treat HLB-infected trees. Dr. Ehsani and his team are attempting to make thermal therapy possible on single trees but also to be applied to whole rows or whole groves. His principle is to add heat in a controlled manner to reach the required temperature in a short period of time, allowing trees and rows to be treated in a reasonable time frame. As with the other programs working on thermal therapy, this team is gathering data to better understand the temperature/time conditions required for effectiveness of treatment. An important new dimension to this program is the testing of steam applied to trees. Steam heat application has been occurred in recent weeks, and the outcome in tree response and pathogen reduction is being monitored.

Hydro-Solar Thermotherapy (HST)

presented by Dr. Tim Gottwald, USDA, ARS USHRL, Fort Pierce

Dr. Gottwald provided the background and objectives for an alternative method to apply heat to infected trees through targeting tree trunks with warm water jackets. The heat source being investigated is a simple closed system to capture solar heat using water-filled tubes, similar to technology used in solar heaters for home and swimming pool use. These units are mobile and can be located within the grove to circulate hot water through the jackets placed around citrus trunks. This is a modification of previous efforts elsewhere in the world to reach lethal temperatures within phloem in trunk and branch areas of the tree. Early evidence indicates that this form of heat application has merit for further evaluation.



Field-portable solar hydro-heaters being evaluated for use in providing supplemental heat to trunks of infected trees (top) and discussion of temperature/time requirement for thermal therapy with program participants (bottom).



Presence of tree cover over 4-5 year old tree showing symptoms of HLB (top) and covering of infected tree with steam shroud prior to 2-minute treatment with steam heat (bottom).

The field day then relocated to the Picos Road USDA, ARS Research Farm, where demonstrations were set up that coincided with the presentations described above. Participants were able to see the equipment and its operation, as well as to see trees that had previously been treated. Each site had relevant scientists and engineers present to describe the details and to answer questions. These demonstrations signified that this HLB tool has moved from the lab to the field and is ready for next stages in adoption. Participants had many questions and discussed details of practicality, cost, tree injury, and when during the year such treatments can be expected to be effective. Other topics included impact on fruit quality and the likelihood that heat treatment would actually eliminate the bacteria from infected trees. Many of these questions are being evaluated further as more trees are treated and the methods continue to be refined.

Following lunch at the ARS Picos Road Research Farm, a field visit to a grove site of Edsell Groves near Ft. Pierce allowed participants to see evidence of treatment of young trees with solar thermal therapy and the results of trees which had been treated very recently and as far back as 2-3 years. Designs for the tree covers were discussed and an active discussion occurred between participants and Dave McKenzie, the production manager who has been a strong supporter of thermal therapy.

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Thanks are expressed to many growers who have been tracking, observing, commenting, and testing thermal therapy in their groves. Adoption of new ideas and tools occurs one grower at a time, and so we applaud all of you have been willing to try something new.

Among the grower participants in the field day were a number of entrepreneurs, innovators, individuals and companies, who are interested and working in this arena, and who attended to learn more and to assist in delivering this tool for broader use in Florida citrus and beyond. Some are already at work on scale-up, while others are contemplating how they might help. This is an important step in moving from proof to use, and CRDF is strongly encouraging the partnerships that can make this happen.

In addition, with recent federal funding, CRDF and the industry are pursuing the opportunity that exists to partner with the USDA Multiagency Coordinating group to direct some of the federal funding to encourage scale-up of thermal therapy. Dr. Mary Palm, a plant pathologist with USDA, APHIS, leads the MAC group and was at the field day to learn more about how the APHIS funding program can assist in this scale-up effort and in other solutions to HLB. An informal follow-up discussion was held at USDA following the completion of the field day for those who were interested. The goal was to discuss how we can move forward in expanding the testing and use of thermal therapy of HLB-infected trees, and to learn more about how to move forward with numerous partnerships. Several additional ideas emerged from the discussion, and many participants are anxious to participate in follow-up discussions and funding opportunities.

CRDF, as the sponsor, reiterated that a group of citrus industry folks are doing an outstanding job in representing the industry in important roles with CRDF. These industry representatives voluntarily work on committees and the board to seek solutions to HLB and other diseases. They are the custodians of the industry's trust and the voice of citrus grower needs. They are committed to finding solutions and are leading an effort that this industry has never seen. Many of the CRDF committee and board members were in attendance at the field day, extending their support and observing how this tool might be useful in the short term.

More information and the presentation contents can be viewed by going to Citrusrdf.org or to the St. Lucie Extension Web page <http://stlucie.ifas.ufl.edu/thermotherapy.html>. These pages highlight the presentations made during the field days, photo galleries from the field visits, and additional information related to thermal therapy and its use in treating HLB-infected trees.



Discussion of thermal therapy at Edsell Groves by Dave McKenzie (left) latest tree cover design (middle) and treated tree showing healthy regrowth following thermal treatment (right).

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League Welcomes New Associate Member

Rick Lewis, President of Winter, Bell Co.

Agricultural Secretary Names Members to Citrus Research Subcommittee

Agriculture Secretary Tom Vilsack has announced the appointment of 8 members to the National Agricultural Research, Extension, Education and Economics (NAREEE) Advisory Board's Citrus Research Subcommittee. The purpose of the committee is to advise the Secretary of Agriculture on citrus research, extension, and development needs, engage in regular consultation and collaboration with USDA and other organizations involved in citrus, and provide recommendations for research and extension activities related to citrus disease. The Committee will also advise the Secretary on the distribution of the \$125 million in research funding contained in the Farm Bill.



The Committee members are:

- Joe Davis, Jr. (FL)
- Tom Jerkins (FL)-Committee Chair
- Matthew McLean (FL)
- Donald Roark (CA)
- Paul Heller (TX)
- Shirley Morgan-Jordan (USDA Staff)
- David Howard (FL)
- Ricke Kress (FL)
- Dr. Etienne Rabe (CA)
- Justin Brown (CA)
- Michele Esch (USDA Staff)

David Howard of Graves Brothers Company and committee appointee stated, "Our industry needs answers quickly! I know the Florida contingent shares this sentiment. Our first priority should be to press the agencies for expedited funding that gets HLB solutions into growers hands as quickly as possible. I see this as an opportunity for Florida's East Coast Citrus Growers to have a research voice on a national level. My efforts are a reflection of Graves Brothers Company's continued support of citrus research as a key component for the viability of our Industry. More specifically, the commitment of the many other local growers who are giving their time in this research process will help insure the future success of citrus in "The Indian River District."

The first meeting scheduled for the Committee is May 19 in Washington, D.C.

Tamarixia Wasps for Citrus Psyllid Control: We Have an App for That

by Steven Rogers, originally published online May 2014 in Digital Citrus. The Division of Plant Industry, Florida Department of Agriculture and Consumer Services, contributed information for this article.

This month, we talk about an exciting program we're working on with the Division of Plant Industry for non-chemical ways of controlling [Asian citrus psyllid](#). We'd also like to introduce a new "right here, right now" technology solution we developed to help with our role in the program. Psyllids are small insects that transmit a disease called [citrus greening](#), which many consider the most serious production issue in Florida. There are a lot of options for controlling psyllids, including [chemical treatments](#) and strategic options like [Citrus Health Management Areas](#). Psyllid interventions are increasingly complicated, and involve an intricate series of field surveys, calculations, regulatory management and treatment maneuvers to achieve control. Chemicals can be effective, but require repeated applications so that the insect is continuously suppressed. This practice isn't sustainable. Citrus Health Management Areas are also effective, but not everyone can fully participate. For example, growers with commercial blocks interspersed between housing subdivisions and abandoned groves (often owned by absentees) can't aerial spray or easily remove declining trees. We need new ways to simplify management practices and control psyllids with fewer chemicals. In our case, non-chemical controls won't replace established practices, but they can extend the range of psyllid control outside the reach of other methods. The [Tamarixia Release Program](#) by the Florida Department of Agriculture and Consumer Services is one of several programs working toward these goals. This article reflects our experience in the program and shows how you can participate and release Tamarixia wasps in your groves, too.

Tamarixia radiata: a beneficial wasp that attacks psyllids While there are other beneficial insects that attack psyllids in Florida (lady beetles are especially good at it), *Tamarixia radiata* is one of [two parasitic wasps](#) released by the state that provide additional control. Figure 1 shows a *T. radiata* wasp (upper right) and a parasitized citrus psyllid (lower left). The wasp is established in Florida and is providing varying levels of control. There's good reason to expect it'll do well here since it has also shown excellent control of psyllids on Reunion and Guadeloupe Islands. One way to improve its performance is by releasing even more wasps in locations where they have a good chance to thrive. An excellent article on the background, rearing and release of the wasps in Florida will be published soon in [Citrus Industry magazine](#) if you're interested in that program.

Tamarixia Release Program The [Tamarixia Release Program](#) is managed by the Bureau of Methods Development and Biological Control at the Division of Plant Industry, Florida Department of Agriculture and Consumer Services. They have two facilities—in [Gainesville](#) and Dundee—which combined rear over a million wasps per year. Within a year, they're expected to scale production up to about 400,000 per month. We recently started working with Dr. Robin Stuart at the Dundee Biological Control Laboratory (Figure 2) to release wasps and reach trees and plantings near ours that we're unable to treat for psyllids in other ways. (Our targets are wild, abandoned and backyard trees in an urban-agricultural interface.) The lab provides wasps in tubes containing 200 individuals, which we set in and around our targets. We came up with a 1-inch PVC pipe staked under the tree and extending up into the foliage as an efficient way to deploy the tubes. Once a week, we switch out the prior week's tubes for new ones containing a fresh group (Figure 3), which allows us to service 35 tube locations in under 2 hours. Our PVC holding tubes can easily be moved to

target emerging flush. So far, we've released over 65,000 wasps in our area. We'll begin surveys for parasitized psyllids when they populate more susceptible flush in our target trees.

Importance of data quality In return for participation, the state asks that we provide records of our releases. This data is for mapping and it's vital to the program because it's used to evaluate survivability and effectiveness of the wasps. Drs. Robin Stuart and Eric Rohrig [developed a form](#) to complete for each release that documents location, weather, tree and psyllid conditions. We also note the number and percentage viability of the released wasps. One consideration as we were gearing up the program was that we would accumulate a lot of forms over many releases. We didn't want to manage too many computer files and forms, so our solution was to create a custom app to consolidate the forms into one computer file for tracking and reporting vital data after each release. Our app is called, the "Tamarixia Tracker". You can learn more about the app on our [Tamarixia Tracker website](#).

Tamarixia Tracker App for Desktop, iPhone and iPad To design our app, we started with the form provided by Drs. Stuart and Rohrig, then converted it into a WYSIWYG single-parameter relational database (Figure 4). This form serves as the app's graphical user interface. More information and an [online screencast](#) is available on our [Tamarixia Tracker website](#) if you're interested in how it works. I selected [FileMaker](#) as our development platform for these reasons:

- FileMaker is a visual environment, so we modeled our database to mimic the appearance of the provided form;
- We developed for both Windows and Mac operating systems by coding one version of the database;
- Our app was [ported to iPhone and iPad](#) with minimal reformatting (Figure 5);
- We can generate real-time summary calculations and reports even as wasps are released. An [example of a generated report](#) is available on our website;
- The parent app can be scaled later as a [web browser solution](#) to accommodate broader participation;
- Data in the web application can be [directly shared](#) within the same collection between growers and researchers;
- Data can be exported into a variety of formats.

How you can participate in the Tamarixia Release Program The *Tamarixia* Release Program is looking for more growers to participate. You need to locate trees that are unmanaged, not sprayed with insecticides and that provide a suitable habitat for the wasp to thrive. Organic groves are also good candidate locations. Contact Dr. Robin Stuart at the Dundee Biological Control Laboratory at robin.stuart@freshfromflorida.com (863-438-9222) and provide your name, company, release locations (GPS coordinates, if possible), and a brief description of the site (wild, abandoned, organic, etc.). Dr. Stuart should get back to you for coordinating your release. Participation is first-come, first-serve and depends on available supplies, but the program is scaling up to accommodate more people. Once again, you'll have to agree to provide timely release data back to the lab.

How to obtain the Tamarixia Tracker App We need to emphasize that Tamarixia Tracker is not state-sponsored software, nor do they have an active role in its development. Instead, my software company designed the app for our own internal use. But it's working well enough that others may benefit from it. If you're interested, [take a look at our screencast](#) to see if it's an app you'd like to use for tracking your Tamarixia releases. If so, [contact me](#) with information about your computer platform. Tamarixia Tracker runs on either Mac or Windows with FileMaker installed. A standalone desktop version for those without FileMaker is also available for Apple Mac desktop (Mavericks-compatible), iPhone and iPad. You need the desktop app to produce reports. We're

currently on Version 2.2 and if there's sufficient interest (and sponsorship), we may consider scaling the app as a web application to make it available to everyone.

Our participation in the *Tamarixia* Release Program is an exciting development in our psyllid management program. It's not an ultimate solution, but it's one important tool in the arsenal. It's greatest benefit may be several years away, but it's non-chemical, it simplifies some aspects of psyllid management, and it's an opportunity to use the latest mobile technologies to collect and share data between growers and researchers. The program's chances of success are much greater with the more people that participate. Our effort in the program represents a serious investment in time and resources, so we designed our *Tamarixia* Tracker app to be an easy-to-use technology for efficiently tracking releases and immediately providing vital data to the state. And the quality of data shared with others this way will help ensure coverage in the most needed locations. The *Tamarixia* Release Program and our *Tamarixia* Tracker are real-world, real-results projects and we look forward to continuing our wasp releases and software development with the program.

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Fig. 1. An Asian citrus psyllid is shown lower left having been parasitized by its natural enemy, a *Tamarixia radiata* wasp (upper right). A wasp oviposited in the psyllid, which developed, then eventually emerged from the top. Image ©2014 Jeff Lotz, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, courtesy of Robin Stuart, Dundee Biological Control Laboratory.



Fig. 2. Dr. Robin Stuart is shown in the orange jasmine greenhouse at the Dundee Biological Control Laboratory. Orange jasmine is a preferred host for rearing Asian citrus psyllid. ©2014 Steven Rogers, All Rights Reserved.



Fig. 3. A group of *Tamarixia radiata* wasps is released into a citrus grove. A 1-inch PVC pipe staked into the ground is used to easily switch out tubes that were released a week earlier. ©2014 Steven Rogers, All Rights Reserved.

Fig. 4. *Tamarixia* Release Program form converted into the *Tamarixia* Tracker database app. Form design by Robin Stuart and Eric Rohrig, Bureau of Methods Development and Biological Control, Florida Department of Agriculture and Consumer Services. Database design and development by Steven Rogers.



FDACS-DPI Tamarixia radiata Release Form B	
* Fill out one form for each release site. * Release wasps from shipping media and allow them to adjust to ambient temperature before release. * Two wasps were brought and directly into GCP nurseries at each release site.	
1. Release Site	2. Release Date
<ul style="list-style-type: none"> Title name, name/manager Site location (GPS, NAD 83 or address, town, county, or GPS coordinates) Site type (specify citrus or other planting, organic, abandoned or conventional management) 	<ul style="list-style-type: none"> Latitude/longitude Latitude/longitude Abandoned, organic, organic
3. Release Date	4. No. of Wasps Released
5. Percent of Wasps Alive When Released	6. Release Temperature
7. Release Weather	8. Release Method
<ul style="list-style-type: none"> Wasp or already in plastic or container Wasp or already in plastic or container Wasp or already in plastic or container 	<ul style="list-style-type: none"> Wasp or already in plastic or container Wasp or already in plastic or container Wasp or already in plastic or container
9. Flush, Broom and Nymph Rating	10. Additional Notes
<ul style="list-style-type: none"> Flush Broom Nymph 	<ul style="list-style-type: none"> Additional Notes Additional Notes Additional Notes

Fig. 5. Home screen of the *Tamarixia* Tracker as seen on an iPhone. ©2014 Steven Rogers, All Rights Reserved.

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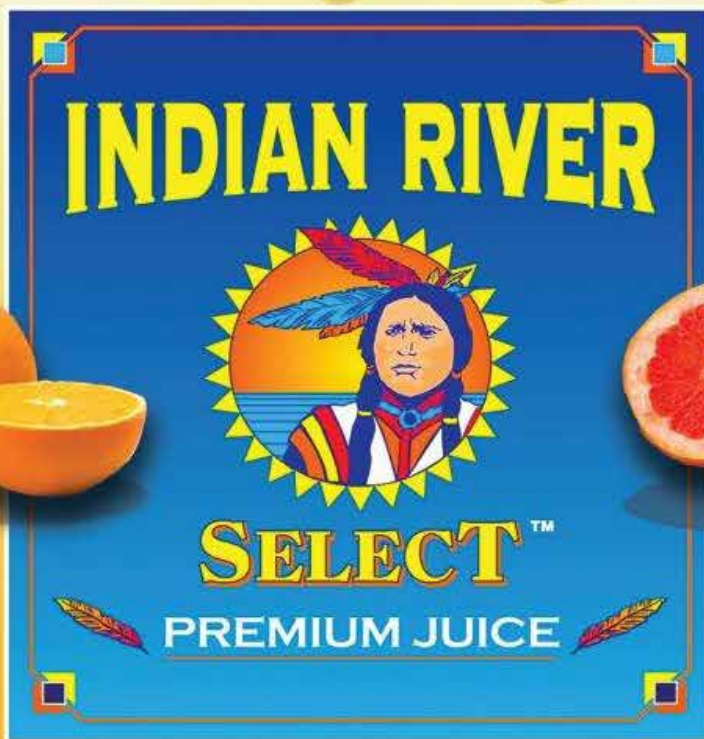
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