Implementation

# Commercial Implementation of Delayed Hanging of Mating Disruption Pheromones for Codling Moth Control in 450 Acres of Pears in California 1998

B.G. Zoller[1] and Rachel B. Elkins[2]
[1]The Pear Doctor, Inc., Kelseyvi1le, CA
[2]University of California Cooperative Extension, Lakeport, CA

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Full season use of mating disruption has required intensive monitoring to assure that the system is working in cool spring conditions in areas whose codling moth pressure can be difficult to assess. Leafroller injury levels have been troubling in full season mating disruption blocks. Real world pest management must deal with some blocks whose size, shape and location may be less than optimal compared with a large, areawide effort.

For these reasons, a less intensively monitored, partial season mating disruption method is being explored. Codling moth pheromone dispensers are hung later in the season in smaller contiguous acreages than in areawide projects. Delayed pheromone use means that an assessment of overwintering codling moth populations with standard pheromone traps is possible. Standard organophosphate treatments are applied early in the season but are omitted closer to harvest and in the next season, as during harvest and postharvest moth generations are controlled better than with preharvest applied chemicals. Early season use of organophosphates, usually through second cover, means that leafroller control is not substantially decreased. In some cases of no codling moth activity past first cover, *Bacillus thuringiensis* is utilized as a second cover for leafroller control augmentation.

Orchardists on 452 acres of pears consisting of 35 blocks located principally in the north coastal mountain districts of California in 1998 utilized the delayed hanging technique summarized in the tables. 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 usually in the first half of June, which however was earlier in the life cycle of the codling moth than usual, owing to the cool season. First cover had been applied earlier in all blocks, with a second cover applied after hanging if moth flights had returned prior to hanging.

Fruit samples and prior codling moth histories were primarily relied upon thereafter to assess the technique's success. Additional treatments were applied in a few cases where puffer dispensers were used and egg infestation levels appeared to be higher. In one Sacramento Valley location utilizing Isomate C+ dispensers, egg levels also suggested additional treatments were needed. These were not applied, however, and this block proved to be the only failure among the 35 blocks studied. Injury levels at second pick reached 5% compared to 1% in the standard area. In the remaining blocks, control measured in postharvest samples was equal to or better than in the standard blocks (Table 2).

Moth catches in standard 1 mg pheromone traps in early 1999 will be used to verify these

results and to suggest program changes, if necessary. Although this was a very short moth season with little postharvest activity in north coast district blocks, if populations appear to have diminished compared with historical levels, some additional organophosphate reduction may be possible in 1999. Reductions in organophosphate use this year are outlined (Table 3).

Additional fruit monitoring and OBLR trap costs added $4.75/acre to the cost of pest management in the pheromone blocks. These and the costs of pheromones and their application bring extra costs to about $150 per acre. These are partially offset in the current year with OP and application reductions. There is also the hope of additional savings in the next season. There was also reduction in use of $10/acre in psyllacides and miticides in the pheromone blocks. However there were additional costs for *Bt* in some pheromone blocks.

**Table 1.** 1998 test areas, late hanging pheromone confusion.

| | | | | | | | | | Moth population per trap prior to hanging | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Dispenser[1] | Total acres | Contiguous areas | Average contiguous acres | No. blocks | Dates hanging | DD 88/50 hanging[2] (Aug 22) | Traps | Phero | Std. | P=0.05 difference |
| Big Valley | Puffer | 30 | 1 | 30.0 | 3 | 6/10-6/12 | 354-386 (1,859) | 3 | 21.0 | 10.0 | no |
| Big Valley | Isomate C+ | 242 | 7 | 34.6 | 16 | 5/28-6/18 | 229-483 (1,859) | 25 | 23.0 | 16.1 | no |
| Upper Lake | Isomate C+ | 33 | 2 | 16.5 | 2 | 6/5-6/20 | 292-515 (1,859) | 4 | 4.5 | 2.5 | no |
| Mendocino | Isomate C+ | 127 | 3 | 42.3 | 13 | 6/5-6/10 | 344-411 (1,954) | 12 | 7.8 | 4.6 | yes |
| Sac Valley | Isomate C+ | 20 | 1 | 20.0 | 1 | 6/1-6/5 | 464-525 (2,505) | 1 | 8.0 | 18.0 | -- |

[1]Parmount Puffers 2/acre; 30µl/puff every 15 minutes, on 3PM-3AM; off below 50˚F; perimeter placement 40 ft; 400 Isomate C+/acre.
[2]Biophenometer, TA 51, Omni Data, Logan, Utah 84321.

**Table 2.** 1998 test results, late hanging pheromone confusion.

| | | Moth flight, post hanging | | | | Preharvest egg infestation | | | Postharvest worm infestation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blocks | Dispenser | Phero | Std. (%) | P=0.05 difference | No. samples[1] | Phero | Std. (%) | P=0.05 difference | No. samples[2] | Phero | Std. (%) | P=0.05 difference |
| Big Valley | Puffers | 0 | 6.0 | yes | 12 | 0.30% | 0.08 | no[3] | 3 | 0 | 0.00 | no |
| Big Valley | Isomate C+ | 0 | 6.8 | yes | 64 | 0.02% | 0.02 | no | 16 | 0 | 0.40 | yes |
| Upper Lake | Isomate C+ | 0 | 2.5 | yes | 6 | 0.00% | 0.00 | no | 3 | 0 | 0.00 | no |
| Mendocino | Isomate C+ | 0 | 5.4 | yes | 26 | 0.04% | 0.04 | no | 13 | 0 | 0.20 | no[3] |
| Sac Valley | Isomate C+ | 1 | 15.0 | -- | 3 | 0.70% | 0.70 | no | 1 | 52 | 11.00 | -- |

[1]100 clusters.
[2]100 fruit.
[3]Difference at P=0.08.

**Table 3.** 1998 organophosphate use.

| | | No. organophosphate treatments | | |
|---|---|---|---|---|
| Blocks | Dispenser | Pheromone | Standard | P=0.05 difference |
| Big Valley | Puffers | 2.5 | 2.7 | no |
| Big Valley | Isomate C+ | 1.6 | 2.8 | yes |
| Upper Lake | Isomate C+ | 1.3 | 2.3 | yes |
| Mendocino | Isomate C+ | 1.0 | 3.1 | yes |
| Sac Valley | Isomate C+ | 2.0 | 4.0 | -- |