Evaluation of Coragen® and Avaunt® Insecticides for Control of Mint Root Borer in Central Oregon

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Abstract

Pheromone traps that attract male mint root borer moths were placed in nine fields in the Culver area of central Oregon on June 18, 2012. Mint root borer moths peaked from mid to late July, which correlated well with the prediction model for root borer development. Two fields with high moth populations were selected for application of two insecticides, chloroantraniliprole (Coragen®) and indoxacarb (Avaunt®). Coragen® is registered for control of cutworms, loopers and mint root borer in peppermint, and Avaunt is registered for control of spotted cutworm and cabbage looper. Significant control compared to the untreated check was provided by applications of Coragen® at peak moth flight and a double application of Coragen® applied at peak moth flight plus peak egg hatch. The double application of Coragen® appears to have provided control of both eggs and first instar larvae. Avaunt® treatments across all application timings showed no difference from the untreated check.

Introduction

The mint root borer is a common pest in mint production areas throughout the Pacific Northwest. Pheromone traps used to determine fields with high moth populations has been an effective indicator of larval populations during late summer and early fall and to identify fields that should be targeted for insecticide application. The product of choice to control mint root borer has traditionally been Lorsban® applied in the fall, which requires application of water to move the product into the soil for control of larvae.

During the 2011 season, the *Integrated Pest Management on Peppermint 3.0* (IPMP) degree day model designed by Berry and Coop (www. http://uspest.org/mint/) to predict mint root borer development was compared with field data to confirm the models ability to predict peak moth flight, peak egg laying and peak egg hatch (Figure 1). Based on field observations, there was good correlation with developmental model predictions.

The objective of this project was to determine the optimal application timing of two insecticides, Coragen® and Avaunt®. Coragen® is registered for control of cutworms, loopers and mint root borer in peppermint, and Avaunt® is registered for control of spotted cutworm and cabbage looper. These products have ovicidal properties, to control mint root borer eggs and first instar larvae in central Oregon. Coragen® and Avaunt® insecticides were selected as treatments because they are highly effective in controlling target pest species at low use rates with minimal impact on beneficial species. Low toxicity, two week persistence and ovicidal properties to control eggs and first instar larvae early in the season make both products good candidates for integrated pest management programs.

Material and Methods

Pheromone trapping for mint root borer moths focused on 9 fields in the Culver area, as no mint for oil was grown in the Madras area and no fields in Prineville appeared to have high mint root borer populations. Pheromone traps were monitored weekly from June 18 to July 16, 2012. Two fields with high moth populations were selected for treatment with Coragen® and Avaunt® followed by root and soil sampling. These were Field 9, located near highway 97 and Field 2, located near the town of Culver. Despite the highest moth population, Field 3 was not selected due to planned removal of the field after harvest. Pheromone traps were removed following peak flight, after fields were identified for insecticide treatments. Field 2 is irrigated by wheel line and Field 9 by lateral move.

Coragen® was applied at 5 oz/acre and Avaunt® at 3.5 oz/acre at peak flight on July 19, at peak egg laying on July 31, and at peak hatch on August 6, 2012 (Table 2). Plots 20 ft x 20 ft were arranged in a randomized block design and replicated four times. Products were applied using a CO_2 backpack sprayer with a handheld boom outfitted with 8002 TeeJet nozzles operated at 40 psi and 20 gallons of water per acre.

Field 9 was swathed on August 14 and Field 2 was swathed on August 17. Soil samples to determine larval numbers were collected at Field 9 on September 10, September 13, and September 19. Sampling dates for Field 2 were September 13 and September 21. In addition, four samples 10 feet outside the plot area were collected and analyzed to provide an informal assessment of commercial insecticide application of Coragen® (Field 9) VoliamFexi® (Field 2) following harvest with treatments applied within the research plot area.

A one-foot-squared sample area with a 3-inch depth was collected from each plot, placed in a plastic bag and placed in cold storage. Soil was sifted to check that larvae were not present in the soil after rhizomes were removed for sampling. Larvae were extracted using Berlese funnels for 4 days using 25 watts bulbs.

Due to a limited number of Berlese funnels (8), samples were initially processed from both fields to determine the relative number of larvae to allow initial focus on the field with the higher overall population. All samples from Field 9 have been processed and are presented in Table 3; sample processing and larvae counts are ongoing for Field 2 and are expect to be completed by the end of November. This information will be provided to the Oregon Mint Commission when available and will be included in the research discussion in January.

Results and Discussion

The total number of mint root borer moths collected across sampling dates in fields ranged from 11 to 88 (Table 1). Peak flight occurred July 10 through July 16. Results across the three sampling dates from field 9 indicate Coragen® application at peak moth flight (July 19) and a double application at peak moth flight (July 19) and peak egg hatch (August 6) significantly reduced mint root borer larvae compared to the untreated check (Table 3). Similar results were found in field 2 but the field had overall lower larvae numbers (Table 4). Samples in field 2 were in cold storage prior to processing through Berlese funnels for a longer period than Field 9, which may have contributed to fewer larvae recovered. Larval numbers following Avaunt®

applications were similar to the untreated check. Coragen® sprayed at peak moth hatch plus peak egg hatch appears to provide control of both eggs and first instar larvae.

The informal assessment of commercial application of Coragen® and VoliamFlexi® post-harvest appear to support data within the research plot area that later applications are less effective in controlling mint root borer than an early or double application.

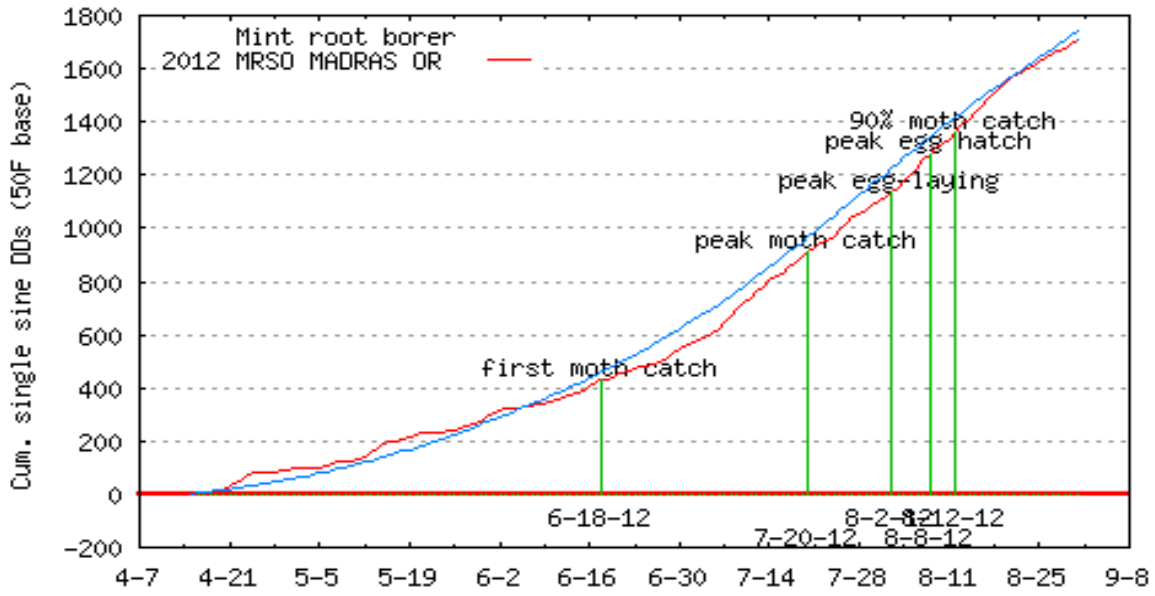

Fig. 1. Prediction model for Madras, OR, 2012. The red line represents Madras during the 2012 season, the blue line the historic average, predicted peak egg laying was August 2, peak egg hatch was August 8 and 90% moth catch was August 12.

Table 1. Number of mint root borer moths collected from pheromone traps placed in 9 fields in the Culver area on June 18, 2012.

Field	Location	Number of MRB Moths Collected			
		3-Jul	10-Jul	16-Jul	Total
1	North Culver	8	19	23	50
2	Culver	-	5	76	81
3	Culver	12	36	40	88
4	West Culver	0	4	7	11
5	West Culver	2	6	12	20
6	Culver	3	4	7	14
7	South Culver	2	11	13	26
8	Culver	6	21	21	48
9	East Culver	5	31	33	69

Table 2. Rates of Coragen and Avaunt and corresponding accumulated degree-days of MRB to time insecticide applications.

Treatments	Application Rate (fl oz/acre)	Application Time (degree days)	Developmental Stage	Date Applied
1. Untreated	---	---		
2. Coragen®	5 oz	900	Peak moth flight	July 19, 2012
3. Coragen®	5 oz	1100	Peak egg laying	July 31, 2012
4. Coragen®	5 oz	1250	Peak egg hatch	August 6, 2012
5. Coragen®	5 oz	900	Peak moth flight	July 19, 2012
+ Coragen®	+ 5 oz	1250	Peak egg hatch	August 6, 2012
6. Avaunt®	3.5 oz	900	Peak moth flight	July 19, 2012
7. Avaunt®	3.5 oz	1100	Peak egg laying	July 31, 2012
8. Avaunt®	3.5 oz	1250	Peak egg hatch	August 6, 2012
9. Avaunt®	3.5 oz	900	Peak moth flight	July 19, 2012
+ Avaunt®	+ 3.5 oz	1250	Peak egg hatch	August 6, 2012

Table 3. Number of mint root borer larvae recovered from soil and rhizome samples at Field 9.

Treatments	Development Stage (degree days)	Mint Root Borer Larvae/Sq Ft			
		Sept 10	Sept 13	Sept 19	Average
1. Untreated	---	4.0 bc	7.0 ab	2.5	4.5 a
2. Coragen®	Peak moth flight (900)	2.3 bc	1.8 ab	1.0	1.7 bc
3. Coragen®	Peak egg laying (1100)	3.8 bc	5.0 ab	1.5	3.4 abc
4. Coragen®	Peak egg hatch (1250)	4.3 abc	5.5 ab	3.0	4.3 ab
5. Coragen®	Peak moth flight (900)				
+ Coragen®	Peak egg hatch (1250)	1.0 c	0.3 b	0.8	0.7 c
6. Avaunt®	Peak moth flight (900)	7.5 a	7.3 a	3.0	5.9 a
7. Avaunt®	Peak egg laying (1100)	4.5 ab	6.0 ab	2.3	4.3 ab
8. Avaunt®	Peak egg hatch (1250)	5.3 ab	6.8 ab	3.0	5.0 a
9. Avaunt®	Peak moth flight (900)				
+ Avaunt®	Peak egg hatch (1250)	5.0 ab	7.3 a	1.8	4.7 a
LSD		*3.3*	*6.9*	*NS*	*2.8*

Table 4. Number of mint root borer larvae recovered from soil and rhizome samples at Field 2.

Treatments	Development Stage (degree days)	Mint Root Borer Larvae/Sq Ft		
		Sept 13	Sept 21	Average
1. Untreated	---	1.5 ab	0.8 a	1.1 a
2. Coragen®	Peak moth flight (900)	0.0 c	0.0 b	0.0 c
3. Coragen®	Peak egg laying (1100)	0.0 c	0.3 ab	0.1 c
4. Coragen®	Peak egg hatch (1250)	0.3 bc	0.0 b	0.1 c
5. Coragen®	Peak moth flight (900)			
+ Coragen®	Peak egg hatch (1250)	0.8 abc	0.3 ab	0.5 abc
6. Avaunt®	Peak moth flight (900)	0.0 c	0.3 ab	0.1 c
7. Avaunt®	Peak egg laying (1100)	1.0 ab	0.3 ab	0.6 abc
8. Avaunt®	Peak egg hatch (1250)	1.8 a	0.3 ab	1.0 ab
9. Avaunt®	Peak moth flight (900)			
+ Avaunt®	Peak egg hatch (1250)	0.5 abc	0.3 ab	0.4 bc
LSD		*1.3*	*0.7*	*0.7*