

Integration of neonicotinoid insecticides into strawberry IPM programs for root, fruit and foliage protection

Annual Report to The National Strawberry Grower's Association

Status: Continuation. Strawberry plants are now established on the MSU campus, the data from 2004 are very promising, and we wish to continue the work to learn more about these new insecticides for strawberry production (see below). In addition, the weather in 2004 was not conducive to insect pest abundance at our cooperator farms. For these reasons, we are proposing a continuation of this project with some changes to the objectives, to the North American Strawberry Grower's Association for 2005.

Team Leader & Team Members

Rufus Isaacs, Keith Mason, Bob Tritten, and Mira Danilovich

Objectives

- 1. Compare efficacy of foliar neonicotinoids against TPB and other early-season insect pests.*
- 2. Determine efficacy of post-harvest neonicotinoids for control of root weevil grubs.*
- 3. Compare neonicotinoids for their efficacy for control of strawberry insect pests when applied at planting.*

Methods

A field trial was established in Sutton's Bay, Michigan at the farm of Gary Bardenhagen in a field of Jewell strawberry, with five treatments replicated six times. Applications were made to 60 square foot plots on May 28 at the start of bloom using a backpack sprayer, delivering spray liquid at the equivalent of 100 gallons of water per acre. Abundance of strawberry aphid and the number of buds clipped by the strawberry clipper were counted in 10 1ft lengths of the field seven days after treatment (DAT) and 25 DAT. Because tarnished plant bugs were at low density and are hard to assess on the plants, we took 100 berry samples from each plot at harvest and measured the % catfacing and average weight of the berries.

Results and Discussion

Due to low pest pressure at this field, differences between treatments were difficult to determine. However, there was no aphid infestation on plants in the plots treated with the neonicotinoids Provado 1.6F and Actara 25WG when assessed seven days after treatment (Table 1).

Table 1. Effect of insecticides on early season insect pests

Treatment	Average aphids		Average clipped buds	
	7 DAT	25 DAT	7 DAT	25 DAT
Untreated	1.8	2.0	0.0	3.5
Thiodan 3EC 1.3qt	0.2	1.3	0.0	4.3
Provado 1.6F 3.75 oz	0.0	2.0	0.2	2.8
Assail 70WP 1.1oz	0.3	1.2	0.0	3.3
Actara 25WG 3.5oz	0.0	1.0	0.0	6.2
	P=0.09	P=0.62	P=0.42	P=0.57

When catfacing was assessed after harvest, this injury was found on fruit in all treatments except those treated with Provado. However, treatments were not significantly different because of variability across the plot. This product has been tested in other crops and demonstrated good activity on tarnished plant bug. We intend to seek additional funding to repeat this field trial in a one year-old planting of strawberries (cv. Surecrop and cv. Annapolis) on the MSU campus.

2. Determine efficacy of post-harvest neonicotinoids for control of root weevil grubs.

Methods

A field trial to address the efficacy of post harvest applications of neonicotinoids has been established at a strawberry farm in SE Michigan at the Farm of Chad Weiland in a field of Honeyoye. Two rates of the two neonicotinoids Admire 2F (16 oz/acre and 25 oz/acre) and Platinum 2SC (5 oz/acre and 8 oz/acre) were applied to 60 sq ft plots in a Latin Square design with five replicates of each treatment including 5 untreated plots. Applications were made after harvest, on 5 August 2004, with a backpack sprayer (50 psi; 100 gal per acre) and irrigated in with 0.5 in. of irrigation. This trial will be assessed during the spring of 2005. At that time, the number of grubs per plot will be quantified by taking 10 randomly placed 0.1 sq ft soil samples per plot using a golf course cup cutter. The root health of the plants will be assessed by removing 10 randomly selected plants per plot, and weighing the root mass.

Results and Discussion

This field trial to be assessed in Spring 2005 (see continuation proposal).

3. Compare neonicotinoids for their efficacy for control of strawberry insect pests when applied at planting.

Methods

During 2004, we attempted to do this trial at a commercial site, but were not allowed an untreated area. To allow us more flexibility over treatments, we planted a 0.17 acre plot of strawberries (cv. Surecrop and cv. Annapolis) at a site on the MSU campus. Treatments (Lorsban 4E – 64 oz/acre; Admire 2F - 16 oz/acre; Admire 2F – 25 oz/acre; Platinum 2SC – 5 oz/acre; Platinum 2SC – 8 oz/acre; untreated control) were applied to 60 sq ft plots in an RCBD with 6 replicates on 9 June 2004 with a backpack sprayer (50 psi; 100 gal per acre) and irrigated in with 0.75 in of precipitation. However, we did not

get potato leafhopper pressure in the field even when insects were brought to the site. To ensure that some data were collected from this trial in 2004, we planted strawberries (cv. Surecrop) in the greenhouse, treated them with insecticides (Lorsban 4E omitted) via drench to mimic an at-planting application, then manually infested them with field collected potato-leafhoppers and caged them on the plants.

Results

Plants were assessed 20 DAT for potato leafhopper survival, by carefully opening cages and recording the number of dead and live leafhoppers. We found that the high rate of Admire and the Platinum low rate both caused increased mortality of potato leafhoppers compared to the untreated control (Figure 1). The rate effect for Platinum was unexpected, but there was considerable variability in the trial that may explain this result.

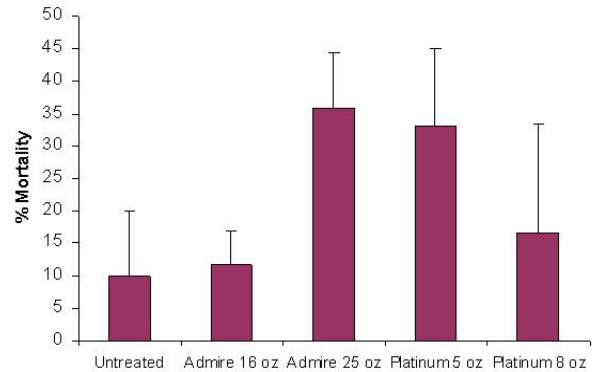


Fig. 1. Effect of soil-applied neonicotinoids on potato leafhopper mortality.

Economic Implications

Provado and Assail may be comparably priced options to control pests such as tarnished plant bug, aphid or whitefly. These compounds are only \$3 to \$5 more per acre to use than Thiodan. Actara does not seem to be a viable option from an economic standpoint as it is nearly twice the cost of Thiodan. Neonicotinoid soil insecticides are more than twice as expensive as Lorsban, and this pricing will likely limit the utility of these new compounds unless multiple pests can be targeted at the same time.

Table 2. Prices per acre for foliar and soil applied insecticides for possible use in strawberry. Conventional insecticides are included in shaded rows for comparison.

	Compound	Price per acre
Foliar	Thiodan 3EC 1.3qt	\$10.40
	Provado 1.6F 3.75 oz	\$14.93
	Assail 70WP 1.1oz*	\$13.75
	Actara 25WG 3.5oz*	\$21.00
Soil	Lorsban 4E 64 oz+	\$19.84
	Admire 16 oz	\$75.52
	Admire 25 oz	\$118.00
	Platinum 5 oz*	\$45.00
	Platinum 8 oz*	\$72.00

* not labeled

+ labeled for prebloom or post harvest use only

Activities, Accomplishments, and Impacts

This project was presented as part of Dr. Isaacs' presentation in the strawberry program at the Great Lakes Expo in 2004. It will also be presented at the North American Strawberry Growers meeting in the spring of 2005. This is the first report from this work, which is still ongoing. We expect to publish results in either *Advances in Strawberry Culture* or *Arthropod Management Tests*. This project will provide growers with Michigan-based information on the relative efficacy of these new insecticides as they become registered for use in strawberry. We expect many different neonicotinoids to receive registrations in this crop in the coming years, and these data will form the foundation of our recommendations in the E-154 publication, Michigan Fruit Management Guide.

Funding Partnerships

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