Monitoring and Management of Mint Root Borer on Mint

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Mint root borer, *Fumibotys fumalis*, is a key, direct, and devastating pest in peppermint production.

- Late summer and early fall feeding by larvae on rhizomes is cryptic and severe injury is manifested as dead fields the subsequent spring.

A pheromone monitoring program for F. fumalis has shown promise under Willamette Valley conditions (Simmons et al. 2011).

Research Objectives 2018

- 1. Conduct a comprehensive pheromone monitoring program in mint fields in the key growing districts near Toppenish, Paterson, and Othello, WA.
- We received a donation of mint root borer (MRB) pheromone lures from Trece™ for use in these studies. We also purchased Delta™ traps from Trece. When we established our initial study sites, the Delta traps proved problematic because the dusty conditions in mint fields in spring clogged the adhesive designed to trap the insects

1. Conduct a comprehensive pheromone monitoring program in mint fields in the key growing districts near Toppenish, Paterson, and Othello, WA.

- We established study sites near Paterson, Toppenish, and Othello.
- Four traps were placed in every field in early April and the traps will be monitored weekly through October, with mint root borers qualified and quantified.
- Beginning in August and continuing into October, soil and rhizome samples were collected and transported to the Environmental and Agricultural Entomology Laboratory located at WSU Prosser where the samples were processed and put in a Berlese funnel for 24 to 48 hours.
- We plan on repeating our pheromone studies in spring 2019.
- We will run regression analyses of the spring 2018 and spring 2019 pheromone counts against the larval abundance counts calculated from the soil and rhizome samples that were processed through the Berlese funnels.
- This will help us determine if the trap moth counts can be used to quantify larval abundance in the soil.

Average number of male MRB captured per wk at 3 mint fields near Othello.

Area	Site	Collection date	Average # moths /wk	Area	Site	Collection date	Average # moths /wk
Othello	1 (East)	31-May-18	0	Othello	2 (Baby)	31-May-18	0
Othello	1 (East)	7-Jun-18	0	Othello	2 (Baby)	7-Jun-18	0
Othello	1 (East)	13-Jun-18	0	Othello	2 (Baby)	13-Jun-18	0
Othello	1 (East)	20-Jun-18	0	Othello	2 (Baby)	20-Jun-18	0
Othello	1 (East)	27-Jun-18	0	Othello	2 (Baby)	27-Jun-18	0
Othello	1 (East)	4-Jul-18	0	Othello	2 (Baby)	4-Jul-18	0
Othello	1 (East)	11-Jul-18	0	Othello	2 (Baby)	11-Jul-18	0
Othello	1 (East)	24-Jul-18	1	Othello	2 (Baby)	24-Jul-18	0.5
Othello	1 (East)	2-Aug-18	2.75	Othello	2 (Baby)	2-Aug-18	1.5
Othello	1 (East)	8-Aug-18	0.75	Othello	2 (Baby)	8-Aug-18	0
Othello	1 (East)	14-Aug-18	0	Othello	3 (North)	14-Aug-18	0.25
Othello	1 (East)	22-Aug-18	0	Othello	3 (North)	22-Aug-18	0
Othello	1 (East)	29-Aug-18	0	Othello	3 (North)	29-Aug-18	0
Othello	3 (North)	4-Jul-18	0				
Othello	3 (North)	11-Jul-18	0				
Othello	3 (North)	24-Jul-18	6.75				
Othello	3 (North)	2-Aug-18	5.25				
Othello	3 (North)	8-Aug-18	6				
Othello	3 (North)	14-Aug-18	4.5				
Othello	3 (North)	22-Aug-18	0.5				
Othello	3 (North)	29-Aug-18	0				

Average number of male MRB captured per wk at 3 mint fields near Paterson.

		Collection date					
	Site	30-May-18	**Average # moths /wk**				
	1 (Sandpiper Gate)	4-Jun-18	0				
	1 (Sandpiper Gate)	12-Jun-18	0	**Area**	**Site**	**Collection date**	**Average # moths /wk**
Area	1 (Sandpiper Gate)	19-Jun-18	0	Paterson	3 (West, swam	30-May-18	0
Paterson	1 (Sandpiper Gate)	26-Jun-18	0	Paterson	3 (West, swam	4-Jun-18	0
Paterson	1 (Sandpiper Gate)	3-Jul-18	0	Paterson	3 (West, swam	12-Jun-18	0
Paterson	1 (Sandpiper Gate)	9-Jul-18	0	Paterson	3 (West, swam	19-Jun-18	0
Paterson	1 (Sandpiper Gate)	23-Jul-18	0	Paterson	3 (West, swam	26-Jun-18	0
Paterson	1 (Sandpiper Gate)	31-Jul-18	0.25	Paterson	3 (West, swam	3-Jul-18	0.25
Paterson	1 (Sandpiper Gate)	6-Aug-18	0.5	Paterson	3 (West, swam	9-Jul-18	0.25
Paterson	1 (Sandpiper Gate)	14-Aug-18	0	Paterson	3 (West, swam	23-Jul-18	0
Paterson	1 (Sandpiper Gate)	23-Aug-18	0	Paterson	3 (West, swam	31-Jul-18	3.25
Paterson	1 (Sandpiper Gate)	28-Aug-18	0	Paterson	3 (West, swam	6-Aug-18	3.25
Paterson	2 (East)	30-May-18	0.5	Paterson	3 (West, swam	14-Aug-18	10.5
Paterson	2 (East)	4-Jun-18	0	Paterson	3 (West, swam	23-Aug-18	5.25
Paterson	2 (East)	12-Jun-18	0	Paterson	3 (West, swam	28-Aug-18	0
Paterson	2 (East)	19-Jun-18	0				
Paterson	2 (East)	26-Jun-18	0				
Paterson	2 (East)	3-Jul-18	0				
Paterson	2 (East)	9-Jul-18	0				
Paterson	2 (East)	23-Jul-18	0				
Paterson	2 (East)	31-Jul-18	0.5				
Paterson	2 (East)	6-Aug-18	3.25				
Paterson	2 (East)	14-Aug-18	5.25				
Paterson	2 (East)	23-Aug-18	2				
Paterson	2 (East)	28-Aug-18	0				

Average number of male MRB captured per wk at 3 mint fields near Toppenish

Area	Site	Collection date	Average # moths /wk	Area	Site	Collection date	Average # moths /wk
Toppenish	1 (Main Farm)	1-Jun-18	0	Toppenish	3 (Baby)	1-Jun-18	0
Toppenish	1 (Main Farm)	6-Jun-18	0	Toppenish	3 (Baby)	6-Jun-18	0
Toppenish	1 (Main Farm)	15-Jun-18	0	Toppenish	3 (Baby)	15-Jun-18	0
Toppenish	1 (Main Farm)	22-Jun-18	0	Toppenish	3 (Baby)	22-Jun-18	0
Toppenish	1 (Main Farm)	29-Jun-18	0	Toppenish	3 (Baby)	29-Jun-18	0
Toppenish	1 (Main Farm)	6-Jul-18	0	Toppenish	3 (Baby)	6-Jul-18	0.5
Toppenish	1 (Main Farm)	12-Jul-18	0.75	Toppenish	3 (Baby)	12-Jul-18	0.75
Toppenish	1 (Main Farm)	26-Jul-18	0.5	Toppenish	3 (Baby)	26-Jul-18	4.5
Toppenish	1 (Main Farm)	3-Aug-18	0.25	Toppenish	3 (Baby)	3-Aug-18	5.5
Toppenish	1 (Main Farm)	10-Aug-18	0.5	Toppenish	3 (Baby)	10-Aug-18	2.5
Toppenish	1 (Main Farm)	17-Aug-18	0.5	Toppenish	3 (Baby)	17-Aug-18	0.5
Toppenish	2 (Larue Rd)	24-Aug-18	0.25	Toppenish	3 (Baby)	24-Aug-18	0
Toppenish	2 (Larue Rd)	1-Jun-18	0				
Toppenish	2 (Larue Rd)	6-Jun-18	0				
Toppenish	2 (Larue Rd)	15-Jun-18	0				
Toppenish	2 (Larue Rd)	22-Jun-18	0				
Toppenish	2 (Larue Rd)	29-Jun-18	0.25				
Toppenish	2 (Larue Rd)	6-Jul-18	0.75				
Toppenish	2 (Larue Rd)	12-Jul-18	1.5				
Toppenish	2 (Larue Rd)	26-Jul-18	6.75				
Toppenish	2 (Larue Rd)	3-Aug-18	3.25				
Toppenish	2 (Larue Rd)	10-Aug-18	0				
Toppenish	2 (Larue Rd)	17-Aug-18	0.75				
Toppenish	2 (Larue Rd)	24-Aug-18	0				

Mint root borer larvae and tipulid larvae captured in soil samples in Berlese funnel samples.

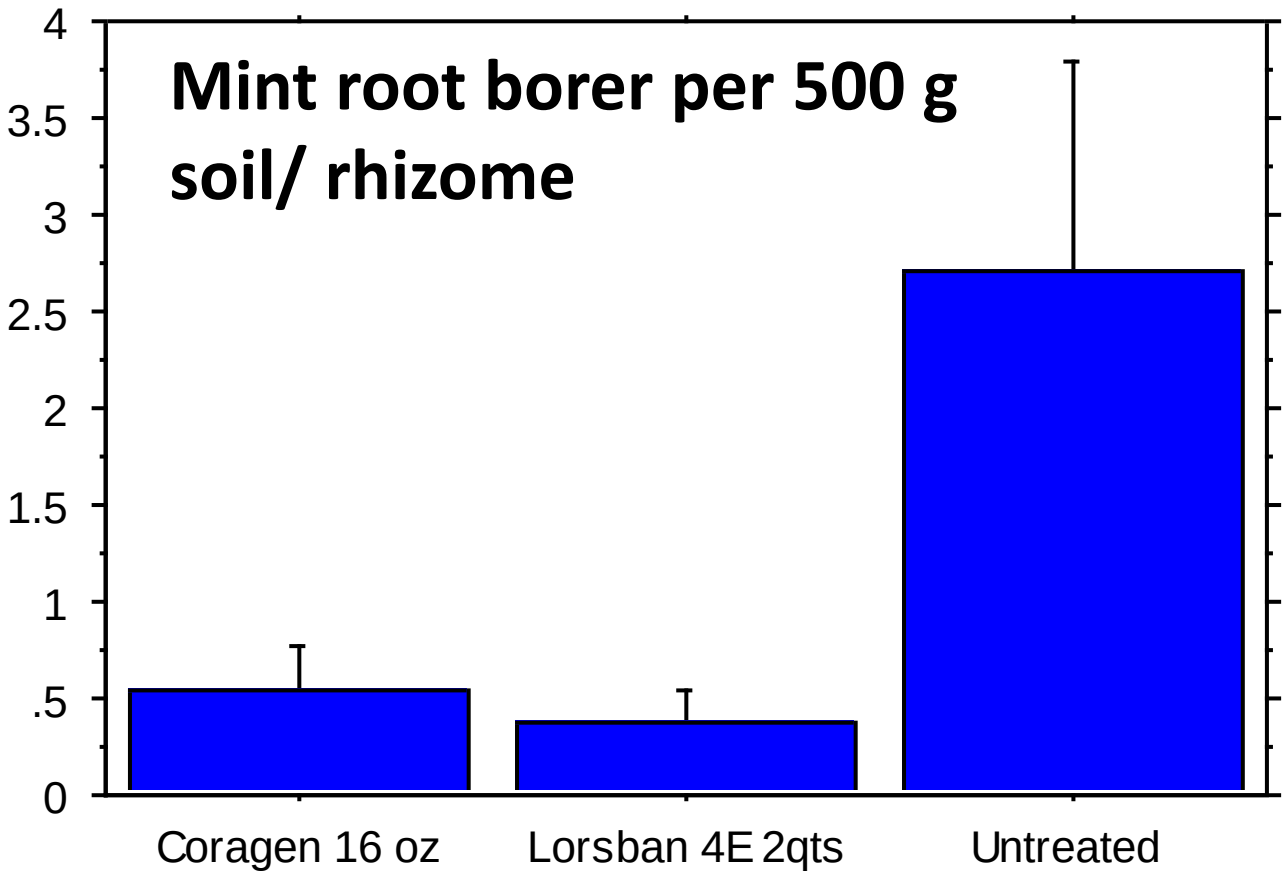
Location	Field	Sample Date	*MRB*	Tipulids
Othello	1 (East)	2-Oct-18	**0**	**0**
Othello	1 (East)	9-Oct-18	**0**	**0.125**
Othello	3 (North)	2-Oct-18	**0**	**0.75**
Othello	3 (North)	9-Oct-18	**0**	**0.625**
Paterson	1 (Sandpiper Gate)	2-Oct-18	**0**	**0**
Paterson	1 (Sandpiper Gate)	11-Oct-18	**1.125**	**0**
Paterson	2 (East)	24-Sep-18	0	2.25
Paterson	2 (East)	2-Oct-18	0	2.375
Paterson	2 (East)	11-Oct-18	0	2.25
Toppenish	1 (Main Farm)	20-Sep-18	0.375	0
Toppenish	1 (Main Farm)	27-Sep-18	0.125	0
Toppenish	2 (Larue Rd)	20-Sep-18	0	0
Toppenish	2 (Larue Rd)	27-Sep-18	0	0
Toppenish	3 (Baby)	20-Sep-18	0	0
Toppenish	3 (Baby)	27-Sep-18	0	0

Mint root borer Control.

- Traditional control has been achieved with a ground application of chlorpyrifos (Lorsban Advanced) in early fall followed by an irrigation event between ½ and ¼ of an inch to get the insecticide into contact with caterpillars feeding on the rhizomes.
- Chlorantraniprole (Coragen) is also registered for control of mint root borer, but control is sporadic.

Mint Root Borer Control with chlorantraniprole in 2009

- Insecticides were applied to double-cut peppermint on the Roza in early October 2009.
- Coragen (chlorantraniprole) was applied at 5 oz ai/ acre
- Lorsban 4E (chlorpyrifos) at was applied at 2 qts per acre.
- ¼ inch irrigation was applied post treatment.
- Soil sample from these plots were collected in early March and placed them in a Berlese funnel for one week.

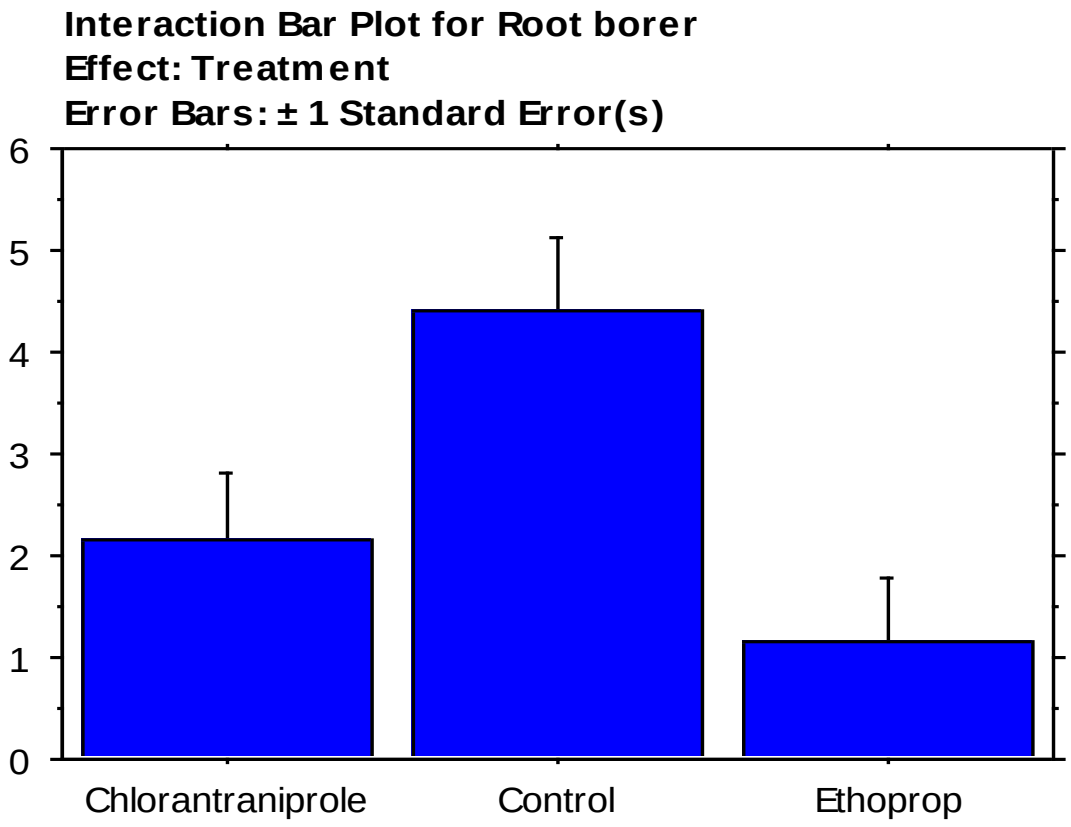


- Both Coragen and Lorsban provided significant ($p<0.01$) control of mint root borer compared to samples collected from the non-treated control plots.
- Coragen is much more environmentally benign then Lorsban.

We were also able to expand the label and develop a use pattern for chlorantraniprole for mint root borer control applied via chemigation.

- We applied chlorantraniprole (Altacor™,) through a center pivot on a peppermint field in Paterson, WA on 27 October. We compared this to chemigation with ethoprop (Mocap™) and a non treated control.

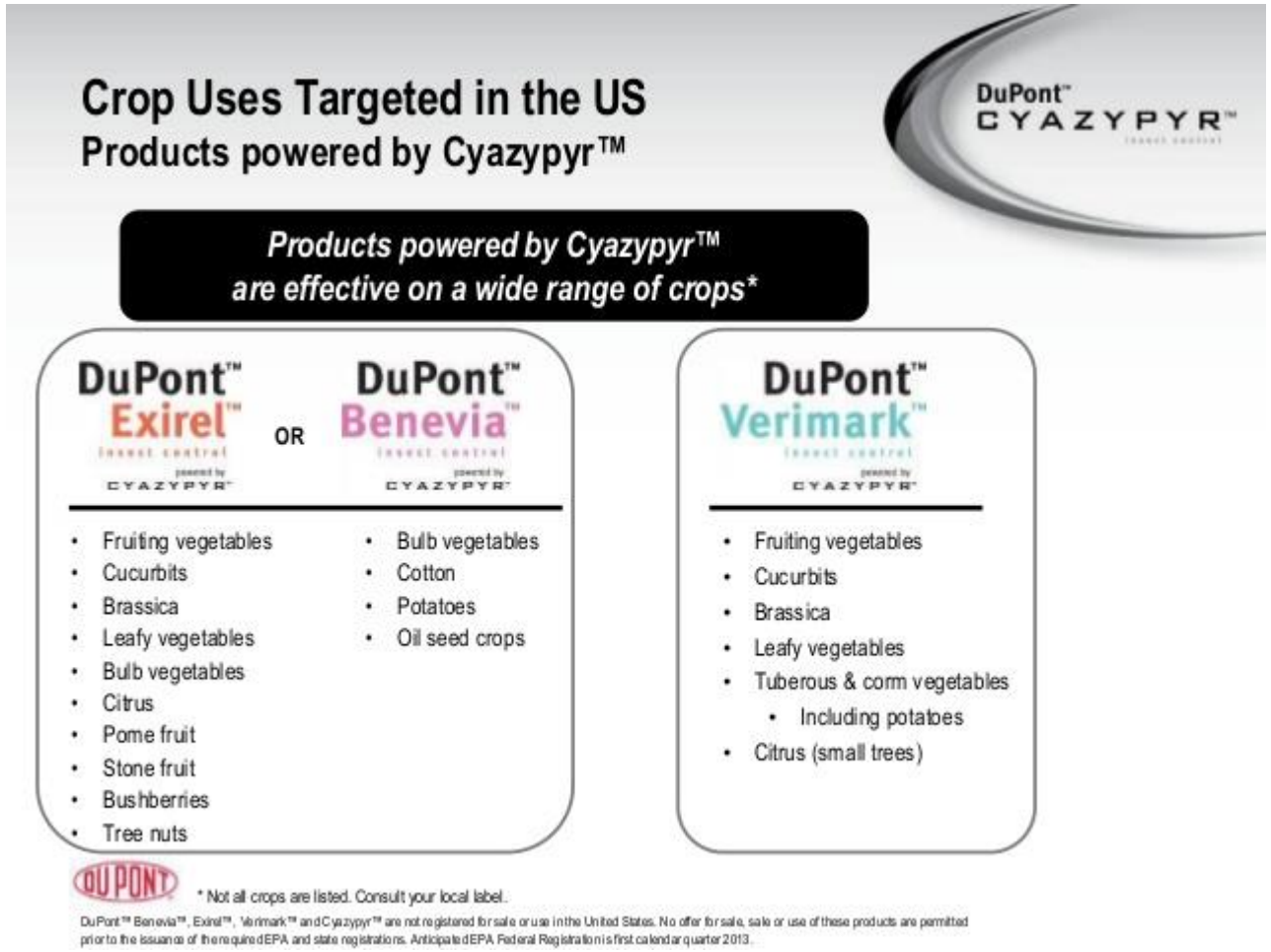
Mint Root Borer Pupa per core sample on 2/25/2009



6” cores down to approximately 4” in depth of soil. 28.26sq inches of surface then dried in a Berlese funnel

Mint root borer, *Fumibotys fumalis*, Control.

- Cyantraniprole under the formulation Verimark™ is a reduced-risk insecticide marketed by FMC that has demonstrated good efficacy against other subterranean pests.
- We propose to test cyantraniprole for efficacy on mint root borer populations infesting Washington State mint fields.



IR-4 Residue Project for Cyantraniliprole

- Mint and Basil are now “representative crops” for EPA Crop Group 25-- spices
- If residue trials are run on mint and basil then other “spices” can get a tolerance.
- IR-4 HQ had my IR-4 Field Residue Program run residue trials in 2018 on mint for a request to control citrus psyllid on Indian curry leaves.
- The application was as a foliar spray.
- I requested to get the soil application use pattern added.
- Basically all I have to do is prove cyantraniliprole is effective against mint root borer and we could have a label in as short as 30 months.

We established 2 insecticide efficacy trials in peppermint fields near Patterson, WA

- We've conducted an insecticide efficacy trial with candidate and registered insecticides for mint root borer control in fall 2018.

Treatment	Ingredient	Rate (product)/acre	a.i./acre
Lorsban Advanced	chlorpyrifos	4 pints	1.8775 lb
Coragen	chlorantraniprole	5 fl oz	0.065 lb
Verimark	cynatraniprole	13.5 fl oz	0.176 lb
Untreated			

- Each replicate plot is 6' by 18'
- We are now evaluating efficacy via Berlese funnel
- We've sampled twice and captured no MRB larva.