Northeast SARE Grant Report: FNE00-293:
Controlling Oriental Fruit Moth in Peaches Using Pheromone Disruption

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Objective:
To implement the use of pheromone technology to control Oriental fruit moth in peaches over a large area of peach production in Western NY State.

Background:
- In the last few years, fruit damage has been at a level of 10-15% by Oriental fruit moth larvae feeding in peach flesh.
- Insecticide resistance monitoring trials in 1999 showed 30 - 35 % of the adult males were resistant to organophosphates and carbamate insecticides.
- Isomate M-100 has been labeled and is, reportedly, an effective control strategy for OFM in peaches but has not been tested or demonstrated in NY against these hugh population levels.
- According to past research, Isomate M-100 works well in areas where there is a low population of OFM. In areas where high populations exist, Canadian researchers and Extension personnel noted that the first generation must be well controlled chemically before they would expect good results using mating disruption for later generations

Methods:
Wing traps were used to monitor the first flight of OFM in several orchards in the region with a total of approximately 80 acres. These traps were hung April 25, when peaches were at early pink bud. Traps were checked twice per week and the number of adults found per trap was recorded. The first generation of OFM was controlled in most blocks using Asana @ 10 oz. per acre at petal fall (about May 15) and again 10-12 days later. This is earlier than normal. Usually our first insecticide is applied at shuck split, which have historically been the best timing for plant bug control and the first opportunity for plum curculio activity. We used 2 sprays because trap catches were so high and drawn out.

The "Murray -P" block was not sprayed for the first generation. One applications of Isomate M-100 made April 27, 2000. Before the second flight began, the Isomate M-100 was hung in the remainder of the orchards at a rate of 100-150 twist ties per acre, with 1 per tree in 2-3 outer rows and one every other tree in the center of the block. The blocks were scouted on a regular basis for plant bug injury and other pests such as aphids by a consultant.

After the first flight, the level of shoot tip infestation was evaluated on July 17 and July 19. Ten trees, scattered throughout each orchard, were evaluated for shoot infestation by selecting 200 shoots per tree, 50 shoots on each of 4 sides of the tree and recorded the number of infested shoots in 200. A second evaluation method was used by noting the total number of shoots infested by looking over the whole tree and recorded as the number of infested shoots per tree. This method was used again in the end of the season to evaluate shoot infestation from all generations. The fruit was evaluated during harvest by having growers sort out infested fruit, keeping culls, identifying damage, and documenting of total number of culls from OFM in total number picked. Spray records were collected for all blocks in the demonstration.

Results:
In blocks that were disrupted using Isomate M-100 for mating disruption, trap catch was virtually "zero" for the remainder of the season, which indicates successful mating disruption within the block. Trap catch counts are shown in Figures 1 and 2. Figure 3 shows trap catch data from traps in other non-disrupted orchards in the area just to demonstrate the long protracted flight of OFM through the harvest season. This long flight demonstrates the need to continue monitoring in the disrupted blocks and may indicate the need to use longer lasting Isomate formulations in the future.

Shoot infestation and fruit damage levels for various orchards are reported in Table 1. Shoot infestation levels were noted after the first generation to show lower OFM populations to be disrupted compared to normal years. For this study, non-disrupted blocks were not evaluated for shoot infestation. Fruit damage was reduced compared to previous seasons' levels, however, it was not eliminated. Since fresh peaches are harvested starting mid-July through mid-September, it is difficult to keep track of specific varieties, as they are being harvest with multiple pickings within each variety. In evaluating the culls from the picked peaches, the fruit damage in disrupted plots was reduced to 3-6% infested fruit from 15% especially in the later varieties from previous seasons. There is still the concern for females that mate outside the orchard migrating into the peach orchards to lay eggs which go uncontrolled unless growers are applying insecticides for other pests such as plant bugs. The solution may be to use border row sprays when flight numbers are high in non-disrupted blocks nearby. Other growers in the neighborhood who experience good control of OFM in fruit admittedly achieve good control by applying insecticide applications approximately every 5-7 days to alternate row middles.

Plant bug control is still the unanswered piece in this integrated pest management program with no controls outside of insecticides. Other states are working with groundcover management for control of the plant bug complex using sod row middles, reducing the number of broadleaf weeds that are commonly present in "trashy cultivation" management systems. This looks like a viable and compatible solution where mating disruption is implemented for OFM.

Conclusions:
Pheromone disruption for OFM control in peaches is a viable alternative to more frequent use of insecticides, especially in light of insecticide resistance in the population. But since there is still the chance for migration of mated females into the orchards from outside of the disrupted area, there is still a need to apply at least border row sprays during peak or sustained flights of the 3rd and 4th generations. In light of the heavy fruit damage by plant bug found in many of these blocks, the next step in peach pest management is to incorporate ground cover management using sod row middles to reduce the broadleaf weed population that can play host to many species in the plant bug complex. In general, since chemical controlled orchards needed 6-7 insecticide applications for control of OFM, the disrupted blocks required only 3-4 insecticide applications. With the heavy use of pyrethroids due to OP and carbamate resistance, we foresee more problems with mite control in the future if we only rely on pyrethroids for control or OFM. A few of the growers used Apollo in blocks where mites started to increase in number. This will certainly add cost to control programs for the future.

The use of pheromone disruption for OFM control industry wide will certainly depend on cost, availability of complimentary insecticides, and practicality in terms of other pests that need to be controlled. The cost of the program includes the additional scouting time and cost of running the traps for monitoring flight. Further economic analysis must be done to determine a reasonable cost for the Isomate formulations.

Figure 1. Trap catch data for first flight of OFM, 2000.

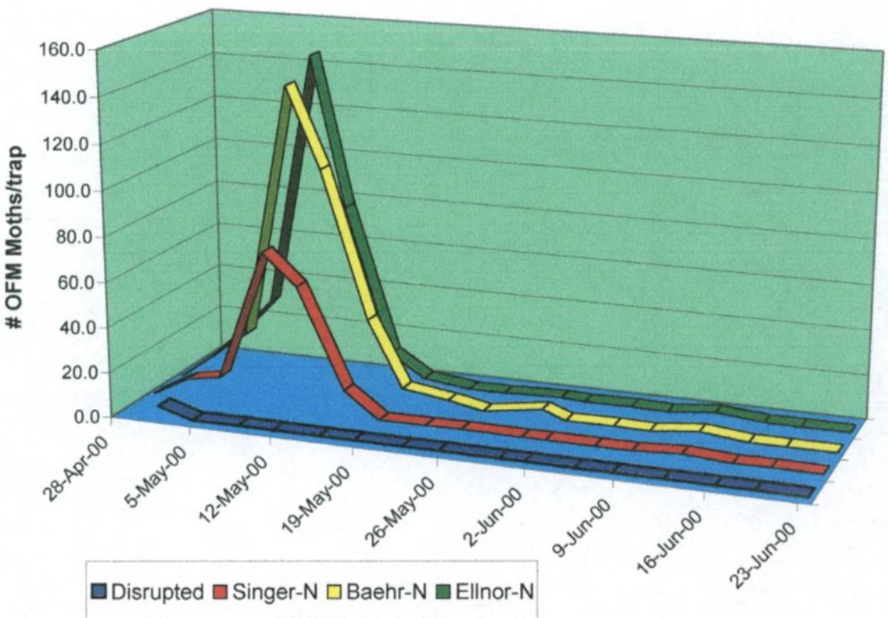

Figure 2. Trap catch data for second flight of OFM, 2000.

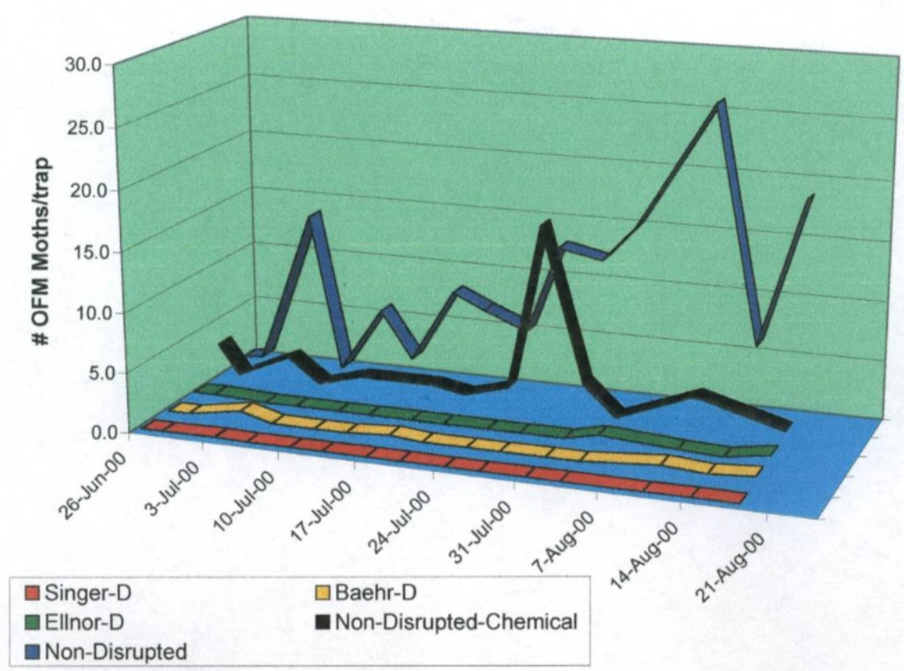

Figure 3. Pheromone trap catches for third and fourth flight of OFM.

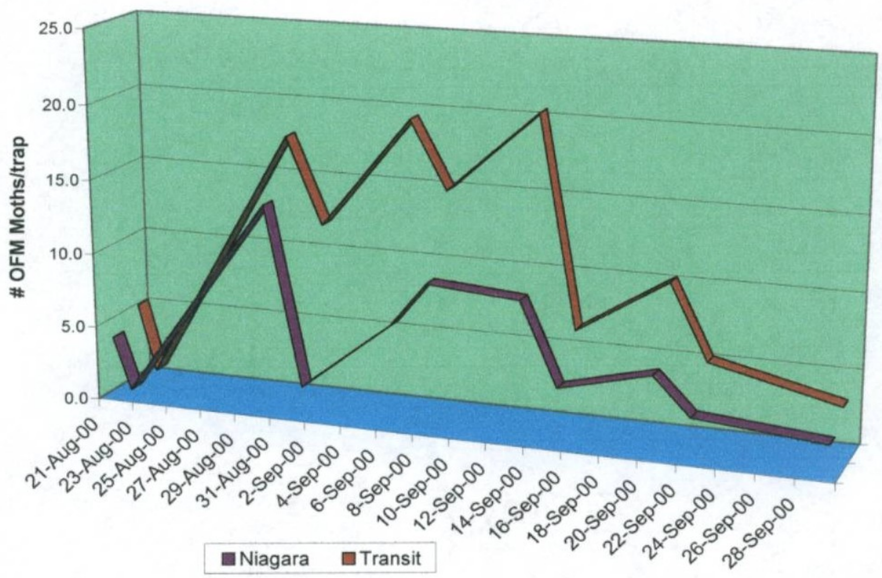

Table 1. Shoot infestation after first generation of OFM, and final season counts in blocks disrupted using Isomate M-100.

Block	17-19 Jul		13-Sep		% Fruit Damage
	% Shoot Infestation	Total Shoot Infestation (10 Trees)	% Shoot Infestation	Total Shoot Infestation (10 Trees)	
Baehr (North end)	1.3	30	1.7	71	ND
Baehr (South end)	1.2	38	ND	ND	3-6%
Ellnor (P1)	1.3	42	1.1	41	ND
Ellnor (P3)	1.3	36	ND	ND	ND
Singer (S6)	0.5	15	1.0	37	?
Singer (Murray - F)	1.1	41	ND	ND	0.6%
Singer (Murray - P)	0.6	16	ND	ND	0%
Singer (Topp)					0.2%
**Kappus					1.4%
**Mayer Bros.					1.0%

** Chemical Control of OFM

Table 2. Insecticide applications made in specific blocks under mating disruption and under chemical control.

Block	Insecticide	Rate/acre	Dates Applied
Singer (Murray-P)	Guthion Solupak	1.5 lb.	3-Jun
	Asana XL	5-6.4 oz.	30-Jun, 31-Jul
Singer (Murray-F)	Asana XL	10 oz.	15-May, 24-May, 3-Jun
Singer (S3)	Asana XL	10 oz.	15-May, 30-May
	Apollo	6 oz.	30-May
	Provado 1.6 F	6 oz.	23-Jun
Singer (S6)	Asana XL	10 oz.	15-May, 30-May
	Apollo	6 oz.	30-May
	Provado 1.6 F	6 oz.	23-Jun
Singer (Topp)	Asana XL	10 oz.	15-May, 24-May, 17-Jul
Baehr	Asana XL	12 oz.	17-May, 29-May, 7-Jul
	Apollo	6 oz.	29-May
	Provado 1.6F	6 oz.	11-Jun
Ellnor	Asana XL	12 oz.	17-May, 29-May
	Apollo	6 oz.	29-May
	Provado 1.6F	6 oz.	13-Jun
Kappus	Asana XL	6 oz.	17-Jun,3-Jul,18-Jul, 24-Jul
	Guthion Solupak	.75 lb.	13-May, 20-May, 5-Jun
	Provado 1.6F	6 oz.	26-May
**Mayer Bros.	Asana XL	10 oz.	12-May,27-May,16-July,27-July,

**Chemical Control plot

2000 OFM Mating Disruption Trials - Fruit Damage Results Summary, Western New York

			% Fruit Injury			
Block	**Treatment**	**Appl. Dates**	**OFM Sting**	**OFM Deep**	**TPB**	**PC**
Murray New	Isomate M-100 Gen 1&2	4/27	0.0	0.0	2.8	26.2
	(Pyrethroid @ PF)					
Murray Old	Isomate M-100 Gen 2	6/12	-	0.6	13.6	-
Topp	Isomate M-100 Gen 2	6/14	-	0.2	11.8	-
Topp	Confuse	6/19, 7/28	-	0.4	17.0	-
Topp	3M Sprayable 2-wk forml	6/23, 7/8, 7/28, 8/14	1.0	0.6	12.2	-
Topp	3M Sprayable 4-wk forml	6/23, 7/28	1.0	0.8	13.2	-
Kappus	Isomate M-100 Gen 2	6/12	0.2	1.2	10.2	0.4
Kappus	Confuse	6/12, 7/28	0.0	3.6	16.8	0.4
Kappus	3M Sprayable 2-wk forml	6/17, 7/3, 7/18, 8/4	1.0	0.4	1.0	-
Kappus	3M Sprayable 4-wk forml	6/17, 7/18, 8/4	0.0	1.2	15.8	0.6
Kappus	Grower Std program	Asana: 6/17,7/3,7/18, 7/24	1.2	0.2	11.4	2.4
Tower	Isomate M-100 Gen 2	6/11	2.6	0.2	20.8	-
Tower	Confuse	6/12, 7/28	0.2	0.0	11.4	0.4
Tower	3M Sprayable 2-wk forml	7/14, 7/29, 8/10, 8/21	0.2	0.4	10.6	0.2
	3M Sprayable 4-wk forml	7/14, 8/9	-	-	-	-
Tower	Grower Std program	Asana: 5/11,5/15,7/6, 7/29, 8/9	5.6	0.0	11.8	-
		Azinphos: 5/30,6/24, 7/14,7/29				
		Provado: 6/12				

OFM = Oriental Fruit Moth
TPB = Tarnished Plant Bug
PC = Plum Curculio