Project Number: 91.A12B.Baker-Phelan (One Project - Two Separate Researchers at two different locations - individually funded but combined report)

1991 ANNUAL PROGRESS REPORT
ALMOND BOARD OF CALIFORNIA

Project No. 91-A12: Timing of Field Applications of Navel Orangeworm Oviposition Disruption Formulations

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Objectives: To increase the efficacy of ovipositional disruption of NOW by comparing different timings of applications of fatty-acid based formulations.

Experiments were conducted this year to determine the effects of two different timings of applying oviposition disruptant. The oviposition disruptant formulation was the same controlled-release formulation used in previous years, containing oleic acid oil, the oviposition attractant of the navel orangeworm (NOW) moth, identified by Phelan and Baker several years ago. The material was formulated by GenCorp Polymers of Akron, Ohio. A large block of Nonpareil almonds was used for the experiment on a farm in Arbuckle. Each treatment was replicated three times on 8-acre blocks (600 trees arrayed in blocks of 15 X 40 trees) for a total of 24 acres per treatment. Three similar 8 acre blocks of an untreated check treatment were also used. One of the disruptant treatments consisted of the oviposition disruptant sprayed at the peak of the July navel orangeworm flight, plus a second spray applied during the August flight. A second treatment consisted of the oviposition disruptant sprayed during the August flight only. Light-traps were used each week to judge the occurrence of the peak flight period. Standard NOW egg traps were employed during the year to monitor oviposition activity, and damage counts of 100 nuts per block were taken during the year also to assess the progress of the populations under the different treatment regimes. A final damage count of 300 nuts per block was taken from fallen nuts after the trees were shaken but before being swept into rows.

Sprays were applied under the supervision of Barry Wilk of Scientific Methods, Inc. and all egg trap and weekly damage counts were also performed by these same cooperator. Egg traps were the standard white traps baited with almond press cake. Although populations were light during the early part of the year, the disruptant reduced oviposition on the egg traps during the August flight (Table 1). NOW Damage at harvest was also significantly reduced by 50% in the treated *vs.* the control plots (Table 2). Damage from NOW averaged 3.6% in the control blocks, whereas it averaged 1.8% in the blocks receiving both July and August sprays (Table 2). Damage in the blocks receiving only the August spray averaged 1.6%. Damage earlier in the year assessed by weekly samples of 100 nuts per replicate also was significantly reduced in the blocks receiving the two disruptant applications, averaging 0.06%, as compared to the check blocks which averaged 0.7% damage (Table 3). Although damage by navel orangeworm was significantly reduced by the oviposition disruptant, damage from peach twig borer (PTB) was high in all plots, averaging 4.0%% in the check plots, 3.9% in the plots receiving two disruptant sprays, and 3.1% in the plots receiving only one spray in August (Table 4).

Table 1. NOW Egg Trap Readings, 1991.

Check Plot: Total Eggs, 17

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
Blue East	0	0	0	0	0	3	6	0
Blue Middle	0	0	0	0	0	3	1	0
Blue West	0	0	0	0	0	4	0	0
	0	0	0	0	0	10	7	0

July and August Sprays, 2 Eggs

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
Orange East	0	0	0	0	0	0	2	0
Orange Mid.	0	0	0	0	0	0	0	0
Orange West	0	0	0	0	0	0	0	2w
	0	0	0	0	0	0	2	2w

August Spray Only, 6 Eggs

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
R & W East	-	-	-	-	-	0	1	0
R & W Mid.	-	-	-	-	-	0	0	3
R & W West	-	-	-	-	-	0	2	0
	-	-	-	-	-	0	3	3

Table 2. Damage from NOW at harvest. 300 nuts cracked in the field per block.

Check Plots: Total NOW Damage,3.6%

	Eggs	1st	2nd	3rd	4th	5th	Pupae	Total
Blue East	12	0	0	0	0	0	4 em.	16
Blue Middle	5	1	0	0	0	0	3 em.	9
Blue West	4	2	0	1	0	0	0	7
	21	3	0	1	0	0	7	32/900

July Plus August Sprays: 1.8% Damage

	Eggs	1st	2nd	3rd	4th	5th	Pupae	Total
Orange East	5	0	0	0	0	0	2 em.	7
Orange Mid.	5	0	0	0	0	0	1 em.	6
Orange West	2	0	0	0	0	0	1	3
	12	0	0	0	0	0	4	16/900

August Spray Only: 1.6% Damage

	Eggs	1st	2nd	3rd	4th	5th	Pupae	Total
R & W East	2	0	0	0	0	0	1 em.	3
R & W Mid.	5	1	0	2	0	0	0	8
R & W West	2	0	0	0	0	0	1 em.	3
	9	1	0	2	0	0	2	14/900

Table 3. Damage Readings During Season for NOW, 1991. 100 nuts cracked per block.

Check Plots

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
Blue East	0	0	0	0	1y	2re,1o	-	-
Blue Mid.	0	0	0	0	1y	0	-	-
Blue West	1re	5y	0	1o	0	0	-	-
	1re	5y	0	1o	2y	2re,1o	-	-

July Plus August Sprays

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
Orange East	0	0	0	0	0	0	-	-
Orange Mid.	0	0	0	0	0	0	-	-
Orange West	0	0	0	0	0	1re	-	-
	0	0	0	0	0	1re	-	-

August Spray Only

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
R & W East	-	-	-	-	-	0	-	-
R & W Mid.	-	-	-	-	-	2we,2o	-	-
R & W West	-	-	-	-	-	1re	-	-
	-	-	-	-	-	3e, 2o	-	-

(re=red egg, we=white egg, y=1st-3rd instar larva, o=older larva or pupa)

Table 4. Damage from Peach Twig Borer in NOW blocks at harvest. 300 nuts cracked in the field per block.

Check Plots: 4.0%

Blue East	3.7%
Blue Middle	4.7%
Blue West	3.7%
Average	4.0%

July and August Sprays: 3.9%

Orange East	3.7%
Orange Mid.	5.0%
Orange West	3.0%
Average	3.9%

August Spray Only: 3.1%

R & W East	3.0%
R & W Mid.	2.7%
R & W West	3.7%
Average	3.1%

The oviposition disruptant was only designed to be specific for the navel orangeworm, which uses these fatty acids to locate vulnerable nuts, and these results confirm that the peach twig borer unfortunately is not also affected by the disruptant. The lack of effect of the disruptant on PTB oviposition was evident even earlier in the year during weekly counts (Table 5).

Table 5. PTB damage in NOW disruption blocks, 1991. 300 nuts cracked per treatment per week.

	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
Check Plot 7.3% Damage	24	25	32	21	15	15	-	-
	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
July and August Sprays 5.5% Damage	14	17	23	17	18	10	-	-
	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/4
August Spray 4.6% Damage	-	-	-	-	-	14	-	-

In a separate experiment, two new formulations were tried, in collaboration with Randy Grigg of PropAG, on a block of nonpareil trees on Wiggins Farms. Both new formulations were applied to three contiguous 5-acre plots, with material going on every other row at an effective rate of 1.25 gal/acre. NOW pressure was quite high in this orchard, with about 5 mummies per tree and at peak flight a nightly egg deposition on standard egg traps of 17 eggs per night. The new CDS formulation clearly reduced egg laying compared to the check plots (Fig. 1). However the PE formulation was a complete failure. In order to see how long the CDS treatment could be effective under summer temperatures, the same CDS formulation was applied to 3 randomly assigned 15 acre plots in September. The applications went on on September 6, and oviposition was clearly suppressed for one week (Fig. 2). However, this did not measure up to the three weeks of complete shutdown that was achieved during the spring flight.

Currently, there is interest by several companies in developing the fatty acid oviposition disruptant and trying to license and market this new tool for navel orangeworm control. Licensing negotiations for developing and marketing an oviposition disruptant product have been in progress between the University of California and the interested companies.

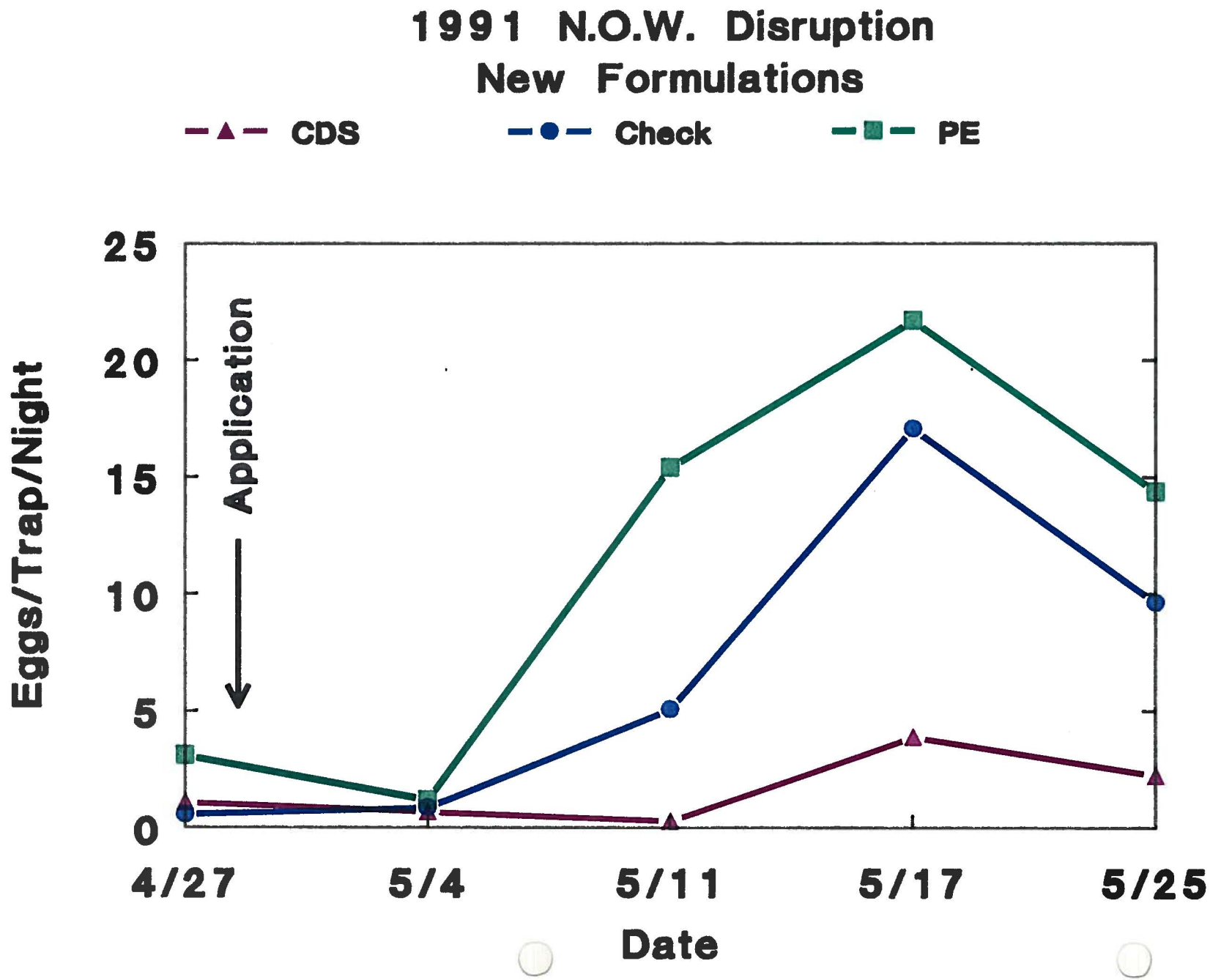
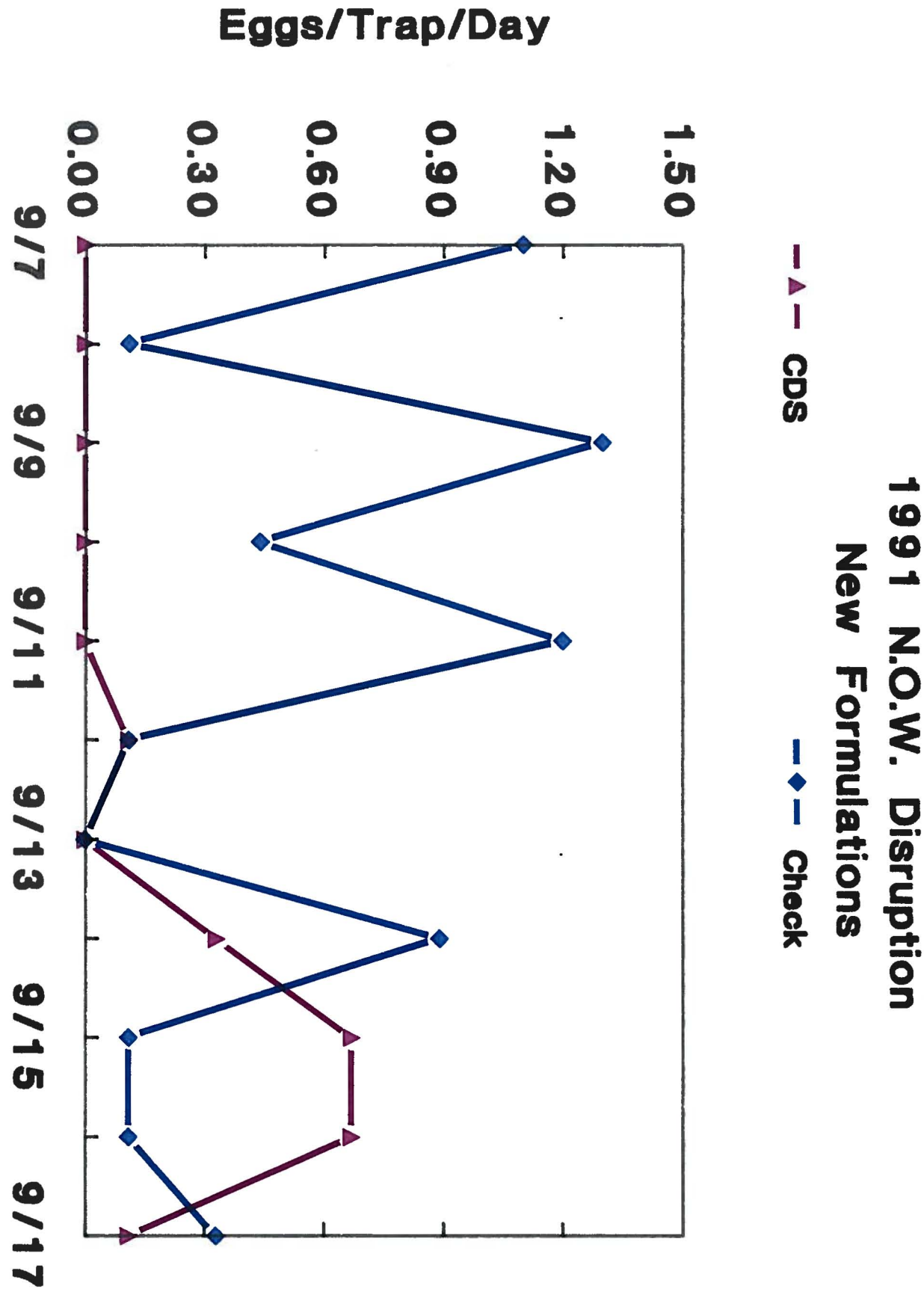

1991 N.O.W. Disruption
New Formulations
CDS
Check
PE
Eggs/Trap/Night
25
20
15
10
5
0
Application
4/27
5/4
5/11
5/17
5/25
Date

Figure 1.

Figure 2.


1991 N.O.W. Disruption
New Formulations
CDS
Check
Eggs/Trap/Day
0.00
0.30
0.60
0.90
1.20
1.50
9/7
9/9
9/11
9/13
9/15
9/17
Date