Section V.
Soil Arthropods

EFFICACY TRIALS OF NEW INSECTICIDES FOR MINT ROOT BORER CONTROL

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INTRODUCTION

Lorsban (chlorpyrifos) is the only chemical pesticide registered for mint root borer (MRB) control. Tilling of mint fields also provides partial control, but is not always an option on verticillium wilt infested fields. Lorsban and other organophosphate insecticides may have their use limited or eliminated in the future due to the Food Quality Protection Act. Therefore, new products that can provide consistent, cost effective control of MRB are needed. We tested the effectiveness of two new experimental insecticides as well as Pounce 3.2 EC (permethrin) against the standard treatment of Lorsban for MRB control.

MATERIALS AND METHODS

Experiment 1

A completely randomized design was used for this bioassay experiment. Mint root borer larvae were collected from peppermint fields and placed in open containers with 11 larvae per container. The following treatments were replicated three times: (1) untreated check (water only), (2) experimental insecticide 1 (referred to as EXP-1), (3) experimental insecticide 2 (referred to as DPX-A), (4) Pounce 3.2 EC (permethrin) at 0.5 lb ai/a, and (5) Lorsban 4E at 2 lb ai/a. Treatments were applied directly to the exposed larvae with a $C0_2$ powered backpack sprayer (20 psi at 20 GPA). No surfactants were used with any treatment. The treated larvae were moved to jars filled with untreated soil and mint rhizomes and treatments were evaluated five, eight and thirteen days after treatment (DAT) by counting the number of live, sick and dead MRB larvae.

Experiments 2 and 3

These experiments were located in production peppermint fields in the LaGrande, Oregon area. All experimental plots were 6'x 15'sections of a peppermint field with a natural infestation of MRB larvae. A randomized block design was used with the following treatments replicated seven and nine times for Experiments 2 and 3, respectively: (1) untreated check, (2) EXP-1 (experimental insecticide 1), (3) DPX-A (experimental insecticide 2), (4) Pounce 3.2 EC (permethrin) at 0.5 lb ai/a, and (5) Lorsban 4E at 2 lb ai/a.

For both experiments, treatments were applied on September 6 with a CO_2 backpack sprayer (20 GPA at 20 psi) to pre-irrigated plots. The insecticides were immediately washed into the soil with approximately 1 inch of water. Experiments were evaluated by taking four, 1-ft^2 soil sample in each plot. The soil was shaken off the mint rhizomes and sifted though a 0.125" screen while the rhizomes were placed in Berlese funnels until dry. The number of MRB larvae recovered from soil sifting was combined with that from Berlese funnel extraction and recorded. Experiment 2 was evaluated 11 DAT while Experiment 3 was evaluated 24 and 49 DAT.

RESULTS AND DISCUSSION

Experiment 1

Lorsban 4E and Pounce 3.2EC provided complete control within the first five days after treatment (Table 1). EXP-1 provided 100% control within eight DAT. DPX-A killed 82% of the MRB larvae by 13 DAT, and the remaining larvae did not exhibit normal movement and appeared to be sick.

Table 1

Comparison of four insecticides for efficacy against mint root borer larvae in a bioassay evaluated after five, eight and thirteen days after treatment (DAT).

Treatment	Five DAT		Eight DAT		Thirteen DAT	
	% dead	% sick	% dead	% sick	% dead	% sick
UTC	12	0	18	0	25	0
EXP-1	96	4	100	0	---	---
DPX-A	0	97	42	58	82	18
Pounce 3.2EC (0.5 lb ai/ac)	100	0	---	---	---	---
Lorsban 4E (2 lb ai/ac)	100	0	---	---	---	---

Experiments 2 and 3

For both experiments, EXP-1 failed to provide significant control compared to the untreated check (Table 2). Pounce 3.2EC provided control similar to the standard treatment of Lorsban at Experiment one and in the second sampling of experiment three. At the first sampling of Experiment three, Pounce did not provide control similar to the Lorsban, but it was observed at this first sampling that Pounce had reduced hibernaculum formation compared to the other treatments. (Table 3) This reduction of hibernaculum formation led us to sample Experiment two a second time. MRB control with DPX-A was similar to the standard treatment of Lorsban in Experiment two and at both sample dates of Experiment three.

Table 2

Results of field efficacy trials for mint root borer control.

Treatment	Rate (lb ai/a)	Experiment 2 Live mint root borers per sq. ft. 11 DAT	Experiment 3 Live mint root borers per sq. ft. 24 DAT	Experiment 3 Live mint root borers per sq. ft. 49 DAT
UTC		5.9 a	7.3 a	10.0 a
EXP-1		4.2 ab	5.4 ab	---
Pounce 3.2 EC	0.5	3.0 bc	3.4 b	1.8 b
DPX-A		2.1 c	1.3 c	1.3 b
Lorsban 4E	2.0	1.5 c	0.7 c	0.8 b

Sample means were compared with Fisher's Protected LSD (p=0.05). Means with the same letter are not significantly different (Petersen 1985).

Experiment 2: LSD =2.04, $p<0.05$

Experiment 3, (24 DAT): LSD=2.07, $p<0.05$

Experiment 3, (49 DAT): LSD=2.07, $p<0.05$

Table 3

Mint root borer stage at the time of sampling of insecticide efficacy trial of experiment three.

	Rate (lb ai/a)	Percent MRB in larvae stage	Percent MRB in hibernaculum stage
UTC		50%	50%
EXP-1		60%	40%
Pounce 3.2 EC	0.5	88%	12%
DPX-A		37%	63%
Lorsban 4E	2.0	50%	50%

CONCLUSION

Although EXP-1 had good direct contact activity against MRB larvae, it did not perform well under field conditions. Pounce had good activity when directly applied and provided control similar to Lorsban under field conditions. In the bioassay, DPX-A was slower and provided less control than the other products, but under field conditions DPX-A was similar to Lorsban. Further research should be conducted to verify the results of DPX-A. DPX-A is a new chemistry insecticide that appears to provide MRB control on par with the standard treatment of Lorsban.