In-season control of navel orangeworm

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Introduction

In recent years several narrow spectrum insecticides (insect growth regulators, anilinic diamides) have been registered for use in almonds and pistachios to control navel orangeworm (NOW) *Amyelois tranistella*,. Multiple control strategies for this insect are currently being evaluated as part of the Areawide Program to Control NOW in Almonds, Pistachios, and Walnuts (Handout). Our interest is evaluation of both the ovicidal/neonate toxicity (Fig. 1) and duration of control provided by insecticides currently registered for use in almonds and pistachios, as well as spray coverage. Insecticide trials were conducted in Fresno and Madera counties, in consultation with Barat Bisabri and Gary Weinberger. These trials complement the independent research of Bradley Higbee at Paramount Farming Company (Handout, Poster). We also are collaborating with the independent spray drift and deposition research of Ken Giles, Franz Niederholzer, and Jim Markle (Poster). The duration of control was determined by removing treated split nuts from the field at intervals and challenging them in the lab with eggs. In addition, research was conducted on the population dynamics of navel orangeworm.

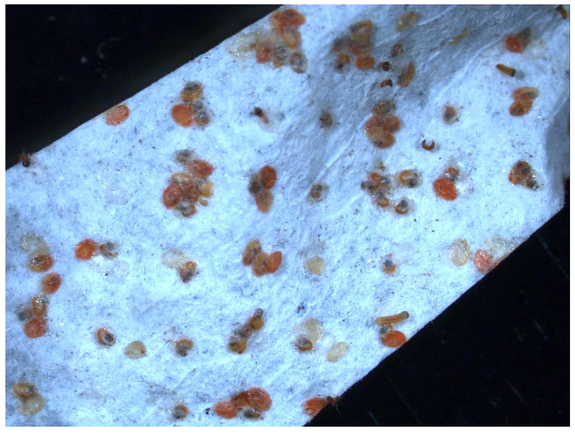


Fig. 1 A combination of ovicidal and neonate mortality, Warrior II

Objectives

1. Determine relative ovicidal/larvicidal activity of registered insecticides;
2. Determine their duration of control on nut surfaces;
3. Determine the population dynamics of navel orangeworm.

Results

Ovicidal/Larvicidal Activity in Almonds

Treatment	Living	Survival	Reduction*	Total Eggs
Control	1,133	49.26% A		2,300
Delegate 6.4 oz	401	13.37% B	72.86%	3,000
Delegate 3.2 oz.+ Intrepid 9 oz	70	3.41% C	93.08%	2,050
Intrepid 18 oz	33	1.83% D	96.29%	1,800
Altacor 4 oz.	55	3.54% C	92.81%	1,550

*Reduction is relative to the Control survival at 3 weeks of 49.26%
Means separated by a different letter differ at $P < 0.0001$

Treatment	Living	Survival	Reduction*	Total Eggs
Control	1,226	87.57% A		1,400
Intrepid 15.4 oz	29	0.76% B	99.13%	3,800

*Reduction is relative to the Control survival at 3 weeks of 87.57%
Means separated by a different letter differ at $P < 0.0001$

Ovicidal/Larvicidal Activity in Pistachios

Treatment	Living	Survival	Reduction*	Total Eggs
Control	996	43.30% A		2,300
Intrepid 24 oz	33	1.40% B	96.76%	2,350
Intrepid 18 oz + Warrior II 2.5 oz + Sulfur 462 oz	13	0.70% C	98.38%	1,850
Warrior II 2.5 oz	27	1.35% B	96.88%	2,000
Brigade 24 oz	9	0.38% D	99.12%	2,350
Bifenture 24 oz	8	0.36% D	99.18%	2,250

*Reduction is relative to the Control survival at 3 weeks of 43.30%
Means separated by a different letter differ at P < 0.001

Figure 2. Egg strips before exposure

Duration of Control in Almonds

Applications made to Nonpareil almonds, Madera County. Hull split application was made on July 16 with Intrepid followed by Brigade 3 weeks later.

Insecticide	Application Date	Day Sampled After Spray	Adults	Survival	Reduction	Total Eggs
Control			72	5.14%		1,400
Intrepid 15.4 oz	July 16	1-3	60	1.42%	**72.96%**	4,200
Brigade 24 oz	August 5	1-3	23	0.40%	**92.22%**	5,750
Brigade 24 oz	August 5	7-10	0	0	**100.00%**	2,400

*Reduction is relative to the Control adult survival of 5.14%

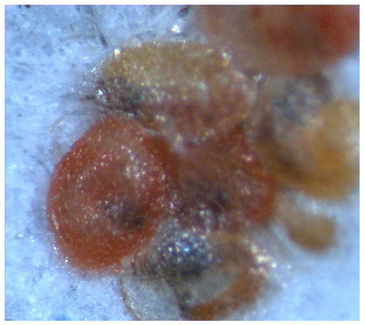


Figure 3. Ovicidal activity

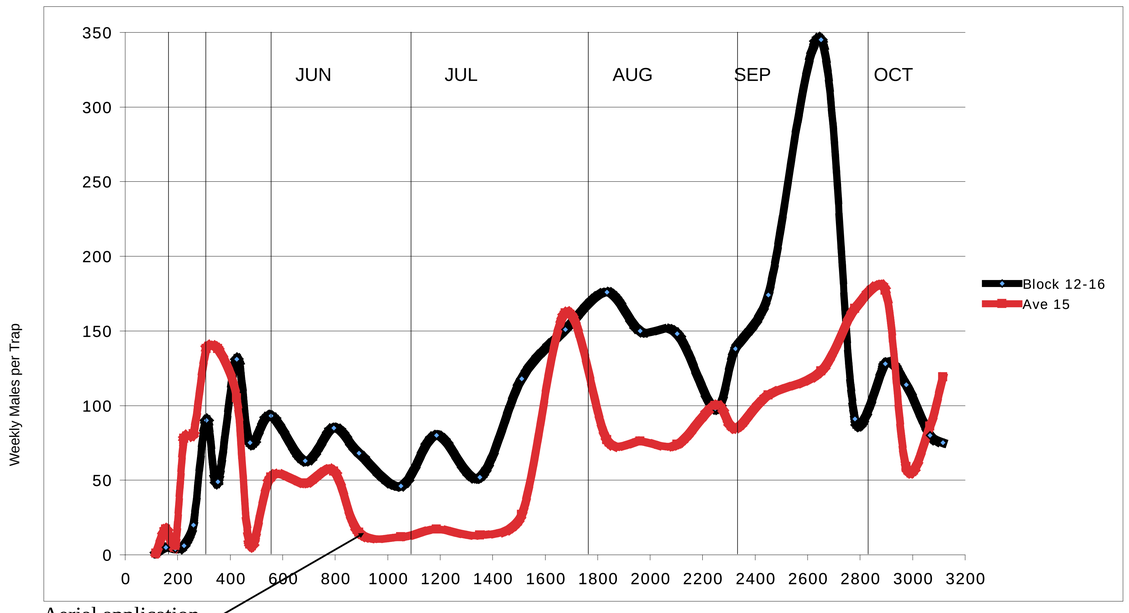
Results, continued

Duration of Control in Pistachios

Duration of control of six insecticides applied to pistachios by tractor (100 gallons per acre, 2 mph) at AgriWorld, Madera County, on August 16, 2010.

Treatment	Survival	Reduction	Eggs
Day 24			
Control	41.64%		1,400
Brigade 24 oz	18.00%	56.78%	200
Bifenture 24 oz	20.00%	51.97%	200
Intrepid 24 oz	7.00%	83.19%	200
Warrior II 2.5 oz	9.00%	78.39%	200
Lambda Cy 5 oz	16.50%	60.38%	200
Intrepid 18 oz +Warrior II 2.5 oz + Sulfur 462 oz	1.500%	96.40%	200
Day 32			
Control	43.64%		2,500
Brigade 24 oz	16.00%	63.34%	300
Bifenture 24 oz	6.33%	85.49%	300
Intrepid 24 oz	2.00%	95.42%	300
Warrior II 2.5 oz	16.50%	62.19%	200
Lambda Cy 5 oz	11.00%	74.79%	300
Intrepid 18 oz +Warrior II 2.5 oz + Sulfur 462 oz	3.00%	93.13%	100
Day 39			
Control	34.11%		900
Brigade 24 oz	56.00%	**NONE**	100
Bifenture 24 oz	13.67%	59.93%	300
Intrepid 24 oz	**ND**		
Warrior II 2.5 oz	8.00%	76.55%	300
Lambda Cy 5 oz	4.00%	88.27%	300
Intrepid 18 oz +Warrior II 2.5 oz + Sulfur 462 oz	1.50%	95.60%	200
Day 53			
Control	23.70%		1,000
Brigade 24 oz	**ND**		
Bifenture 24 oz	61.50%	**NONE**	200
Intrepid 24 oz	28.25%	**NONE**	400
Warrior II 2.5 oz	17.00%	28.27%	200
Lambda Cy 5 oz	40.00%	**NONE**	200
Intrepid 18 oz +Warrior II 2.5 oz + Sulfur	6.000%	74.68%	200

Male capture Madera County, 2010. Note peaks coinciding with Nonpareil, Carmel and Butte hull split.



Aerial application of esfenvalerate for bug control