EVALUATING FOLIAR INSECTICIDES FOR CONTROL OF THRIPS AND OTHER INSECTS ON SNAP BEANS

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Introduction

Insect pests are an annual threat to Georgia’s snap bean crop, causing over $2.3 million in control costs and crop damage in 2004 (UGA, CAES, Misc. Pub. 106, Summary of losses from insect damage and cost of control in Georgia, 2004). Thrips, several foliage and bloom species, are one of the major insect pests of the crop, causing premature defoliation, bronzing or a silvery cast on the leaves, and scarring on the pods. High thrips populations can result in stunted plant growth. This test was conducted to evaluate the effectiveness of selected foliar insecticides in suppressing thrips populations in snap bean blooms and other suppressing insect species present on the snap bean foliage.

Materials and Methods

Replicated field plots were established at the University of Georgia Lang Research Farm in Tift County Georgia. “Carlo” snap beans were planted on 12 April 2006. On 30 May, plots 4 rows (3-ft row spacing) x 70 feet were established and eight insecticides treatments were randomly arranged in each of three replications in a randomized complete block design. There were two untreated border rows on each side of each plot.

On 30 May, each insecticide was applied using a CO₂ – powered backpack sprayer delivering 21.3 gpa at 40 psi through two 8002 flat fan nozzles per row. An untreated control was also included. All plots were sampled prior to treatment (Pre-t) and at 1, 3, 7, and 10 days after treatment (DAT). On each sampling date, 10 blooms were randomly collected from each plot, placed into a vial, containing 70% ethanol, labeled, and returned to the laboratory for observations. Also on each date except 1 DAT, a 25 – sweep sample was taken down a single row from each plot, placed into a clear plastic bag, labeled, and returned to the lab where it was frozen and then counted on a later date. All thrips, both immatures and adults, and minute pirate bags (insect predators of thrips) were recorded from each vial on each sampling date. Random adult thrips were obtained from the vial samples from each date and sent to the UGA Thrips Diagnostics Lab where they were mounted on microscope slides and identified to species by Mr. Stan Diffie. All arthropod pests in each sweep net sample also were identified and counted. All insect count data were analyzed using the ANOVA procedure of SAS (P<0.05) and significant mean differences were separated using the Waller-Duncan K-ratio t-test, (P=0.05).

Results and Discussion

Thrips adults per 10 blooms were significantly lower in some treatments than in the untreated control at 1 DAT and all treatments were lower than the control at 3 DAT (Table 1). At 7 and 10 DAT, adult thrips populations were not different between any of the treatments. Of the adult thrips identified, 10.3% were the western flower thrips, Frankliniella occidentalis, and 89.7% were flower thips, F. tritici plus f. bispinosa combined. Similar results were noted for immature thrips and total thrips (adults plus immatures) densities in the blooms, except that Lannate was not different than the untreated plots at 3 DAT (Tables 2 and 3). There were no differences in minute pirate bugs between the treated and untreated plots on any sampling date (Table 4). However, the Asana treatment had more pirate bugs than in the Mustang Max and Orthene treatments at 7 DAT (Table 4). In the sweep net samples, there were no treatment differences in threecornered alfalfa hoppers.
(Table 5) and minute pirate bugs (Table 6) on any of the sampling dates. Stink bugs were more numerous in the Tracer plots than in five of the other insecticide treatments at 3 DAT, and more numerous in the control plots than in all the treated plots (except Asana) at 10 DAT (Table 7). Arthropod predators (bigeyed bugs, nabids and spiders, combined) were lower in most of the treated plots than in the Lannate and Orthene plots at 3 DAT, but no other treatment differences were noted (Table 8).

All of the seven insecticides evaluated in this trial are labeled for snap beans, except that Tracer 4 SC is the labeled formulation of spinosad that is used in row crops while SpinTor 2 SC is actually the formulation of spinosad labeled for use in vegetable pest control. All of these products suppressed thrips for up to 3 DAT; however, populations were similar in all treatments on 7 to 10 DAT. Minute pirate bug, threecornered alfalfa hopper and stink bug densities were affected very little by these insecticides; however populations were relatively low in all plots, including the untreated control, on all the sampling dates during this study.

Acknowledgments
The author expresses his gratitude to Neal Roberson, Del Taylor and Stan Diffie for technical support and to the University of Georgia Agricultural Experiment Stations for financial support.

<table>
<thead>
<tr>
<th>Insecticide and lbs.</th>
<th>Adult thrips per 10 blooms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre–t</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.0625</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.73</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.025</td>
</tr>
<tr>
<td>Lannate 2LV</td>
<td>0.6</td>
</tr>
<tr>
<td>Mustang Max 0.8EC</td>
<td>0.022</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.078</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.04</td>
</tr>
<tr>
<td>Untreated</td>
<td>108.5a</td>
</tr>
</tbody>
</table>

F value 0.26 3.38 2.98 0.62 0.83
Degrees of freedom 7,14 7,14 7,14 7,14 7,14
P value 0.951 0.025 0.038 0.731 0.582

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO$_2$–powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).
Table 2. Control of immature thrips on snap bean blooms treated with selective foliar insecticides, Tift County, GA, 2006.

<table>
<thead>
<tr>
<th>Insecticide and lbs.</th>
<th>Pre–t</th>
<th>Immature thrips per 10 blooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI / acre</td>
<td>1 DAT</td>
<td>3 DAT</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.0625</td>
<td>30.5a</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.73</td>
<td>29.0a</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.025</td>
<td>40.0a</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>0.6</td>
<td>34.0a</td>
</tr>
<tr>
<td>Mustang Max 0.8EC</td>
<td>0.022</td>
<td>20.5a</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.078</td>
<td>39.0a</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.04</td>
<td>14.0a</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>43.0a</td>
</tr>
</tbody>
</table>

F value 0.85 3.93 3.09 1.38 0.76
Degrees of freedom 7,14 7,14 7,14 7,14 7,14
P value 0.584 0.014 0.034 0.286 0.631

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2–powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncun K-ratio t-test (P=0.05).

Table 3. Control of thrips (adults & immatures) on snap bean blooms treated with selective foliar insecticides, Tift County, GA, 2006.

<table>
<thead>
<tr>
<th>Insecticide and lbs.</th>
<th>Pre–t</th>
<th>Thrips per 10 blooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI / acre</td>
<td>1 DAT</td>
<td>3 DAT</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.0625</td>
<td>140.0a</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.73</td>
<td>119.5a</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.025</td>
<td>141.5a</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>0.6</td>
<td>139.0a</td>
</tr>
<tr>
<td>Mustang Max 0.8EC</td>
<td>0.022</td>
<td>128.0a</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.078</td>
<td>171.5a</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.04</td>
<td>112.5a</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>151.5a</td>
</tr>
</tbody>
</table>

F value 0.39 4.46 3.43 1.22 0.95
Degrees of freedom 7,14 7,14 7,14 7,14 7,14
P value 0.884 0.008 0.023 0.355 0.502

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2–powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncun K-ratio t-test (P=0.05).
### Table 4. Control of minute pirate bugs on snap bean blooms treated with selective foliar insecticides, Tift County, GA, 2006

<table>
<thead>
<tr>
<th>Insecticide and lbs. AI / acre</th>
<th>Minute pirate bugs per 10 blooms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre–t</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.0625</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.73</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.025</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>0.6</td>
</tr>
<tr>
<td>Mustang Max 0.8EC</td>
<td>0.022</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.078</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.04</td>
</tr>
<tr>
<td>Untreated</td>
<td>1.0a</td>
</tr>
</tbody>
</table>

F value: 0.11 0.80 0.53 2.65 1.36
Degrees of freedom: 7,14 7,14 7,14 7,14 7,14
P value: 0.995 0.604 0.797 0.056 0.296

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2–powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).

### Table 5. Control of threecornered alfalfa hoppers on snap beans treated with selected foliar insecticides, Tift County, GA, 2006

<table>
<thead>
<tr>
<th>Insecticide and lbs. AI/acre</th>
<th>Threecornered alfalfa hoppers per 25 sweeps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-t</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.0625</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.73</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.025</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>0.6</td>
</tr>
<tr>
<td>Mustang Max 0.8EC 0.022</td>
<td>2.0a</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.078</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.04</td>
</tr>
<tr>
<td>Untreated</td>
<td>1.3a</td>
</tr>
</tbody>
</table>

F value: 0.79 1.39 0.50 1.54
Degrees of freedom: 7,14 7,14 7,14 7,14
P value: 0.607 0.283 0.822 0.233

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2–powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).
Table 6. Control of minute pirate bugs on snap beans treated with selected foliar insecticides, Tift County, GA, 2006.

<table>
<thead>
<tr>
<th>Insecticide and lbs. AI/acre</th>
<th>Pirate bugs per 25 sweeps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-t</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>2.0a</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>2.3a</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>3.0a</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>2.7a</td>
</tr>
<tr>
<td>Mustang Max 0.8EC 0.022</td>
<td>2.0a</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>3.0a</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>3.3a</td>
</tr>
<tr>
<td>Untreated</td>
<td>2.7a</td>
</tr>
</tbody>
</table>

| F value | 0.95 | 1.20 | 1.13 | 0.56 |
| Degrees of freedom | 7.14 | 7.14 | 7.14 | 7.14 |
| P value       | 0.980 | 0.363 | 0.396 | 0.775 |

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2-powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).

Table 7. Control of stink bugs (southern green, brown and green, combined) on snap beans treated with selected foliar insecticides, Tift County, GA, 2006.

<table>
<thead>
<tr>
<th>Insecticide and lbs. AI/acre</th>
<th>Stink bugs per 25 sweeps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-t</td>
</tr>
<tr>
<td>Capture 2EC</td>
<td>0.3a</td>
</tr>
<tr>
<td>Orthene 97PE</td>
<td>0.3a</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>0.0a</td>
</tr>
<tr>
<td>Lannate 2.4LV</td>
<td>0.0a</td>
</tr>
<tr>
<td>Mustang Max 0.8EC 0.022</td>
<td>0.3a</td>
</tr>
<tr>
<td>Tracer 4SC</td>
<td>0.3a</td>
</tr>
<tr>
<td>Asana 0.66EC</td>
<td>0.0a</td>
</tr>
<tr>
<td>Untreated</td>
<td>0.7a</td>
</tr>
</tbody>
</table>

| F value | 0.90 | 2.90 | 0.59 | 2.64 |
| Degrees of freedom | 7.14 | 7.14 | 7.14 | 7.14 |
| P value       | 0.530 | 0.042 | 0.753 | 0.058 |

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2-powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).
Table 8. Control of arthropod predators (big-eyed bugs, nabids, and spiders, combined) on snap beans treated with selected foliar insecticides, Tift County, GA, 2006.

<table>
<thead>
<tr>
<th>Insecticide and lbs. AI/acre</th>
<th>Predators per 25 sweeps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-t</td>
</tr>
<tr>
<td>Capture 2EC 0.0625</td>
<td>2.0a</td>
</tr>
<tr>
<td>Orthene 97PE 0.73</td>
<td>3.3a</td>
</tr>
<tr>
<td>Warrior 1CS 0.025</td>
<td>1.3a</td>
</tr>
<tr>
<td>Lannate 2.4LV 0.6</td>
<td>2.3a</td>
</tr>
<tr>
<td>Mustang Max 0.8EC 0.022</td>
<td>2.0a</td>
</tr>
<tr>
<td>Tracer 4SC 0.078</td>
<td>4.0a</td>
</tr>
<tr>
<td>Asana 0.66EC 0.04</td>
<td>3.0a</td>
</tr>
<tr>
<td>Untreated</td>
<td>3.0a</td>
</tr>
</tbody>
</table>

F value                              | 0.93  | 6.77  | 0.68  | 0.44  |
Degrees of freedom                    | 7.14  | 7.14  | 7.14  | 7.14  |
P value                               | 0.516 | 0.001 | 0.688 | 0.859 |

Carlo snap beans planted on 12 April. Plots 4 rows x 70 ft with 2 row untreated border, RCBD with 3 reps. Treatments applied with a CO2-powered backpack sprayer on 30 May. Column means with the same letter are not significantly different, Waller-Duncan K-ratio t-test (P=0.05).