Efficiency of Three Monitoring Methods for Asian citrus, \textit{Diaphorina citri}, Kuwamayama, populations on commercial and research plots in Florida

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Abstract

Yellow Corn Root Worm Sticky Traps (YCRW), "The ACP Trap", and tap sampling were compared to determine their efficiency and effectiveness for detecting adult populations of the Asian citrus psyllid (ACP) in the field. The traps were deployed over a period of two weeks under two ACP densities, "low" and "high" and compared with one tap sample at the end of the two week period. While all sampling techniques were effective, tap samples were faster to collect and as reliable as both types of sticky traps to detect adult ACP even low densities.

Introduction

The Asian citrus psyllid (ACP), \textit{Diaphorina citri} Kuwamayama (Homoptera: Psyllidae), was first reported in Florida in June 1998. This invasive psyllid is the vector of \textit{Candidatus Liberibacter asiaticus}, the bacterium associated with huanglongbing (HLB), the most serious citrus disease in the US, and in the world (Bové 2006, Habart 1998).

A simple and efficient sampling procedure for \textit{D. citri} is important to develop a successful Integrated Pest Management (IPM) program aimed to manage HLB. The presence and relative abundance of adult \textit{D. citri} in citrus groves is best determined by sampling ACP populations from within the trees (Hall 2007, Qureshi 2007). We selected tap sampling and sticky traps since these are the two most widely used methods to monitor adult ACP populations. The tap sampling method uses a 21.6 x 27.9 cm (letter size) laminated white-paper sheet (on a clipboard) held under a randomly selected branch that is tapped three times using a PVC tube. The number of adult psyllids knocked onto the sheet of paper is counted and recorded (Qureshi, 2007). Sticky traps can be used to detect relative abundance of \textit{D. citri}. Hall (2007) indicated that yellow sticky card traps capture significantly more adults than blue sticky cards, thus this color was selected.

Objective

- Compare the Yellow Corn Root Worm Sticky Trap (YCRW), "The ACP Trap", and tap sampling to determine their efficiency and effectiveness in detecting adult ACP populations.

Methods

This study was conducted on a 16 acre block of Valencia x Carrizo orange grove located in Collier Co., FL. The plot was randomly divided in 16 plots, 8 of which are sprayed with insecticide based on monitoring (Low ACP density) and 8 remained untreated (High ACP density). Six trees per plot were selected. On each tree, a Yellow Corn Root Worm Sticky Trap (YCRW) [Great lakes IPM, Inc. Vestaburg, MI (Fig 1) and a "The ACP Trap" [Alpha-Scents™, Bridgeport, NY] (Fig 2) were deployed simultaneously and collected 15 days later. Immediately after the collection of the traps, a tap sample (Fig 3) was conducted according to Arevalo et al. (2008) on the same tree. After collection, the YCRW was closed and "The ACP Trap" was wrapped in Saran™ (C. Johnson & Son, Inc, Racine, WI) plastic wrap to be transported to the laboratory where adult ACP on the traps were counted under a magnifying lamp. Mean time for each sampling method was measured from entrance to exit of the plot taking 100 tap samples (10 stops with 10 trees/stop) or deploying, collecting, and reading (in the laboratory) 100 evenly distributed sticky traps on the selected plot.

Collected data were analyzed using bootstrapping. Mean and standard error of the mean (SEM) of the pulled data were calculated for 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, 180, 200, 250, and 300 samples. ANOVA and LSD (α=0.05) were used for mean comparison of the total number of adult ACP captured.

Table 1:

<table>
<thead>
<tr>
<th></th>
<th>Low Density</th>
<th>High Density</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SEM</td>
</tr>
<tr>
<td>YCRW</td>
<td>14</td>
<td>2.1</td>
</tr>
<tr>
<td>The ACP Trap</td>
<td>12</td>
<td>0.8</td>
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</tbody>
</table>

Results and Discussion

The ACP trap captured significantly more ACP adults than the tap sample, but significantly less than the YCRW trap under Low (F = 18.88, d.f = 2,144, P ≤ 0.001) and High (F=32.92, d.f = 2,125, ≤ 0.001) ACP population densities (Fig 4).

Acknowledgements

We would like to thank the Florida Citrus Production Research Advisory Council (FCPRAC) for providing the funding for this project. The staff at the Entomology Laboratory at the Southwest Florida Research and Education Center (SWFREC) at the University of Florida, to Arrow Pesticides for the use of this poster, and special thanks to The Barron Collier Co. for allowing us to use their groves to conduct this trial.

References


