Squeezed: Current Challenges for Small Citrus Operations

Hearing

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Chairman Curbelo, Ranking Member Meng, and members of the subcommittee, thank you for the opportunity to speak to you today about citrus greening, the impact this disease is having on citrus production, and the prospects for potential research-based solutions.

My name is Michael Rogers and I am an associate professor of entomology at the University of Florida where I serve as interim director of the Citrus Research and Education Center (CREC) near Orlando, the largest research center in the world dedicated to one crop, Citrus! The mission of the CREC is *"…to discover and deliver innovative solutions that empower citrus and other agricultural interests to conduct responsible and profitable business. CREC fosters scientific excellence and efficient use of resources."* With that charge, scientists from CREC and throughout UF/IFAS, along with researchers from other citrus producing states and countries, are collaborating to solve the most devastating disease of citrus worldwide, citrus greening disease.

Also referred to by its Chinese name Huanglongbing (HLB), citrus greening was first documented in Asian countries in the late 1800's. Prior to the discovery of citrus greening in Florida in 2005, very little was known about this disease and that lack of knowledge made commercial citrus production economically unfeasible in those countries where the disease was present. In the absence of citrus greening disease, the state of Florida and the country of Brazil were the global leaders in orange juice production.

Citrus greening disease is caused by a bacterium that is spread tree-to-tree by an insect known as the Asian citrus psyllid. When a psyllid carrying the bacteria feeds on a citrus tree, it "injects" the disease-causing bacteria into the vascular system of the plant. The bacteria then move throughout the plant, increasing in number, over

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time destroying the vascular system in both the above ground parts of the tree and the below ground root system that supports overall tree health. As the vascular system is weakened, the health of the tree begins to decline with the trees dying a slow death. Long before the trees completely succumb to the disease, citrus fruit production is severely impacted. Much of the fruit on diseased trees is reduced in size and quality, making them unusable for processing for orange juice or for sale as fresh fruit. After a tree has been infected for several years, the continued deterioration of the root system results in trees being unable to hold most of their fruit load and the potentially harvestable fruit that growers have spent thousands of dollars per acre growing, drops to the ground just before its ready to be picked. Currently, this is the situation for the majority of the mature fruit-bearing citrus groves in Florida. As a direct result of greening disease, the 2015 all orange harvest is predicted to be 96.4 million boxes of fruit[2]. This is down from 240 million in 2003 and is the smallest Florida orange crop since 1966.

When citrus greening disease was first found in Florida in 2005, management programs were adopted by growers to slow the spread of the disease until a sustainable long-term solution could be developed. The approach implemented to manage greening included use of insecticides to control the insect which spreads the disease, removing infected trees from groves because they served as a source for continued spread of the bacteria, and where trees were removed, replanting with trees grown in certified disease-free nurseries. Adoption of these practices increased the production costs for Florida citrus growers from $800 per acre to more than $2,000 per acre.

By August 2008, citrus greening disease was confirmed to be present in every county located within the primary citrus growing region of Florida. Since that time, the disease has spread to every commercial citrus grove in the state, infecting most, if not all, of the fruit-bearing trees at present. One of the difficulties in managing this disease is the fact that it can take several years from the time a tree is infected until visible symptoms are apparent. It's likely that much of the disease found by 2008 occurred before citrus greening was confirmed to be present in Florida and any management programs were implemented.

Now that most of the citrus trees in Florida have greening disease, growers have made changes to their management programs in attempts to remain in business as long as possible. Removal of diseased trees is no longer a viable option in most situations. Instead, growers are attempting to maintain the health of these infected trees using improved fertilization programs. These improved fertilization programs appear at best to only slow the rate of tree death, but do little to prevent fruit drop prior to harvest.

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[2] Citrus Forecast (May 2015), USDA-National Agricultural Statistics Service. http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Citrus/cit/2014-15/cit0515.pdf

Since the discovery of greening in Florida ten years ago, all citrus research programs in Florida, along with citrus researchers from other states and countries, have shifted their emphasis to finding a solution to citrus greening disease. Important research-based advances have been made that have provided growers with the tools needed to slow the rate of spread of this disease and remain in business to date. These advances include improved efficacy and cost-effectiveness of psyllid management programs, and improvements in tree care through adjustments made to plant nutritional and root health programs. However, simply put, these improvements are just a bandage on a gaping wound. They won't solve the problem, but instead serve to slow the bleeding.

One question I am constantly asked is "Why is it taking so long to find a solution to greening?" The reason is this is a very tough disease to work with. Our research began with minimal accurate information on this disease. This is complicated by the fact that the bacterium that causes the disease had not and has still not been grown in culture in the laboratory to date. The inability to grow the bacteria in the lab greatly limits the research that can be done to find a cure. Furthermore, a thorough understanding of how the disease develops, from start to finish, is required to develop "the cure." In the case of citrus greening, this is a disease of a perennial crop that takes years to progress through the disease cycle. Compared to an annual crop such as wheat or corn where you can study a complete disease cycle in a matter of months, studying the disease cycle in a citrus tree takes years. This increases the time to get results and requires lots of funding.

Despite these challenges, scientists have made tremendous advances in our understanding and management of this disease. We have learned more in the past 10 years than in the previous 100+ years this disease has been present in other countries. It should be acknowledged that the Florida citrus growers deserve the credit for these accomplishments that would not have been possible without the $90+ million in research funds they provided over the past 10 years through self-imposed taxes on their production.

The most important scientific breakthroughs that hold promise for developing a long term solution to greening disease are molecular based. The genomes of the psyllid, the greening bacterium, and citrus itself have all been sequenced. With this information in hand, researchers are now able to target specific genes required for survival of both the insect and the disease-causing bacterium. For example, researchers have used such approaches to successfully control psyllids by interfering with their ability to fly and feed on plants, thus preventing the insect's ability to spread the disease. Genes have also been identified that could potentially provide resistance to the disease-causing bacteria. Citrus trees with these genes for resistance are being tested in field trials and the results to date look promising.

While there are many potential research solutions being developed that hold promise, putting that ultimate answer in the hand of growers is still years away. If we had a citrus tree today that we knew for certain was resistant to this disease, it

would take 2-3 years to scale-up commercial nursery production of that resistant tree for purchase by growers. If the resistant plant happens to be a GMO, the regulatory red tape adds even more time to make that a reality. Once a grower is able to plant trees resistant to the disease, it will take at least 4 years for those trees to begin producing a harvestable crop, and additional years beyond that time to recover the costs required grow the trees to that point. This is a discouraging prospect, especially for the small citrus grower who is currently struggling to stay in business.

However, research that has been conducted since greening arrived in Florida is now providing exciting new potential solutions for living with this disease in the short term while work continues on the potential long-term solutions that hold promise. Through the efforts of plant breeders at the CREC and the USDA, new citrus rootstocks and scions (hereafter in this testimony referred to collectively as varieties) have been developed that appear to be tolerant to citrus greening disease. These plants are described as tolerant because while they may become infected with the greening bacterium, field studies have shown they will survive and produce fruit for a longer period of time in the presence of greening compared to varieties previously grown in Florida. To date, 18 of these potentially tolerant varieties have been made commercially available for growers to use in replanting their groves.

Should those replanted trees become infected with greening, a new approach to rehabilitate diseased trees has been developed. Known as thermal therapy[3], researchers at the CREC have designed machines to rapidly cover trees in the field and apply steam to kill the bacterium in the above ground parts tree. While the steam treatment does not completely cure the disease, it extends the life of trees, buying additional years of positive crop yields for the grower.

Progress has been made developing other tools that could soon be used in the near-term for managing greening disease. Examples include the development of compounds that can be applied to the trees to kill the bacteria in the plant. Numerous bactericidal compounds have been screened in laboratory and greenhouse trials. The most promising candidate compounds are now being tested in field trials as possible tools that can be used by growers to reduce or eliminate the effects of the disease.

As previously mentioned, the majority of fruit bearing trees that are providing income to Florida growers are infected with citrus greening disease and have been for a number of years. As diseased trees are removed, growers must replant new trees in their groves to maintain continuity of production until better solutions are developed. The availability of tolerant varieties, thermal therapy, and other short term solutions under development will play an important role in providing that needed continuity of production. For the grower, time is not on their side. Growers are in desperate need of assistance to maintain their operations. Citrus research

[3] http://bit.ly/citrussteaming

programs are also being negatively affected by the reduction in fruit yields. The research funds provided by the self-imposed grower tax are drying up, thus threatening to impede the progress of the promising research that must be continued to provide solutions for this disease.

Fortunately, the availability of new federal research funds, specifically the USDA-SCRI and USDA-APHIS-MAC programs, are providing additional support for research on citrus greening. A sincere thank you to those who helped provide this needed funding through the Farm Bill. A large majority of the funding provided this past year went to support research projects at the CREC. While these funds will provide needed support for some very promising research projects, there are still gaps in funding that exist for many promising areas of research previously funded by the citrus grower generated tax.

Your financial support for further research is crucial for the future of citrus growers not only in Florida, but throughout the entire country. Land-grant universities in every state are dedicated to serving the public, and federal research dollars are crucial for universities to continue their research to benefit economic development.

I appreciate the opportunity to address the committee and bring to your attention these important issues facing the citrus industry. I extend an invitation to any of the members who are interested, to please contact me to arrange a visit to the CREC to witness first hand the effects of this disease and the research underway to develop solutions to this problem.

That concludes my formal statement and I am happy to answer any questions you may have.

Thank you.