Mating Disruption/SIR

FIELD STUDIES WITH ENCAPSULATED SPRAYABLE CODLING MOTH PHEROMONE

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Abstract: Field studies were carried out comparing encapsulated sprayable codling moth pheromone treatments against hand-applied pheromone dispensers and conventional codling moth control practices. The effect of rates and overhead irrigation on efficacy was also evaluated. In general, the encapsulated sprayable pheromone provided crop protection equal to that of hand-applied dispensers and conventional control practices in low to moderate codling pressure orchards. Overhead irrigation had a negative impact on efficacy in orchards treated with the encapsulated sprayable pheromone.

Materials and Methods

Field comparisons were carried out in large non-replicated blocks in commercial orchards producing apples, pears or walnuts throughout the western United States. Efficacy studies were designed to compare encapsulated sprayable codling moth pheromone produced by Suterra LLC, CheckMate CM-F against standard mating disruption practices and/or conventional grower practices. Treatments of the CheckMate CM-F were applied using a low-volume sprayer designed by Suterra or conventional orchard sprayers used by the growers. Spray volumes ranged from two gallons per acre to 100 gallons per acre. Application rates ranged from 10 to 30 g AI/acre. Efficacy was evaluated with 1x and 10x baited pheromone traps checked once or twice weekly during the season and by examining the crop in season or at harvest for codling moth damage.

The ability of CheckMate CM-F to withstand rainfall was evaluated in a commercial apple orchard utilizing overhead sprinkler irrigation. The study compared CheckMate CM-F applications of 10 g AI/acre made with and without the addition of NuFilm-17. NuFilm-17 was added at a rate of one pint per 100 gallons of spray. CheckMate CM-F was applied using a conventional orchard sprayer in a volume of 80 gallons of water per acre. The treatments were allowed to stand for 24 hours. After 24 hours overhead irrigation began and continued with intermittent sets for ten days. Each irrigation set was allowed to run for 24 hours and applied nearly two inches of water in each 24-hour period. Treatments were evaluated with 1x and 10x pheromone baited traps checked twice weekly during the duration of the study.

The effective duration of a single application of CheckMate CM-F was evaluated in a commercial apple orchard with undertree irrigation. Two rates of the sprayable pheromone, 10 g AI/acre (DD-10) and 5 g AI/acre (DD-5) were applied using a low volume sprayer in a total spray volume of two gallons per acre. No additional adjuvants were included with the application. Each treatment was evaluated utilizing 1x and 10x pheromone-baited traps. Two non-pheromone treated controls were included: one on the west (CW) or upwind side of the

treatments and one on the east (CE) or downwind side of the treatments.

Results and Discussions

Efficacy. The effect of CheckMate CM-F versus conventional grower practices on 10x pheromone-baited traps is shown in Figure 1. This study was conducted in the Zillah, WA, area and consisted of two contiguous eight-acre blocks. The conventional portion of the orchard consisted of 'Golden Delicious' and was treated three times with Guthion 50WP on May 23, June 14 and July 5. Guthion treatments were discontinued following the July application due to hail damage incurred in the orchard. The CheckMate CM-F treatment, consisting of 'Red Delicious' apples, was treated at 10 g AI/acre on approximately a 30-day schedule throughout the season utilizing a low volume sprayer in a total spray volume of two gallons per acre. No additional spray adjuvants were included. Fruit damage assessments in this trial are shown in Figure 2. Damage was determined by examining 1,500 fruit from each treatment to determine presence of codling moth damage. In this low pressure situation the application of CheckMate CM-F at 10 g AI/acre applied on a 30-day interval provided acceptable codling moth protection.

In Figure 3, the effect of CheckMate CM-F versus Isomate C+ (200/acre) on 10x pheromone-baited traps in apples is shown. This study consisted of two contiguous eight-acre blocks of 'Red Delicious' apples in the Moxee, WA, area that were uniform in tree size and age. Both blocks received a first cover Guthion 50WP at one pound/acre on May 22. No additional insecticide treatments were made for the remainder of the season to either block. The CheckMate CM-F was applied at a rate of 10 g AI/acre on approximately a 30-day schedule utilizing a low volume sprayer in a total spray volume of two gallons per acre. No additional spray adjuvants were included with any of the CheckMate CM-F treatments. Fruit damage assessments in this trial are shown in Figure 4. Damage was determined by examining 1,500 fruit from each treatment to determine presence of codling moth damage. In this low-pressure orchard CheckMate CM-F provided codling moth control equivalent to that of Isomate C+.

The effectiveness of CheckMate CM-F versus Isomate C+ (200/acre) in pears was evaluated in Hood River, OR. Figure 5 shows the effect of these treatments on 10x baited pheromone traps throughout the season. The first CheckMate CM-F application (20 g AI/acre) was begun on April 26 and completed on May 3 due to windy and rainy conditions. Subsequent applications (20 g AI/acre) were applied on approximately a 30-day schedule using conventional spray equipment in a spray volume of 30 gallons per acre. NuFilm-17 was included in all CM-F treatments. Trap capture recording did not begin until May 21. The data shown are the average capture in 10x pheromone-baited traps through August 7. Trap captures in the Isomate C+ treated block began to increase dramatically in late June. Two Imidan cover sprays were applied to this treatment on July 23 and August 10 due to detection of codling moth stings in this block. No insecticide cover sprays were made in the block treated with CM-F. Codling moth damage detected at harvest is shown in Figure 6.

Walnut results are reported in Figures 7 through 10. Figure 7 shows the average trap capture in 1x baited traps from a walnut orchard treated with CheckMate CM-F as compared to the growers' conventional practices in San Joaquin County, CA, in 2001. The CM-F treatments were applied at 20 g AI/acre using the grower's equipment on a 30 to 45 day schedule. Four applications were made throughout the season. On August 13, canopy counts were made on ten

trees in each treatment to determine the number of nuts infested with codling moth. One hundred nuts were sampled from each tree. The data are shown in Figure 8. A second walnut trial was conducted near Yuba City, CA, in 2001. This trial compared CheckMate CM-F against Isomate C+ dispensers. The sprayable pheromone was applied at a rate of 30 g AI/acre every 30 days using conventional spray equipment. Isomate C+ (400/acre) was applied by air and by hand. Additional treatments included were sprayable pheromone and ISOMATE C+ treatments plus Lorsban, Lorsban alone and ISOMATE C+ plus Trichogramma releases. The effect of these treatments on codling moth and navel orangeworm damage is shown in Figure 9. The results of a third walnut trial conducted near Farmington, CA, in 2001 are shown in Figure 10. In this trial CheckMate CM-F was applied at a rate of 30 g AI/acre in conventional spray equipment on both a 30-day schedule and a 60-day schedule. The data shown are codling moth damage reported in the nut, hull and the combined total. These results suggest that the 60-day spray schedule was as effective in reducing codling moth damage as the 30-day schedule.

Rainfastness. The effects of overhead irrigation (i.e., rainfall) on trap captures in sprayable pheromone treatments are shown in Figure 11. These results indicate that the addition of a sticker such a NuFilm-17 in situations where rainfall is anticipated may be beneficial in protecting the microcapsules from wash-off. This trial looked only at the effect on trap captures and did not measure the ability of the treatments to protect the crop. In another location, where a different sticker was employed, season-long applications of the sprayable pheromone failed to protect the crop from damage in an overhead irrigated block despite the fact that trap captures were very low.

Duration. The effects of a single application of the sprayable pheromone on trap captures in a conventional apple block are shown in Figure 12. In this trial the treatments were applied one time during the hottest part of the summer and trap captures were recorded twice weekly. The sprayable pheromone at a rate of 10 g AI/acre a (DD-10) reduced moth capture in 10x traps for approximately 40 days in this apple orchard.

Figure 1

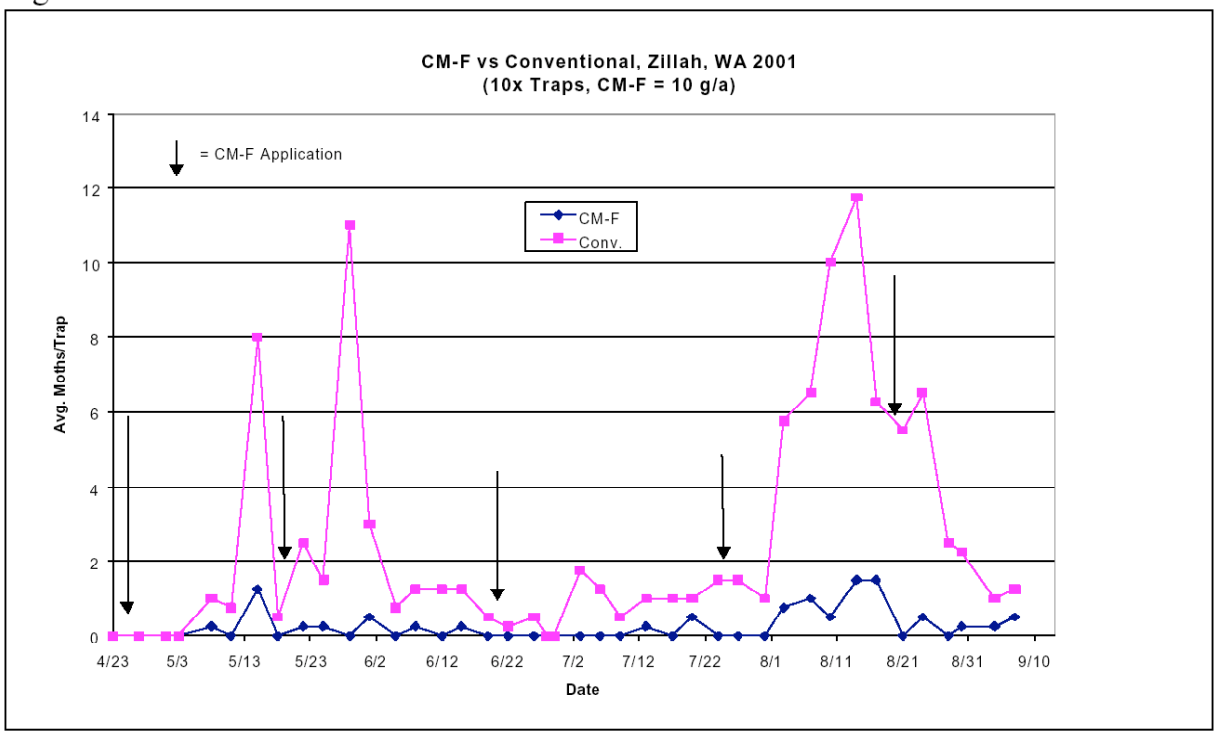


Figure 2.

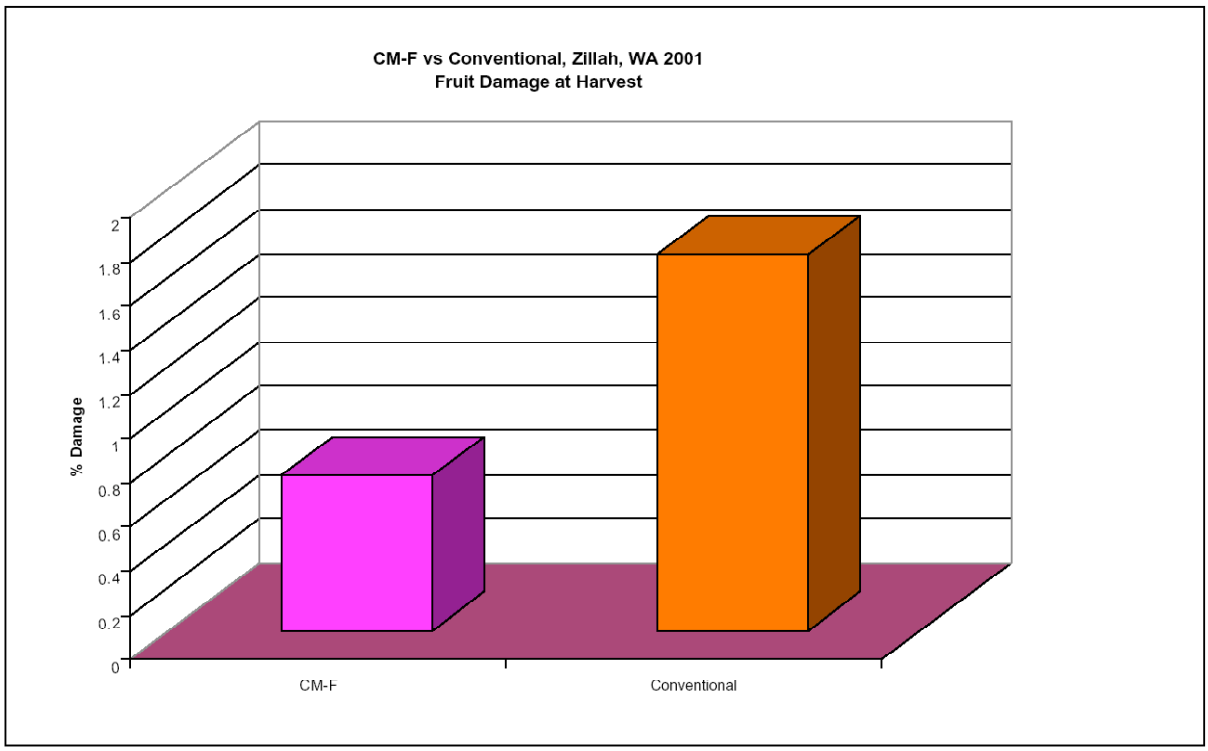
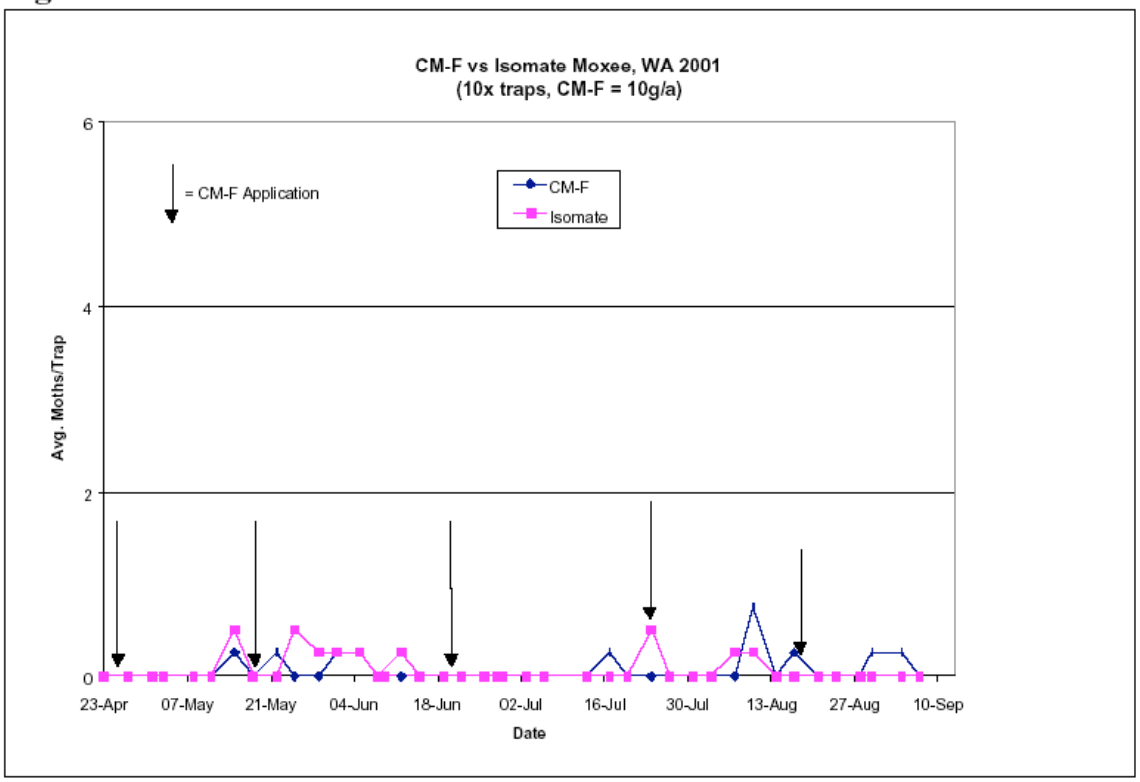


Figure 3.



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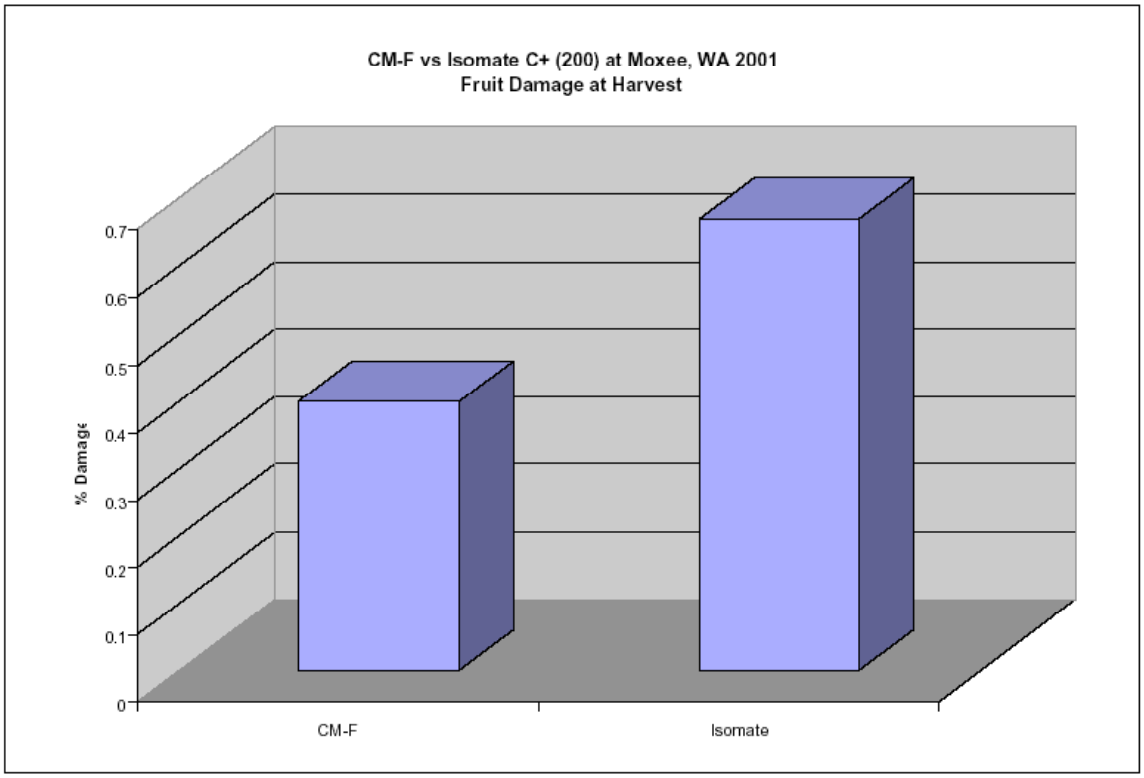
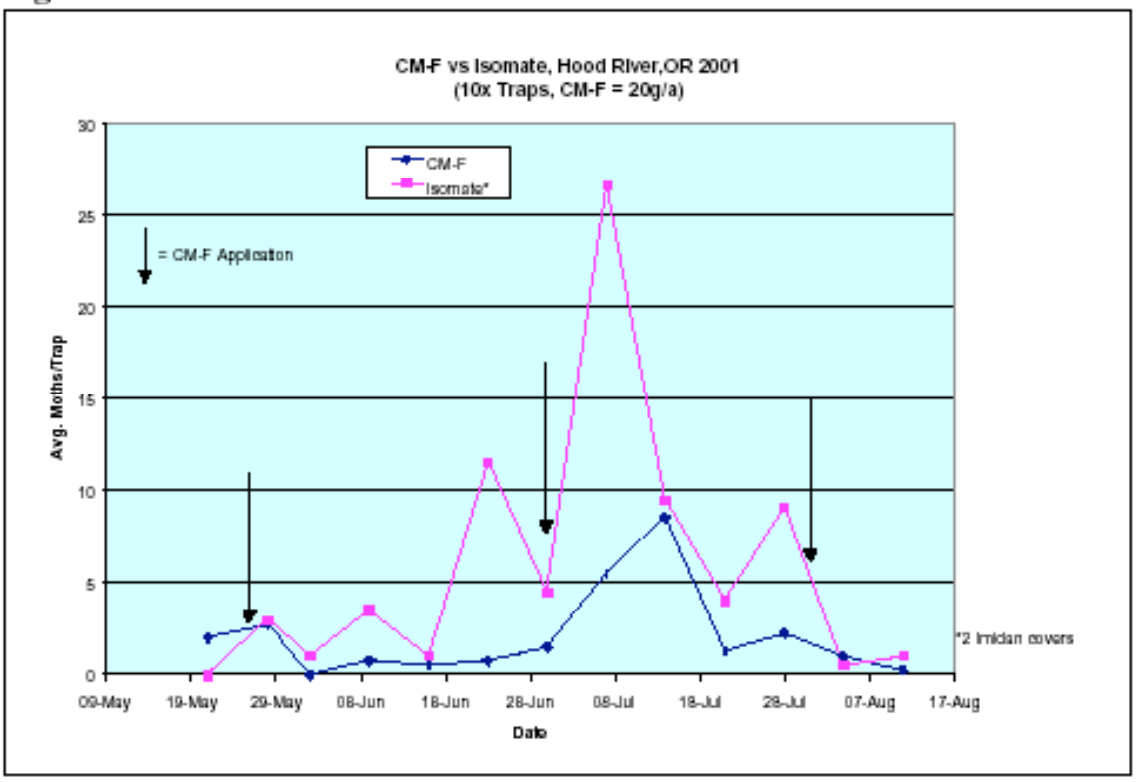


Figure 5.



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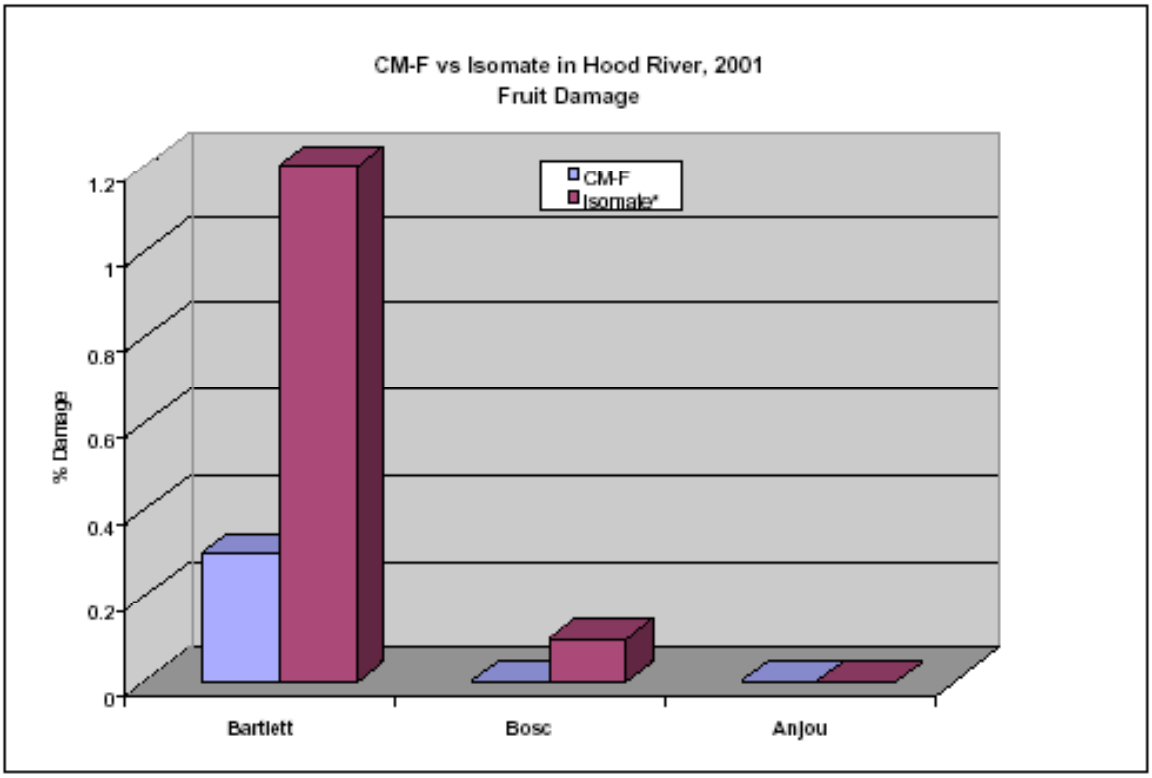


Figure 7.

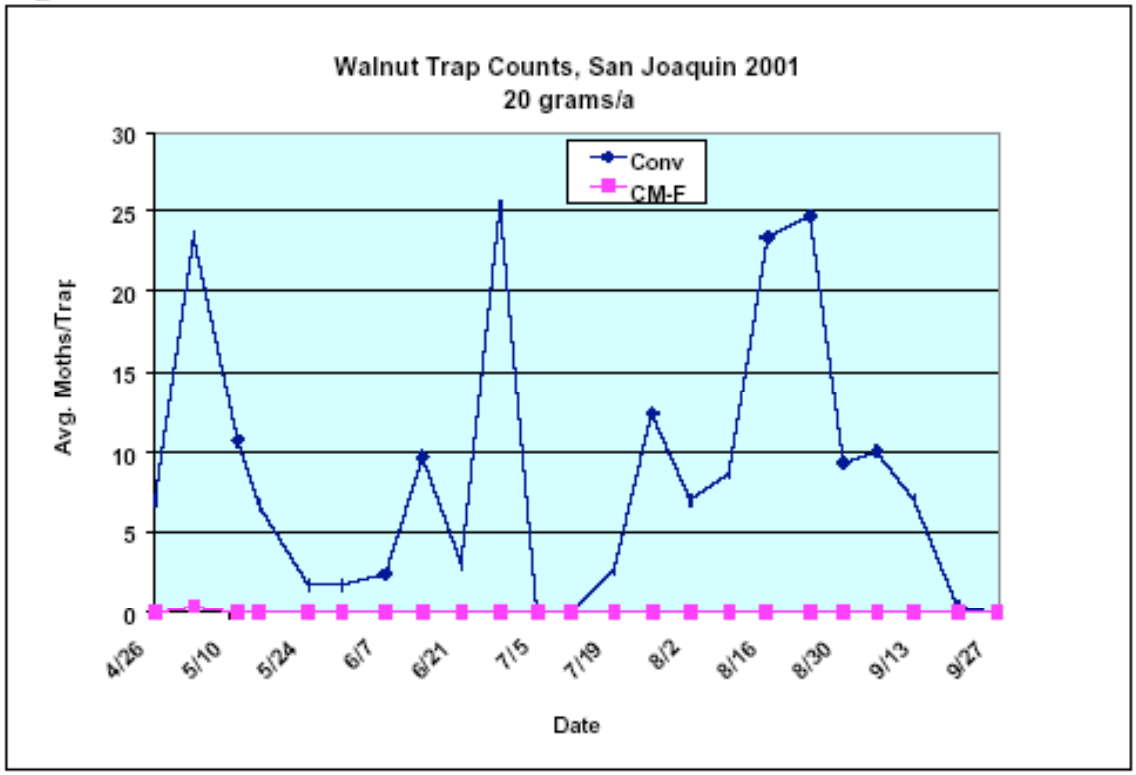
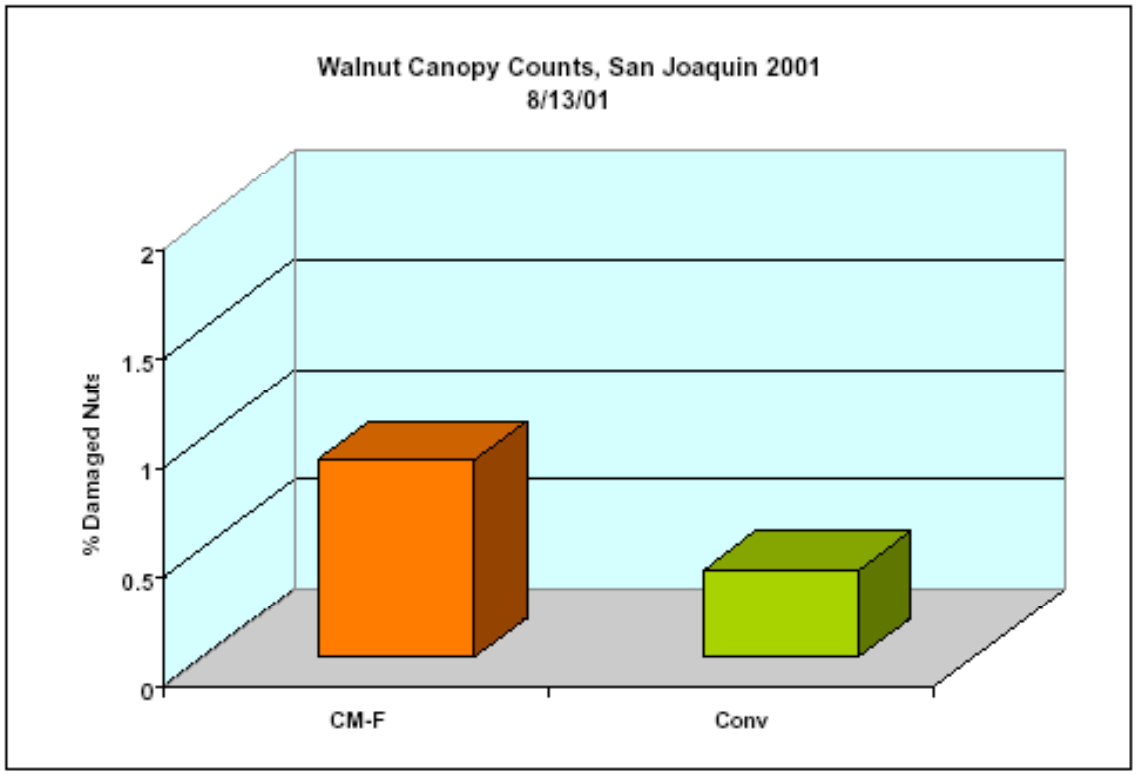


Figure 8.



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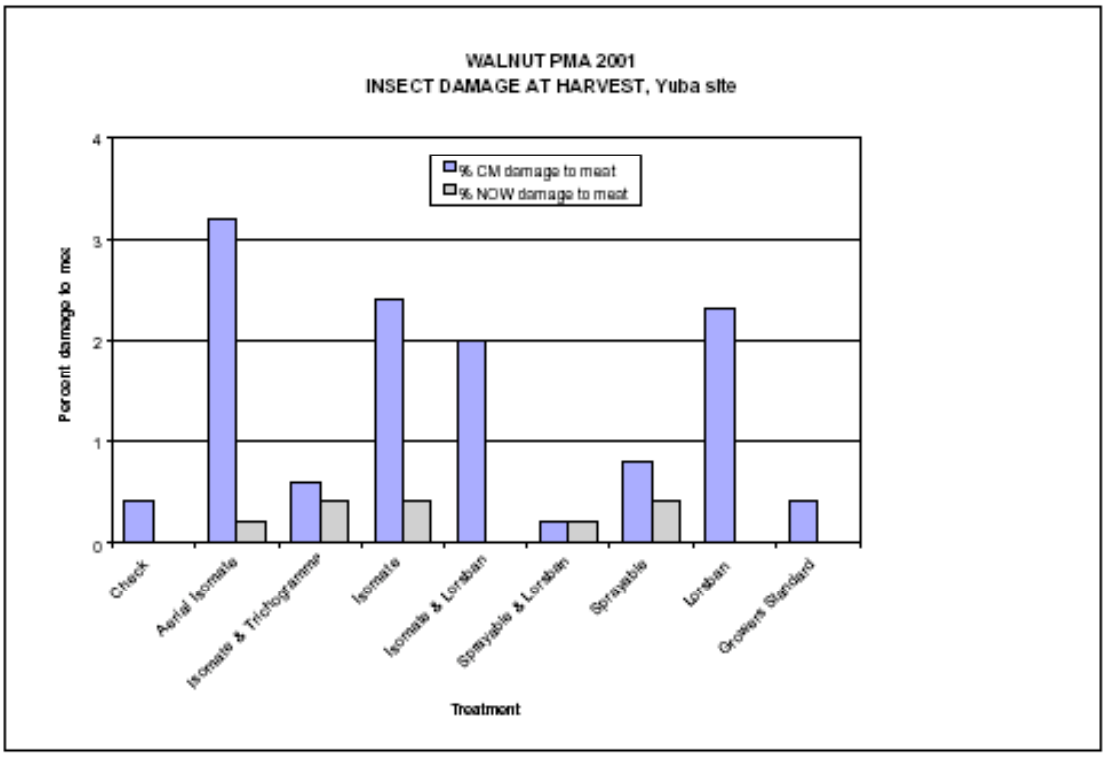

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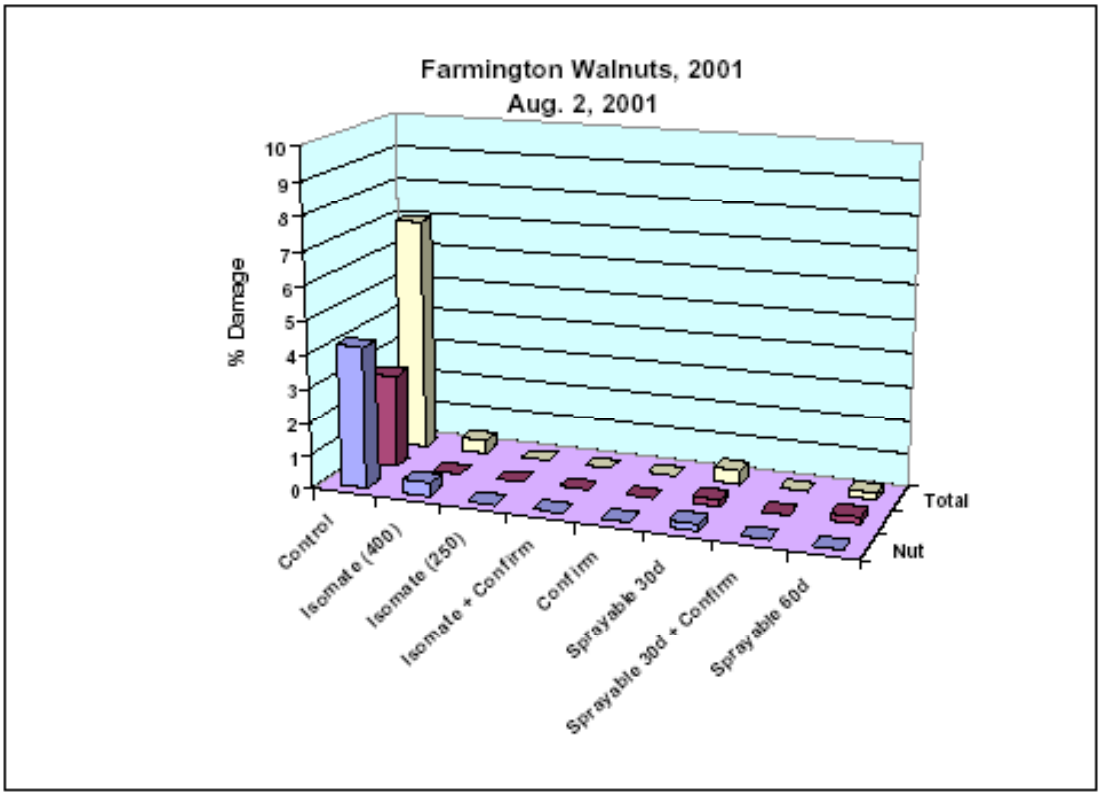

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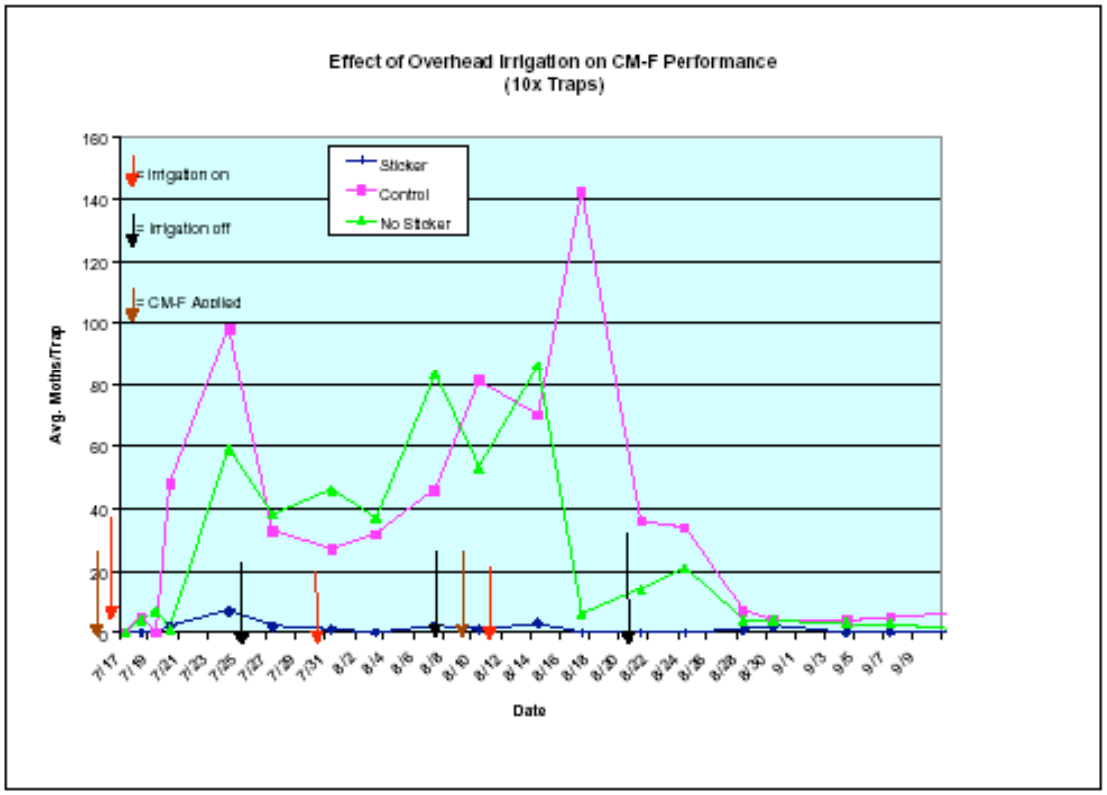

Figure 12.