Thresholds and Monitoring

Comparison of kairomone DA 2313 and pheromone lure trapping for codling moth with oviposition monitoring

B. G. Zoller and A. M. Zoller
The Pear Doctor, Inc., Kelseyville, CA

Keywords: codling moth, *Cydia pomonella*, pear, oviposition monitoring, kairomone

Abstract: A kairomone-based codling moth (CM) adult trapping system was paired with a pheromone-based male trapping system in 137 interior locations of 836 hectares of pear orchards utilizing mating disruption for control in 4 California north coast geographic areas. To monitor oviposition during June and July, 1.3 cutfruit/hectare/week were located in the trap locations; in perimeter locations of the same blocks there were 3.0 cutfruit/hectare/week. The ratio of DA capture to pheromone capture (by field age of the pheromone lure) suggested greater stability of the DA lure response compared with the pheromone lures in the highest population area. A comparison of the fraction of the season total ovae counted with the accumulated CM/trap at the time of oviposition detection showed that 92% of ovae were detected with 1 or more adults/DA trap vs. 79% of ovae detected with 1 or more males/pheromone trap. However, 83% were detected with 4 or more accumulated DA captures vs. only 44% detected with 4 or more males/pheromone trap. The experiences indicated that DA action thresholds may be utilized at levels below detection of CM using pheromone traps; however, more frequent lure change could increase the sensitivity of the latter.

Introduction

Pheromone trap catch is shut down to very low levels in mating disrupted orchards, making the need for additional control difficult to ascertain. Oviposition detection in cutfruit clusters was compared with male catch in pheromone traps and adult catch in kairomone DA 2313 traps in mating disrupted orchards.

Methods

Pheromone traps, 1 gal. ice cream carton style (Agricultural Advisors, Inc., Live Oak, CA), were positioned in the center of blocks in the upper one-quarter of the tree canopy at 1 trap per 4 hectares. They utilized one 10 mg lure (IPM Technologies Inc., Portland, OR) in the early season at 0-203 degree-days (88/50F), a second 10 mg lure 5 weeks in the mid-season (May to middle June) at 203-714 degree-days, and a Megalure (Trécé, Inc., Salinas, CA) 5 weeks in the summer at 714-1557 degree-days.

Paired kairomone traps (Pherocon IIC, Trécé, Inc.) were placed 5 trees distant from every other pheromone trap, in the upper one-quarter of the canopy on March 25-31. They utilized kairomone DA 2313 lures (Trécé, Inc) with one new lure change on May 31.

Cutfruit clusters were used to monitor oviposition. One fruit in a cluster of at least two was cut weekly, one week prior to examination for oviposition. Cutfruit clusters were observed weekly, beginning on June 3. The area of the cut surface increased with the weekly size of the fruit. Effort was made to maintain the cut area at a constant 15 to 20% of the total fruit surface.

Block perimeter and interior cutfruit clusters were examined. Perimeter samples were usually located on the south and west windward edges at 3.0 cutfruit/hectare per week (11 to 12 per 10-acre block). Cutfruit interior samples were in the trap areas at 1.3 cutfruit/hectare/week (5-6 per trap area). All cutfruit clusters were located at eye level on the east sides of trees.

Results and Discussion

The ratio of DA capture to pheromone capture suggested greater stability of the DA lure response compared with pheromone lures. The earlier cool season pheromone 10x lure change seemed to be more consistent with age than the midseason 10x lure change in terms of relative attractiveness to CM compared with the DA lure. The Megalure (summer season) pheromone lures were consistent for 3 weeks in the Lake County district, then began to decline in relation to the DA lures in weeks 4 and 5 (Fig. 1). Results of Megalure pheromone trapping in the lower, more coastal Mendocino County orchards presented a more consistent response with 5 weeks age relative to DA trapping. However, low populations encountered in the early and midseason resulted in too many null readings to create ratio values for many weeks, making interpretation difficult for the 10x lure response (Fig. 2).

DA traps outperformed pheromone traps in most orchards. However, pheromone catch in early June likely was understated because of 10x lure age. DA traps peaked as the 10x lure aged, then declined with installation of the Megalures. This suggested competition for males in the paired trap areas. Cutfruit tests began to outperform pheromone traps at the end of the season at 4 to 5 weeks Megalure age. However, there could be effects of population protandry as well as lure age involved. The summer DA lure was 7 weeks old in the last week of readings and could have been declining in effectiveness with development of fruit volatile substances (Figs. 3 and 4). In one geographic area representing 18 of 137 trap pairs the pheromone traps out-performed the DA traps most of the season in contrast to all other areas (Fig. 5). However, for all 137 trap pair areas, if only data of 1 to 2 week aged 10x pheromone lures are considered for April and May, DA traps caught 3.6 to 4.5 times as many moths as 10x pheromone traps. This was very similar to the June and July Megalure data for one to five weeks of field age in all areas.

There were many cases where 4 or more moths had been caught in DA traps with no ovae detected using the cutfruit method. However, in 84% of cutfruit ova detections, 4 or more moths had been caught in DA traps prior to or concurrently at the 1.72 cutfruit/acre/week rate employed. Using the experiences with the pheromone traps, in only 44% of ova detections were 4 or moths accumulated per trap prior to the detection. In order to account for over 80% of detections, less than 1 or more moths per pheromone trap is the needed threshold. Using 1 moth caught in a pheromone trap as a spray threshold results in 21% of cutfruit ova detections not being controlled. (However, the aging studies suggest this might be improved using more frequent lure changes.) Using 3-4 accumulated moths in a DA trap as a spray threshold results in

16% of cutfruit ova detections not being controlled. Use of 1 moth in a DA trap as a spray threshold improves control to 8% of detected ovae not being covered (Fig. 6).

Summary

The ratio of DA capture to pheromone capture by field age of the pheromone lure suggested greater stability of the DA lure response compared with the pheromone lures. The experiences indicated that DA action thresholds may be utilized below detection of CM using pheromone traps; however, more frequent lure change could increase sensitivity of the pheromone traps.

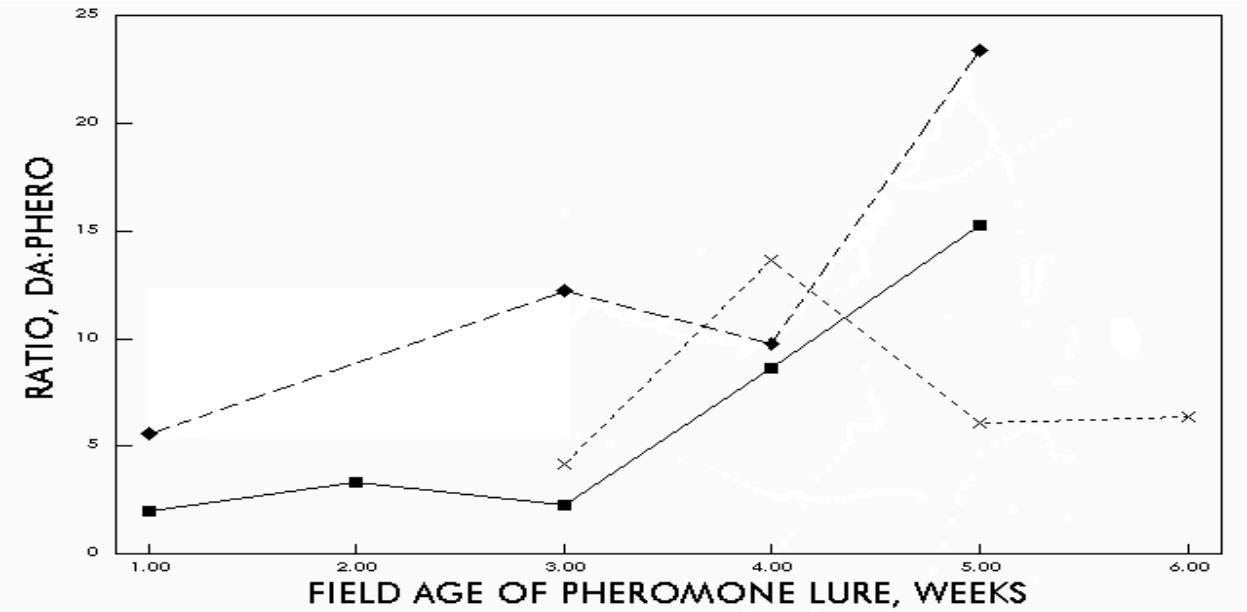

FIG.1. DA:PHEROMONE TRAP CATCH, BIG VALLEY

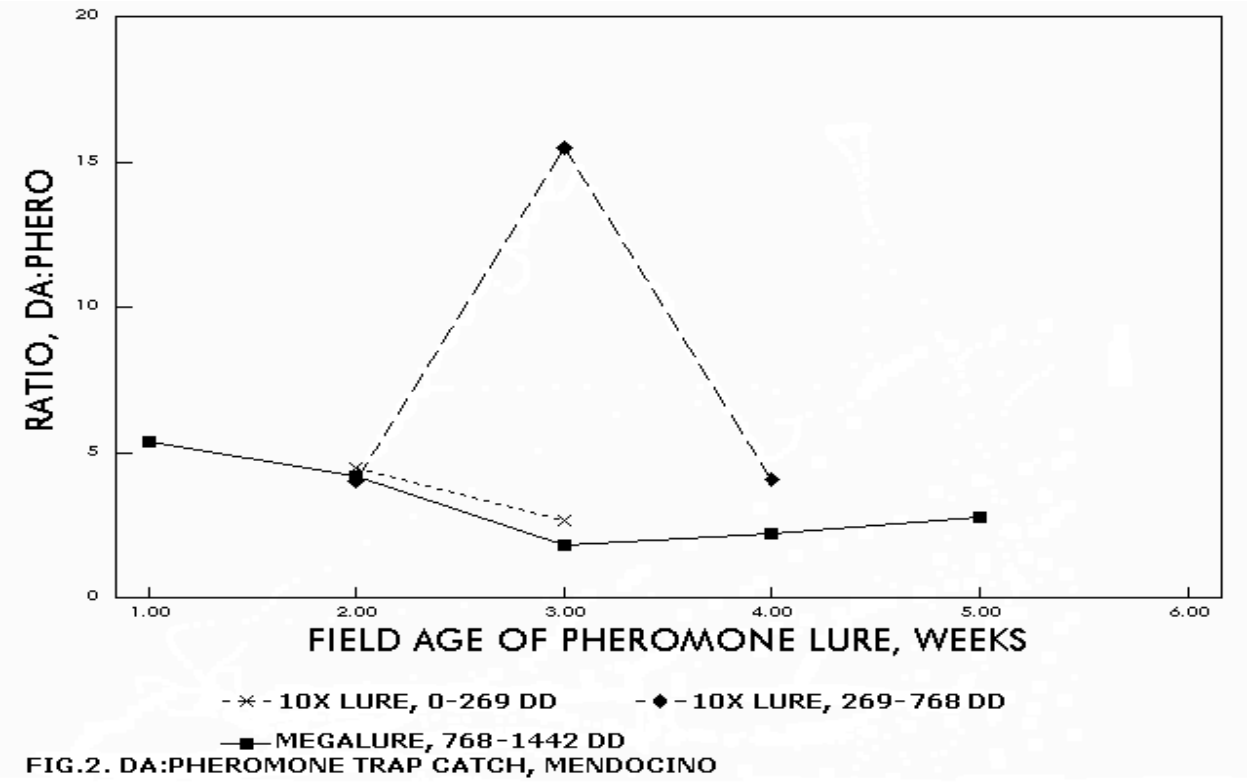

FIG.2. DA:PHEROMONE TRAP CATCH, MENDOCINO

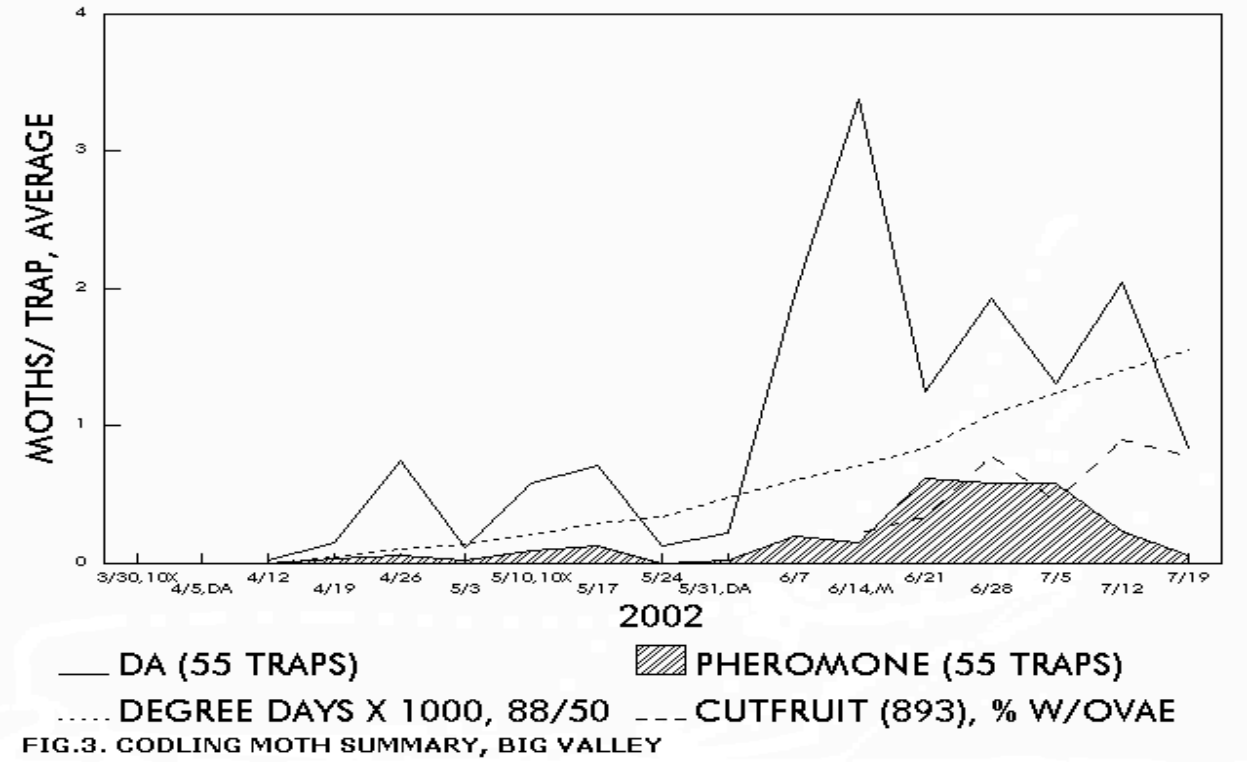

FIG.3. CODLING MOTH SUMMARY, BIG VALLEY

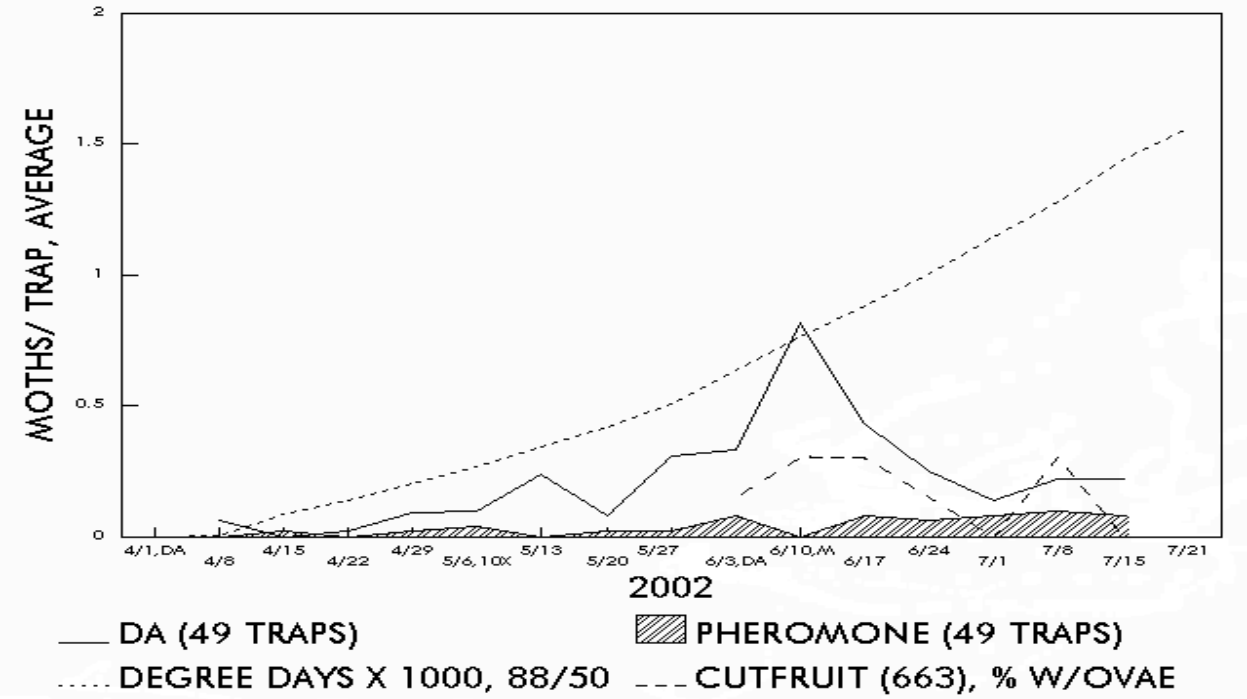

FIG.4. CODLING MOTH MONITORING SUMMARY, MENDOCINO

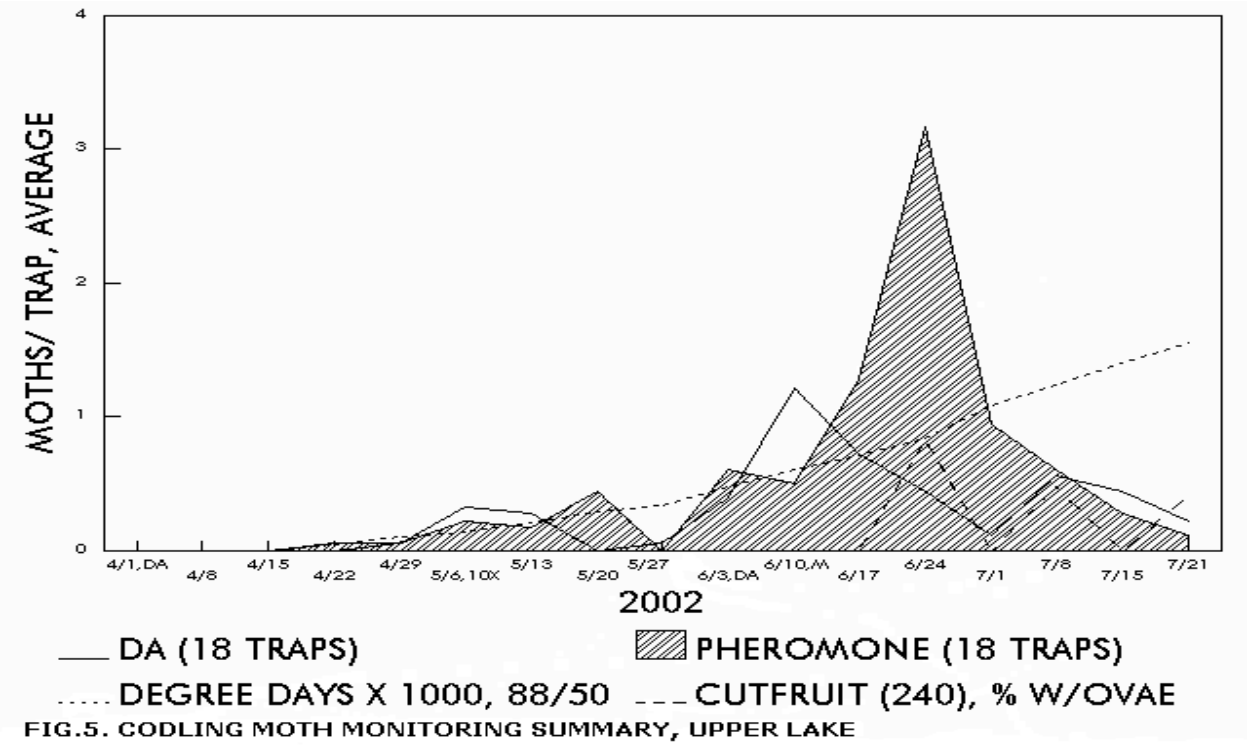

FIG.5. CODLING MOTH MONITORING SUMMARY, UPPER LAKE

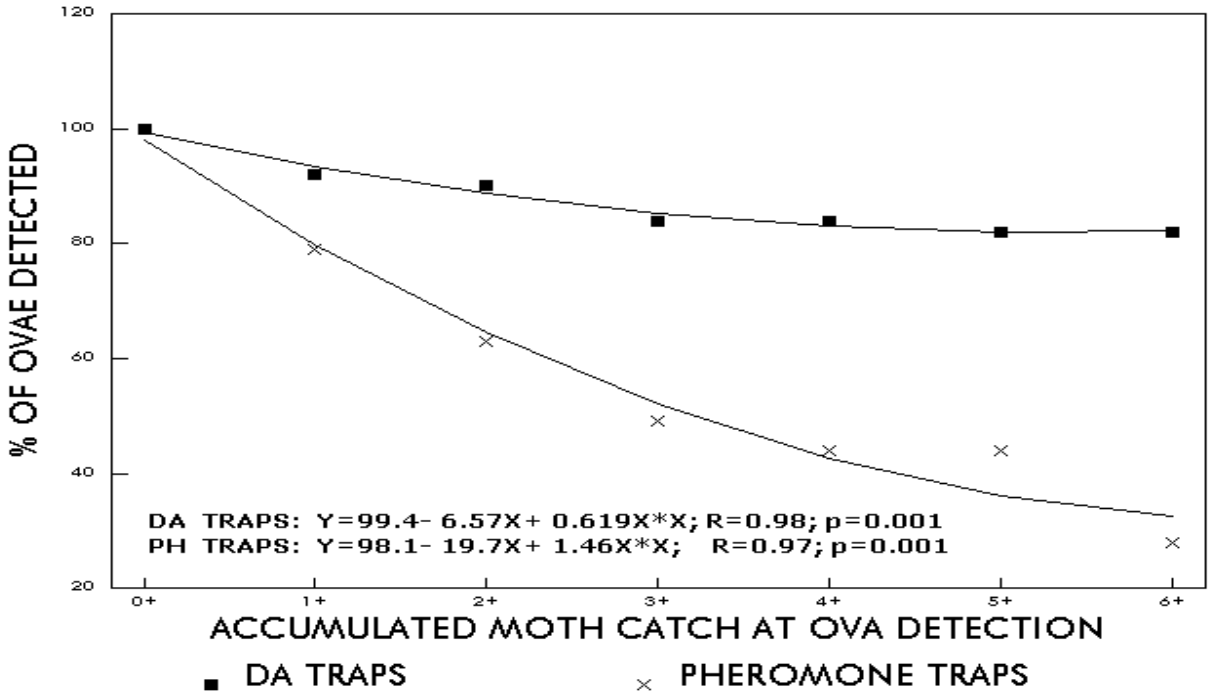

FIG. 6. OVAE DETECTED VS TRAP CATCH