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A Tomato Detached Leaf Assay for Chemical Genomics of an HLB Model System

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To better understand plant-pathogen interactions in Huanglongbing disease and develop control strategies we investigated a novel approach known as chemical genomics with Tomato "Psyllid Yellows", caused by *Candidatus* Liberibacter psyllaurous (CLps), as a model of HLB. Chemical genomics involves three key stages starting with designing and performing high-throughput chemical screening, identifying chemicals inducing desired effects and dissecting the genetic targets of the candidate chemical. Our study has been focused on developing a high throughput chemical screen assay using model plants such as tomato and Arabidopsis that can be infected by Candidatus *Liberibacter psyllaurous* (Clps). The key objective is to identify chemicals that induce plant defense against CLps infection or its transmission via psyllids. We evaluated *Arabidopsis thaliana* and tomato in different media such as MS sterile media and hydroponic culture, however qPCR results indicated very low and inconsistent numbers of CLps positive plants. We designed a modified detached leaf assay for tomato based on the citrus detached leaf assay (Eldesouky Ammar, USDA-ARS) that has resulted in consistently high (80-85%) number of CLps-positive leaf petioles. We are currently evaluating application of the detached leaf assay in screening chemicals using a tomato CaBP22-GUS transgenic line. This line was developed by Dr. Isgouhi Kaloshian and Dr. Thomas Eulgem (University of California, Riverside) based on a transgenic Arabidopsis reporter line with the promoter $CaBP22^{-333}$ promoter fused to *GUS* (Knoth et.al. 2009). The *Arabidopsis* transgenic line has been used successfully in many high-throughput chemical screens to identify chemicals inducing defense responses. In our study, we will test chemical uptake and its effect on the transgenic tomato line using GUS expression by RT-PCR. To develop methods to test responses to candidate chemicals in citrus, we are testing gene expression of sweet orange seedlings following exposure to four chemicals known to induce defense responses in other plants.

References

Knoth C, Salus MS, Girke T, Eulgem T. 2009. The synthetic elicitor 3,5- Dichloroanthranillic acid (DCA) induces *NPR1*-dependent and *NPR1*-independent mechanisms of disease resistance in *Arabidopsis thaliana.* Plant Physiology 150:333-347