
Better Understanding and Management of Tenlined June Beetle

Project Leader: Marshall W. Johnson

Cooperators: Kevin Day

ABSTRACT

Grubs were allowed to feed for 7 days and then they were transferred to another cup with a new untreated carrot. Carrots were changed weekly to ensure a good food source for the grubs. Grubs were observed for 4 weeks. No grubs died in the experiment and most of the grubs fed on the carrots offered. We concluded that either 1) Movento did not kill TLJB grubs or 2) the manner in which we tried to offer the Movento via the carrot root was unsuitable for the mode of action of the product.

Plants were held in a greenhouse until 20 January at which time the plants were all removed from their containers and the numbers of live and dead grubs were counted and the numbers of fed-upon carrots were recorded. The grubs were not checked for about 4 weeks because it was expected that it would take considerable time for mortality based on previous tests with diazinon and imidacloprid. All grubs were checked among the various treatments and all grubs were alive and appeared healthy. However, not many carrots appeared to have been fed upon. This may be because it was very cool in the greenhouses and many of the grubs were rolled into tight balls when we excavated them.

At this point we can still not say whether Movento impacts the 3rd instar grubs. We may have not seen any impacts because 1) Movento does not move through the carrot foliage into the carrot roots; and 2) the grubs did not feed at high rates on the roots, although there were numerous feeder roots growing from the large carrots that the grubs may have fed upon. We are continuing to monitor the grubs to see if any detrimental impacts occur (i.e., lack of feeding; mortality).

DISCUSSION AND RESULTS

1. Field-Test the Use of Admire® in an Orchard System

Before we field test Admire® in the field, I wish to ensure my ability to move the product at least 36 inches down through sandy soil. To date, we have shown that we can move the product at least 10 vertical inches through a column of soil. If we can achieve 36 vertical inches, we should be able to contact the majority of the grubs that make up most field populations of the insect. I have designed a methodology (**Fig. 1**) that should be experimentally sound to address the challenges of moving an insecticide 36 inches through a vertical soil column so that it will contact Tenlined June beetles

(TLJB) with an adequate food source to feed surviving grubs over the 10 week or greater observation period needed to assess the effectiveness of the insecticide trial.

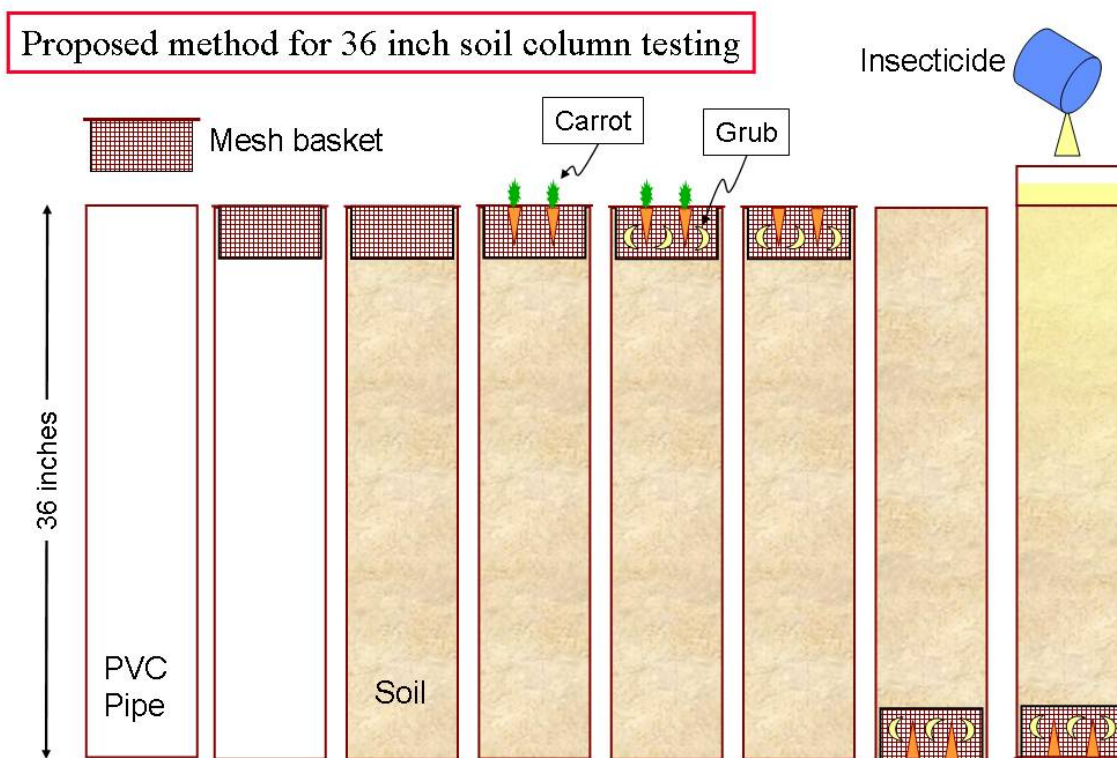


Fig. 1. Proposed method to evaluate the movement of soil insecticides through a 36 inch column to kill 3rd instar Tenlined June beetle grubs at the bottom of the column.

A 36 inch column made of 6-inch PVC irrigation pipe will be used in the test. An empty pipe will be filled 83% with sandy soil. This will leave the top 6 inches vacant. A mesh basket will be inserted into the column and sand will be added to fill the column to the top. Small seedling carrots will be planted into the mesh basket. These will be maintained in the basket for one month to obtain a healthy root mass in the basket. Next, we will infest the basket with five 3rd instar TLJB grubs and allow them to feed for 48 hours. Following, we will remove the foliage from the carrot tops, and invert the column. This will then provide us with an inverted soil column with grubs at the bottom with access to food. We will bring the column to field capacity by dipping the column into a 55 gallon barrel filled with water. The column will be allowed to drain for 48 hours and then insecticide material will be added to the column. Following that 24 hours later, “3 inches” of water will be added to the column. We anticipate that for each “inch” of water added, the insecticide material will be moved down one foot. If it moves 3 feet, then the grubs at the bottom of the container should make contact with the insecticide and should die. Using this technique, we can assess variables such as soil type and adjuvants (e.g., Dyne-amic) to determine how they affect movement of the insecticide and grub mortality. We are currently developing this technique and hope to do our first tests before 1 March. This methodology will be employed to test Admire®, Venom™, and Clutch™.

2. Laboratory and Field Test the Potential of Movento™, Venom™, and Clutch™ as a TLJB Control

We have initially focused on the product Movento™ because of its potential ability to move from the plant canopy into the roots. If successful, this may be the “silver bullet” to manage TLJB grubs. The senior P.I. was contacted by Bayer research entomologists regarding field tests that they were conducting with Movento in almond orchards. One of the major questions that had not been answered was the actual efficacy of Movento in killing TLJB grubs. Thus, we designed two simple experiments to ask whether the product would kill the grubs in the absence of all the variables that impact field experiments. We designed two simple experiments using carrots as the host plant. Part of this was because of the ease of working with carrots, which TLJB grubs readily eat. Secondly, when we started the study, it was late fall and plum seedlings were unavailable until late winter. Thus, experiment 1 consisted of soaking carrot roots (i.e., the part that is consumed by humans) into three different concentrations of Movento. We were advised by one Bayer entomologist that because the carrot was a root, it should absorb the Movento. The concentrations that we used were the label rate (2 lbs ai/gallon of water), one fifth the label rate, and 5-fold the label rate. We added Dyne-amic as an adjuvant. Whole carrots were soaked for one hour in the solutions and then placed into holding cups with sandy loam soil. There was one 3rd instar TLJB grub added to each cup with a treated carrot. We also had a control that was carrots that were not soaked. Each carrot represented a replication and we had 20 replications per treatment to give 80 total insects tested. Grubs were allowed to feed for 7 days and then they were transferred to another cup with a new untreated carrot. Carrots were changed weekly to ensure a good food source for the grubs. Grubs were observed for 4 weeks. No grubs died in the experiment and most of the grubs fed on the carrots offered. We concluded that either 1) Movento did not kill TLJB grubs or 2) the manner in which we tried to offer the Movento via the carrot root was unsuitable for the mode of action of the product.

For experiment 2, we again used carrots. However, this time we planted 6 seedling carrots (about 5-6 inch roots) into large plastic containers (ca. 1 ft X 1.5 ft X 0.75 ft. in dimension) that were filled with sandy soil. The carrots were maintained for several weeks until a very good root mass had grown and the leafy tops were quite thick. Prior to treatments, the carrots were well watered and after one day, five 3rd instar TLJB grubs were placed into small holes (about the size of a human thumb) in the soil surface of each container. One grub was placed near each carrot to ensure a ready available food source and to reduce the chances of cannibalism. Two days later, after all grubs had tunneled into the soil, we treated the foliar tops of the carrots with Movento. Just as in experiment 1, we had 3 treatments and a control. Again, we used the label rate of Movento, one fifth the rate, and five-fold the rate. We added Dyne-amic as an adjuvant to the solutions. Four plastic containers of carrots were treated with each concentration of Movento using a hand mister applicator. The controls were treated with Dyne-amic alone. All plants were sprayed until run-off of the solutions. Application of the treatments was conducted on 18 December. Plants were held in a greenhouse until 20 January at which time the plants were all removed from their containers and the numbers of live and dead grubs were counted and the numbers of fed-upon carrots were recorded. The grubs were not checked for about 4 weeks because it was expected that it would take considerable time for mortality based on previous tests with diazinon and imidacloprid. All grubs were checked among the various treatments and all grubs were alive and appeared healthy. However, not many carrots appeared to have been fed upon. This may be because it was very cool in the greenhouses and many of the grubs were rolled into tight balls when we excavated them. All

grubs were transferred into small cups with untreated slices of carrots for them to feed on. Grubs will be held for 8 weeks past 20 January to determine final mortality counts.

At this point we can still not say whether Movento impacts the 3rd instar grubs. We may have not seen any impacts because 1) Movento does not move through the carrot foliage into the carrot roots; and 2) the grubs did not feed at high rates on the roots, although there were numerous feeder roots growing from the large carrots that the grubs may have fed upon. We are continuing to monitor the grubs to see if any detrimental impacts occur (i.e., lack of feeding; mortality).

We plan to repeat this experiment again when it warms up in the spring. We will also repeat a similar version of the study using plum saplings in pots to eliminate the possibility that carrots do not move the Movento from the foliage to the roots.

Studies on Venom™ and Clutch™ will be started as soon as we can collect enough grubs from the field.

3. Quantify the Impacts of Increased Soil Moisture on TLJB Biology and Mortality

No results to report at this time. With the assistance of Dr. Fichtner, we are designing experiments to meet this objective. We will be conducting the study during the spring and summer of 2010.

4. Evaluate New Insecticides (Movento™ and Venom™) to Suppress Pacific Flat Head Borer Larval Infestations within Trees

No results to report at this time. The senior P.I. has been reviewing available literature on this species to determine what management efforts have been successful for its control.