DESCRIPTION:	Comparison of Kairmone DA 2313 and Pheromone Lure Trapping for Codling Moth with Oviposition Monitoring
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COMPARISON OF KAIROMONE DA 2313 AND PHEROMONE LURE TRAPPING FOR CODLING MOTH WITH OVIPOSITION MONITORING

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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 northcoast 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 maybe 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 ¼ 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 – middle June) at 203-714 degree days, and a Megalure (Trece, Inc., Salinas, Ca.) 5 weeks in the summer at 714-1557 degree days.

Paired kairomone traps (Pherocon IIC, Trece, Inc.) were placed 5 trees distant from every other pheromone trap, in the upper ¼ of the canopy on March 25-31. They utilized kairomone DA 2313 lures (Trece, Inc) with one new lure change 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 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 15-20% 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 (11-12 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 (Figure 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 (Figure 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 4-5 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 (Figures 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 (Figure 5). However, for all 137 trap pair areas, if only data of 1-2 week aged 10x pheromone lures are considered for April and May, DA traps caught 3.6 - 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 of 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 (Figure 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.
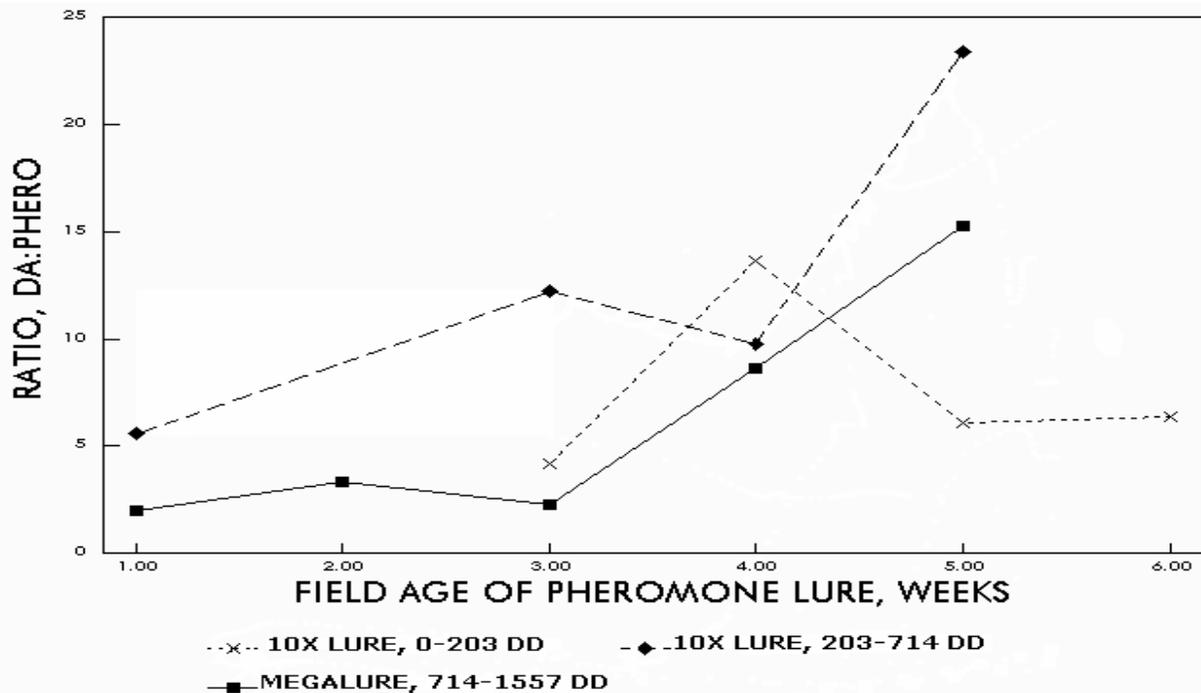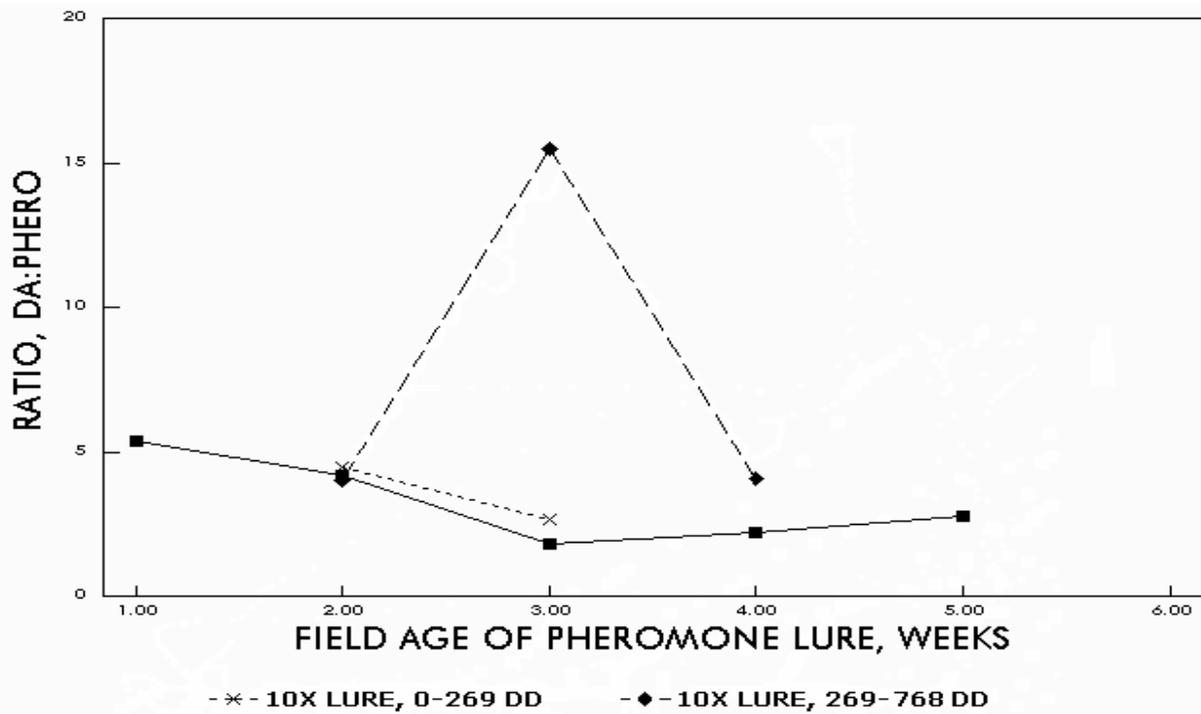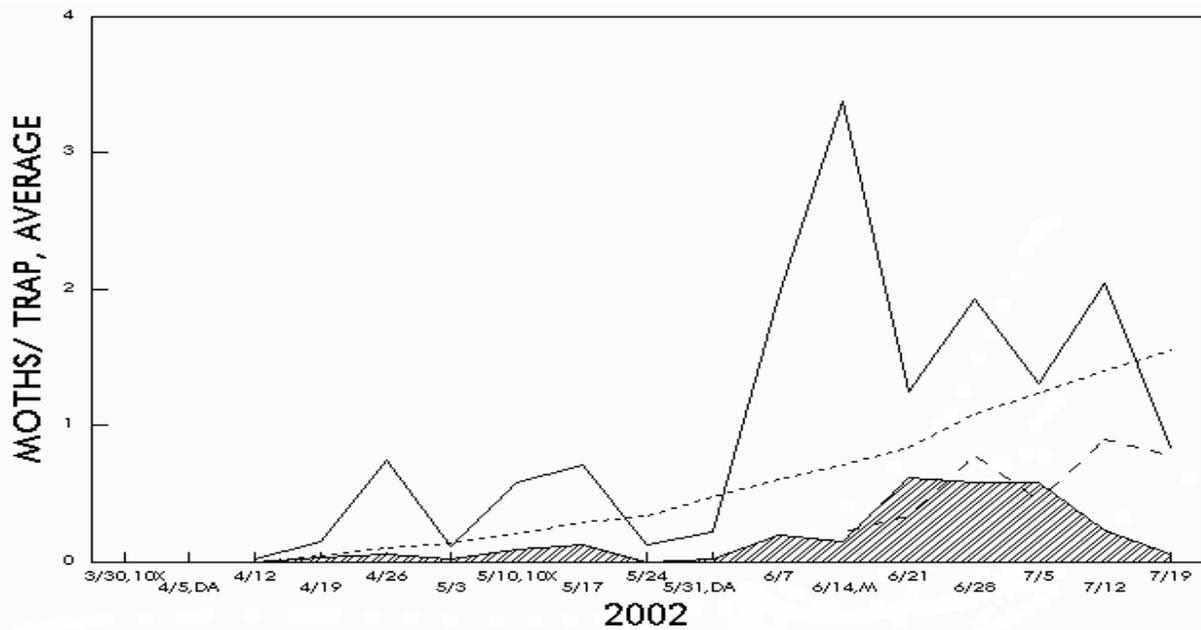
25
20
RATIO, DA:PHERO
15
10
5
0
1.00   2.00   3.00   4.00   5.00   6.00
FIELD AGE OF PHEROMONE LURE, WEEKS

- - ✕ - - 10X LURE, 0-203 DD   - ◆ - 10X LURE, 203-714 DD
——■—— MEGALURE, 714-1557 DD

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

20
15
RATIO, DA:PHERO
10
5
0
1.00   2.00   3.00   4.00   5.00   6.00
FIELD AGE OF PHEROMONE LURE, WEEKS

- ✳ - 10X LURE, 0-269 DD   - ◆ - 10X LURE, 269-768 DD
——■—— MEGALURE, 768-1442 DD

FIG.2. DA:PHEROMONE TRAP CATCH, MENDOCINO

FIG.3. CODLING MOTH SUMMARY, BIG VALLEY

DA (55 TRAPS)   PHEROMONE (55 TRAPS)
DEGREE DAYS X 1000, 88/50   CUTFRUIT (893), % W/OVAE

FIG.4. CODLING MOTH MONITORING SUMMARY, MENDOCINO
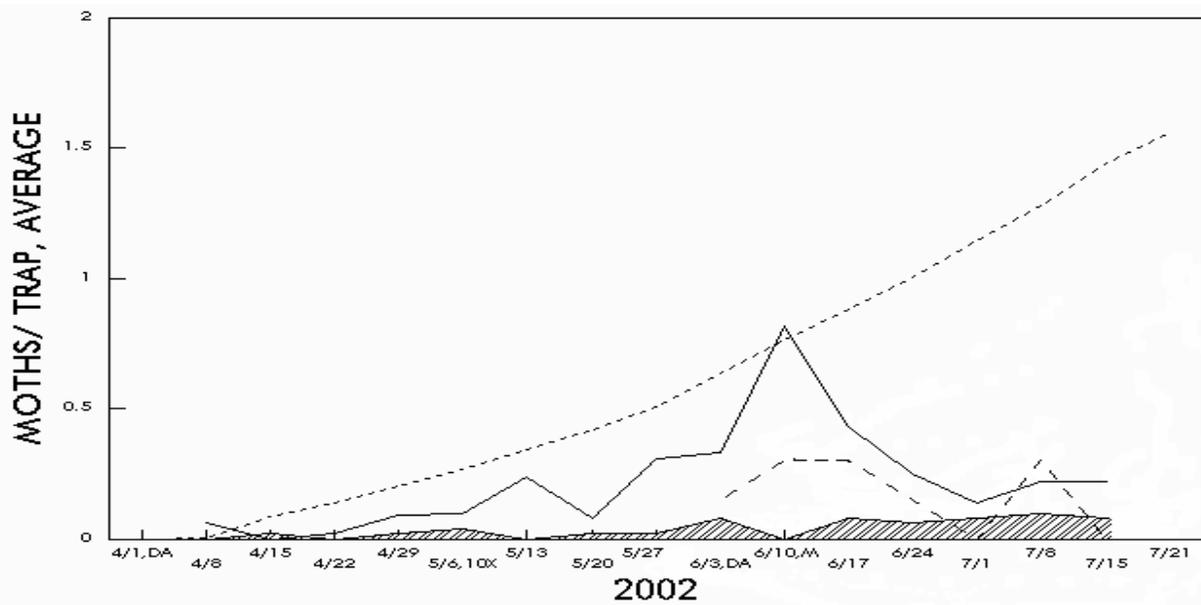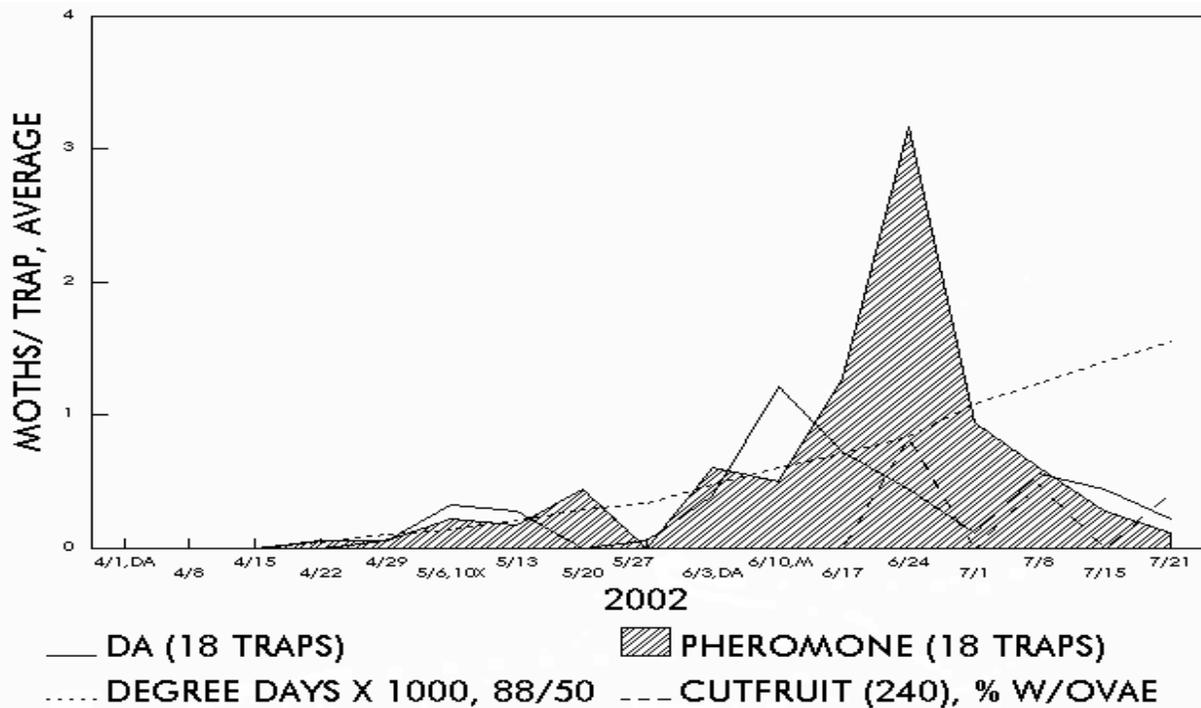
DA (49 TRAPS)   PHEROMONE (49 TRAPS)
DEGREE DAYS X 1000, 88/50   CUTFRUIT (663), % W/OVAE

FIG.5. CODLING MOTH MONITORING SUMMARY, UPPER LAKE

Legend:
— DA (18 TRAPS)
▨ PHEROMONE (18 TRAPS)
···· DEGREE DAYS X 1000, 88/50
--- CUTFRUIT (240), % W/OVAE

Y-axis: MOTHS/ TRAP, AVERAGE
X-axis: 2002

DA TRAPS: Y=99.4- 6.57X+ 0.619X*X; R=0.98; p=0.001
PH TRAPS: Y=98.1- 19.7X+ 1.46X*X; R=0.97; p=0.001

Y-axis: % OF OVAE DETECTED
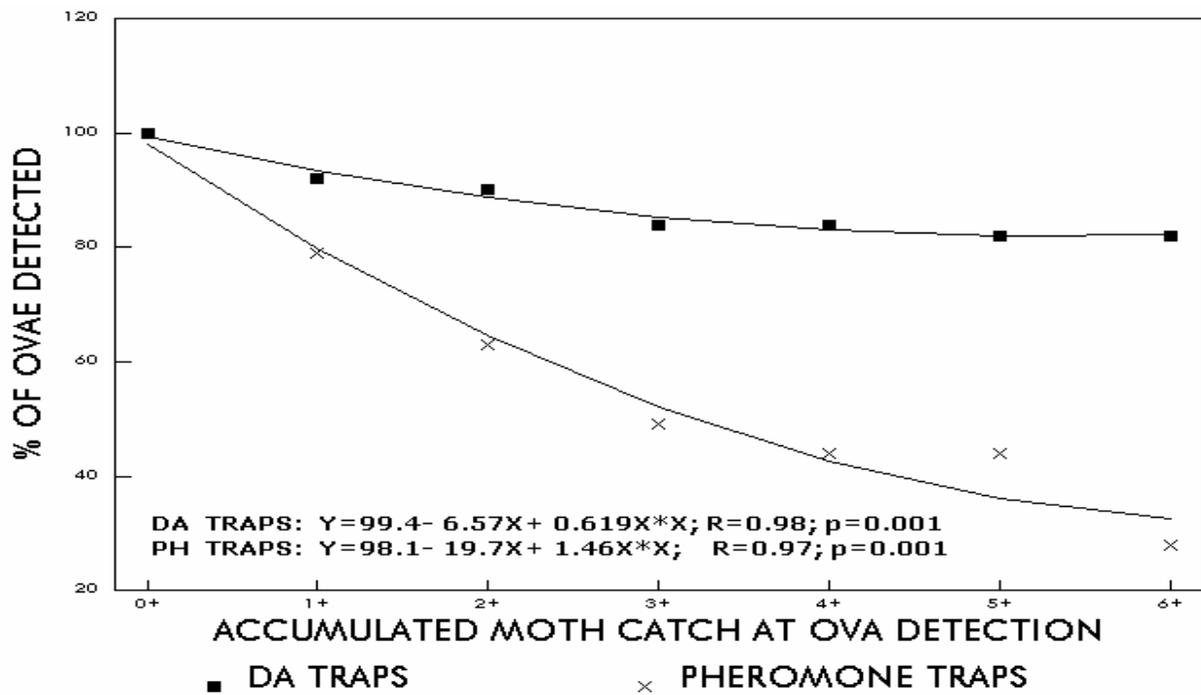X-axis: ACCUMULATED MOTH CATCH AT OVA DETECTION

Legend:
■ DA TRAPS
× PHEROMONE TRAPS

FIG. 6. OVAE DETECTED VS TRAP CATCH