BEHAVIOR OF MICROENCAPSULATED CODDLING MOTH AND ORIENTAL FRUIT MOTH PHEROMONE FORMULATIONS IN CALIFORNIA FILED TESTS

R. Gerber, H. Shorey, Dept. Entomology, University of California, Riverside, Riverside, CA and C. Thies, Thies Technology, St. Louis, MO

This report summarizes results of field studies carried out in California designed to evaluate the behavior of two microencapsulated coddling moth (CM) and two microencapsulated oriental fruit moth (OFM) pheromone formulations. The OFM formulations (Formulations A and B) were applied at 20 gms. actives per acre to 10 acre blocks of almonds in Kern County, CA, with a tractor drawn sprayer on July 6, 1998. The CM formulations (Formulations C and D) were applied at 20 gms. actives per acre by helicopter to 10 acre blocks of Serr walnuts in Tulare County, CA, on July 24, 1998. Four lure baited winged sticky traps placed in each treated block were checked periodically for moth capture. Control traps (four for OFM-treated blocks and two for CM-treated blocks) were placed approximately one mile upwind from the treated blocks. Reported trap counts are mean values recorded at the time periods specified.

Table 1 contains trap count data for OFM-treated almond blocks. For the first 51 days post-spray, both formulations reduced the trap count to zero. At days 63 through 93 post-spray, trap counts in both treated blocks remained low. During the first 93 days post-spray, a total of four moths were caught in traps in the block treated with Formulation A while three moths were captured in the block treated with Formulation B during the same period. The trap count increased significantly at 98 days post-spray. Thus, a single application of the two OFM-loaded microcapsule formulations reduced moth capture in the treated almond blocks to a very low level throughout this period. This is attributed to their ability to release OFM at a finite rate throughout the test.

Table 1
Mean number of oriental fruit moths captured at various times after application of microencapsulated OFM pheromone formulations as a spray on almond trees at a rate of 20 gm. actives/acre.

	Mean number of moths captured									
Days after spraying	**7**	**18**	**28**	**38**	**51**	**60**	**72**	**81**	**93**	**98**
Microcapsule formulation A	0	0	0	0	0	0.25	0	0.75	0	6.5
Microcapsule formulation B	0	0	0	0	0	0	0.25	0.25	0.25	2.5
Control	10	4.8	10.8	9.0	26.3	18.0	12.3	38.8	16.8	10.8

Table 2 contains trap count data for CM-treated Serr walnut blocks. Formulation C reduced the coddling moth trap count to zero for 18 days post-spray. The mean trap count increased to 1.25 moths at 32 days post-spray, but this still represented a 93.9% reduction in trap count relative to control. Formulation D gave zero trap count for 11 days post-spray, but the trap count at days 18, 32 and 47 post-spray was reduced by 95-97 % relative to control. Both microencapsulated CM pheromone formulations at days 53 and 62 post-spray gave trap counts significantly higher than control. The reduction in trap count caused by the microencapsulated CM formulations is taken as evidence that the capsules released CM pheromone at a finite rate throughout the test.

Table 2
Mean number of coddling moths captured at various times after application of microencapsulated CM pheromone formulations as a spray on Serr walnut trees at a rate of 20 gm. actives/acre.

	Mean number of moths captured					
Days after spraying	**11**	**18**	**32**	**47**	**53**	**62**
Microcapsule formulation C	0	0	1.25	3.0	9.0	24.0
Microcapsule formulation D	0	0.25	0.75	0.5	12.75	27.25
Control	17.5	9.5	20.5	11.0	8.5	13.0

The data in Tables 1 and 2 indicate that the microcapsule formulations evaluated cause a significant reduction in the number of coddling or oriental fruit moths captured in traps over a prolonged period, but it must be stressed that this is not necessarily an indication they can minimize fruit damage by these pests for the same length of time. This remains to be defined in further studies. The effect of the encapsulated CM pheromone formulations on female CM virginity is another factor that could be evaluated.

The observations reported here may be unique to the conditions that existed in California during the test. No rain fell on any of the test blocks throughout the test period. Furthermore, temperatures in the region of the test blocks were high throughout much of the test period. Daily high temperatures were primarily 35-40^{0}C and daily low temperatures were primarily 17-22^{0}C until day 72 post-spray of the OFM test and day 53 post-spray of the CM test. In spite of these elevated temperature conditions, the microencapsulated CM formulations remained highly effective in causing trap count reduction for periods of 32-47 days. This is significant, because CM pheromone is susceptible to degradation. Scanning electron micrographs of leaf surfaces showed that the CM capsules were in various stages of deterioration at approximately 42 days post-spray.

In summary, the results reported here provide encouragement that microencapsulated pheromone formulations capable of multi-month field life can be produced and microcapsules loaded with pheromones susceptible to degradation can remain active in the field for a multi-week period.