

Chemical Control/New Products

Control of Codling Moth by Combination Programs of IGR and Organophosphate Insecticides in Walnuts

R. A. Van Steenwyk and R. M. Nomoto
University of California Department of Environmental Science, Policy and Management,
Berkeley, CA

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Methods and Materials

A study was conducted in a commercial 'Payne' walnut orchard planted on a 24 ft x 24 ft spacing (75 tree/acre) in Hollister, California. Fourteen treatments were replicated three times in a randomized, complete block design. Each replicate was an individual tree. Foliar sprays were applied with a handgun operating at 200 psi with a finished spray volume of 250 gal/acre (3.33 gal/tree). Applications were scheduled based on degree days (DD). DD were calculated with a biofix of 20 April for the first generation and with a biofix of 22 July from the second generation. Flight activity of codling moth (CM) was monitored with a pheromone trap placed high in the tree canopy. Control of the first CM generation (overwintering flight) was evaluated by inspecting all dropped nuts weekly from 10 July through 14 August for CM infestation. Control of the second generation (summer flight) was evaluated at commercial harvest on 14 September by inspecting a maximum of 250 nuts per tree for CM and navel orangeworm (NOW) infestation.

Results and Discussion

First Generation Evaluation

The study was conducted in a semi-abandoned orchard that had experienced very high CM damage in previous years. One edge (along a road) of the orchard harbored a large population of ground squirrels which removed most of the nuts from the adjacent replicate. Due to the low number of nuts in this replicate, it was deleted from the study. Because of a lack of proper maintenance, the number of nuts per tree was generally low and there was considerable variation in the number of nuts among experimental trees. Since it was possible to count all the nuts per tree at harvest, we calculated the percent CM infested dropped nuts by dividing the total CM infested dropped nuts by the total nuts at harvest plus the total CM infested dropped nuts. This removed the effect of a variable crop load on the number of CM infested dropped nuts by transforming the data to a percent infested dropped nuts.

All experimental treatments had significantly lower percent CM infested dropped nuts than the untreated control. There was no significant difference in the percent CM infested dropped nuts between the experimental treatments and the grower standard treatment.

Harvest Evaluation

All experimental treatments had significantly lower percent CM and NOW infested nuts at harvest than the untreated control. When considering CM and NOW infestation separately,

there was no significant difference between the experimental treatments and the grower standard. However, when CM and NOW infestations were combined, two applications of Esteem with Volck oil followed by one application of Confirm with Volck oil and three applications of the low rate of Success with Volck oil had significantly higher percent infestations than the grower standard.

Conclusions

This study was conducted against an extremely high CM population with over 45% of the nuts infested. Since walnuts are not a preferred host of CM, it is uncommon to observe infestation greater than about 25% in walnuts. Considering the size of the CM population, the control achieved by most experimental treatments was acceptable, if not outstanding. Particularly impressive were three applications of Brigade, Confirm with Volck oil followed by two applications of Confirm, Dimilin and Volck oil and Esteem with Volck oil followed by two applications of Confirm, Dimilin and Volck oil.

Table 1. Mean percent CM infested dropped nuts for first generation and CM and NOW infestation at harvest at Hollister, CA, 1998.

Treatment*	Rate lb (AI)/ac	No. appl.	Dropped nuts	Mean* percent infested		
				Nuts at harvest		
				NOW	CM	Total
1) Lorsban 4E	2.0	1	1.8abc	0.3ab	3.7abcd	4.0abcd
Imidan 70W**	4.0	1				
Lorsban 4E	2.0	1				
2) Lorsban 75WG	2.0	1	1.8abc	0.0a	4.8abcd	4.8abcd
Imidan 70W**	4.0	1				
Lorsban 4WG	2.0	1				
3) Brigade 10WP	0.08	3	0.8ab	0.5ab	1.9ab	2.4abc
4) Comply 40WP***	0.1	2	1.2abc	0.0a	4.1abcd	4.1abcd
Success 2SC***	0.141	1				
5) Esteem 2.9EC***	0.113	2	3.9bc	0.0a	5.8bcd	5.8 bcde
Success 2SC***	0.141	1				
6) Esteem 2.9EC***	0.113	2	3.2bc	1.0ab	11.4d	12.4e
Confirm 2F***	0.25	1				
7) Esteem 2.9EC***	0.113	2	3.3bc	0.9ab	11.0d	11.9de
Confirm 2F	0.25	1				
+ Latron CS-7 by vol.	0.125%					
8) Confirm 2F***	0.25	1	0.4a	0.0a	1.0a	1.0a
Confirm 2F***	0.25	2				
+ Dimilin 25W	0.5					
9) Esteem 2.9EC***	0.113	1	2.4abc	0.0a	2.0abc	2.0ab
Confirm 2F***	0.25	2				
Dimilin 25W	0.5					
10) Success 2SC***	0.094	3	4.6c	1.0ab	11.8d	12.8e
11) Success 2SC***	0.141	3	3.5bc	1.0ab	8.2bcd	9.2cde
12) NAF-443 37.6WP***	0.094	3	1.4abc	1.6b	8.9cd	10.5de
13) NAF-443 37.6WP***	0.141	3	2.7abc	0.3ab	4.7abcd	5.0abcd
14) Untreated	---	0	14.1d	5.4c	45.7e	51.1f

*Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, $P \leq 0.05$). Data analyzed using an arcsin transformation.

**pH of Imidan applications was adjusted to about 6 pH by Bu-pH-er.

***Treatment contained 1.0% Volck oil by volume.