II. Pome Fruits
c Biological Control- Mating Disruption
f Implementation
1. Codling Moth
2. Fruittree Leafroller, Obliquebanded Leafroller, Omnivorous Leafroller

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A mature Sacramento Valley Barlett pear orchard was completely treated with CM pheromone dispensers, formulated and supplied by Biocontrol Ltd., at a rate of 100 dispensers per acre. Dispensers, designed to have a 6 month field life, did not require replacement throughout the season. CM damage levels in the pheromone treated orchard were compared to damage in a conventionally treated orchard and to damage in an abandoned plot of trees at the same location. The conventionally treated orchard received five insecticide applications whereas the abandoned trees remained untreated throughout the season.

The potential for leafroller damage when replacing insecticides with mating disruption, was evaluated under five different treatment regimes in a latin square trial placed centrally within the pheromone treated orchard. Each treatment was replicated five times and each replicate was surrounded by a buffer zone. From June 2 onwards, this buffer zone was insecticide treated when insecticide treatments were applied to other parts of the trial. The five treatments and insecticide timing are shown in Table 1.

Mating disruption controlled codling moth to commercially acceptable levels in this trial. This orchard had a high resident population of CM

and was treated with 4-5 applications of azinphos-methyl annually prior to 1987. CM damage levels were quite high in the adjacent abandoned trees.

In the absence of insecticidal control measures for CM, the use of mating disruption in pears will need augmentative applications of insecticide for control of leafrollers. The results indicate that one, or at most two, supplementary insecticides will be sufficient in controlling the leafrollers. These sprays will need to be timed for moth flights and additional research is required in this area. Use of pheromones for control of CM combined with these additional applications of insecticide for leafroller control should be competitive with the current spray program .

An option exists for the use of selective or microbial insecticides for the control of the leafroller larvae. This would enhance any biological control of the leafrollers, as well as increase the potential role of biological control agents in management of psylla and phytophagous mites. Further, a program integrating mating disruption pheromones with selectively timed insecticides should reduce the current insecticide load on the environment and give pear producers safer alternatives in pest management.

Table 1. Treatments and spray timing.

| Treatment Number | Pheromone | Spray timing. #1 4/15 | #2 5/6 | #3 6/2 | #4 6/17 | #5 7/8 |
|---|---|---|---|---|---|---|
| A | * | - | - | - | - | - |
| B | * | * | - | - | - | - |
| C | * | * | * | - | * | - |
| D | * | - | * | - | * | * |
| E | * | - | - | - | * | - |
| Insecticide Comparison | - | * | * | * | * | * |

Table 2. Per Cent Lepidopterous damage to pears at harvest[1]

| Treatment | CM | Leafroller Complex[2] | | Total |
|---|---|---|---|---|
| | | Early season | Mid-late season | |
| A (Pher. only) | 0.36 | 1.77 | 13.41 | 15.54 |
| B (Pher + 1) | 0.0 | 0.34 | 2.28 | 2.62 |
| C (Pher + 1,2,4) | 0.0 | 0.31 | 0.36 | 0.67 |
| D (Pher + 2,4,5) | 0.01 | 1.76 | 1.65 | 3.42 |
| E (Pher + 4) | 0.16 | 2.37 | 7.39 | 9.92 |
| Insecticide Control (5 sprays) | 0.04 | 0.23 | 0.15 | 0.41 |
| Abandoned Trees[3] (100 m from trial) | 36.50 | 19.50 | 2.50 | 58.50 |

1. 7500 fruit sampled/treatment (except for abandoned trees)
2. Leafroller complex includes OLR, OBLR, and FTLR.
3. Total sample : 400 fruit, taken from 2 trees.