

I. Thresholds/Monitoring/Sampling

Monitoring Codling Moth with Traps and Lures

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Codling moth has been monitored in orchards with traps baited with red rubber lures impregnated with codlemone for over twenty years. Moth catch in these traps are widely used to time insecticide applications and to establish action thresholds. Due to this long successful history pest managers have been reluctant to change lure types. However, following the registration of the mating disruption (MD) technology in 1991 growers started using a high load (10 mg) red rubber lure. The increased importance in monitoring codling moth in MD orchards has focused more attention on how the current lure performs and in developing an improved lure. This work has clearly shown that the red lure has a number of problems, yet acceptance of an alternate lure has not yet occurred. Recommendations for monitoring codling moth with the red lure in MD orchards now suggest that the lures be changed every three weeks in the spring and two weeks during the summer. This has increased the cost of monitoring especially when traps are used at one per 2.5 acres in MD orchards.

Studies were conducted to compare the current red septum with an alternative gray septum. The gray septum is commercially available and is already used as the lure for a number of other pest species. The advantage of the gray lure is that the codling moth pheromone is more stable and thus the lure lasts longer. One disadvantage of the gray lure is that less pheromone can be loaded and it has a different release rate than the red lure. Field tests were conducted to compare red lures loaded with 1 and 10 milligrams of codlemone against gray lures loaded with 1 and 4 milligrams of codlemone. Replicated experiments (n = 5) were conducted with lures aged from 0 - 42 d in the field within both a mating disrupted and conventional orchard. In each test one lure of each age and type were placed in a trap and 200 male codling moths were released. Traps were checked after 7 days. To support these field tests the emission rates of lures were determined and the residual analysis of lures was conducted to examine the stability of the pheromone.

Recapture of moths were similar between the 1 mg red and gray lure for the first two weeks. After two weeks moth catch dropped off in traps baited with the red lure but remained nearly unchanged for 6 weeks in traps with the gray. Similar results were found when we compared the 10 mg red and the 4 mg gray lures: no difference for the first two weeks but then the red lure's performance declined.

The characteristics of these dispensers were measured in the laboratory. The emission rate from the red lures declined by 50% while the emission rate of the gray lures were more even over 42 d. The isomeric purity of codlemone in the red lures declined from 93

to 72%, but remained unchanged in the gray lures. The importance of pheromone purity on lure performance can be seen if we compare moth capture by red and gray lures emitting a similar level of pheromone. Thus for 7 day-old red and 28 d-old gray lures both loaded with 1 mg their average emission rate was 0.3 micrograms per hour, but the gray lure caught 67% more moths in a conventional orchard. Similarly, a 28 d-old red lure loaded with 10 mg and a 21 d-old gray lure loaded with 4 mg both emitted approximately 5.2 micrograms per hour, but the gray lure caught nearly twice the number of moths in a MD orchard.

Clearly these data show that the gray lure is superior to the red as a tool to monitor codling moth in terms of its consistency and longevity. The gray lure will need to be changed less often and this will lower the grower's cost in monitoring codling moth. The gray lure should also be cheaper since it contains less pheromone. The final question is whether the current thresholds based on the red lure would need to be changed if we switched to the gray lure. Our data suggest that switching from the red to the gray lure may have little effect on total moth catch. For example if we compare moth catch over six weeks by the 10 mg red lure changed every two weeks and the 4 mg gray lure unchanged for six weeks the total moth catch was only 10% higher by the gray lure in a mating disrupted orchard (47.1 vs 42.9 moths). In a conventional orchard under similar circumstances but with the red and gray lures loaded each with 1 mg, total moth catch over six weeks was only 4% lower with the gray lure (140.2 vs 145.8 moths).

However, before pest managers switch from the red to the gray lure we need more experience with its use. For example, data is needed on the performance of the gray lure in the cooler spring months. Use of the gray lure in MD orchards should probably be gradual to build up experience with its performance. Beginning in 1997 gray lures will be widely tested in certain grower/research programs in Washington and California.