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DISRUPTION OF PHEROMONE COMMUNICATION FOR CONTROL OF PEACH
TWIGBORERS AND NAVEL ORANGEWORMS IN ALMONDS

Harry Shorey / Roland Gerber

ABSTRACT:

The major moth pests in almonds are Peach Twigborer (PTB) and Navel Orangeworm (NOW). The currently accepted method for controlling these pests is to use pesticide sprays. Since moths communicate using the chemical senses permeating the atmosphere with synthetic pheromone so as to cause the male moths incapable of finding the female can disrupt the life cycle. With these species it does not matter how close together or far apart the pheromone emitting devices are, as long as the critical concentration of pheromone is maintained. Puffers, aerosol cans of synthetic pheromone, were placed around the perimeter of each 40 acre parcel of 40, 160 and 640 orchards of almonds in Kern county. Some of the orchards received a dormant spray and others received no spray. The manufacture of NOW pheromone had problems with the synthesis and delivery was late and in partial shipments. Due to this delivery problem we could only fill cans that last for 50 days before replacing the can. In aerosol-cans there is a known problem of inconsistent release when working with the bottom 10 % of the can volume. Due to our having to work in this part of the can PTB and NOW disruption was less than satisfactory. Where we used a full can that remained the entire 200- day season mating disruption and crop damage was satisfactory. There is a built-in safety margin when using a 200-day can by having the puffer turn off when the temperature reaches 10 degrees C. There are enough days where the cabinets turn off to give a full delivery each puff during the critical part of the season. The last 10 % of pheromone is discharged after the crop is harvested. We had this problem of poor disruption every place where we had to replace the cans throughout toe season, no matter what crop were working in. In comparing spacing between puffers the 66 feet spacing worked better than the 132 feet spacing used in previous years.

OBJECTIVE:

In season long, whole orchard experimentation, use two different strategies for placement of puffers releasing either or both PBT and NOW pheromones in 40-, 160-, and 640-acre, square, almond orchards, and compare and contrast the efficacy of communication disruption and resulting larval control for these pests.

PROCEDURES:

This work was done in 1 640-acre, 2 160-acre and 3 40-acre blocks of almonds. Puffers were placed around the perimeter of each 40-acre parcel with the internal borders serving both parcels in the 160-acre and the 640-acre blocks. Spacing was at 66 feet or 132 feet separation between puffers and height was alternating 40% and 80% of the orchard height. All test plots were on Paramount Farms ranches with 3 ranches on the west-side and 2 ranches on the east-side using both PTB and NOW and one ranch used PTB only. Puffers were set to work from 6 PM to 6 AM puffing every 15 minutes with the ones spaced at 66 feet releasing half the material as those at 132 feet. Machines spaced at 66 feet separation served one-half an acre for the entire season, (200 days) while machines at 132 feet separation served one acre but required a can replacement at mid season (100 days). For the 40-acre blocks machines were positioned on the perimeter only while on the larger blocks they were placed around every 40-acre block within the orchard. Puffers on the internal quadrants served the 2 adjacent 40-acre blocks.

Moths were monitored by the use of pheromone lure baited wing traps to capture male moths for PTB. Virgin females placed in cages secured to the inside top of the winged trap were used for NOW. Traps were placed strategically around the perimeters and in the centers of each quarter of the plot and the center of the plot.

RESULTS AND DISCUSSION:

Due to production problems associated with synthesizing NOW pheromone the manufacture was unable to deliver the chemical on time. There was no pheromone delivered for use on the over-wintering flight with the pheromone being delivered in several shipments with only enough to fill cans for 50 days at a time. Now pheromone was available in early June for a mid-summer flight and cans were changed as needed to maintain a critical pheromone concentration to ensure mating disruption. The critical pheromone concentration was difficult to achieve due to a known problem of inconsistent delivery from aerosol cans when the volume reaches the bottom 10 % of the can. This is the area we were required to work in for the entire season due to only being able to use partial filled cans. Similarly puffers are designed to turn off any time the temperature reaches 10 degrees C. There are enough nights throughout the season where the temperature is low enough to turn off the machines that puffer cans remain above the 10 % volume during the critical part of the 200 day season. This last 10 % is discharged after harvest.

With all the problems obtaining pheromones chemicals the data consistently showed a reduction of 95% to 100% in male moth attractancy in both PTB and NOW in the pheromone treated areas compared to untreated areas. At harvest nuts sampled near the center of the orchards had an infestation of NOW and PTB the same or lower than control orchards sprayed with Imidan but the samples taken from near the edge of the orchard had a high incidence of damage. Those blocks that received a dormant spray had a lower incidence of trap captures than the blocks that received no dormant spray. There were

consistently better results from orchards that had puffers at close spacing (66 feet apart) than those that had puffers at wide spacing (132 feet). Both spacings gave the same amount of pheromone per acre per season; however the closer spacing provides a more even distribution of the pheromone throughout the orchard.

With results received from this years and previous years research we feel confident in stating 40-acres is the minimum size orchard that pheromones will work. Pheromones will shut-down trap captures in blocks smaller than 40-acres but the flight characteristics of female moths mated outside the pheromone treated area allow these females to infiltrate and lay eggs. This allows increased damage on the orchard edges that result in higher than acceptable crop damage.

Table 1. Percent damage to almond sampled at harvest of whole-orchard experimentation with puffers for control of NOW infestations in almonds.

PLOT	ACRES	1 ST HARVEST	3 RD HARVEST
1	640	1.8	10.8
Untreated	160	1.7	9.6
#2	160	0.8	24.1
Untreated	160	0.5	16.7
3	40	1.2	3.7
Untreated	40	0.9	12.9
*4	105	0.6	2.7
Untreated	80	0.8	2.7
5	72	0.6	2.6
Untreated	80	1.3	0.2

Table 2. Percent damage to almonds sampled at harvest of whole-orchard experimentation with puffers continuously releasing PTB pheromone.

PLOT	ACRES	1 ST HARVEST	3 RD HARVEST
1	640	0.2	0.1
Untreated	160	0.0	0.1
#2	160	0.1	0.0
Untreated	160	0.2	0.2
3	40	0.1	0.0
Untreated	40	0.1	0.1
*4	105	3.6	0.8
Untreated	80	2.3	0.3
5	72	1.4	1.5
Untreated	80	0.0	0.0

- * Indicates where PTB pheromone only was released.
- # Indicates 132 ft spacing between puffers.