CITRUS ADVANCED TECHNOLOGY PROGRAM

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

SELECT PERIOD March 2014

Quarterly Report Final

Proposal Title

Exploitation of visual Stimuli for Better Monitoring and Management of ACP in Young Citrus

Today's Date	Sponsoring Organization (drop-down)	Category (drop down)
4/15/14	Citrus Research and Development Foundation	Vector Monitoring, Behavior, Cultivation

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

The overall objective of this research is to develop a push-pull system for the Asian citrus psyllid (ACP) that can complement integrated management systems in young citrus plantings. Towards that goal, visual factors that affect psyllid takeoff into flight and landing are being examined to guide development of an optimal pull component.

A vertical flight attraction assay was developed to examine response of ACP resting or in flight towards visual targets that consist of different wavelengths of filtered light. Narrowband width filters (10 nm) were used to allow clear delineation between colors tested. This assay simulates the response of ACP to visual cues that are above them such as when an adult is settled on vegetation and looks up at the sky or when having fallen to the ground looks up and sees its host plant from the ground. ACP response was lowest to red and orange in the visible spectrum. Yellow was more attractive to ACP then orange or red, but less attractive then blue, green, or lime green. Green and lime green were the most attractive to ACP in the visible spectrum. In the ultraviolet spectrum the most attractive wavelength was long UV (405nm) compared to shorter wavelengths arranged in order of decreasing attractiveness 350nm, 380nm, and 365 nm (least attractive). The vertical bioassay differed from the horizontal bioassay, in that ACP responded as strongly to UV as they did to green and lime green. This may be evidence that the ACP orient differently to vertical and horizontal cues. For example, when ACP drop to the ground following a disturbance vertical cues of UV (sky) or green and lime green (leaves) are both used to return to a place of rest (the host plant). Whereas horizontal cues are more typically used when ACP are already situated on a plant and therefore only UV (sky) cues are used to navigate towards increasingly younger and more optimal portions of the host plant (young flush), which are near the edge of the plant (near UV) versus in the center of the plant (away from UV). Ultimately, the UV cues from the horizontal axis may be causing the ACP to move to another plant in search of new host locations. Further studies are on-going with the vertical bioassay to see if there is a difference between 0-1 day old and 4-7 day old ACP in this orientation. Additionally, studies are being undertaken to see if flying ACP will be attracted to different colors then walking/flying ACP by using specially designed walking preventing chambers coated with Fluon.

A horizontal walking assay was developed to stimulate walking responses of ACP on vegetation and this assay measured direction of movement as well as speed of movement. Known age studies with ACP in the horizontal bioassay revealed that 1 day old ACP were positively attracted toward green light , whereas 4-7 day old ACP remained relatively neutral to green light. Both 1 day old and 4-7 day old ACP showed more positive attraction towards long UV light. These findings indicate that newly emerging ACP may be more attracted to green, because they need to acquire nutrients from feeding on a plant. Conversely, older ACP may be more interested in movement to other plants in search of mates and oviposition sites. Further studies with the horizontal walking assay will be made between newly emerged unmated female ACP and older gravid females.

Examination of the effect of different visual stimuli on flight duration of ACP as measured on flight mills is on-going. Comparisons in the duration of flight and numbers of flight bouts are being made between different colored substrates, different quality of light overhead (colored, with UV, without UV, polarized), contrast between overhead lighting and substrate coloring and presence of visual targets.

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