

## Integrating Chloronicotinyl Pesticides with Red Scale Biological Control

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This project investigates the impact of a glassy-winged sharpshooter (GWSS) treatment of Admire and a Citricola scale treatment of Assail on the natural enemies suppressing California red scale (CRS) in the San Joaquin Valley (SJV), including *Aphytis melinus* releases. Before GWSS, *Aphytis* released argumentatively in association with resident natural enemies effectively suppressed CRS. This project interfaces with Grafton-Cardwell's CRB project: "Long-term effects of chloronicotinyls on citrus IPM".

The use of *Aphytis melinus* releases has decreased during the last few years because of an extremely effective CRS material (Esteem). Also contributing to this decline are pesticide applications for control of GWSS, cottony cushion scale, and citricola scale, which disrupt biologically based pest management programs. In the long-term, we predict that CRS will develop Esteem resistance, especially if this material continues to be relied on heavily. Other effective chemical control alternatives may or may not be developed, and we believe it is prudent to continue to develop ways to implement a biologically-based approach to control CRS in the context of new pests and treatments.

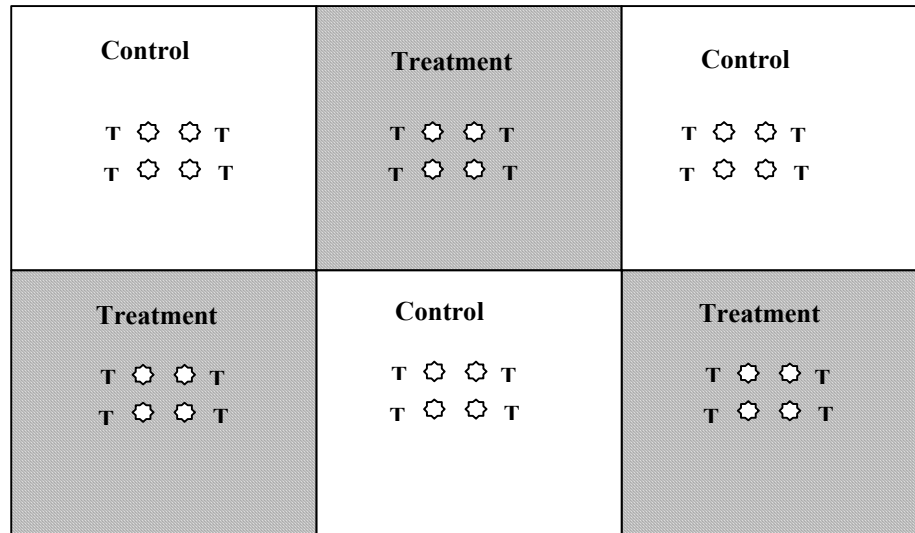
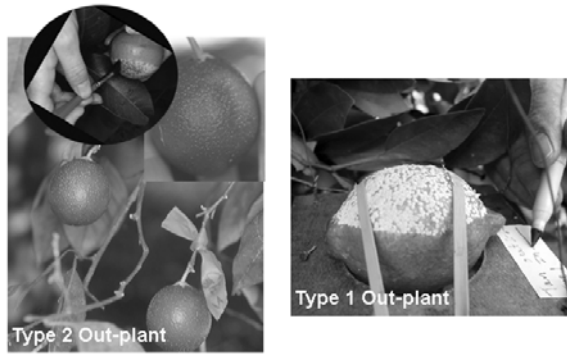


Figure 1. Example of plot layout for Admire and Assail experiments.

We conduct our experiments in two commercial citrus blocks in the San Joaquin Valley. Each block is divided into 3 treatment and 3 control plots and each plot consists of 4 experimental trees located in the middle of each plot (Figure 1). Each year, prior to treatment, we evaluate each plot for CRS and its natural enemies by taking random samples from both leaves and fruit.



*Figure 2. Type 1 fruit inoculated with red and oleander scale used to assay field predation and parasitism. Type 2 fruit were inoculated using resident field fruit to also assay natural enemy activity.*

Similar to last year, we found very few CRS and almost no natural enemies on these samples. We have two methods of collecting pre- and post-treatment data. We hang scale-infested lemons in all sample trees to capture/identify the natural enemies present (type 1 out-plants). Each lemon is infested with a mixture of CRS and oleander scale, which are counted prior to hanging the fruit in the field. They are collected 30-40 days later and assessed for scale parasitism and predation (Figure 2). With the other method (type 2 out-plants), we inoculate resident fruit with immature CRS and then monitoring these fruit for natural enemy activity (Figure 2).

Summer post treatment data evaluations (type 1 and type 2 out-plants) continue to yield almost no natural enemy activity on these fruit. We encountered predation on only two fruit from the Assail block. Late summer data evaluations, however, suggest much more natural enemy activity in the untreated Admire and Assail control blocks. We will know more after processing these November samples.

This year we also added a test plot at UC Riverside to test the impacts of Admire versus no treatment on 10 single-tree replicates. In addition to assessing the impact of Admire on natural enemies of red scale in southern California as comparison to our study in the SJV, we also looked at the variability in Admire uptake over time by the 10 data trees. We found that although the uptake of imidacloprid into a tree was quite variable, the fruit uptake showed greater uniformity (Figure 3).

*Contact Citrus Research Board for Figure 3.*