Evaluation of Insecticides and Repellents for Suppression of Feeding Injury by Deer in South Carolina Soybeans

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The Reality of Deer Damage

• We cannot depend on hunters to regulate populations!!!!!!!!!!!!!!!
• Deer depredation programs have proven ineffective
• Deer exclusion techniques are expensive
• Our understanding of repellents is limited
Purpose

• The purpose of this study was to evaluate the effectiveness of insecticides, nematicides, and repellents at reducing deer damage to soybeans. Additionally, we sought to identify potential cost effective repellent programs.
2016 Study Design

- Randomized Complete Block Design
  - 3 at plant treatment blocks
  - 11 post emergent treatments per block
    - Applied weekly for 3 weeks following emergence
  - 4 replications for each block
  - 132 total plots, one study site (Orangeburg)
  - Weekly damage monitoring (0-5 Rating)
2016 At-Plant Treatments

- Untreated Control
- Aldicarb
  - 5lbs per acre
  - Banded behind planter
- Phorate
  - 5lbs per acre
  - Banded behind planter
2016 Post Emergent Repellents

- **Insecticides**
  - Acephate (8 oz/ac)
  - Chlorpyrifos (16 oz/ac)
  - Dimethoate (16 oz/ac)
  - Lannate (16 oz/ac)
  - Insecticidal Soap (2.5 oz/gal)

- **Repellents**
  - Bobbex Deer Repellent (14 oz/ac)
  - Dave’s Insanity Sauce (6 oz/ac)
  - Hinder (5 oz/gal)
  - Miller’s Hot Sauce (6 oz/ac)
  - Ortho Deer B Gone (13 oz/ac)
Damage Ratings
2016 At-Plant Results

Observed Damage Ratings for At-Plant Treatments

- Aldicarb
- Control
- Phorate

Damage Rating

CLEMSON COOPERATIVE EXTENSION
Aldicarb + Insecticidal Soap

*Entire study conducted in this field in 16 rows along the entire edge
No At-Plant + Bobbex
2017 Study

- At-Plant Applications of Aldicarb
  - Orangeburg

- Foliar Repellents at 2 weeks post emergence or at 2 & 4 weeks
  - Columbia – Sandhill REC
  - Pendleton – Simpson REC
  - Pendleton – Starkey Swine Center

- Combination of Foliar and At-Plant
  - Blackville – Edisto REC

- Trials Carried to Harvest
  - Orangeburg
  - Edisto REC
  - Simpson REC

- Weekly damage monitoring at all sites
  - Edisto REC – 6 weeks
  - Orangeburg – Full Bloom
  - Sandhills, Simpson, Starkey – Entire Season
  - Plant Heights were also collected during monitoring at Simpson and Starkey
2017 Study

- **Experimental Design**
  - **Orangeburg**
    - Entire Field, 3 treatments, 32 replications
  - **Edisto REC**
    - Entire Field, 10 treatments, 4 replications
  - **Simpson REC**
    - Field Cove (High Damage Area), 10 treatments, 7 replications
  - **Starkey Swine Center**
    - Field Cove (High Damage Area), 10 treatments, 4 replications
  - **Sandhill REC**
    - Field was ½ Corn ½ Soybean, 10 treatments, 4 replications
2017 Treatments

• **At-Plant**
  - AgLogic 15g
    • In-Furrow
    • 0 lbs/ac
    • 3 lbs/ac
    • 5 lbs/ac

• **Foliar**
  - Hinder (5 oz/ac)
  - Insecticidal Soap (2.5 oz/ac)
  - Deer Pro Summer (1 pt/ac)
  - Deer Pro Winter (1 pt/ac)
  - Deer Pro Ag (1 pt/ac)

  - For each repellent
    • 2 week post emergence application
    • 2 week and 4 week post emergence applications
At-Plant Trials in Orangeburg

- 8 Row Planter
  - Split Calibration of Insecticide Boxes
    - 4 @ 3 lbs/ac
    - 4 @ 5 lbs/ac
  - Treatments across field
    - 8 Rows UTC
    - 4 Rows 5 lbs
    - 4 Rows 3 lbs
    - 32 replications

- Damage Early
- Near Complete Avoidance Through Maturity

<table>
<thead>
<tr>
<th>Rate</th>
<th>Mean Damage Rating</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lbs/ac</td>
<td>1.85</td>
<td>49.14 bu/ac</td>
</tr>
<tr>
<td>3 lbs/ac</td>
<td>1.76</td>
<td>49.94 bu/ac</td>
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<tr>
<td>5 lbs/ac</td>
<td>1.80</td>
<td>50.36 bu/ac</td>
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</table>
We had questionable soil moisture for emergence at planting, followed by 4 weeks of extremely dry weather.
Don’t Let The Stats Fool You!
## Simpson REC – Pendleton

<table>
<thead>
<tr>
<th>Repellent</th>
<th>Application</th>
<th>Mean Damage</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer Pro Ag</td>
<td>2 and 4 weeks</td>
<td>1.22</td>
<td>7.75 bu/ac</td>
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<tr>
<td>Deer Pro Summer</td>
<td>2 weeks</td>
<td>1.49</td>
<td>7.04 bu/ac</td>
</tr>
<tr>
<td>Deer Pro Summer</td>
<td>2 and 4 weeks</td>
<td>1.07</td>
<td>9.94 bu/ac</td>
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<tr>
<td>Deer Pro Winter</td>
<td>2 weeks</td>
<td>1.32</td>
<td>7.45 bu/ac</td>
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<tr>
<td>Deer Pro Winter</td>
<td>2 and 4 weeks</td>
<td>1.05</td>
<td>12.06 bu/ac</td>
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<tr>
<td>Hinder</td>
<td>2 weeks</td>
<td>1.00</td>
<td>12.11 bu/ac</td>
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<tr>
<td>Hinder</td>
<td>2 and 4 weeks</td>
<td>0.73</td>
<td>15.01 bu/ac</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>2 weeks</td>
<td>1.04</td>
<td>9.39 bu/ac</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>2 and 4 weeks</td>
<td>0.65</td>
<td>12.23 bu/ac</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>1.38</td>
<td>6.28 bu/ac</td>
</tr>
</tbody>
</table>
First 6 Weeks – Damage Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Least Sq Mean</th>
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<tbody>
<tr>
<td>UTC</td>
<td>0.97619048</td>
</tr>
<tr>
<td>Dp Summer1</td>
<td>0.95238095</td>
</tr>
<tr>
<td>Soap1</td>
<td>0.76190476</td>
</tr>
<tr>
<td>Dp Ag2</td>
<td>0.70238095</td>
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<tr>
<td>Dp Winter1</td>
<td>0.67857143</td>
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<tr>
<td>Dp Winter2</td>
<td>0.61904762</td>
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<tr>
<td>Hinder1</td>
<td>0.61904762</td>
</tr>
<tr>
<td>Dp Summer2</td>
<td>0.50000000</td>
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<tr>
<td>Hinder2</td>
<td>0.35365854</td>
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<tr>
<td>Soap2</td>
<td>0.22619048</td>
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</tbody>
</table>

Levels not connected by same letter are significantly different.
Treatments at 2 weeks post emergence (1) or 2 and 4 weeks post emergence (2)
Simpson REC – Mean Damage Rating

Mean Damage Rating by Treatment

Ratings: 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4

Graph showing the mean damage rating by treatment, with box plots for each category.
Simpson REC Plant Heights

Soybean Plant Heights by Treatment at Pod Set

Height in Inches

Treatment (2 = 1 application at 2 weeks, 2,4 = treatments at 2 and 4 weeks)
Simpson REC - Yields
## Starkey Swine Center

<table>
<thead>
<tr>
<th>Repellent</th>
<th>Applications</th>
<th>Mean Damage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer Pro Ag</td>
<td>2 and 4 weeks</td>
<td>0.39</td>
</tr>
<tr>
<td>Deer Pro Summer</td>
<td>2 weeks</td>
<td>0.32</td>
</tr>
<tr>
<td>Deer Pro Summer</td>
<td>2 and 4 weeks</td>
<td>0.34</td>
</tr>
<tr>
<td>Deer Pro Winter</td>
<td>2 weeks</td>
<td>0.45</td>
</tr>
<tr>
<td>Deer Pro Winter</td>
<td>2 and 4 weeks</td>
<td>0.41</td>
</tr>
<tr>
<td>Hinder</td>
<td>2 weeks</td>
<td>0.34</td>
</tr>
<tr>
<td>Hinder</td>
<td>2 and 4 weeks</td>
<td>0.44</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>2 weeks</td>
<td>0.35</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>2 and 4 weeks</td>
<td>0.47</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>0.51</td>
</tr>
</tbody>
</table>
## Sandhill REC - Columbia

<table>
<thead>
<tr>
<th>Repellent</th>
<th>Applications</th>
<th>Mean Damage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer Pro Ag</td>
<td>2 and 4 weeks</td>
<td>0.26</td>
</tr>
<tr>
<td>Deer Pro Summer</td>
<td>2 weeks</td>
<td>0.19</td>
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<tr>
<td>Deer Pro Summer</td>
<td>2 and 4 weeks</td>
<td>0.28</td>
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<tr>
<td>Deer Pro Winter</td>
<td>2 weeks</td>
<td>0.20</td>
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<tr>
<td>Deer Pro Winter</td>
<td>2 and 4 weeks</td>
<td>0.30</td>
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<tr>
<td>Hinder</td>
<td>2 weeks</td>
<td>0.18</td>
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<tr>
<td>Hinder</td>
<td>2 and 4 weeks</td>
<td>0.17</td>
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<tr>
<td>Insecticidal Soap</td>
<td>2 weeks</td>
<td>0.25</td>
</tr>
<tr>
<td>Insecticidal Soap</td>
<td>2 and 4 weeks</td>
<td>0.31</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>0.25</td>
</tr>
</tbody>
</table>
Edisto REC - Blackville

- Study was carried to harvest
- Data analysis not complete
- Deer damage was not evenly distributed across field!
- Nutgrass was a major issue on bottom end of field.
Take Away

• At-Plant applications of aldicarb for nematode and early insect control will provide satisfactory deer repellency

• While full season data doesn’t support...damage early in the study was lower in soap based treatments (Hinder and Insecticidal Soap)
Questions?