2021 Ohio Vegetable & Small Fruit Research & Development Program

# Insecticides for Control of Onion Thrips in Direct-Seeded Green Onions

## Final Report

**Principal Investigators:** Dr. Douglas Doohan, Catherine Herms and Allison Robinson, Horticulture and Crop Science, OSU.

## Take Home Message

- Onion thrips (*Thrips tabaci*) are a major pest for green onion growers in Ohio's muck soil regions, and a limited number of effective management tools are available for control. We conducted research in 2021 to identify effective pesticides, among products that are and are not currently available on the market, to provide more thrips control options for growers.
- A replicated RCBD field experiment was conducted in commercially planted green onions in muck soils near Hartville, Ohio, with an untreated control and 9 foliar-broadcast insecticide treatments:
  - 5 products registered for onion thrips control in green onion: Radiant SC, Agri-Mek SC, PREV-AM, Entrust SC and Torac;
  - 3 products registered for thrips in other crops: Sivanto HL, Harvanta 50 SL and Rimon 0.83 EC; &
  - A tank mix of Agri-Mek SC and PREV-AM.
- The first application was done on 7/28/21 when green onions were at the 3-leaf stage, followed by subsequent applications on 8/5/21, 9/3/21 and 9/17/21. Treatment effectiveness was evaluated 1-2 weeks after application by counting the number of thrips larvae and adults on 10-15 plants per plot.
- Four of the 5 products registered for control of onion thrips in green onion, Radiant SC, Agri-Mek SC, Entrust SC and Torac, provided effective thrips control, even under incredibly high pest pressure. PREV-AM provided poor control, especially as thrips pressure increased. The tank mix of Agri-Mek SC and PREV-AM performed similarly well to Agri-Mek SC alone.
- Of the 3 products registered for thrips control in crops other than green onion, Harvanta 50 SL and Sivanto HL provided effective thrips control, while Rimon 0.83 EC provided little to no control. Based on final thrips counts, there is some indication that Sivanto HL may provide a shorter period of control compared to the other effective products, and should be retested in a future trial.
- Entrust SC, which performed as well as the current industry standard, Radiant SC, offers an OMRI-certified treatment option for onion thrips in green onion.
- Harvanta 50 SL and Sivanto HL have the potential to provide additional effective onion thrips control options for green onion growers if registered for use in that crop.

## Methods

**Study Design**: A field experiment on insecticidal control of onion thrips in green onion was conducted in 2021 on the commercial farm of K.W. Zellers and Sons, Inc. (13494 Duquette Avenue NE, Hartville, OH 44632). The experimental design was a randomized complete block (RCB) with 4 replications per treatment (Figure 1). The study area consisted of five 5-ft-wide beds of green onions (total width of ~37 feet) by 180-ft length of row. Each experimental unit (i.e. plot) was 20 feet of row in one 5-ft wide bed.

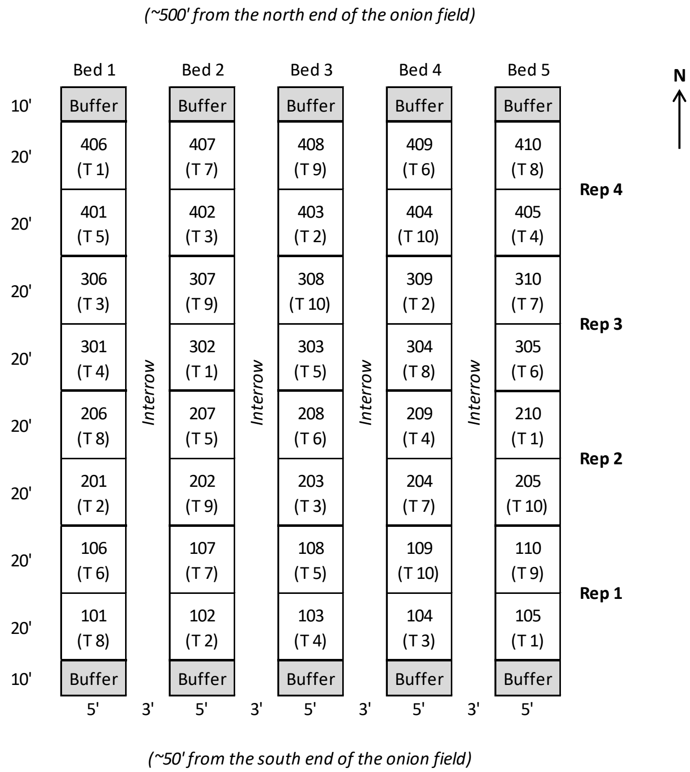


***Figure 1.*** *Layout of experimental field plots, with treatment number in "( )".*

**Crop & Target Pest**: The spring (bunching) onion (*Allium cepa*) 'Feast' F1 hybrid was seeded into 5-ft-wide beds (74 inches on center) on 6/22/21, with 5 rows/bed at 12.5-in spacing and 18-20 plants/row ft. The target pest was onion thrips, *Thrips tabaci*. The grower reported a history of annual thrips infestations from natural overwintering populations in their green onion fields.

**Treatments**: Treatments consisted of an untreated control, 8 individual insecticide treatments and 1 combination treatment, for a total of 9 insecticide treatments (Table 1). Five of the 8 insecticides were registered for control of onion thrips in green onions, and 3 were registered for control of thrips in crops other than green onions. All applications were made using a backup sprayer with $CO_2$ propellant and a 3-nozzle boom (TeeJet XR 11003 VS nozzles at 20 inch spacing) at an application rate of 30 gal/A.

**Applications & Data Collection**: Plots were flagged on 7/19/21, and four treatment applications were made (7/28/21, 8/5/21, 9/3/21 and 9/17/21) (Table 1). Prior to Application 1 (PRE), 20 random onion plants in each replication were inspected to determine the baseline number of leaves and thrips (larvae and adults). To evaluate treatment effectiveness, the number of thrips larvae and adults were counted on 15 randomly selected plants per plot 7 days after treatment (DAT) for Applications 1, 2 and 3, and on 10-12 randomly selected plants per plot 3 DAT and 10 DAT for Application 4. Since Application 3 occurred 29 days after Application 2, a new baseline thrips count (15 plants/plot) was done prior to Application 3. For each evaluation, leaf number was also recorded for 20 onion plants per replication, and thrips plant counts in each plot were converted to number of thrips per leaf. All plant sampling was non-destructive, except for the last two evaluations (following Application 4). No phytotoxicity was observed for any of the treatments. Yields were not taken.

***Table 1.*** *List of onion thrips treatments and application dates (with crop growth stage).*

| Trt. No. | Product (EPA Reg. No.) | A.I. | Registrant | Rate | Adjuvant (Rate) | Application Dates (Crop Growth Stage) |
|---|---|---|---|---|---|---|
| 1 | Untreated (N/A) | N/A | N/A | N/A | N/A | N/A |
| 2 | Radiant SC (62719-545) | Spinetoram | Corteva | 10 fl oz/A | Induce (0.5% v/v) | 7/28/21 (3-lf)<br>8/5/21 (4-lf)<br>9/3/21 (6-lf)<br>9/17/21 (7-lf) |
| 3* | Sivanto HL (264-1198) | Flupyradifurone | Bayer | 7 fl oz/A | | |
| 4 | Agri-Mek SC (100-1351) | Abamectin | Syngenta | 3.5 fl oz/A | | |
| 5 | PREV-AM (72662-3) | Sodium tetraborohydrate decahydrate | OroAgri | 0.4% v/v | N/A | |
| 6 | Agri-Mek SC + PREV-AM | Abamectin + Sodium tetraborohydrate decahydrate | Syngenta + OroAgri | 3.5 fl oz/A + 0.4% v/v | | |
| 7* | Harvanta 50 SL (71512-26) | Cyclaniliprole | ISK | 16.4 fl oz/A | Induce (0.5% v/v) | |
| 8* | Rimon 0.83 EC (66222-35) | Novaluron | UPL | 12 fl oz/A | | |
| 9 | Entrust SC (62719-621) | Spinosad | Dow Agro-Sciences | 8 fl oz/A | | |
| 10 | Torac (71711-31) | Tolfenpyrad | Nichino America | 24 fl oz/A | | |

**Products registered for thrips control, but not in green onions.*

**Application Delays**: The first two applications were made one week apart, as planned. However, due to low pest pressure, Application 3 was delayed three weeks to allow thrips populations to build. For Application 4, when we arrived to conduct the 7 DAT evaluation for Application 3 and make the fourth application, the grower had already started harvesting the green onions adjacent to the study area. It appeared that the number of thrips was higher in plots adjacent to the harvested area regardless of treatment. We felt it best to delay Application 4 for one week to allow the grower to finish harvesting the adjacent onions and the thrips population to normalize.

Results

**Baseline Thrips and Crop Data**: The starting number of thrips prior to Application 1 (7/28/21) was 0.3 thrips/leaf (0.2 larvae/leaf and 0.1 adults/leaf). Onion plants averaged 3 leaves/plant. The grower considered these thrips numbers sufficient for initiating a control program.

**Thrips Response to Insecticides**: Most of the thrips observed during the study were larvae (Table 2). Larval and adult thrips populations were low (< 1 thrips/leaf) for the first three applications (Table 2.a-d), limiting the potential for treatment differentiation. However, larval numbers increased greatly preceding Application 4, after the grower harvested all adjacent onions and plots became a refugia, as reflected in the last two evaluations (Table 2.e, f).

- One week after Application 1, the untreated, PREV-AM, Rimon 0.83 EC and Torac provided the least control of thrips larvae compared to Radiant SC and Entrust SC (Table 2.a).
- One week after Application 2, untreated plots had more larvae than most of the other treatments (Table 2.b), but no residual treatment effect on thrips number was detected 4 WAT (Table 2.c).
- One week after Application 3, Rimon 0.83 EC provided the least control compared to Radiant SC, Entrust SC, Sivanto HL, Agri-Mek SC, Harvanta 50 SL and Torac (Table 2.d).
- Following Application 4, thrips counts were higher in the untreated, PREV-AM and Rimon 0.83 EC treatments compared to all others. Larval number ranged from 3.5 to 6.8 larvae/leaf at 3 DAT and 9.3 to 10.2 larvae /leaf at 12 DAT for those three treatments, while $\leq$ 1 larva/leaf was observed for most of the other treatments (Table 2.e, f). At 12 DAT, Silvanto HL averaged 3.3 larvae/leaf, but this was not statistically different from the other treatments providing effective thrips control.
- The combination of Agri-Mek SC and PREV-AM performed similarly to Agri-Mek SC alone (Table 2).

***Table 2.*** *Response of thrips larvae and adults (#/leaf) to insecticide treatments: (a) 7 DAT for Application 1; (b) 7 DAT for Application 2; (c) 29 DAT for Application 2 (and just prior to Application 3); (d) 7 DAT for Application 3; (e) 3 DAT for Application 4; and (f) 12 DAT for Application 4.*

| (a) 7 DAT for Application 1 (8/4/21) | | | |
|---|---|---|---|
| **Trt** | **# Larvae / leaf (SD)** | **# Adults / leaf (SD)** | **# Ttl / leaf (SD)** |
| 1 (Unt) | 0.12 (0.04) a | 0.02 (0.02) | 0.14 (0.03) |
| 2 (Rad) | 0.02 (0.03) b | 0.02 (0.02) | 0.04 (0.05) |
| 3 (Siv) | 0.08 (0.06) ab | 0.05 (0.05) | 0.12 (0.09) |
| 4 (Agr) | 0.10 (0.01) ab | 0.03 (0.02) | 0.12 (0.02) |
| 5 (PRE) | 0.13 (0.04) a | 0.05 (0.01) | 0.18 (0.04) |
| 6 (A+P) | 0.06 (0.01) ab | 0.04 (0.06) | 0.09 (0.06) |
| 7 (Har) | 0.09 (0.06) ab | 0.03 (0.03) | 0.12 (0.07) |
| 8 (Rim) | 0.11 (0.08) a | 0.03 (0.02) | 0.14 (0.10) |
| 9 (Ent) | 0.04 (0.05) b | 0.05 (0.06) | 0.09 (0.10) |
| 10 (Tor) | 0.10 (0.01) a | 0.05 (0.04) | 0.14 (0.05) |
| ANOVA | P=0.0024; F=4.01; df=9, 27 | P=0.8917; F=0.46; df=9, 30 | P=0.1032; F=1.86; df=9, 27 |

| (b) 7 DAT for Application 2 (8/12/21) | | | |
|---|---|---|---|
| **Trt** | **# Larvae / leaf (SD)** | **# Adults / leaf (SD)** | **# Ttl / leaf (SD)** |
| 1 (Unt) | 0.08 (0.05) a | 0.01 (0.02) ab | 0.09 (0.04) a |
| 2 (Rad) | 0.01 (0.01) b | 0.01 (0.01) ab | 0.02 (0.01) b |
| 3 (Siv) | 0.02 (0.01) b | 0.02 (0.02) a | 0.05 (0.03) ab |
| 4 (Agr) | 0.02 (0.02) b | 0.00 (0.00) b | 0.02 (0.02) b |
| 5 (PRE) | 0.02 (0.01) b | 0.00 (0.00) b | 0.02 (0.01) b |
| 6 (A+P) | 0.03 (0.02) b | 0.00 (0.00) b | 0.03 (0.02) b |
| 7 (Har) | 0.04 (0.04) ab | 0.00 (0.00) b | 0.04 (0.04) ab |
| 8 (Rim) | 0.03 (0.02) ab | 0.02 (0.01) ab | 0.04 (0.01) ab |
| 9 (Ent) | 0.02 (0.01) b | 0.00 (0.00) b | 0.02 (0.01) b |
| 10 (Tor) | 0.02 (0.01) b | 0.01 (0.01) ab | 0.02 (0.02) b |
| ANOVA | P=0.0385; F=2.35; df=9, 30 | P=0.0202; F=2.75; df=9, 27 | P=0.0064; F=3.31; df=9, 30 |

| (c) 29 DAT for Application 2 (and just prior to Application 3) (9/3/21); | | | |
|---|---|---|---|
| **Trt** | **# Larvae / leaf (SD)** | **# Adults / leaf (SD)** | **# Ttl / leaf (SD)** |
| 1 (Unt) | 0.21 (0.08) | 0.04 (0.02) | 0.25 (0.08) |
| 2 (Rad) | 0.20 (0.09) | 0.03 (0.03) | 0.23 (0.08) |
| 3 (Siv) | 0.17 (0.12) | 0.06 (0.03) | 0.23 (0.13) |
| 4 (Agr) | 0.13 (0.08) | 0.05 (0.03) | 0.19 (0.09) |
| 5 (PRE) | 0.18 (0.04) | 0.07 (0.02) | 0.25 (0.05) |
| 6 (A+P) | 0.21 (0.11) | 0.06 (0.02) | 0.27 (0.10) |
| 7 (Har) | 0.13 (0.04) | 0.06 (0.04) | 0.19 (0.04) |
| 8 (Rim) | 0.14 (0.10) | 0.05 (0.05) | 0.18 (0.08) |
| 9 (Ent) | 0.17 (0.06) | 0.07 (0.02) | 0.23 (0.06) |
| 10 (Tor) | 0.21 (0.10) | 0.07 (0.04) | 0.27 (0.06) |
| ANOVA | P=0.5328; F=0.91; df=9, 27 | P=0.7842; F=0.6; df=9, 30 | P=0.406; F=1.08; df=9, 27 |

| (d) 7 DAT for Application 3 (9/10/21) | | | |
|---|---|---|---|
| **Trt** | **# Larvae / leaf (SD)** | **# Adults / leaf (SD)** | **# Ttl / leaf (SD)** |
| 1 (Unt) | 0.44 (0.29) ab | 0.03 (0.02) | 0.47 (0.28) ab |
| 2 (Rad) | 0.10 (0.11) c | 0.12 (0.09) | 0.22 (0.13) b |
| 3 (Siv) | 0.25 (0.12) bc | 0.09 (0.13) | 0.34 (0.12) b |
| 4 (Agr) | 0.10 (0.03) c | 0.15 (0.11) | 0.25 (0.11) b |
| 5 (PRE) | 0.38 (0.29) abc | 0.10 (0.12) | 0.48 (0.25) ab |
| 6 (A+P) | 0.35 (0.11) abc | 0.04 (0.03) | 0.40 (0.10) ab |
| 7 (Har) | 0.13 (0.06) bc | 0.03 (0.04) | 0.15 (0.03) b |
| 8 (Rim) | 0.69 (0.34) a | 0.10 (0.07) | 0.80 (0.33) a |
| 9 (Ent) | 0.19 (0.07) bc | 0.06 (0.08) | 0.25 (0.12) b |
| 10 (Tor) | 0.16 (0.09) bc | 0.03 (0.05) | 0.20 (0.13) b |
| ANOVA | P=0.0002; F=5.8; df=9, 27 | P=0.3455; F=1.18; df=9, 30 | P=0.0003; F=5.33; df=9, 27 |

| (e) 3 DAT for Application 4 (9/20/21) | | | |
|---|---|---|---|
| Trt | # Larvae / leaf (SD) | # Adults / leaf (SD) | # Ttl / leaf (SD) |
| 1 (Unt) | 3.5 (1.6) a | 0.1 (0.1) ab | 3.6 (1.6) a |
| 2 (Rad) | 0.1 (0.1) b | 0.0 (0.0) b | 0.2 (0.1) b |
| 3 (Siv) | 0.7 (0.3) b | 0.1 (0.0) b | 0.7 (0.3) b |
| 4 (Agr) | 0.3 (0.1) b | 0.0 (0.0) b | 0.4 (0.1) b |
| 5 (PRE) | 6.8 (4.9) a | 0.1 (0.1) b | 6.8 (4.9) a |
| 6 (A+P) | 0.7 (0.4) b | 0.1 (0.1) ab | 0.8 (0.4) b |
| 7 (Har) | 0.3 (0.2) b | 0.0 (0.0) b | 0.4 (0.2) b |
| 8 (Rim) | 5.1 (2.2) a | 0.2 (0.1) a | 5.3 (2.2) a |
| 9 (Ent) | 0.3 (0.0) b | 0.0 (0.0) b | 0.3 (0.0) b |
| 10 (Tor) | 0.3 (0.2) b | 0.0 (0.0) b | 0.3 (0.2) b |
| ANOVA | P<0.0001; F=24.35; df=9, 27 | P=0.0029; F=3.77; df=9, 30 | P<0.0001; F=24.27; df=9, 27 |

| (f) 12 DAT for Application 4 (9/29/21) | | | |
|---|---|---|---|
| Trt | # Larvae / leaf (SD) | # Adults / leaf (SD) | # Ttl / leaf (SD) |
| 1 (Unt) | 10.0 8.3 a | 0.6 0.4 a | 10.6 8.1 a |
| 2 (Rad) | 0.5 0.4 b | 0.1 0.1 bc | 0.5 0.4 c |
| 3 (Siv) | 3.3 1.3 b | 0.2 0.3 abc | 3.4 1.5 b |
| 4 (Agr) | 0.7 0.2 b | 0.1 0.1 bc | 0.8 0.2 c |
| 5 (PRE) | 10.2 7.1 a | 0.5 0.5 ab | 10.7 7.4 a |
| 6 (A+P) | 1.1 0.5 b | 0.1 0.0 c | 1.2 0.5 bc |
| 7 (Har) | 0.9 0.6 b | 0.1 0.1 abc | 1.0 0.6 c |
| 8 (Rim) | 9.3 3.1 a | 0.4 0.1 abc | 9.7 3.0 a |
| 9 (Ent) | 0.9 0.5 b | 0.1 0.1 bc | 0.9 0.5 c |
| 10 (Tor) | 0.4 0.2 b | 0.1 0.1 bc | 0.5 0.2 c |
| ANOVA | P<0.0001; F=22.47; df=9, 27 | P=0.0029; F=3.77; df=9, 30 | P<0.0001; F=23.78; df=9, 30 |

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