

# Pheromone application for mating disruption of carob moth, *Ectomyelois ceratoniae*, in commercial date gardens



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**Abstract** Commercial scale field experiments were established at two date gardens to evaluate the use of the female pheromone mimic (Z7, E9, 11-dodecatrieryl formate) in a carob moth mating disruption strategy during 2007 and 2008. The mimic was mixed with a biodegradable wax carrier (SPLAT<sup>®</sup>) that was applied directly to the trunks of date palms. Sticky traps, baited with synthetic lures and placed in the center of the 4-acre blocks, registered trap shutdown in the mimic-plots that was maintained from the treatment date (early September 2007 and early August 2008) through harvest in late October. At harvest, infestation rates were similar or lower in the mimic-treated plots than in either malathion plots (the industry standard) or non-treated control plots. These results indicate that a single treatment with carob moth pheromone mimic, which is economically comparable to malathion treatments, is a viable alternative to malathion dust for carob moth management in date gardens.

## Introduction

The carob moth, *Ectomyelois ceratoniae* (Zeller), is recognized as the most economically damaging pest of the date industry in the US. In the past 20 years the carob moth has been attributed with causing 10-40% damage in the harvestable crop annually. This equates to \$4.1- \$16.4 million in economic losses annually, not including control costs (Nay and Perring 2005; Warner 1988). Currently only malathion dust is registered for carob moth control and it often is applied every 2 weeks from mid-August through harvest. An alternative approach to the extensive use of this chemical is required.



We have been working with the date industry on a mating-disruption strategy to replace malathion dust. This paper discusses a large scale field trial conducted over 2 seasons, designed to evaluate a synthetic pheromone mimic on the ability of male moths to find traps baited with the mimic and on the infestation of dates at harvest.

## Experimental design

Two adjacent date gardens were used for our study. At the first (Tierra Linda), we established 3 replicates, each containing a mimic-treated plot, a malathion-treated plot, and a non-treated plot. At the second site (Home Ranch) we established 2 replicates, each containing mimic and malathion-treated plots. Each plot was 4 acres in size (196 palms) to provide sufficient space between the centers of the plots where data were collected. Every palm within the mimic-treated plots was treated near the top of the palm where the bunches are located and ca. 1.5 m from the ground. The SPLAT EC<sup>®</sup> was applied with a "gun" applicator, and a 2.5g dollop of material containing a 2% concentration of mimic was applied at each site (total of 5g per palm).

A single delta trap baited with mimic was placed in the center of each plot, and these were changed weekly to monitor the success of the treatments. Based on the trap counts, we determined that a single application of mimic was effective for season-long trap shut-down.

## Synthetic pheromone delivery system



Mixing SPLAT (wax carrier) and pheromone mimic (in the lab)



SPLAT was pre-loaded into silicon cartridge (2008)



Loading SPLAT into custom dispenser (2007)



Applying SPLAT to palm tree in 2008



Applying SPLAT to palm tree in 2007



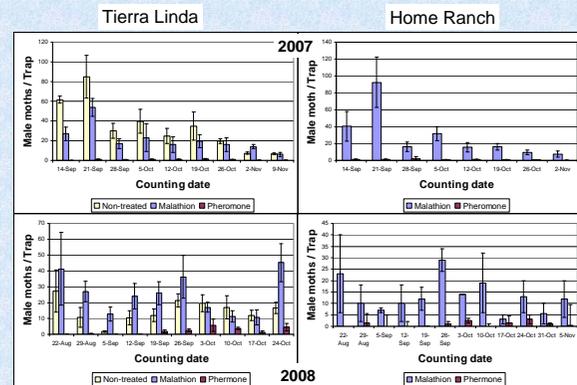
SPLAT dollop on palm tree

For harvest, the largest date bunch from each of 16 palms located in the center of the each plot was selected. The bunch was removed from the palm, the dates were mixed, and 100 fruit per bunch were inspected. Infestation was determined by observing webbing at the calyx end of the date (see figure at right)



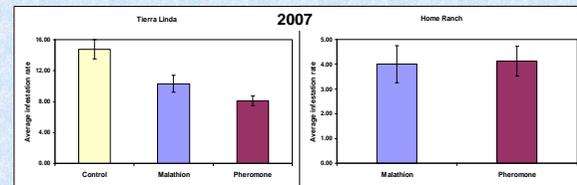
## Male moth catches

Our studies found low moth counts in the mimic-treated plots, whereas non-treated and malathion-treated plots had high moth counts. Based on the trap results, male confusion was nearly complete from the one-time pheromone mimic application until harvest.



## Fruit infestation

Our studies showed that similar (Home Ranch) or better (Tierra Linda) suppression of carob moth infestation was observed in mimic-treated plots than malathion-treated plots (multiple comparison at  $P < 0.05$ , PROC GLM, SAS, 2001). The control areas had the highest infestation of carob moth larvae. The 2008 plots were harvested on November 6 and 7, and we are in the process of determining the infestations in this study.



## Literature cited

Nay, J.E. and T.M. Perring. 2005. Impact of Ant Predation and Heat on Carob Moth (Lepidoptera: Pyralidae) Mortality in California Date Gardens. *J. Econ. Entomol.* 725-731.  
 SAS Institute. 2001. SAS OnlineDoc<sup>®</sup>, Version 8.02. SAS Institute Inc., Cary, NC.  
 Warner, R.L. 1988. Contribution to the biology and the management of the carob moth, *Ectomyelois ceratoniae* (Zeller) in 'Deglet Noor' date gardens in the Coachella Valley of California. Ph.D. dissertation, University of California, Riverside

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