ABSTRACT

PROJECT TITLE: **Springtail and Symphylans Control with Chemigation**

PRINCIPAL INVESTIGATOR:

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SUMMARY:

Springtails and Symphylans have become more significant pests in recent years, but effective control has been difficult. In an attempt to control these pests more efficiently, we applied pesticides through the drip irrigation system of a commercial lettuce field in Salinas. Applications were made by injecting the pesticides into the drip irrigation system put in place by the grower. A total of four pesticides were tested for efficacy against springtails in this study. Two of the chemicals applied were organically certified and the other two were for conventional use. The organic pesticides were azadirachtin and a mix of rosemary and peppermint oil. The conventional pesticides used in the study were thiamethoxam and imidacloprid. These materials were compared to an untreated control to determine their effectiveness at controlling springtails. Springtail populations were sampled weekly, before the first application was made, and continuing until after the final injection had been made. Springtails were sampled by using a potato bait station underneath an inverted flower pot. After at least 24 hours had elapsed, springtails were counted on the surface of the potato as well as on the soil surface. Treatment differences were not observed when the average number of springtails was compared across all sampling dates. Springtail numbers were similar on all five of the treatment areas in this study.

PROJECT REPORT

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OBJECTIVES:

The primary objective of this study was to control springtails and symphylans in lettuce fields before they cause severe economic damage.

PROCEDURE AND RESULTS:

Sampling Springtail Populations.

To estimate springtail populations and better understand the effects of different pesticides on their survivorship, traps were baited throughout the field before and after each application was made. To place a trap in position for springtail attraction, soil was scraped away from the soil to a depth where moist soil was present. A lettuce knife was used to scrape away the soil so that existing pores and tunnels already present in the soil would not be destroyed. These holes and spaces in the soil allow springtails and symphylans to travel up and down the soil column. A potato was then placed in the newly created soil depression. A seven inch diameter white flower pot with no holes was placed upside down on the potato so that the potato did not dry out. The outside perimeter of the pot was then secured with soil to ensure that it was not moved by the wind. Flower pots were then left in the field for 24-48 hours. After the pots were in the field for the required time period, two people reentered the field to count the springtails attracted to the potato slice. To count the number of springtails present at a bait station, the potato was exposed to light by removing the pot. While one person counted the springtails on the potato, the other person counted the springtails present on the soil surface. Counts had to be done quickly as springtails would either hop away or wind would blow them off of the potato slice. A total of 200 pots were placed in the trial area on each sampling date. On each row, ten pots were placed 90 feet away from each other on a total of 20 rows.

Experimental Design.

Experimental plots were arranged in the field based on a randomized complete block design. There were four blocks and five treatments so each treatment was replicated four times. The treatments were made up of four pesticides and an untreated control. Two of the pesticides were labeled for conventional use and two were labeled for organic use. The conventional chemicals used in this trial were imidacloprid, the grower's standard for the control of springtails and symphylans, and thiamethoxam. The organically approved chemicals used were azadirachtin and a mix of rosemary and peppermint oil. All pesticides were injected into the drip system at the maximum rate allowed on the label (See Table 1). All products applied were done so in accordance with the label so that all of the plots used in the trial could be harvested for market by the grower. Because none of our treatments were labeled as crop destruct, the grower gave us a much larger area to work with. The lettuce field used in this trial was located in the Blanco area of the Salinas Valley.

Product	Active Ingredient	Rate/ acre
Ecotrol	rosemary oil, peppermint oil	64 oz.
Aza-Direct	azadirachtin	56 oz.
Platinum	thiamethoxam	11 oz.
Admire Pro	imidacloprid	10.5 oz.

Table 1. Pesticide rates used in springtail trial.

A large area is important in monitoring soil pests such as springtails and symphylans because they usually have a clumped distribution pattern where one section of a field has them, while another nearby area may have none or very low numbers that are difficult to assess when trapping. The width of each row was a standard 40-inch double bed with drip tape buried down the center of each row to minimize the need for excess irrigation. The length of each row used in this study was 960 feet. We were able to use a total area of approximately 1.5 acres. There were a total of 24 rows in this study. Rows 1, 2, 23, and 24 were buffer rows and were treated with imidacloprid, the grower's standard. The remaining middle 20 rows were made of four blocks, with five treatments randomly assigned a row in each block. Each row had one treatment applied on it to limit any chance of contamination by another treatment. Imidacloprid was applied to a total of eight rows while the remaining four treatments were applied over an area of four rows. Imidacloprid was applied on four rows as a treatment and on the four buffer rows to control populations on these rows so that they could be harvested. The concentrate of each pesticide was diluted in a 5 gallon bucket and at 200 ml per minute over a one hour period. The start and end time for each individual injection was recorded so that the total time that it took to complete each injection could be recorded. Prior to injection the drip system was run for approximately 30 minutes. After the application was completed and the bucket was empty, the drip system ran for approximately one hour to ensure that each of the treatments had been properly and evenly disbursed in the field. Before and after the irrigation, the reading from a flow meter was recorded to determine the total gallonage that had passed through the system. Prior to the wet date, springtail populations were monitored to determine their abundance in the field before any application had been made. Lettuce was planted by seed on March 7, 2008.

Before they were planted, drip irrigation lines were buried underground in each row.

The first injection was made on March 12, 2008, before the lettuce seedlings germinated. All four of the pesticide treatments were injected on this date. The untreated control treatment was treated with water in the drip system without any added chemical treatments. Imidacloprid and thiamethoxam were only applied once due to label restrictions. The two organic treatments were injected into the drip system a second and third time, on March 19th and March 26th, one week and two weeks after the initial injection.

Results.

Treatment differences were not observed when the average number of springtails was compared across all sampling dates. Springtail numbers were similar on all five of the treatment areas in this study. The five treatments were untreated control, Admire Pro, Platinum, Ecotrol, and Aza-Direct (See Figure 1). A table was created to show which days the treatments were made and the corresponding dates that springtail counts were made (See Table 2).

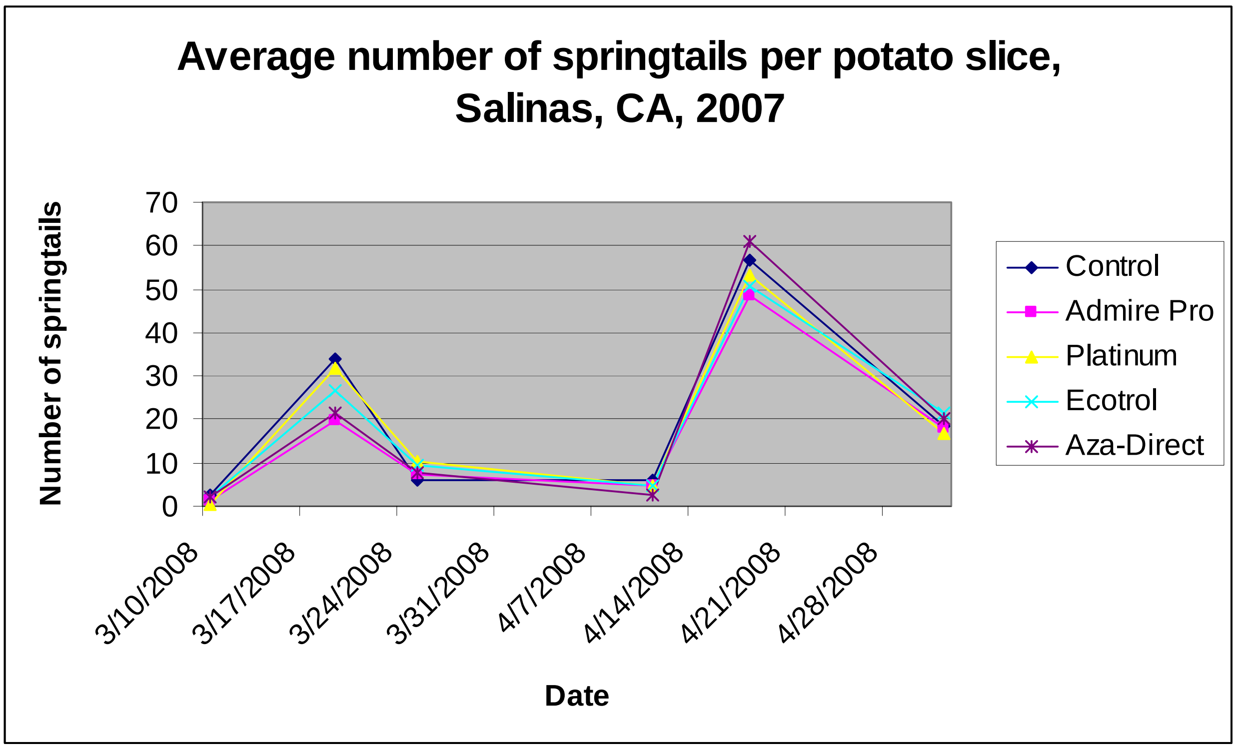

Figure 1. Average number of springtails per potato slice based on treatment and date sampled.

	Date of Injection	Springtail Count Dates after Injection
Preinjection count	**N/A**	**3/10/2008 (before injection 1)**
Injection 1	**3/12/2008**	**3/19/2008 (after injection 1)**
Injection 2	**3/19/2008**	**3/25/2008 (after injection 2)**
Injection 3	**3/25/2008**	**4/11/2008, 4/19/2008, 5/2/2008 (after injecti**

Table 2. Dates of pesticide injection and dates springtail counts were completed.

Statistical Analysis.

The springtail counts were analyzed using SAS. All data from all sample dates was analyzed as a repeated measures analysis of variance so that treatment effects could be measured across all dates. Each date was also analyzed separately to determine treatment effects by date. Treatment differences across dates were not significant ($p=0.0665$). When individual dates were viewed, however, differences in treatments were noticeable but not significant.

Conclusions.

Treatment differences in this trial were not significantly different. While the original objective of this study was to evaluate materials for suppression of symphylans, apparently springtails rather than symphylans were causing crop damage in the field where the trial was carried out. Overall springtail numbers were low. Future studies should incorporate information on irrigation into the sampling plan. Soil moisture influences where symphylans and springtails are in the soil profile, and therefore the densities at which they are trapped near the soil surface. Further studies should be implemented to develop more effective control measures for springtails and symphylans in the future. These pests still remain difficult to control in lettuce and many other crops that they inhabit.

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