

Registration of New Insecticides for Mint

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Abstract

Platinum 2SC and Furadan 4L provided significant control when applied directly to strawberry root weevil (*Otiorynchus ovatus*) larvae, while Steward failed to provide control. However, naturally occurring strawberry root weevil larvae were not controlled when Platinum 2SC, Steward, or Furadan 4L were chemigated into the soil. Strawberry root weevil adults that were directly treated were effectively controlled with Orthene 75S, Steward, and all rates of Actara 25 WG.

Introduction

New effective pesticides are needed to replace pesticides that may be lost due to the Food Quality Protection Act (FQPA). These new pesticides need to be compatible with biological control, thus assisting growers in lowering input costs by reducing pesticide applications. The focus of this research was to test new

pesticides that may fit these criteria. In the following studies, we tested the efficacy of (1) Platinum 2SC (thiamethoxam) and Steward (indoxacarb) for control of strawberry root weevils in the larval stage, and (2) Actara 25WG (thiamethoxam) and Steward for control of strawberry root weevil adults.

Objective 1: Platinum (thiamethoxam) and Steward (indoxacarb) for control of strawberry root weevil larvae in mint.

Strawberry root weevil (SRW) larvae (*Otiorynchus ovatus*) feed on mint roots and weaken or kill the plant. The current SRW control targets only

the adult stage and not the larvae. We wanted to test insecticides that may have efficacy in controlling SRW in the larval stage.

Materials and Methods

Experiment 1

A completely randomized design (CRD) was used for this experiment with four replications. Groups of 11 SRW larvae were placed in open containers. The exposed larvae were treated directly with the following treatments delivered by a CO₂-powered backpack sprayer (28 psi at 20 gal/acre): (1) untreated check, (2) Furadan 4F at 1 lb ai/acre, (3) Platinum 2SC at 0.19 lb ai/acre, and (4) Steward at 0.1 lb ai/acre. No surfactant or additives were used in any treatment. After the treatments were applied, the treated larvae were moved into small containers filled with untreated soil. Treatments were evaluated 6 and 12 days after treatment (DAT) by counting the number of live SRW larvae.

Experiment 2

A CRD was used with three replications. Strawberry root weevil larvae were put in small containers filled with 2 inches of soil. After the soil was saturated with water the following treatments were applied with a CO₂-powered backpack sprayer (20 gal/acre at 28 psi): (1) untreated check, (2) Platinum 2SC at 0.19 lb ai/acre, (3) Platinum 2SC 0.38 lb ai/acre, (4) Success at 0.16 lb ai/acre, (5) Success at 0.32 lb ai/acre, (6) Steward at 0.1 lb ai/acre, (7) Steward at 0.2 lb ai/acre, and (8) Orthene 75S at 2.0 lb ai/acre. After treatments were applied, additional water was applied until excess water drained from the bottom of the containers. No surfactants were used with any treatment.

Experiment 3

Mint plants were planted in a fallow field early in the spring. A fine mesh screen was placed under each plant to completely encompass the soil around the roots. At the time of planting, 25 SRW larvae were released in the root zone of each plant. On April 28, the treatments were applied using a CO₂-powered backpack sprayer (20 gal/acre at 28 psi). The following treatments were applied as a CRD with six replications: (1) untreated check, (2) Furadan 4F at 1 lb ai/acre, (3) Platinum 2SC at 0.19 lb ai/acre, and (4) Steward at 0.1 lb ai/acre. The soil surface was saturated from rain when the treatments were applied. Additional water was applied immediately after treating with a total of 1 inch of water within 4 hours. Plots were evaluated by screening plant material and soil for SRW larvae from May 19 through May 24.

Experiment 4

This trial was located in a production field of peppermint with a native population of SRW larvae. A randomized block design (RBD) was used with the following treatments replicated four times: (1) untreated check (2) Furadan 4F at 1 lb ai/acre, (3) Platinum 2SC at 0.198 lb ai/acre, and (4) Steward at 0.1 lb ai/acre.

Treatments were applied on May 5 by mixing each insecticide in 1.5 gal of water. The treatments were applied with watering cans to each 4-ft² plot. An additional inch of water was applied immediately to wash the insecticides into the soil. Treatments were evaluated between May 29 through June 4 by sifting the soil shaken from the mint roots through screens.

Results and Discussion

Experiment 1

A significant number of SRW larvae died in the Platinum 2SC and Furadan 4F treatments, showing that these two products do have some effect on the SRW larvae (Table 1). The control obtained by the

standard treatment of Furadan 4L may have been lower than expected because a lower rate of 1 lb ai/acre was used instead of 2 lb ai/acre.

Table 1: Mean number of live strawberry root weevil larvae, treated directly, 6 and 12 DAT (n = 11).

Treatment	Rate	Mean no. alive 6 DAT	Mean no. alive 12 DAT
Untreated check	---	9.75 a	8.25 a
Steward	0.1 lb ai/acre	9.25 a	8.25 a
Platinum 2SC	0.19 lb ai/acre	6.50 b	5.25 b
Furadan 4F	1.0 lb ai/acre	5.00 b	3.25 b

Sample means were compared with Fisher's Protected LSD (P = 0.05). Means with the same letter are not significantly different (Petersen 1985). Live weevils 6 DAT: F = 7.5; df = 3,12; P < 0.05. Live weevils 12 DAT: F = 8.7; df = 3,12; P < 0.05.

Experiment 2

Results show no statistical differences between any of the treatments (Table 2). The lack of control by any treatment may have been caused by the

products being too diluted with water or because the larvae were starting to change into the pupae stage and were not susceptible to insecticides.

Table 2. Mean number of live SRW larvae 18 days after treatment (DAT) (n = 10).

Treatment	Rate	Mean no. alive
Untreated check	---	9.0 a
Platinum	0.19 lb ai/acre	7.7 a
Platinum	0.38 lb ai/acre	6.0 a
Success	0.16 lb ai/acre	6.0 a
Success	0.32 lb ai/acre	8.3 a
Steward	0.1 lb ai/acre	7.7 a
Steward	0.2 lb ai/acre	8.3 a
Orthene	2.0 lb ai/acre	9.0 a

Sample means were compared with Fisher's Protected LSD (P = 0.05). Means with the same letter are not significantly different (Peterson 1985). Live weevils: F = 1.1; df = 7,16; P < 0.05.

Experiment 3

Results show no statistical differences between any of the treatments (Table 3). The treatments may have been ineffective because the SRW did not receive a lethal dose. Perhaps a higher rate of each product is needed to overcome the protective nature

of the soil. In addition, the larvae were nearing the end of the larval stage at the time of this experiment. Whether this may have affected their susceptibility to insecticide is not known. No phytotoxic response was observed on the mint plants from any treatment.

Table 3. Mean number of live strawberry root weevil larvae 21–26 DAT (n = 25).

Treatment	Rate	Mean no. alive per plant
Untreated check	---	11.3 a
Platinum 2SC	0.19 lb ai/acre	12.7 a
Steward	0.1 lb ai/acre	11.5 a
Furadan 4F	1.0 lb ai/acre	9.5 a

Sample means were compared with Fisher's Protected LSD (P = 0.05). Means with the same letter are not significantly different (Petersen 1985). Live weevils: F = 0.9; df = 3,20; P < 0.05.

Experiment 4

No statistical differences were found between any of the treatments (Table 4). Again, the larvae were at the end of their larval stage and were

changing into pupae. No phytotoxic response was observed on the mint plants.

Table 4. Mean number of live strawberry root weevil larvae per ft², 24–30 DAT.

Treatment	Rate	Mean no. alive
Untreated check	---	12.6 a
Furadan 4F	1.0 lb ai/acre	16.8 a
Platinum 2SC	0.19 lb ai/acre	19.7 a
Steward	0.1 lb ai/acre	16.2 a

Sample means were compared with Fisher's Protected LSD (P = 0.05). Means with the same letter are not significantly different (Petersen 1985). Live weevils: F = 2.3; df = 3,9; P < 0.05.

Objective 2: Actara 25WG (thiamethoxam) and Steward (indoxacarb) for control of adult strawberry root weevils in mint.

Currently, the only effective control of SRW adults is with two well-timed night applications of Orthene. Actara 25WG is soft on beneficial organisms and is a potential replacement if Orthene were lost due to FQPA. In 2000, our field tests with Actara 25WG showed some activity on SRW adults when applied at

the highest labeled rate at night. Due to the thick plant canopy, the ability of the spray to contact the SRW adults was questioned. To test the efficacy of Actara 25WG and Steward against adult SRW, these products were applied directly to the adults and to the plants upon which they were placed.

Materials and Methods

A CRD was used for this experiment with five replications. Thirty SRW adults were placed in shallow, open containers. The following treatments were applied directly to the adult SRW with a CO₂-powered backpack sprayer (20 gal/acre at 28 psi): (1) untreated check, (2) Orthene 75S at 1 lb ai/acre, (3) Actara 25WG at 0.023 lb ai/acre, (4) Actara 25WG at 0.047 lb ai/acre, (5) Actara 25WG at 0.062 lb ai/acre, (6) Actara 25WG at 0.124 lb ai/acre, and (7) Steward at 0.1 lb ai/acre.

Treatment number six was double the maximum labeled rate of Actara 25WG. Potted mint plants were also treated. After treating, the SRW adults were placed in the pots of the treated mint plants so that they would have an opportunity to feed on treated plant material in addition to having been directly contacted with the insecticides. The treated plants with the SRW adults were placed in screen cages.

Results and Discussion

All products and rates were effective against the SRW adults after 21 days (Table 5). No feeding was observed for the first 14 days even for the untreated check. SRW adults moved to the bottom of the cage and would not climb on the potted plants to feed. After 14 days, mint stems were taken off the plants, and

placed on the bottom of the cages to encourage feeding. Feeding on the plant material at the bottom of the cage was observed only in the untreated check from 14 to 21 DAT. After 21 days, some of the Steward-treated SRW were still alive but had not moved for 7 days. These immobilized SRW were counted as dead.

Table 5. Mean number of live SRW adults, 14 and 21 days after treatment (DAT) (n = 30).

Treatment	Rate	Mean no. alive 14 DAT	Mean no. alive 21 DAT
Untreated check	---	25.8 a	16.8 a
Orthene 75S	1.0 lb ai/acre	0.2 d	0.0 b
Actara 25 WG	0.023 lb ai/acre	9.4 b	2.2 b
Actara 25 WG	0.047 lb ai/acre	3.0 cd	0.6 b
Actara 25 WG	0.062 lb ai/acre	5.8 bc	0.4 b
Actara 25 WG	0.124 lb ai/acre	0.8 cd	0.0 b
Steward	0.1 lb ai/acre	6.4 bc	0.0 b

Sample means were compared with Fisher's Protected LSD (P = 0.05). Means with the same letter are not significantly different (Petersen 1985). Live weevils: F = 39.9; df = 6,28; P < 0.05.

Reference Cited

Petersen, R. G. 1985. Design and analysis of experiments. Dekker. New York. 429 pp.