**Project Title:** Comparative study of spider mite control in nonirrigated peanuts using registered and unregistered miticides for special registrations

**Lead Persons:** Dr. Ayanava Majumdar, Kris Balkcom

**Report prepared by:** Dr. Ayanava Majumdar, extension peanut entomologist

**Field Activities and Observations:**
Major issue for farmers: Spider mites are a rising issue in peanut production due to the following reasons: a.) Wide weather fluctuations between years (2016 – a drought year, 2017 – very wet year); b.) Several species of caterpillars are active in dry and wet year which leads to the use of synthetic pyrethroid insecticides – this flares up spider mite issues; c.) There is only chemical class of miticides available for peanut producers (propargite or Comite). Any overuse of one chemistry can become a major issue for producers. We had nearly 6 phone call from producers directly about spider mites with over 5,000 acres at threat; there were many other producers who do not call but use propargite for mite control. Current research fits the needs of the peanut industry and helped generate new information. Several images from research plots and a short report on producer-centered educational events are included in the latter part of this report.

Inducing spider mites for tests: 2016 and 2017 were very different crop seasons. Spider mites prefer hot and dry environment, but not wet weather. In order to carry on timely studies, peanuts were grown inside a 35 ft by 72 ft high tunnel in Headland and Clanton (Fig. 1). Six rows of peanuts inside the high tunnel allowed five treatments replicated four times (20 ft plots). In 2016, spider mites were induced by just two applications of bifenthrin sprayed on the foliage about 10 days apart – this flare up is what producers experience when they are trying to manage caterpillars in the mid and late season. In 2017, four applications of zeta-cypermethrin (Mustang Max) and bifenthrin (Tundra) were needed in August and September to induce two-spotted spider mite outbreak (Fig. 2). In both years, spider mite outbreak was uniform throughout the high tunnel. We have also recorded a rare outbreak of *Tetranychus tumidellus* or red spider mite after bifenthrin applications (Fig. 2). Based on this project experience, producers were alerted to the risk of spider mites via publications and social media posts, and the PI was able to assist farmers directly.

Spider mite control with miticides: Peanut plots were established at the Wiregrass Research and Extension Center (Headland, AL) and Brewton Ag Research Unit (Brewton, AL) to test new insecticides/miticides. Due to excessive rainfall/moisture in 2017, we were not able to induce spider mites in the peanut plots in Headland. However, peanuts planted in Clanton did well and we were able to induce spider mite outbreak for control tests under high pest pressure conditions. To provide a good overview of results, we have included observations from 2016 and 2017 spider mite tests.

2016 peanut treatments included: 1. Untreated check; 2. Portal 1 pt per acre (2 application); 3. Portal 2 pt per acre (1 application); 4. Agri-Mek 1.75 oz per acre (2 applications); 5. Agri-Mek 3.5 oz per acre (1 application); and, 6. Comite 2.2 pt per acre (1 application).

2017 peanut treatments included: 1. Untreated check; 2. Portal 2 pt per acre (1 application); 3. Agri-Mek 3.5 oz per acre (1 application); 3. Aramite 32 oz per acre and Bemix 18 oz per acre; and, 4. Comite 2.2 pt per acre (1 application).

Results from 2016 and 2017 tests indicated significant treatment responses in terms of spider mite numbers. Currently unregistered miticides, such Portal and Agri-Mek, showed significant reduction in spider mites along with good residual of 14 days. In comparison, Comite (currently registered on peanuts)
also provided significant reduction in spider mites; the reduction was short-lived (Fig. 3). In 2017, Portal provided nearly 98% spider mite control at the full rate within 7 days after one application. After 14 days, Portal still provided 90% spider mite control under dry conditions of a high tunnel. Agri-Mek also showed similar significant control of spider mites after one spray with adequate residual activity (Fig. 4). The organic product called Aramite (mixed with feeding stimulant Bemix) was not able to control spider mites under a high pressure. These studies also provided evidence that spider mites can cause over 22% yield loss and severe crop contamination in the absence of control measures (Fig. 5).

Results of these tests have been communicated with producers who have been alerted regarding the risk of over-dependence on synthetic insecticides commonly used for caterpillar control (next section). Typically, poor planning of caterpillar control results in large-scale spider mite outbreaks in Alabama.

Fig. 1 (A&B). Peanuts grown under high tunnel for excluding rain for spider mite study (A). Synthetic pyrethroid insecticides were used to flare up spider mites (B).
Fig. 2. Spider mite outbreaks of two species were induced by pesticide sprays. Peanut producers were alerted to such undesirable consequences through publications and email alerts.

Spider mite counts in high tunnel peanuts
(Clanton, 2016 – A drought year!)

Fig. 3. Spider mite control with registered (Comite) and unregistered miticides. Results from this study will support future registration of miticides.
Spider mite counts in high tunnel peanuts  
(Clanton, 2017 – A very wet year!)

Treatment 1: Sept 26 (leaf sampled on Oct 3)  
Treatment 2: Oct 4 (leaf sampled on Oct 16)  
20 ft plots, single rows  
10 terminal leaves per plot, washed in alcohol  
Mustang Max (Deltacyclone) = Aug 8, Aug 22  
Bexenthrin treatments = Sept 5, Sept 12

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Virginia peanuts

<table>
<thead>
<tr>
<th>Treatment</th>
<th>7DAT1 (Oct 3)</th>
<th>12DAT2 (Oct 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>197</td>
<td>240</td>
</tr>
<tr>
<td>Portal 2</td>
<td>4 b</td>
<td>23 a</td>
</tr>
<tr>
<td>Agri-Mek 3.5</td>
<td>2 a</td>
<td>31 b</td>
</tr>
<tr>
<td>Aramite 32 oz</td>
<td>50 c</td>
<td>50 a</td>
</tr>
<tr>
<td>Comite 2.2 pt</td>
<td>.5 b</td>
<td></td>
</tr>
</tbody>
</table>

F = 10.2, Sig = .000***
F = 35.4, Sig = .000***

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Fig. 4. Spider mite control using various miticides. Treatments resulted in significant reduction in mite numbers. Results from this study will support future registration of miticides.

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Fig. 5. Spider mites can cause 22% yield loss and severe crop contamination if uncontrolled (central rows). Treatment with miticides provided significant reduction in spider mites.
ACES
2016-2017 Project Summary

Producer training/information dissemination:

Information about insect pest occurrence and spider mite control methods was shared with peanut producers in Alabama via new publications, spring meetings, and field events in the summer. A total of 497 participants attended 13 events to receive research-based IPM information. The Alabama Peanut IPM Guide for Insect Control (http://www.aces.edu/pubs/docs/I/IPM-0360/IPM-0360.pdf) was updated with new information; this IPM information is also available as a slide chart (Fig. 6 on left). Peanut IPM slide charts were made available to all producers, crop advisors, regional extension agents, and pesticide dealers during education events where feedback was also collected about the quality of IPM recommendations and publications. 90% producers at the meeting were very satisfied with the quality of information provided to them and the consultation support provided by the PI through phone calls and publications.

Pest management/outbreak information was also shared with producer through the Alabama IPM Communicator newsletter (www.aces.edu/ipmcommunicator) and Facebook (https://www.facebook.com/Alabama-Peanut-IPM-Program-166598770047038/). Other major publications such as the Peanut Grower magazine and AgFax also shared pest alerts with peanut producers across the southeast. All recent publication are available for download from the Alabama Peanut IPM website (www.aces.edu/peanutipm). Presentations made at 10 indoor events have been shared with the Alabama Peanut Producers Association for upload to their website as well. We thank the Alabama Peanut Producers Association and the National Peanut Board for funding this project. We continue to work with the industry in support new miticides and insecticide registrations based on the described research.

A. B.
Fig. 6. New peanut IPM slide chart
Fig. 7. Peanut production meeting in progress (A). Producers provided feedback to the project leader about the quality of information and services (B).
EXHIBIT B
ATTACHMENT D
Format for Annual/Final Research Report Submission

1. Abstract.

Project Title: Benefitting new and experienced peanut producers through pest alerts and updated IPM recommendations to reduce spider mite problems

Principal Investigator(s): Ayana Majumdar (Extension Specialist, Department of Entomology and Plant Pathology, Auburn University, azm0024@auburn.edu, 251-331-8416)

Cooperating Personnel: Kris Balkcom (Research Associate, Department of Crop, Soil, and Environmental Sciences, Auburn University); Larry Wells (Director, Wiregrass Research and Extension Center, Headland, AL), Matthew Price (Director, Chilton Research and Extension Center, Clanton, AL)

Summary: Seven major moth pests of peanuts were monitored using sticky wing pheromone traps across 20 locations with mixed crops (peanuts/cotton/soybean). Results indicated a high activity of fall armyworm and tobacco budworms statewide in 2018 along with soybean looper caterpillars. Due to cool wet season, most insect lifecycles were pushed late in the season. Peanut research plots for spider mites were established at two locations – Headland and Clanton, AL. Peanuts (GA-06G) were planted in May and spider mites were induced by four applications of synthetic pyrethroid insecticides under high heat conditions of a high tunnel. Observations on thrips and two-spotted spider mites were gathered from both locations. Results indicated that Portal (conventional miticide) and Aramite (organic miticide) can reduce spider mites by over 70% with repeated applications. As a side project, thrips counts were also done with various organic and conventional insecticides under the high tunnel; it appears foliar insecticides may not be fully effective against thrips due to some tolerance to conventional products. Neem-based alternative insecticides (e.g., Molt-X) may be more effective with 3-4 applications similar to the applications of premix conventional formulations (e.g., Intrepid Edge).
II. Main Body of Report

Project Title: **Benefiting new and experienced peanut producers through pest alerts and updated IPM recommendations to reduce spider mite problems**

Principal Investigator(s): **Ayanava Majumdar** (Extension Specialist, Department of Entomology and Plant Pathology, Auburn University, azm0024@auburn.edu, 251-331-8416)

Cooperating Personnel: **Kris Balkcom** (Research Associate, Department of Crop, Soil, and Environmental Sciences, Auburn University); **Larry Wells** (Director, Wiregrass Research and Extension Center, Headland, AL); **Matthew Price** (Director, Chilton Research and Extension Center, Clanton, AL)

Objectives:

Obj. 1: Establish a moth insect pest monitoring system using pheromone traps for research and training purposes. This will provide critical pest migration and seasonal activity data for producers in 2018.

Obj. 2: Conduct spider mite management research with the long-term goal of registering additional miticides in peanuts.

Procedures:

Obj. 1. We used sticky wing pheromone traps for monitoring seven major species of moths that often cause caterpillar issues in peanuts. About 20 locations with mixed crops (peanuts/cotton/soybean) were monitored and insect counts from trap bottoms were entered into a database using “OpenScout” software. Regular pest alerts based on insect counts and direct scouting of crops were provided to producers and crop advisers as an advance warning system.

Obj. 2. For spider mite research, peanuts were planted under high tunnels (to exclude rainfall and simulate drought conditions with high temperatures) at two locations – Headland and Clanton. Cullman Research Station has closed and was not used for the test. Treatments were arranged in randomized complete block design with four replications. The high tunnel at
Results and Discussion:

Obj. 1. Year 2018 was a cool and moderately wet year. Insects were monitored across 20 locations that were consistent with year before. It was relatively dry during the peak production season with plenty of scattered weather events. Weather fluctuations affect insect activity significantly. Beet armyworm activity was high in July followed by fall armyworm; beet armyworm numbers were slightly lower compared to 2017 production year. Fall armyworm activity was intense and several growers experienced late season outbreak of caterpillars in peanut fields. Cabbage looper moth activity was relatively lower in 2018 compared to 2017 production season; soybean looper activity intensified in peanut fields in late-August. Interestingly, there was a much higher number of tobacco budworms were captured in 2018 with significant caterpillar activity. Lesser cornstalk borer (LCB) moth activity was lower due to unfavorable conditions in the open field; drought simulation on peanut plots in high tunnel raised LCB larval activity in sandy soil in Headland but not in Clanton.

### Insect Pest Activity in Crops (moths/trap per 10 days)

<table>
<thead>
<tr>
<th>Insect Pests</th>
<th>2016 Production Season (year)</th>
<th>2017 Production Season (very wet year)</th>
<th>2016 Production Season (extreme drought)</th>
<th>Historic peak activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Av.</td>
<td>Range</td>
<td>Peak</td>
<td>Total</td>
</tr>
<tr>
<td>Beet armyworm</td>
<td>15</td>
<td>2-25</td>
<td>July</td>
<td>592</td>
</tr>
<tr>
<td>Fall armyworm</td>
<td>23</td>
<td>1-43</td>
<td>Aug</td>
<td>933</td>
</tr>
<tr>
<td>Cabbage looper</td>
<td>17</td>
<td>10-26</td>
<td>Aug</td>
<td>297</td>
</tr>
<tr>
<td>Corn earworm</td>
<td>2</td>
<td>0-3</td>
<td>Aug</td>
<td>77</td>
</tr>
<tr>
<td>Tobacco budworm</td>
<td>8</td>
<td>0-26</td>
<td>Aug</td>
<td>311</td>
</tr>
<tr>
<td>Lesser cornst borer</td>
<td>190</td>
<td>3-280</td>
<td>Jul</td>
<td>5190</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>7,977</td>
<td></td>
<td></td>
<td>10,541</td>
</tr>
</tbody>
</table>
A total of 8,507 moths were counted and identified by the PI from across the state; trend reports (pest alerts) were presented during grower field days in Headland and Eufaula. Results from the insect monitoring project were published in the Alabama IPM Communicator blogs and AgFax articles that reached hundreds of peanut producers and crop advisers (agfax.com).

- Watch for caterpillars in peanuts (blog post on June 29, 2018):
  https://sites.aces.edu/group/crops/blog/Lists/Posts/Post.aspx?ID=223
- Peanut insect pest activity report (blog post on July 20, 2018):
  https://sites.aces.edu/group/crops/blog/Lists/Posts/Post.aspx?ID=228

Obj. 2. Georgia 06-G peanut variety was used for small plot spider mite research under high tunnels in Clanton and Headland. The primary mite species is the two-spotted spider mite (*Tetranychus urticae*). Due to excessive humidity and fluctuating temperatures, it was a challenge to flare up spider mites for a uniform population in Headland, AL. We had more success of insecticide-induced spider mite outbreak in Clanton where two applications each of Mustang Max (zeta-cypermethrin) and Tundra (bifenthrin) was necessary. Excessive use of synthetic pyrethroids for inducing mites also serves as a demonstration for peanut producers who may be using the same products alternatively in hot weather resulting in their battle with spider mites. Spider mites treatments were applied 1 to 4 times depending on the product label in September when mite activity inside the high tunnel was at peak. We compared the effectiveness of five miticides to an untreated check and results are as follows: Portal (1.5 pt/A, conventional miticide) reduced spider mites by 82%; Comite (32 oz/A, conventional miticide) reduced mites by 71%; Aramite (48 oz/A, organic miticides) reduced mite numbers by 78%; Aramite & Bemix (32 oz/A + 18 oz/A, organic tank-mix) reduced mite numbers by 50%. Peanut yields were improved 10 to 11% by consistent miticides applications in the small plots; organic materials have better persistence in high tunnels where rainfall excluded.
Spider Mite Direct Counts in High Tunnel
(Clanton, 2018)

Currently, Comite is the only miticides registered in peanuts. Spider mite data from this study will be available to the industry to promote additional miticides registrations that will benefit the producers.

Peanut Yields (Lb/A) from Spider Mite Test in High Tunnel
(Clanton, 2018)
Thrips control test (side-study due to high pest population under high tunnels): In Clanton, two applications of Molt-X (organic insecticide with neem & azadirachtin) reduced thrips counts on leaves and flowers by 62% followed by Intrepid Edge and Radiant (38% control) and Beseige (25% control) suggesting there may be some tolerance to conventional insecticides in thrips infesting peanuts. Unfortunately, organic insecticides have to be reapplied at a weekly interval which raises cost of insect control.

**Thrips control under high tunnel peanuts**  
*(Clanton 2018)*

![Thrips control under high tunnel peanuts](image)

7DAT? (July 20)

- Untreated check
- Molt-X (10 oz/A)
- Intrepid Edge (4oz/A)
- Radiant (2 oz/A)
- Beseige (10 oz)

Peanut variety: GA-066  
Planting date: May 14, 2018  
Thrips numbers per 10 terminals per plot.

In Headland, three applications of BotaniGard Maxx and Molt-X (both organic insecticides) to the foliage reduced thrips numbers on leaves and flowers 58 to 74% which was similar to the conventional insecticide applications. Results seem to be consistent across locations and may be indicative of the limitations of foliar insecticides for thrips control. Producers have been recommended the use of in-furrow systemic insecticides for thrips management to reduce the need for overhead insecticide applications. This is also favorable for beneficial insects that are able to establish in peanut fields and provide some natural control of thrips and caterpillars with reduced insecticide applications.
Discoveries:

**Thrips control in high tunnel peanuts**
*(Headland, 2018)*

![Graph showing thrips control](image)

Peanut variety: GA-06G  
Planting date: May 17, 2018  
Thrips numbers on 10 terminals per plot.

No phytotoxicity observed for any treatments.

The only new pest incidence that came to our attention was the snail infestation in the late season that caused contamination at the receiving/shelling stations. A new project preproposal to investigate this has been submitted to NPB/SPRI. In the meantime, we have provided some basic recommendations to producers with emphasis on cultural control tactics since molluscsicides are expensive and ineffective late in the season.

Snails and slugs in peanuts (blog post on Aug 3, 2018):  
[https://sites.aces.edu/group/crops/blog/Lists/Posts/Post.aspx?Id=229](https://sites.aces.edu/group/crops/blog/Lists/Posts/Post.aspx?Id=229)

**Snail issues with wet weather**

**Favorable conditions for snails/slugs:**

- Frequent rainfall as we have experienced in 2018 and 2017.
- High organic matter and debris on soil — this allows snails/slugs to hide during the day.
- Dense crop foliage provides shelter and makes it easy for the pest to move between plants.
- Excessive foliage also hinders treatment applications and product effectiveness.