DESCRIPTION:	**2001 Pear Pest Management Alliance Project for the Sacramento River District**
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2001 PEAR PEST MANAGEMENT ALLIANCE PROJECT FOR THE SACRAMENTO RIVER DISTRICT

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Cooperating Personnel

Participating Growers: Gary Martinez (Pacific Fruit Farms), Ed McDowell (McDowell Farms), Beth Robbins (Brown & Kahrs), Matt Hemly (Greene & Hemly)
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Background

Pear growers in the Sacramento river district have made a rapid transition from a organophosphate (OP) based codling moth (CM) control program to a mating disruption control program with few OP insecticides. The transition is now nearly complete with over 95 percent of the pear acreage under CM mating disruption. This rapid transition was brought about by the elimination of Penncap-M and further restrictions on Guthion. Also, the Pest Management Alliance projects provided growers and PCAs with the support needed to make this transition possible. The 1999 and 2000 PMA efforts involved assistance with monitoring for growers who had not used mating disruption before.

In 1999, codling moth populations were reduced to negligible levels in most orchards because of the widespread use of Penncap-M and because of the unusually cool spring and summer. Populations in 2000 were also low in most orchards, although they increased in a few orchards in which no OP has been used for several years. The current standard method of CM control in the Sacramento district is the use of either 400 Isomate C+ or 200 CheckMate pheromone dispensers per acre, along with one OP application. These standard methods of control are very effective when CM populations are low to moderate. CM populations in recent years have been so low that the OP spray has been directed as much at obliquebanded leafroller (OBLR) as CM. If CM populations remain low, then growers would be inclined to use "softer" chemicals, such as IGR or reduced risk insecticides instead of OP. These products, Confirm and Success, have been shown to be every effective against OBLR and afford some control for CM.

The reduced OP use through mating disruption has allowed some growers to greatly reduce or eliminate certain pesticides used for twospotted spider mite, European red mite and pear psylla. Mating disruption enhances beneficial insect and mite populations through the reduced number of OP insecticide applications. For example, some growers have eliminated, or reduced to every other year, the costly Agri-Mek spray, which is used after petal fall for controlling pear psylla and mites.

As a result of the closure of Tri-Valley Growers and low prices received for pears, a major factor guiding pest management decisions will be input costs. In the future, pest management method will need to be both effective and low cost. One problem with the currently used mating disruption technique of hanging Isomate C+ dispensers is that they are very labor

intensive and costly to apply. The standard mating disruption program in this district utilizes 400 Isomate C+ dispensers per acre. In 2000, some growers began using CheckMate dispensers that do not require tying on to a clip before hanging and are applied at only 200 per acre. However, they do not emit pheromone as long as Isomate, and some studies have shown them to be less effective. In 2001, several more growers used CheckMate dispensers.

Methods

1. Spray Trial

We sought to demonstrate the use of reduced risk insecticides that had some efficacy against codling moth (there are very few effective codling moth products), but which were effective OBLR materials. In four orchards, each of which were pheromone disrupted with 300 Isomate C+ ties/acre, spray treatments were applied in blocks of 4 or 5 acres, depending on whether 100 gal./acre (5 acres) or 125 gal./acre (4 acres) was used. There was no replication within the orchard; rather, each orchard was considered a replication. In addition, we tested the elimination of the Agri-Mek spray on the basis that a reduction in broad-spectrum insecticide sprays would improve biological control. The following treatment timings were used in this demonstration:

1. OP & Agri-Mek (grower standard)
2. OP, no Agri-Mek
3. Intrepid & Agri-Mek (no OP)
4. Intrepid, no Agri-Mek (no OP)
5. Avaunt & Agri-Mek (no OP)

The actual spray timings are shown in the table below. Psylla began to build up in some of the treatments, especially the OP/non Agri-Mek blocks, so Provado was applied in these blocks in June. In one orchard (Greene & Hemly), codling moth populations were so high that the grower applied Guthion to all treatments in May.

Grower	**OP**	**Avaunt & Intrepid**		
		1A	**1B**	**Other sprays**
McDowell	Imidan May 6	April 3	June 1	9/1 Provado to Treatments #2 & #4
Pacific Fruit Farms	Guthion May 29	April 10	May 31	6/21 Intrepid to Avaunt block (OBLR) 6/22 Provado to Treatment #2
Br. & Kahrs	Guthion May 11	April 3	May 30	8/17 Provado to Treatment #2
Gr. & Hemly	Guthion May 19	April 22	--	5/19 Guthion to all blocks (CM)

Sampling. One 1-mg trap and one 10-mg codling moth trap was hung in each block. In addition, two OBLR traps were hung in each orchard. Spider mites were monitored by sampling 100 leaves per block periodically, removing them with a mite-brushing machine, and counting them under a dissecting microscope. Pear psylla were evaluated by examining 20 topshoots per block from June through August.

Shoots were examined in early May for damage by green fruitworm and OBLR. Fruit were examined from each section of each orchard three times during the season: 1) end of the first Codling moth generation, 2) during harvest, and 3) postharvest.

Results. Codling moth trap catches were near zero throughout the season in three of the orchards. One of the orchards (Greene & Hemly) had relatively high trap counts, with a seasonal average total of 75 to 100 moths per trap in each of the treatments for the 10-mg traps, and 1 to 6 moths per trap in the 1-mg traps. The far majority of the moths were caught in mid-May. OBLR moth counts peaked at about 17 per trap in early May and in mid-July.

OBLR and GFW damage to shoots was very low and damage was found in only one orchard each during the early May sampling. Higher damage was found in the Avaunt and Intrepid treatments (about 0.3%) than the OP blocks (about 0.06%), but the damage may have occurred before the Avaunt and Intrepid were applied; furthermore, the OP had not yet been applied. Very few live worms were found, and one or more live worms were found in the Avaunt, Intrepid, and OP treatments. Some GFW damage was found in one orchard only.

Sampling at the 1,000-DD timing for codling moth (June 11) showed very little insect damage to the fruit. At harvest the harvest sampling (July 10), codling moth damage occurred only in the Greene & Hemly orchard. However, since Guthion was sprayed on all treatments in mid-May, no conclusions can be drawn. Damage at harvest in this orchard was 0.2% or less in all but one treatment, which had 0.8% damage. This treatment also sustained about 28% damage at the postharvest sampling (Aug. 22), which was more than double the damage found in most other treatment blocks. But again, because of the mid-May Guthion spray and the fact that there was no replication, no conclusions can be drawn.

There were no spider mites at the May 30 sampling date, except for 5 twospotted mites found in the Intrepid/non-Agri-Mek treatment at the Brown & Kahrs orchard. On the Aug. 22 sampling date, there were significantly more mites in the OP/non-Agri-Mek blocks than in other treatments (Fig. 1). There were no significant differences in European mite populations (data not shown), however, at Pacific Fruit Farms, 73 mites/100 leaves were found whereas none were found in the other treatments.

Psylla were monitored weekly through the season, but our numbers were zero or near zero except for two dates: June 11 (Brown & Kahrs = 8 psylla/100 leaves; Pacific Fruit Farms = 5 psylla/100 leaves) and July 30 (Pacific Fruit Farms = 7 psylla/100 leaves). However, additional monitoring found that there were actually high populations in the OP/non-Agri-Mek blocks in three orchards, so these blocks were treated with Provado (see spray table above). High psylla populations were found in the entire McDowell orchard in late August, but they were highest in the two non-Agri-Mek blocks, so both were treated with Provado. Clearly, the OP/non-Agri-Mek treatment had substantial psylla populations (which went largely undetected by field scouts) and Agri-Mek should be used whenever an OP is used. On the final count on Aug. 22, there were no significant differences in psylla populations (data not shown).

2. Pheromone Dispenser Trial

This trial was conducted in different areas of the same orchards used in the spray trial. The purpose was to compare the efficacy of the two standard pheromone disruption methods (Isomate C+ at 300 ties/acre and CheckMate at 200 ties/acre) and the new Isomate C-TT dispensers, which do not require tying onto clips and are used at only 200/acre. One 10-acre block of each treatment was used in each orchard. Each orchard was treated with a single OP spray, either Imidan or Guthion, and either at the 1A or 1B timing.

In order to ensure that moths would be present in high enough numbers to be able to evaluate differences in trap counts, sterile male CM adults were released and trapped three times through the season as they became available. Release dates were May 17, May 31, and Aug. 2. On each release date, two plates of 1,000 moths each were released in each block in all four orchards. Three traps were placed one tree apart about 30 ft. away, upwind from each release site, in the following manner: 1) trap placed 6 ft. high with 1-mg lure, 2) trap placed in the top 2 ft. of tree with 1-mg lure, and 3) trap placed in the top 2 ft. of tree with 10-mg lure. Traps were monitored 1 week after release.

Sterile moths were identified by a pink color when squished, whereas local (resident) moths had no coloration. Local moths were present in only one orchard (Greene & Hemly), so those data are not reported. CM damage to fruit was also evaluated at 1,000 DD (June 11), harvest (July 10), and postharvest (Aug. 22).

Pheromone dispensers were gathered and sent to Scenturion Inc. (Clinton, WA) for analysis of the amount of CM pheromone (codlemone) remaining at different time periods. Enough dispensers of each of the three types were hung in a tree in early April to enable collection of five of each type at 0, 90, and 120 days. Dispensers were immediately placed in a plastic bag and frozen until they were sent to a lab for analysis at the end of the season.

Results. Trap counts were fairly low, and in future trials traps will be placed 15 ft. away rather than 30 ft. The standard trapping method in orchards is to place traps with 1-mg lures at 6 ft. and those with 10-mg lures in the top 2 ft. of the tree. High traps with 1-mg lures were included to provide a comparison with 1-mg low traps.

Although it appears that traps in CheckMate blocks often caught slightly more moths than those in the other blocks, the differences were very small and not consistent (Figs. 2 and 3). It appears that all pheromone treatments were more or less equally effective at suppressing trap catches and presumably equally effective at disrupting mating. No fruit damage was found except at the Greene & Hemly orchard at harvest, when 0.1 percent damage in each treatment was found, and postharvest, when damage ranged from 8 to 11 percent in the three treatments.

Analyses of dispensers are shown in Fig. 4. These data do not show the actual emission rate nor do they show the total amount of active ingredient in the field, but the data do provide an indication of the relative amount of pheromone remaining. Bear in mind that the recommended application rate for Isomate C+ is 400 per acre, but the recommended rate for Isomate C-TT and CheckMate is 200 per acre.

Previous research over several years has shown that the typical longevity for Isomate C+ in the Sacramento district is about 140 days. On day 120 (early August), these dispensers still had about 21 mg of codlemone or about 14.7% of initial load (Table 1). This amount should provide for adequate mating disruption for several more days (J. Jenkins, pers. comm.).

The release rate per day can be calculated by subtracting the day 120 load from the initial load, then dividing by the number of days (120) (Table 1). Release rates often vary among locations. For example, in a similar study in Fresno, the release rate of C-TT and CheckMate was much higher (J. Jenkins, pers. comm..).

Table 1. Pheromone loss and release rates of three dispenser types.

	Pheromone		**Amount**	**Release Rate**	
	Initial	**Day 120**	**Lost**		
	---------mg/dispenser---------			*mg/dispenser/day*	*g/acre/day*
C+	143	21	122	1.0	0.40
C-TT	298	132	166	1.4	0.28
ChMate	254	117	137	1.2	0.24

Figure 1. Two-Spotted Spider Mites
Aug. 22, 2001

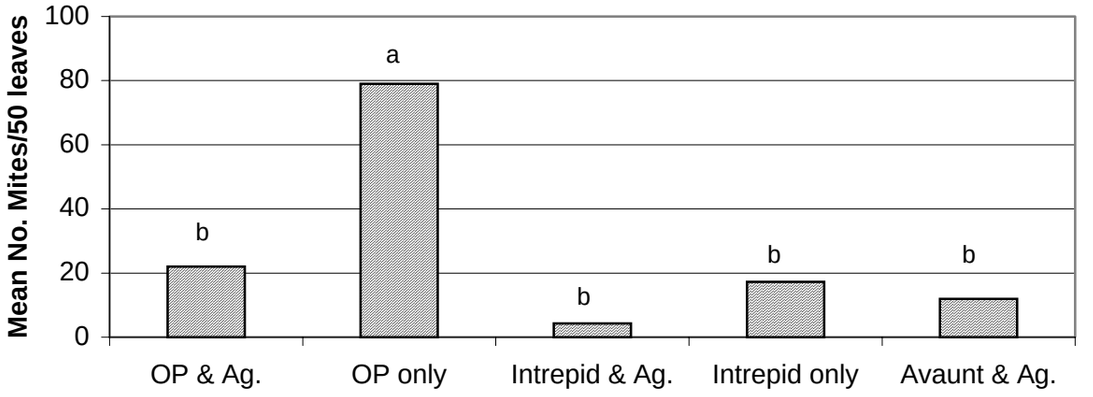

Figure 2. Sterile Male CM Trap Counts
Release Dates: Avg. of May 17 & 31, 2001

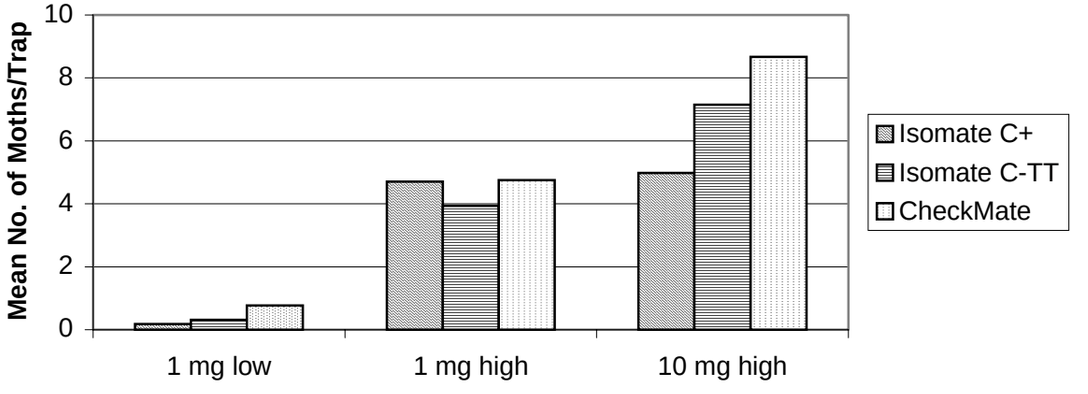

Figure 3. Sterile Male CM Trap Counts
Release Date: August 2, 2001