February 2022
VEPART Research Update

It's February and despite the blanket of snow that currently sits atop the landscape, many of us are deep in the depths of planning for the upcoming growing season. What better way to warm up from one of coldest Januarys on record than with an update on our latest pest management projects!

In this research brief we will be sharing results from the following research projects:

- Pre- and Post-Harvest Strategies for ***leek moth*** Control on Diversified Vegetable Farms
- Cultural and biological control tactics for the management of ***wireworms*** in root crops
- Evaluation of ***swede midge*** tolerance and resistance among four popular kale varieties
- Vermont Pest Scouting and Monitoring Program

PARTICIPATORY ACTION RESEARCH

Over the past 7 years, our research team has had the great opportunity to work with a host of growers, gardeners, and researchers throughout Northeast. Our research framework, technically referred to as participatory action research (PAR), is the heart of our work. The three components of this research paradigm: participation, research, and action, each play a critical role in the success of our projects.

- First, **participation** relates to the collaborative process of working with farmers and other community members in the development and execution of each and every research idea.
- Second, we set out to conduct ***relevant research*** based upon the experience and needs shared by growers through a participatory process.
- Finally, ***action*** refers to the concrete steps that we take to leverage our research results to affect change in the communities we serve.

We would also like to acknowledge that without the participation and support of growers and other farm community members, our work has no value.

2021 LEEK MOTH RESEARCH UPDATE

Our team is currently concluding a multi-year project to assess the efficacy of pre and post-harvest strategies for managing leek moth larvae (Figure 1) in onion crops.

Figure 1. Leek moth larva, pupa & damage on garlic & onion

Parasitoid Wasp Field Trials

In collaboration with the Canadian biological control company, Anatis Bioprotection, we are currently testing the efficacy of the parasitoid wasp, *Trichogramma brassicae*, as a biological control option for managing leek moth in onion crops. This past year we completed our third consecutive season testing the efficacy of these parasitoid wasps. As with previous seasons, the release of *T.brassicae* within onion plots significantly reduced the incidence of LM larval damage in onion leaves (Figure 2).

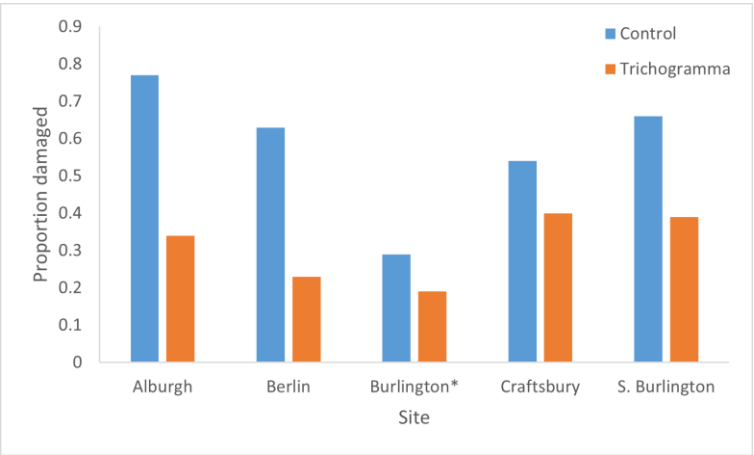


Figure 2. Leek moth damage with and without Trichogramma wasps releases

Post Harvest Trials

Onion topping as a cultural control

Because leek moth typically lay their eggs in the above ground tissue of onions, we tested the utility of onion topping as a strategy to remove larvae before they can move into the onion bulb and cause damage during curing or long-term storage. At harvest, onions were clipped at 1in, 6in, and 10in from the shoulder, and an uncut control (i.e. full length leaf tube). We assessed both the effect on leek moth damage and onion quality.

Onion topping displayed a significant effect on the incidence of leek moth damage during curing (Table 1). **"Topped" onions exhibited significantly fewer larval exit holes when compared to onions cured with intact leaf tubes**. These results suggest that topping prior to curing may prevent leek moth larvae from feeding upon stored onions by never bringing them in from the field in first place. In addition, larvae are likely found farther than 10" from the shoulder of the bulb at the time of harvest.

Onion topping and long-term storage

Onion topping did not significantly affect onion quality after six months of cold storage in any of our research trials. Sugar content was between 11-11.5% for all four treatments and was not significantly different.

WIREWORM RESEARCH UPDATE

The objective of our wireworm project is to assess potential organic strategies to reduce the likelihood of significant wireworm pressure in sweet potatoes.

Sweet potato exhibiting wireworm feeding galleries (above). Click beetle larva, aka wireworm, emerging from soil (below)

Specifically we looked to:

- Assess different cover crops (rye and oats) to determine how they attract or repel wireworms.
- Evaluate the performance of several biorational soil drenches for wireworm management entomopathogenic fungi for biological control of wireworms

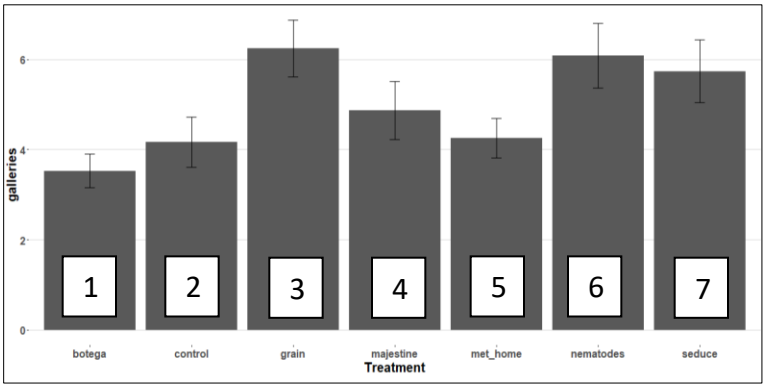
Cover crop assessment

During field season 2021 we planted two of the most commonly used cover crops to assess their effect of wireworm pressure: Oat and winter rye. The trials were replicated on five farms in the northwest region of Vermont. However, only two of the trials exhibited high enough levels of wireworm pressure to evaluate the cover crops. (Burlington and West Haven)

Cover crop treatments (oat/rye) at the Burlington and the West Haven sites exhibited opposing results. Sweet potatoes from winter rye treatments in Burlington displayed significantly more wireworm galleries when compared with oat cover crop treatments. While at the West Haven site, oat cover crop treatments displayed significantly higher levels of wireworm pressure when compared to the rye cover crop treatments. Provided the conflicting results, we will be conducing this trial again this upcoming season and will add a new site to the mix.

Biopesticide trial

We tested several different biorational soil amendments and evaluated their effect on wireworm pressure (measured as the number of wireworm feeding galleries) in sweet potato plantings.



The treatments and their primary biological control agent were the following (from left to right in the figure):

1. Beuavaria (entomopathogenic fungus- liquid) = **BoteGHA**
2. Control (no amendment) = **control**
3. Grain control (sterilized grain) = **grain**
4. Majestine (heat-killed bacteria) = **Majestine**
5. Metarhizium (entomopathogenic fungus - grain) = **met-home**
6. Entomopathogenic Nematodes (three species) = **nematodes**;
7. Spinosad (insect bait) = **Seduce**.

Biorational soil amendments failed to significantly reduce wireworm damage, when compared to untreated control. However, the *Beuavaria* fungi did exhibit a decreasing trend. Finally, the **grain controls (sterilized barley and millet) significantly increased the incidence of wireworm damage when compared to the untreated control.** The increase in wireworm pressure from barly and millet grain is important, especially for those growers that rotate different grains into their crop schedule. Some of those grains may act as attractants for wireworms.

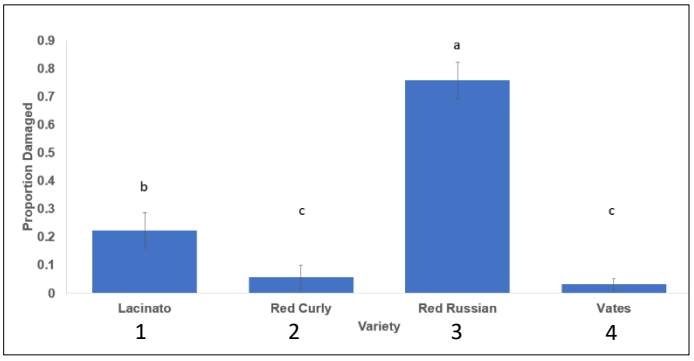
We will be repeating all of the wireworm trials this upcoming season and will look to add site that have a history of high wireworm pressure.

2021 KALE VARIETY TRIAL UPDATE

We performed a kale varietal trial to evaluate the relative attractiveness of different kale varieties for swede midge. We assessed the incidence of swede midge damage among four commonly planted kale varieties. Damage incidence was assessed at harvest. Damage was cumulative and we didn't harvest any kale until the data were collected on. As such, the entire season's damage is reflected in the final damage assessment.

The four varieties of kale were selected based upon a grower survey distributed to several regional grower listserves. They included:

1. Lacinato
2. Red Curly
3. Red Russian
4. Vates



At harvest, ***B. oleracea* varieties (Vates, Red Curly, and Lacinato) showed far less swede midge damage than *B. napus* (Red Russian)**. Only 3% of the Vates and 6% of the Red Curly plants were damaged, which was significantly less that the 22% of Lacinato plants damaged, and all three were significantly less than the 76% of the Red Russian plants damaged.

Provided the encouraging results of this varietal trial, we are in the process of developing a project to assess the viability of red ***Russian kale (B. napus) as a potential trap crop for swede midge for kale or potentially other brassicas.*** The data collected from these follow-up trials will allow us to better estimate the strength of host preference for swede midge. These trials will generate important data for the development of a novel IPM tactic for the management of swede midge on Northeastern vegetable farms by exploring a new potential cultural control – trap cropping!

2021 VERMONT PEST SCOUTING AND MONITORING PROGRAM

This past season we piloted a pest and disease scouting program to provide consistent and coordinated information on the seasonal dynamics of many high priority native and non-native pest insects and diseases for VVBGA members. The positive feedback that we received from VVBGA members throughout last season confirmed the utility of the program. As a result, we are planning to continue the monitoring program and are looking to expand our efforts to include another monitoring sire somewhere in central Vermont to pair with our current Burlington location.

THANK YOU AND STAY IN TOUCH

As always, we thank you for any and all feedback that you may have regarding our collective work.

For more information regarding any of our research and/or monitoring efforts or participating in any of our future research, check out our website: go.uvm.edu/pests

Feel free to reach out to our research team at any time!

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- Pre- and Post-Harvest Strategies for leek moth Control on Diversified Vegetable Farms [LNE20-400]
- Cultural and biological control tactics for the management of wireworms in root crops [LNE19-379]

New England Vegetable & Berry Growers Association (NEV&BGA)

- Evaluation of swede midge tolerance and resistance among four popular kale varieties

Vermont Vegetable and Berry Grower's Association

- Vermont Pest Scouting and Monitoring Program

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