

Implementation Programs

Commercial Implementation of Delayed Hanging of Mating Disruption Pheromones for Codling Moth Control in 477 Acres of Pears in California in 1999

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The second year of delayed, partial season codling moth (CM) mating disruption (MD) was carried out in 41 blocks of pear orchards in 12 small contiguous acreages in the north coastal districts of Lake and Mendocino in California (Table 1). Delayed pheromone use means that an assessment of overwintering CM populations with standard 1 mg pheromone traps is possible. Each pheromone block was paired with a standard block to allow assessment using paired t tests. Since improvements in some products have resulted in 120-day effectiveness, pheromones were hung by early June. First cover had been applied earlier in all blocks, with a second cover applied after hanging in two blocks where CM flights had returned prior to hanging. In the 39 blocks with no codling moth activity past first cover, *Bacillus thuringiensis* (*Bt*) was utilized as a second cover for obliquebanded leafroller (OBLR) control. In several blocks, a second OBLR *Bt* treatment was applied as flights persisted.

Fruit samples and 1 mg low pheromone traps at 1 per 10 acres were relied upon to assess the technique's success. In test areas of sufficient sample numbers, blocks which utilized delayed MD the previous year, 1998, showed significant lowering of CM flight prior to hanging in 1999 (Table 1).

Moth flights after hanging pheromones were shut down. Pre-harvest fruit samples during July and August 1999 showed significantly lower CM egg infestation. Post-harvest worm infestation in pheromone blocks was lower than in standard blocks, but only at $P = 0.122$ (Table 2).

Additional fruit monitoring and OBLR trap costs added \$4.75/acre to the cost of pest management in the pheromone blocks. These, and costs of pheromones and their application, bring extra costs to about \$150 per acre. These are partially offset in the current year with Organophosphate (OP) and application cost reductions of 1.2 treatments/acre. There was also reduction in use of about \$45/acre in psyllacides and miticides in the pheromone blocks. However, there were additional costs for *Bt* as well as an extra delayed dormant chlorpyrifos treatment in all pheromone blocks to reduce OBLR. Although the delayed hanging technique has increased pest management costs somewhat, OP use past first cover is largely avoided and less pesticide use close to harvest for mites and psylla has been achieved. These results have been attained the last two years in test blocks with low CM populations present, while experiencing the relatively short moth seasons indicated in Table 1, however.

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Table 1. 1999 test areas (late hanging pheromone confusion).

Area	Year	Dispenser ¹	Total acres	# Blocks	Contiguous areas	Average contiguous acres	Dates hanging	DD ² 88/50 hanging (Aug 22)	Traps	Phero	Std	P=0.05 difference
Big Valley	2	Puffer	30	3	1	30.0	5/27	375 (1,807)	3	1.3	3.7	No
Big Valley	1	Isomate C+	80	5	5	47.6	5/25-6/15	330-576 (1,807)	8	5.0	4.0	No
Big Valley	2		158	12					18	0.6	5.1	Yes
Upper Lake	2	Isomate C+	33	2	2	16.5	5/25-6/5	330-463 (1,807)	4	0	0.3	No
Mendocino	1	Isomate C+	56	6	4	44.0	5/25-6/10	323-452 (1,671)	6	1.0	0	No
	2		120	13					13	0	0.9	Yes

¹Paramount Puffers 1.5/acre; 30 ut/puff (7.5 mg codlemone) every 15 minutes, on 3PM-3AM; off below 50°F; perimeter placement 40'; 400 Isomate C+/acre.
²Biophenometer, TA 51, Omni Data, Logan, Utah 84321.

Table 2. 1999 test results (late hanging pheromone confusion).

Area	Dispenser	Year	Moth flight, post hanging				July-August			Late Sept-Oct.			
			Phero	Std.	P=0.05 difference	# Samples ¹	Pre-harvest egg infestation		Post-harvest worm infestation		# Samples ²	Phero	Std.
							Phero	Std.	P=0.05 difference				
Big Valley	Puffers	2	0	1.0		15	0.00%	0.00%		3	0.00%	0.30%	
Big Valley	Isomate C+	1	0	1.4		25	0.00%	0.04%		5	0.20%	0.20%	
Big Valley	Isomate C+	2	0	3.6		60	0.00%	0.03%		7	0.00%	0.14%	
Upper Lake	Isomate C+	2	0	0.3		15	0.00%	0.07%		3	0.00%	0.00%	
Mendocino	Isomate C+	1	0	1.5		30	0.03%	0.07%		4	0.00%	0.50%	
Mendocino	Isomate C+	2	0	2.0		65	0.00%	0.06%		6	0.00%	0.00%	
Average			0	1.6	Yes		0.01%	0.05%	Yes		0.03%	0.16%	No ³

¹100 clusters.

²100 fruit.

³P=0.122.

Table 3. 1999 organophosphate use.					
Area	Dispenser	# organophosphate treatments			P=0.05 difference
		Year	Pheromone	Standard	
Big Valley	Puffers	2	1.0	2.7	yes
Big Valley	Isomate C+	1	1.2	2.0	yes
Big Valley	Isomate C+	2	1.2	2.5	yes
Upper Lake	Isomate C+	2	1.0	2.0	yes
Mendocino	Isomate C+	1	1.0	2.4	yes
Mendocino	Isomate C+	2	1.0	2.0	yes