Thrips Control and Yield Response of Peanut with Selected Insecticide Treatments as Influenced by Location, Planting Date, and Cultivar Selection - Summary of 2014 Research Projects

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Thrips are a common early season insect pest in peanut. Tobacco thrips, along with the eastern and western flower thrips are the most common species in peanut. Tobacco and western flower thrips also transmit the tomato spotted wilt virus to peanut as well as tobacco, tomato, and pepper. Thrips migrate from small grains and winter weeds and into seedling peanuts. Typically, populations of migrating thrips peak in April-planted peanuts but cooler spring weather in the past two years have delayed thrips movement into peanuts into June. Slowed seeding growth due to cooler temperatures also increased plant vulnerability to thrips feeding damage and may have reduced insecticide efficacy. The rasping of the folded leaves in the shoot terminal by feeding thrips results in scarred, malformed leaves and in severe cases stunting of seedling peanuts (Fig. 1). The extended feeding window for thrips in peanut and reduced insecticide efficacy has not resulted in a noticeable increase in tomato spotted wilt in Alabama peanuts. A reduction in thrips damage in peanut often does not result in significant yield gains. However, Thimet 20G or Phorate 20G has been shown to be useful in suppressing TSW in peanut.

Figure 1. Thrips damage to the shoot terminals and leaves of peanut.
Influence of Planting Date, Cultivar, and Insecticide program on Thrips Populations and Feeding Damage, TSW and White Mold Incidence, Leaf Spot Intensity, Rust Severity, and Pod Yield in Dryland Peanut at the Gulf Coast Research and Extension Center in 2014.

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Objective: Evaluate the effectiveness of seed treatment and granular insecticides as influenced by planting date and cultivar for the control of thrips as well as tomato spotted wilt (TSW) and white mold incidence, leaf spot disease intensity, and yield response of Flavorunner 458 and Georgia-06G peanut.

Production Methods: Rows were laid off with a KMC strip till rig with rolling baskets. Georgia-06G (TSW resistant) and Flavorunner 458 (TSW susceptible) cultivars were planted on April 25 (1st DOP) and May 22 (2nd DOP) at a rate of 6 seed/ft in a Malbis fine sandy loam (OM≤1%) in a field cropped to peanut every third year at the Gulf Coast Research and Extension Center in Fairhope, AL. Soil fertility and weed control was according to Alabama Cooperative Extension System recommendations. The study was not irrigated. A factorial design arranged as a split-split plot with planting date as whole plots, cultivar as the split-plot, and insecticide program as split-split plot treatments was used. Whole plots were randomized in four complete blocks. Individual subplots consisted of four 30-foot rows spaced 3.2-feet apart. With the exception of the seed treated with CruiserMaxx at 4 oz/cwt, all remaining seed were treated with Dynasty PD fungicide seed treatment at 3.4 oz/cwt. Thimet 20G at 5 lb/A and Temik 15G at 7 lb/A were applied in-furrow. Early post-emergence banded applications of Orthene 97S at 6 oz/A were made either 1 week after planting at true ground cracking on May 8 or 3 weeks after planting at cracking on May 18 for the 1st date of planting (DOP) and June 2 and June 17 for the 2nd DOP using a tractor-mounted sprayer with a single TX-8 tip nozzle located over the row middle at 10 gal/A spray volume at 31 psi. Chlorothalonil at 1.5 pt/A was applied for leaf spot control on June 6, June 16, July 2, July 8, July 21, August 4, August 19, and September 3 for the 1st DOP and July 2, July 8, July 21, August 4, August 19, September 3, September 18, and September 30 for the 2nd DOP with a tractor mounted boom sprayer with three TX-8 nozzles per row delivering 15 gal/A of spray volume 45 psi.

Insect and Disease Assessment: Terminals from 10 shoots collected from seedlings in the two middle harvest rows in each plot on June 4 for the 1st DOP and on June 26 for the 2nd DOP in a plastic bag containing an alcohol-based kill solution. The alcohol solution was strained through filter paper and the adult and juvenile thrips were counted. Thrips feeding damage rating (TDR) on the leaves was assessed on a 0 to 10 scale where 0 = no visible leaf scarring, 1=10% leaf area scarred, 2=20% leaf area scarred, 3=30% leaf area scarred, 4=40% leaf area scarred, 5=50% leaf area scarred, 6=60% leaf area scarred, 7=70% leaf area scarred, 8=80% leaf area scarred, 9=90% leaf area scarred, to 10=100% leaf area affected and plants near death on June 3, June 11, and June 19 and June 19, June 24, and July 5 for the 1st and 2nd DOP, respectively. Final TSW hit counts (one hit was defined a < 1 foot of consecutive symptomatic plants per row) were made on September 9 for the 1st and 2nd DOP. Leaf spot diseases were rated together on September 9 and October 7 for the 1st and 2nd DOP, respectively, using the 1-10 Florida peanut leaf spot scoring system. Rust severity was assessed using the ICRISAT 1-9 rating scale on September 9 and October 7 for the 1st and 2nd DOP, respectively. White mold hit counts (1 hit was defined as ≤1 foot of consecutive white mold-damaged plants per row) were made immediately after plot inversion on September 22 and October 9 for the 1st and 2nd DOP, respectively. Plots were dug on September 22 and October 8 for the 1st and 2nd DOP, respectively and combined several days later. Significance of interactions was evaluated using PROC GLIMMIX procedure in SAS (Table 1). Statistical analyses were done on rank transformations for non-normal data for thrips counts, thrips damage ratings, leaf spot intensity, TSW and white mold incidence, and rust, which were back transformed for presentation. Means were separated using the least significant difference (LSD) test (P≤0.05 or as indicated otherwise).
**Weather:** Monthly rainfall totals were above to well above the 30 year historical average in May, June, July, and September but were below average for August. Temperatures were at to above normal for the study period.

**Results**

While overall counts were low, fewer adult and juvenile thrips were collected in May than in April (Table 2). Thrips counts differed by insecticide treatment with the highest number of thrips adults and juveniles collected from the Thimet 20G-treated peanuts but not by cultivar. When compared with Thimet 20G, lower thrips counts were recorded for Temik 15G, CruiserMaxx + Orthene 97S, and Thimet 20G + one or two applications of Orthene 97S. Incidence of TSW was also low, which limited insecticide impact on this disease. Although planting date did not impact this disease, TSW hit counts were higher for Flavorunner 458 than Georgia-06G. Rust severity, which was higher in the May- than April-planted peanuts, was not impacted by cultivar or insecticide treatment.

Table 1. F-values from generalized linear mixed model analysis for effects of planting date, peanut cultivar selection, and insecticide on thrips counts, thrips feeding damage, TSW incidence, leaf spot intensity, white mold incidence, rust severity, and yield at the GCREC in 2014.

<table>
<thead>
<tr>
<th>Source of variation (F values)</th>
<th>Thrips count</th>
<th>TDR 1</th>
<th>TSW</th>
<th>Leaf Spot</th>
<th>White mold</th>
<th>Rust</th>
<th>Yield lb/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting date</td>
<td>5.46*</td>
<td>11.88*</td>
<td>2.12</td>
<td>443.84***</td>
<td>1.63</td>
<td>140.65***</td>
<td>7.40*</td>
</tr>
<tr>
<td>Variety</td>
<td>1.48</td>
<td>0.00</td>
<td>79.26***</td>
<td>6.75*</td>
<td>36.87***</td>
<td>0.50</td>
<td>21.23***</td>
</tr>
<tr>
<td>Planting date x Variety</td>
<td>0.02</td>
<td>0.48</td>
<td>0.03</td>
<td>6.75*</td>
<td>0.03</td>
<td>0.50</td>
<td>1.52</td>
</tr>
<tr>
<td>Treatment</td>
<td>2.26*</td>
<td>49.34***</td>
<td>1.51</td>
<td>0.16</td>
<td>1.02</td>
<td>0.32</td>
<td>1.16</td>
</tr>
<tr>
<td>Planting date x Treatment</td>
<td>0.81</td>
<td>10.03***</td>
<td>0.76</td>
<td>0.16</td>
<td>0.76</td>
<td>0.32</td>
<td>2.07^</td>
</tr>
<tr>
<td>Variety x Treatment</td>
<td>1.05</td>
<td>1.22</td>
<td>1.81</td>
<td>0.41</td>
<td>2.03^</td>
<td>0.28</td>
<td>2.96*</td>
</tr>
<tr>
<td>Planting date x Variety x Treatment</td>
<td>0.95</td>
<td>0.18</td>
<td>0.62</td>
<td>0.41</td>
<td>0.76</td>
<td>0.28</td>
<td>0.51</td>
</tr>
</tbody>
</table>

*Significance at the 0.10, 0.05, 0.01, and 0.001 levels is indicated by ^, *, **, or ***, respectively.

Thrips damage ratings (TDR) differed by planting date and insecticide program but not by cultivar (Table 1). In April, thrips damage was reduced with CruiserMaxx + Orthene 97S at cracking, Thimet 20G alone or in combination with one or two at-cracking Orthene 97S applications, and Temik 15G when compared with the non-insecticide (Dynasty PD) treated control (Fig. 2). The largest TDR reduction was obtained with the Thimet 20G + Orthene 97S programs, while Thimet 20G and Temik 15G gave the least thrips protection. For May-planted peanuts, all insecticide programs reduced thrips damage when compared with the non-insecticide treated control. The Thimet 20G + one or two Orthene 97S programs and Temik 15G matched the high level of thrips protection provided by Thimet 20G. When comparing the efficacy of each insecticide by planting date, better protection from thrips feeding injury was obtained in 2nd than 1st DOP with CruiserMaxx, Thimet 20G, and Temik 15G. One or two supplemental applications of Orthene 97S improved the efficacy of Thimet 20G and CruiserMaxx in April- but not in May-planted peanuts when thrips pressure was lower. The TDR values for Flavorunner 458 and Georgia-06G, which were similar, did not differ by planting date.
Table 2. Influence of planting date, cultivar, and insecticide program on thrips populations, TSW incidence, and rust severity.

<table>
<thead>
<tr>
<th>Planting Date</th>
<th>Application timing and placement</th>
<th>Thrips count(^z)</th>
<th>TSW incidence(^y)</th>
<th>Rust severity(^x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April (1(^{st}) DOP)</td>
<td>---</td>
<td>1.5 a(^w)</td>
<td>1.6 a</td>
<td>1.0 b</td>
</tr>
<tr>
<td>May (2(^{nd}) DOP)</td>
<td>---</td>
<td>0.8 b</td>
<td>1.3 a</td>
<td>3.2 a</td>
</tr>
</tbody>
</table>

**Cultivar**

- Georgia-06G
  - ---
  - 1.3 a
  - 0.5 b
  - 2.1 a
- Flavorunner
  - ---
  - 0.9 a
  - 2.5 a
  - 2.2 a

**Insecticide Program**

- Control
  - Seed dressing
  - 1.5 abc
  - 1.9 a
  - 2.1 a
- CruiserMaxx 4 oz/100 lb seed
  - Seed dressing
  - 1.6 ab
  - 1.8 a
  - 2.0 a
- CruiserMaxx 4 oz/100 lb seed fb Orthene 97S
  - 3 wk AP
  - 0.5 c
  - 1.7 ab
  - 2.1 a
- Thimet 20G 5 lb/A
  - In-furrow AP
  - 2.0 a
  - 1.5 ab
  - 2.2 a
- Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A
  - 3 wk AP
  - 0.9 bc
  - 1.1 ab
  - 2.0 a
- Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A fb Orthene 97S 6 oz/A
  - In-furrow AP
  - 1 wk AP
  - 0.8 bc
  - 0.9 b
  - 2.1 a
- Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A fb Orthene 97S 6 oz/A fb Orthene 97S 6 oz/A
  - 3 wk AP
  - 0.6 bc
  - 1.6 ab
  - 2.4 a
- Temik 15G 7 lb/A
  - In-furrow AP
  - 0.6 bc
  - 0.6 a
  - 2.4 a

\(^z\)Mean number of adult and juvenile thrips found at first sampling date for each planting date.

\(^y\)TSW (tomato spotted wilt) incidence is expressed as the number of diseased plants per 60 ft of row.

\(^x\)Rust severity was rated on a 1 to 9 scale.

\(^w\)Means in each column that are followed by the same letter are not significantly different according to Fisher’s least significant difference (LSD) test (\(P\leq0.05\)).

Figure 2. Interaction of planting date and insecticide program on thrips feeding damage to peanut.

\(^7\)Means followed by the same letter are not significantly different according to Fisher’s LSD (\(P\leq0.05\)).
Yield also differed by cultivar and insecticide program (Table 1). Higher yields were seen for the 1st DOP (April) for all programs except Temik 15G and Thimet 20G + one Orthene 97S application (Fig. 4). Yield for CruiserMaxx alone or with a single Orthene 97S application, Thimet 20G + two Orthene 97S applications, and non-insecticide treated control were similar to the high yields obtained with Thimet 20G, while lower yields were noted for Thimet 20G + one Orthene 97S application, and Temik 15G. For the 2nd DOP (May), yields for the insecticide programs and non-insecticide treated control were similar.

Figure 4. Yield as influence by an interaction of planting date and insecticide program.

Means followed by the same letter are not significantly different according to Fisher’s LSD (P<0.10).

On Georgia-06G, higher yields were recorded for both CruiserMaxx programs than the non-insecticide control (Fig. 5.). No yield gains were seen with addition of an at-cracking application of Orthene 97S to CruiserMaxx-treated peanuts. Yields for the remaining insecticide programs and the non-insecticide treated control were similar. For Flavorunner 458, higher yields were obtained with Thimet 20G + two Orthene 97S applications than CruiserMaxx alone in combination with Orthene 97S. In addition, the non-insecticide treated control and all insecticide programs had similar yields. Significant yield declines were noted on Flavorunner 458 compared with Georgia-06G for the CruiserMaxx but not the other programs, including the non-insecticide treated control.
Figure 5. Yield as influenced by an interaction of cultivar and insecticide program.

![Yield Bar Chart](image)

Means followed by the same letter are not significantly different according to Fisher’s LSD ($P \leq 0.05$).

Figure 6. Leaf spot intensity as influenced by an interaction of planting date and cultivar.

![Leaf Spot Intensity Bar Chart](image)

Means followed by the same letter are not significantly different according to Fisher’s LSD ($P \leq 0.05$).

Leaf spot intensity was influenced by planting date and cultivar but not by insecticide program (Table 1). While similar leaf spot intensity ratings were noted for the 1st and 2nd DOP with Georgia-06G, Flavorunner 458 had higher disease levels in at the 2nd than 1st DOP (Fig.6). Insecticide programs all had similarly low ratings for leaf spot intensity.

White mold incidence was influence by peanut cultivar and insecticide program but not planting date where similar indices were noted for the April- and May-planted peanuts (Table 3). While similarly low white mold hit counts were noted for all insecticide programs on Georgia-06G, disease incidence on
Florunner 458 was higher for CruiserMaxx + Orthene 97S and Temik 15G compared with the non-fungicide treated control, which had similar ratings to the remaining fungicide programs. White mold incidence was higher for CruiserMaxx + single Orthene 97S, Thimet 20G, Thimet 20G + two Orthene 97S application, and Temik 15G on Flavorunner 458 than Georgia-06G.

Table 3. Cultivar and insecticide program but not planting date influence white mold incidence in peanut.

<table>
<thead>
<tr>
<th>Planting Date</th>
<th>Application timing and placement</th>
<th>White mold*</th>
</tr>
</thead>
<tbody>
<tr>
<td>April (1st DOP)</td>
<td>---</td>
<td>1.6 a</td>
</tr>
<tr>
<td>May (2nd DOP)</td>
<td>---</td>
<td>1.8 a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insecticide Program</th>
<th>Georgia 06G‡</th>
<th>Flavorunner 458</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1.3 cde</td>
<td>1.6 bcd</td>
</tr>
<tr>
<td>CruiserMaxx 4 oz/100 lb seed fb Orthene 97S</td>
<td>Seed dressing 3 wk AP</td>
<td>0.8 e</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A</td>
<td>In-furrow AP</td>
<td>1.0 de</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A</td>
<td>In-furrow AP 3 wk AP</td>
<td>1.1 cde</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A fb Orthene 97S 6 oz/A</td>
<td>In-furrow AP 1 wk AP 3 wk AP</td>
<td>1.0 de</td>
</tr>
<tr>
<td>Temik 15G 7 lb/A</td>
<td>In-furrow AP</td>
<td>1.0 de</td>
</tr>
</tbody>
</table>

*White mold incidence is expressed as the number of hits per 60 ft of row.
‡Means in each column that are followed by the same letter are not significantly different according to Fisher’s LSD (P<0.10).

Summary

When compared with the study site at the Wiregrass Research and Extension Center, thrips counts were very low given the level of leaf and terminal damage observed at both the 1st and 2nd DOP and likely reflect poor sampling technique rather than low overall thrips populations. While TSW incidence was higher on the susceptible Flavorunner 458 than resistant Georgia-06G, overall incidence was very low. In contrast to previous studies, planting date had no impact on TSW or white mold incidence. Elevated hit counts noted for some insecticide programs on the white mold susceptible Flavorunner 458 but not partially resistant Georgia-06G likely had no impact on yield. Dry August weather limited leaf spot development on Flavorunner 458 and to a lesser extent on Georgia-06G. Higher leaf spot ratings were see on Flavorunner 458 at the May compared with April planting date. This observation confirms other recent Alabama studies that leaf spot risk increases as planting dates advance from mid-April into early June.

Study results illustrate little relationship between the level of thrips damage and yield. While CruiserMaxx alone or in combination with a single at-cracking application of Orthene 97S often failed to match the level of thrips protection provided by other insecticide treatments, yield response with the former two programs was comparable and in some cases superior to other insecticide programs on Georgia-06G, where lower yields were reported with Temik 15G but not on Flavorunner 458. Reduced thrips pressure at the 1st than 2nd resulted in sizable reductions in thrips feeding damage with CruiserMaxx, Thimet 20G, and Temik 15G but not the Thimet 20G + Orthene 97S programs. Planting date impacted yield response to insecticide programs in 1st but not 2nd DOP where Temik 15G failed to match the yields obtained with Thimet 20G alone or in combination with a single at-cracking application.
of Orthene 97S. Higher yields were also recorded at the 1st DOP for the non-insecticide treated control, CruiserMaxx + Orthene 97S, Thimet 20G, and Thimet 20G + Orthene 97S programs. Combination of one or two Orthene 97 applications with CruiserMaxx seed treatment or Thimet 20G granular insecticide did improve thrips protection but failed to increase yield on either Flavorunner 458 or Georgia-06G when compared with the non-insecticide treated (Dynasty PD) control.

Figure 7. Thrips damage on Flavorunner 458 A) Non-treated control; B) CruiserMaxx, C) Temik 15G, and D) Thimet 20G + Orthene 97S. Note the higher number of ‘normal’ leaves on the Temik 15G and Thimet 20G + Orthene 97S-treated peanuts.
06G and Flavorunner 458 peanuts were planted at rates of 6 seed/ft row using conventional tillage practices on April 28 (1st date of planting [DOP]) and May 28 (2nd DOP) in a Dothan fine sandy loam (OM<1%) soil at the Wiregrass Research and Extension Center in Headland, AL. Weed control and soil fertility recommendations of the Alabama Cooperative Extension System were followed. The study area received 1.0 acre inches on July 28, August 6, August 20, September 5, and September 16. A split split-plot design with planting date as whole plots, cultivar as the split-plot, and insecticide treatment as the split-split plot was used. Insecticide treatments included 4 oz/cwt of seed of Cruiser FS5 seed treatment, 4 oz/cwt seed of Cruiser FS5 followed by an early post (21 days after planting [DAP]) banded application of Orthene 97S at 6 oz/A, 5 lb/A Thimet 20G in-furrow alone or followed by either a single early post (21 DAP) banded application of 6 oz/A Orthene 97S or banded applications of 6 oz/A Orthene 97S at true ground cracking (7 DAP) and early post (21 DAP), 7 lb/A Temik 15G applied in-furrow. The fungicide seed treatment Dynasty PD at 3 oz/cwt was applied to all seed. Whole plots were randomized in four complete blocks. Individual split-split plots, which consisted of four 30-foot rows spaced 3-feet apart, were randomized within each whole plot. Leaf spot control was obtained with seven applications of 1.5 pt/A chlorothalonil at 1.5 pt/A applied at two week intervals. Stand counts were recorded on May 16 and June 13 for the April (1st DOP) and May (2nd DOP) plantings, respectively, from the second row of each plot as the actual number of plants emerged. The 1st and 2nd DOP plantings were combined on September 23 and October 17.

Insect and Disease Assessment: Terminals from 10 shoots collected in the two middle harvest rows in each plot on May 30 for the 1st DOP and on June 19 for the 2nd DOP in a plastic bag containing an alcohol-based kill solution. The alcohol solution was strained through filter paper and the thrips adults and juveniles were counted using a low power microscope. Thrips damage rating (TDR) on the leaves was assessed on a 0 to 10 scale where 0 = no visible leaf scarring, 1=10% leaf area scarred, 2=20% leaf area scarred, 3=30% leaf area scarred, 4=40% leaf area scarred, to 10=100% leaf area affected and plants near death on June 13 for the 1st DOP and July 7 for the 2nd DOP. Final TSW hit counts (one hit was defined a < 1 foot of consecutive symptomatic plants per row) were made on September 3 and October 12 for the 1st and 2nd DOP, respectively. Early and late leaf spot were rated together on September 12 and October 12 for the first and second planting dates, respectively, using the 1-10 Florida peanut leaf spot scoring system. White mold hit counts (1 hit was defined as ≤ 1 foot of consecutive white mold-damaged plants per row) were made immediately after plot inversion on for the first and second planting dates on September 18 and October 13, respectively. Yields are reported at 8.25% and 8.45% moisture for the 1st and 2nd DOP, respectively. Significance of interactions was evaluated using PROC GLIMMIX procedure in SAS. Statistical analyses for thrips counts, thrips damage, stand density, leaf spot intensity, along with TSW and white mold incidence were done on rank transformations for non-normal data, which were back transformed for presentation. Means were separated using Fisher’s least significant difference (LSD) test ($P<0.05$).

Weather: Monthly rainfall totals for the entire production season except for August were below the 30 year mean for the study location. Temperatures during the study period were at or above the 30 year historical average.

Results

Since the interactions for white mold incidence and yield were not significant, data are pooled by planting date, cultivar, and insecticide treatment (Table 1). One or more interactions for thrips feeding damage, TSW incidence, and leaf spot intensity were significant and data are presented by planting date, cultivar, or insecticide treatment.
Table 1. F-values from generalized linear mixed model analysis for effects of planting date, peanut variety selection, and insecticide on thrips counts, thrips feeding damage, TSW incidence, leaf spot intensity, stem rot incidence, and yield at the WGREC in 2014.

<table>
<thead>
<tr>
<th>Source (F values)</th>
<th>Thrips count</th>
<th>Thrips damage rating</th>
<th>TSW</th>
<th>Leaf spot</th>
<th>White mold</th>
<th>Yield lb/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting date</td>
<td>90.46***</td>
<td>126.07***</td>
<td>8.62</td>
<td>102.32***</td>
<td>11.47**</td>
<td>12.62***</td>
</tr>
<tr>
<td>Variety</td>
<td>1.08</td>
<td>15.34****</td>
<td>77.17***</td>
<td>2.76</td>
<td>6.52*</td>
<td>27.58***</td>
</tr>
<tr>
<td>Planting date × Variety</td>
<td>1.78</td>
<td>0.61</td>
<td>19.45***</td>
<td>10.07**</td>
<td>2.04</td>
<td>0.58</td>
</tr>
<tr>
<td>Insecticide</td>
<td>26.63***</td>
<td>80.93***</td>
<td>0.77</td>
<td>1.39</td>
<td>0.64</td>
<td>0.53</td>
</tr>
<tr>
<td>Planting date × Insecticide</td>
<td>7.44***</td>
<td>13.59***</td>
<td>0.83</td>
<td>0.73</td>
<td>2.04</td>
<td>0.75</td>
</tr>
<tr>
<td>Variety x Insecticide</td>
<td>1.45</td>
<td>1.66</td>
<td>1.18</td>
<td>1.01</td>
<td>0.51</td>
<td>1.36</td>
</tr>
<tr>
<td>Planting date × Variety × Insecticide</td>
<td>1.69</td>
<td>0.77</td>
<td>0.58</td>
<td>0.63</td>
<td>0.74</td>
<td>0.45</td>
</tr>
</tbody>
</table>

*Significance at the 0.05, 0.01, and 0.001 levels is indicated by *, **, or ***, respectively.

Thrips counts were influenced by planting date and insecticide treatment (Table 1). Adult thrips were identified as the eastern flower thrips. With the exception of the non-insecticide treated control, higher thrips counts were noted at the 1st than 2nd DOP for each insecticide program (Table 2). When compared with the non-insecticide-treated control, Cruiser 5FS alone or in combination with Orthene 97S 3-wk AP reduced thrips populations in the May but not the April planted-peanuts. While similarly high thrips counts were recorded for the 1st DOP for the non-insecticide treated control, Cruiser 5FS and Cruiser 5FS + Orthene 97S 3 wk AP programs, fewest thrips were recovered from the Thimet 20G + Orthene 97S 1 wk AP + Orthene 97S 3 wk AP-treated peanuts. Similarly effective thrips control was also noted at the 1st DOP with Thimet 20G alone or in combination with Orthene 97S at 3 wk AP. At the 2nd DOP, Thimet 20G alone or in combination with one or two post-plant applications of Orthene 97S as well as Temik 15G also gave a highly effective thrips control. Better thrips control was obtained with Cruiser 5FS + Orthene 97S 3 wk AP compared with Cruiser 5FS alone.

Table 2. Thrips (adult + juvenile) counts in peanut terminals as influenced by planting date.

<table>
<thead>
<tr>
<th>Insecticide and rate</th>
<th>Placement and timing</th>
<th>Thrips counts&lt;sup&gt;y&lt;/sup&gt;</th>
<th>Thrips feeding damage&lt;sup&gt;y&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&lt;sup&gt;st&lt;/sup&gt; DOP</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; DOP</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; DOP</td>
</tr>
<tr>
<td>Non-insecticide treated control&lt;sup&gt;x&lt;/sup&gt;</td>
<td>---</td>
<td>41 ab&lt;sup&gt;w&lt;/sup&gt;</td>
<td>25.6 bc</td>
</tr>
<tr>
<td>Cruiser 5FS 4 oz/cwt seed</td>
<td>Seed dressing</td>
<td>54.8 a</td>
<td>14.5 de</td>
</tr>
<tr>
<td>Cruiser 5FS 4 oz/cwt seed fb Orthene 97S 6 oz</td>
<td>Seed dressing 3 wk AP</td>
<td>39.3 abc</td>
<td>6.4 fg</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A</td>
<td>In-furrow AP</td>
<td>11.8 ef</td>
<td>3.4 h</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A fb Orthene 97S 6 oz</td>
<td>In-furrow AP 3 wk AP</td>
<td>8.9 f</td>
<td>2.3 hi</td>
</tr>
<tr>
<td>Thimet 20G 5 lb/A fb Orthene 97S 6 oz/A Orthene 97S 6 oz/A</td>
<td>In-furrow AP 1 wk AP 3 wk AP</td>
<td>4.3 gh</td>
<td>0.9 i</td>
</tr>
<tr>
<td>Temik 15G 5 lb/A</td>
<td>In-furrow AP</td>
<td>24.5 cd</td>
<td>2.3 hi</td>
</tr>
</tbody>
</table>

<sup>x</sup>Number of thrips were collected on May 30 and June 19 for the 1<sup>st</sup> and 2<sup>nd</sup> DOP, respectively.

<sup>y</sup>Thrips feeding damage was rated on a 1 to 10 scale on June 13 and July 7 for the 1<sup>st</sup> and 2<sup>nd</sup> DOP.

<sup>z</sup>Dynasty PD fungicide seed dressing at 3 oz/cwt seed was applied to all seed.

<sup>w</sup>Means in each column that are followed by the same letter are not significantly different according to Fisher’s LSD (P<0.05).
Thrips feed damage to the foliage differed by planting date and insecticide treatment (Table 1). With the exception of both of the Thimet 20G + Orthene 97S programs, which had similarly low thrips damage ratings at both planting dates, ratings were higher at the April (1st DOP) than May (2nd DOP) plantings for the remaining insecticide treatments and the non-insecticide treated control (Table 2). At the 1st DOP, Cruiser 5FS alone or in combination with Orthene 97S 3 wk AP failed to reduce thrips feeding damage compared with the non-insecticide treated control. Temik 15G gave less effective thrips protection at the both DOP than Thimet 20G alone or in combination with Orthene 97S. On the Thimet 20G-treated peanuts, an additional reduction in thrips feeding damage was obtained with one or two additional applications of Orthene 97S at the 1st but not 2nd DOP.

Flavorunner 458 suffered heavier thrips damage than Georgia-06G (Figure 8).

Figure 8. Thrips feeding damage differed between Flavorunner 458 and Georgia-06G peanuts.

Means followed by the same letter are not significantly different according to Fisher’s LSD (P≤0.05).

Despite sizable thrips populations and extensive thrips feeding injury (Table 2), TSW incidence was low on both the TSW susceptible Flavorunner 458 and resistant Georgia-06G peanuts (data not shown). As indicated by a significant planting date × variety interaction, planting date impacted TSW incidence on Flavorunner 458 but not Georgia-06G (Table 1). Higher disease incidence was reported in the former but not the latter cultivars at the 1st but not 2nd DOP (data not shown). At both planting dates, TSW incidence was higher in Flavorunner 458 than Georgia-06G (Fig. 9). Incidence of TSW was not impacted by insecticide treatment.
Figure 9. Impact of planting date on TSW incidence in Flavorunner 458 and Georgia-06G.

Overall, leaf spot damage, as indicated by ratings no higher the 3.6, was limited to moderate leaf spotting in the lower and mid-canopy along with a low level of premature defoliation (Fig. 2). Mean leaf spot ratings were lower at the 1st than 2nd DOP (Fig. 10). At the 1st DOP, leaf spot intensity was lower in Georgia-06G compared with Flavorunner 458, while similarly high ratings were recorded for both cultivars at the 2nd DOP. The insecticide treatments, including the non-insecticide treated control, had no impact on leaf spot intensity (data not shown).

Figure 10. Effect planting date and peanut variety selection on the incidence of white mold in 2014.

White mold damage was significantly impacted by planting date and cultivar but not by insecticide (Table 1). Incidence of white mold was higher at the 1st than 2nd planting date (Fig. 11A) with Flavorunner 458
suffering higher stem rot damage than Georgia-06G (Fig. 11B). Similar white mold ratings were recorded for all insecticide treatments (Table 3).

Figure 11. Pod yield as influenced by A) planting date and B) variety selection.

<table>
<thead>
<tr>
<th>Insecticide Program</th>
<th>Placement and timing</th>
<th>White mold No. hits/plot</th>
<th>Yield bu/A</th>
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<tr>
<td>Non-insecticide treated control</td>
<td>---</td>
<td>7.8 a²</td>
<td>2836 a</td>
</tr>
<tr>
<td>Cruiser 5FS 4 oz/cwt seed</td>
<td>Seed dressing</td>
<td>8.8 a</td>
<td>3064 a</td>
</tr>
<tr>
<td>Orthene 97 6 oz</td>
<td>Seed dressing 3 wk AP</td>
<td>9.7 a</td>
<td>2995 a</td>
</tr>
<tr>
<td>Thimet 20G 5 lb</td>
<td>In-furrow AP</td>
<td>7.9 a</td>
<td>3191 a</td>
</tr>
<tr>
<td>Orthene 97 6 oz</td>
<td>In-furrow AP 3 wk AP</td>
<td>8.3 a</td>
<td>2972 a</td>
</tr>
<tr>
<td>Thimet 20G 5 lb fb Orthene 97S 6 oz</td>
<td>In-furrow AP 1 wk AP</td>
<td>10.2 a</td>
<td>3173 a</td>
</tr>
<tr>
<td>Thimet 20G 5 lb fb Orthene 97S 6 oz</td>
<td>In-furrow AP 3 wk AP</td>
<td>10.2 a</td>
<td>3173 a</td>
</tr>
<tr>
<td>Temik 15G 5 lb</td>
<td>In-furrow AP</td>
<td>8.6 a</td>
<td>2992 a</td>
</tr>
</tbody>
</table>

²Means in each column that are followed by the same letter are not significantly different according to Fisher’s LSD (P≤0.05).

Summary

Planting date, cultivar selection, and insecticide treatment had a significant impact on thrips populations and thrips damage to the leaf canopy. As has been previously reported, adult and juvenile thrips counts as
well as canopy damage were higher in the 1st DOP (April)- than 2nd DOP (May)-planted peanuts. Insecticide efficacy also differed by planting date with Cruiser FS5 and Temik 15G proving much more effective in thrips protection the 2nd- than the 1st DOP. In contrast, the Thimet 20G-based thrips control programs proved highly effective in suppressing thrips populations and minimizing thrips feed damage to the foliage regardless of the planting date. Post-plant Orthene 97S treatments enhanced thrips control and further reduce terminal damage in the Cruiser FS2-treated peanuts at the 2nd but not the 1st DOP when thrips pressure was highest. Thrips control with Thimet 20G was not improved with one or two post-plant Orthene 97S applications. Despite sizable differences in thrips damage to the shoot terminals and juvenile leaves, yields were similar across all insecticide treatments, including the non-insecticide treated control.

Planting date also impacted leaf spot intensity, white mold incidence, and yield. Higher leaf spot intensity at the 2nd as compared with 1st DOP illustrates the increased risk of disease outbreaks in later-planted peanuts due to increasing inoculum levels. While planting early reduces the risk of leaf spot diseases, white mold incidence, as shown in this study, is higher in earlier than later planted peanuts. While not shown here, TSW incidence is also higher in April than May-planted peanuts. Depending on the risk in a given field, growers do have the option of varying planting dates to help manage these diseases. The yield advantage displayed by Georgia-06G illustrates the value of planting peanut varieties that possess partial resistance to multiple diseases. Under ideal growing conditions with minimal disease pressure, Georgia-06G has a sizable yield advantage over Flavorunner 458.

Yields were higher in the May than April-planted peanuts. Reduced white mold damage, particularly on Flavorunner 458, likely accounts for the yield advantage obtained at the 2nd compared with the 1st DOP.

Overall, sizable differences in thrips control were noted between insecticide treatments with Thimet 20G generally giving better control than Temik 15G and both insecticides outperforming CruiserMaxx seed treatment. Shorter residual activity as well as other factors may have contributed to the poor efficacy displayed by the latter seed treatment against thrips. There’s also some indication that thrips populations found in cotton and possibly peanut may be increasingly tolerant or resistant to CruiserMaxx and other neonicotinoid insecticides. Despite the extensive thrips damage, a significant yield gain was obtained with CruiserMaxx as well as Thimet 20G but not Temik 15G in one of two trials on Georgia-06G. Oversprays of Orthene 97S improved plant cosmetic appearance but failed to increase pod yield.