CITRUS ADVANCED TECHNOLOGY PROGRAM

QUARTERLY & FINAL REPORTS: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

▶ SELECT PERIOD March 2016

○ *Quarterly Report* ● *Final*

Proposal Title

High-throughput screen of seedlings for resistance to citrus greening based on optical sensing

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
March 11, 20	Citrus Research and Development Foundation	Conventional breeding for resistance

REPORT UPDATE (500 words-It is not necessary in this public report to disclose your institution's proprietary information or intellectual property.)

The goal of this project was to determine the feasibility of developing a high-throughput screen of citrus seedlings to identify naturally resistant plants based on optical sensing. Although the project initially focused on fluorescent imaging, the use of polarized light proved more advantageous. The buildup of starch in the leaves is a hallmark of the disease, and starch grains rotate reflected light having a wavelength around 595 nm by 90°. The polarized images were acquired using a conventional DLS camera. The strategy was to infect seedling by exposure to a population of psyllids that were positive for CLas (Candidatus Liberibacter asiaticus). Employing the natural method of inoculation has the advantage of detecting seedling resistance at all stages of the process, from alterations in psyllid feeding behavior to resistance to the bacterial pathogen. Seedlings of sweet orange were exposed to infected psyllids for eight weeks and allowed to recover for either two months or four months before image acquisition and analysis of HLB status by quantitative PCR. Image analysis was conducted by manually segmenting the images and analyzing pixel distributions. A total of seven different texture feature sets were identified and assessed in pairwise comparisons using a support vector machine (SVM) approach to predict the HLB infection status. In comparisons among seedlings that had all been exposed to infected psyllids, the accuracies ranged from 59.79% (moderately vs. strongly infected) to 98.06% (questionable vs. weakly infected) depending on the comparison. Previous studies employed clearly symptomatic leaves; whereas, the current study included pre-symptomatic leaves which is a more difficult task. The present study imaged leaves on seedlings where angles and distances to the camera are variable, which is challenging compared to studies using individually mounted leaves. In future studies, increased prediction accuracies seem likely if distances of the leaves to the camera lens are incorporated to normalize image texture. Also, our preliminary results with fluorescence imaging and recent literature suggest that prediction accuracies could be significantly improved by combining fluorescence and polarization imaging to create an index of infection.

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Project Number 880

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Total Funds (current year) $101,758

Form PR-12 Quarterly Reports **SUBMIT REPORT**

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