

Title:	Testing the Efficacy of Insecticides and Fungicides Allowed for Organic Vegetable Production		
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Performing Department

CCE Integrated Pest Mgmt

Non-Technical Summary

While organic certification standards and practice prescribe an approach to pest management that integrates soil health, rotation, resistant varieties, and other cultural practices, damage from certain pests is still present at levels requiring intervention in many years. Efficacy information on many products allowed for organic production is scarce and difficult for farmers to find. Organic vegetable farmers and those contemplating a transition to organic need reliable information on the effectiveness of the products they are allowed to use. In addition, new products are coming on the market for which objective efficacy information is not available. This project addresses this issue by testing the efficacy of insecticides and fungicides allowed for organic production against high-priority pests identified by organic vegetable farmers in New York.

Accomplishments

Major goals of the project

The goal of this project is to provide organic vegetable farmers with information on the effectiveness of insecticide and fungicides allowed for organic production. This information will help existing organic farmers be more profitable by increasing marketable yield and quality, and allow farmers considering a transition to organic to assess their risks of crop loss from insect and disease pests.

What was accomplished under these goals?

We generated data on the efficacy of insecticides and fungicides allowed for organic production against five insect and disease pests that organic farmers have identified as important production challenges. Results are summarized below:

Swede midge on broccoli field trial:

Treatments included Azera (pyrethrum plus azadirachtin) at 3.5 pt/A, Grandevo (Chromobacterium substugae strain PRAA4-1 and spent fermentation media) at 3 lb./A, Surround (kaolin clay) at 0.5 lb./gal, Venerate (heat-killed Burkholderia sp.) at 4 qt/A, Veratran (Sabadilla alkaloids) at 15 lb/A, and an untreated control. Treatments were initiated 7/7 and repeated for five consecutive weeks. Unfortunately our swede midge population has disappeared from this field. We will conduct trials at a commercial farm with a known infestation next season.

Striped cucumber beetle (SCB) field trial and bioassay:

Treatments included: Azera (1.4% pyrethrum plus 1.2% azadirachtin) at 3.5 pt/acre, Grandevo (Chromobacterium substugae strain PRAA4-1 and spent fermentation media) at 2 lb/acre, Venerate (heat-killed Burkholderia spp. strain A396 cells and spent fermentation media), Veratran (Sabadilla alkaloids) at 15 lb/acre, Surround (kaolin clay) at 0.5 lb/gal, and an untreated control. Nu-film P at a rate of x per acre was included with each treatment

Field trial: Four flats of six zucchini plants each were sprayed with each treatment. Plants were in the one true leaf stage. Flats were arranged on the surface of the soil in a randomized complete block design, with each flat constituting a replicate. Beetles were allowed to colonize the plants for 48 hours, at which time each flat was photographed to be evaluated for percent leaf area consumed. Images are being processed for analysis.

Bioassay: Leaf disks were dipped into the solutions used to treat the field trial plants and placed in small, ventilated cages. The Surround treatment was not included in the bioassay. Ten field-collected adult SCB were introduced into each cage and allowed to feed for 48 hours, when live and dead beetles were counted. SCB mortality was 79% in the Azera treatment. No

other treatment resulted in significant mortality compared with the untreated control.

Squash bug on zucchini field trial:

Treatments included: Azera (1.4% pyrethrum plus 1.2% azadirachtin) at 3.5 pt/acre, Grandevo (*Chromobacterium substugae* strain PRAA4-1 and spent fermentation media) at 2 lb/acre, Venerate (heat-killed *Burkholderia* spp. strain A396 cells and spent fermentation media), Veratran (*Sabadilla* alkaloids) at 15 lb/acre, Surround (kaolin clay) at 0.5 lb/gal, and an untreated control. Treatments were applied on 8/17 and 27. Insect colonization of the plots was very uneven so results were not useful. We will conduct a bioassay with this insect next season.

Fulvia leaf mold on tomato:

Treatments included Actinovate AG (*Streptomyces lydicus* WYEC 108) at 6 oz/50 gal, Double Nickel (*Bacillus amyloliquefaciens* strain D747) at 3 lb/A, Regalia (extract of *Reynoutria sachalinensis*) at 3 pt/5p gal, a mixture of Actinovate and Regalia at the rates stated above, Zonix (Rhamnolipid biosurfactant) at 300 ppm, Oxidate (Hydrogen dioxide) at 1 gal/100 gal, and Nordox (Cuprous oxide) at 1.25 lb/A. Treatments were applied 8/17 and plants inoculated with the pathogen 8/19. Treatments were applied three more times on 8/24 and 13, and 9/9. The Nordox, Oxidate, and Zonix treatments resulted in the highest level of disease suppression, with Regalia and the Regalia/Actinovate treatments also significantly different from the untreated control.

Cucurbit downy mildew on cucumber:

Treatments included Actinovate AG at 6 oz/50 gal, Double Nickel at 3 lb/A, Regalia at 3 pt/5p gal, a mixture of Actinovate and Regalia at the rates stated above, Zonix at 300 ppm, Oxidate at 1 gal/100 gal, and Nordox at 1.25 lb/A, Champ WG at 0.25 lb/A, and Cueva at 1 gal/100 gal. The Actinovate, Regalia, Actinovate and Regalia tank mix, and Double Nickel treatments were applied 7/16 and 7/23, before disease was present. All treatments were applied 7/30, 8/6, and 8/13. All treatments resulted in disease levels significantly lower than the untreated control, but none provided commercially viable levels of disease suppression.

Late blight management on tomato:

Two late blight trials were conducted: one using the late blight Decision Support System (<http://blight.eas.cornell.edu/blight/>) to time copper fungicide (Nordox at 1.25 lb/A) applications on susceptible and moderately resistant varieties and one to test a grower reported practice of alternating copper fungicide and Oxidate applications weekly. We found that the Decision Support System provided equivalent levels of late blight control with five fewer fungicide applications for a susceptible tomato variety and six fewer for a moderately resistant variety. This result reflects the relatively dry conditions of the 2015 growing season and will not hold for all growing seasons.

In the second trial we found that alternating weekly applications of copper fungicide with Oxidate did not provide higher levels of late blight control than biweekly copper fungicide applications.

What opportunities for training and professional development has the project provided?

This project provides information that allows PIs to speak knowledgeably with organic vegetable farmers and Extension field staff about their pest management options. It also provides Extension field staff working with organic vegetable farmers information they need to help growers successfully manage their insect and disease pests. Results from the trials were shared with Extension field staff at an annual in-service training.

How have the results been disseminated to communities of interest?

The results of these trials are shared with farmers, extension educators, consultants and others by incorporating them into Organic Production Guides (http://nysipm.cornell.edu/organic_guide/default.asp), presenting it at educational meetings and in-service trainings, making it available on the New York State Integrated Pest Management Program web site (<http://nysipm.cornell.edu/grantspgm/projects/default.asp>). They are also shared as needed with growers on visits to their farms.

Formal presentations that included information from these trials:

Seaman, A. J. Organic efficacy trial update and discussion. Cornell Cooperative Extension Agriculture and Food Systems In-Service. November, 2015.

Seaman, A. J. OMRI Listed Insecticides and Fungicides: How Well do they Work? NOFA-NJ Winter Conference. 1/25/15

Lange, H. W. Field trials utilizing products approved for organic use to control plant pathogens and insect pests. Cornell College of Agriculture and Life Sciences Annual Pesticide Updates, Geneva and Ithaca. April, 2015.

Smart, C. D. 1 hour discussion with 40 growers about disease problems common during the 2015 growing season. Twilight meeting in Eden Valley, NY August 19, 2015.

Smart, C. D. Northern NY (Essex and Clinton counties) visit to six mixed vegetable growers suffering from many disease problems, including high tunnel problems. August 17-18, 2015. A 1 hour visit to each of six farms, talking with at least 1 grower per farm.

Smart, C. D. Geneva Community Garden Disease Discussion. May 20, 2015. 30 minute talk to 10 gardeners.

Smart, C. D. Webinar for beginning vegetable growers entitled 'Vegetable Diseases', March 12, 2014. This was a 1 hour webinar to about 30 participants.

Smart, C. D. Empire State Producers Expo. January 20, 2015, Syracuse NY. Managing black rot, downy mildew and Alternaria leaf spot in cole crops. 20 minute talk to 30 growers and educators.

Shelton, A. W. Swede midge- a new pest of cole crops. Great Lakes Expo, Grand Rapids MI. Dec. 9, 2015

What do you plan to do during the next reporting period to accomplish the goals?

We will continue to conduct efficacy trials with products we found to be promising in previous trials and with new products that become available, against pests identified as production challenges by organic vegetable farmers.

Target Audience

Target audiences reached during this reporting period include vegetable farmers, Cornell Cooperative Extension colleagues, crop consultants, and graduate students.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2016	YES

Citations

Lange, H.W., C.D. Smart, and A.J. Seaman. 2016. Evaluation of fungicides allowed for organic production on downy mildew of cucumber, 2015. Submitted to Plant Disease Management Reports.

Lange, H.W., C.D. Smart, and A.J. Seaman. 2016. Evaluation of fungicides allowed for organic production on leaf mold of tomato, 2015. Submitted to Plant Disease Management Reports.

Other Products**Product Type**

Data and Research Material

Description

We conducted trials and analyzed data, wrote publications, and gave presentations on the results of four trials that created efficacy data for insecticides and fungicides allowed for organic production. This data will benefit organic vegetable growers and Cooperative Extension educators in New York and other Northeastern states as well as Ontario, Canada

Changes/Problems

Because the swede midge population at our research site has crashed, we will conduct the next swede midge trial on a commercial farm with a known swede midge population, as this continues to be an important pest for organic crucifer growers in NY. We will also focus on bioassays rather than field trials for striped cucumber beetle and squash bug because populations in the field are not reliable or evenly distributed.

