Efficacy of Selected Insecticides for Control of Plant Bugs in Arkansas

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RESEARCH PROBLEM

The tarnished plant bug, has become the most destructive pest in cotton. Multiple applications are required to achieve control of this pest, making it very expensive to control as well. Due to the difficulty in achieving adequate control, efficacy trials are essential in determining which insecticides provide adequate control.

BACKGROUND INFORMATION

The tarnished plant bug (TPB), *Lygus lineolaris*, has become the most destructive pest in cotton since the eradication of the boll weevil and the development of *Bacillus thuringiensis* (Bt) technologies. Before 1995, TPB were controlled with insecticides targeting other insect pests such as the tobacco budworm/cotton bollworm and boll weevil. Reduced applications for these pests have established the TPB as the primary insect pest of cotton in the Mid-south. Recently, TPB has become resistant to several classes of insecticides, further compounding the problem (Catchot et. al., 2009). In 2010, Arkansas growers treated 92% of the cotton acreage planted at a cost of $18.06/acre. In spite of the aggressive attempts to control this pest, a total of 38,946 bales of cotton were lost to the TPB, 48% of the total bales lost for the year. These studies were conducted to evaluate the efficacy of insecticides currently recommended, as well as some new products and tank-mixes, for control of TPB in Arkansas and the Mid-south.

RESEARCH DESCRIPTION

Trials were located at the Lon Mann Cotton Branch Experiment Station in Lee County, Ark. 2011. Plot size was 12.5 feet (4 rows) by 50 feet in a randomized

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complete block design with 4 replications. DPL 0912, BGII RRG was planted on 15 May (PB3), and 27 May (PB12, PB13) 2011. Insecticide treatments were applied with a Mud Master fitted with TX6 hollow cone nozzles at 19 in nozzle spacing; spray volume was 10 gal/acre, at 40 psi. Insect numbers were determined by using a 2.5-ft drop cloth. Two drop cloth samples were taken per plot for a total of 10 row ft per plot. Treatments were evaluated based on the current University of Arkansas Cooperative Extension Service threshold of 6 plant bugs per 10 row ft. Data were processed using Agriculture Research Manager V. 8 (Gylling Data Management, Inc., Brookings, S.D.) and Duncan’s New Multiple Range Test ($P = 0.10$) to separate means.

**RESULTS AND DISCUSSION**

In PB3-2011 at 3 days after the first application (3 DAT-1), all treatments reduced plant bug numbers compared to the untreated check (UTC) (Table 1). Lorsban Advanced (24 and 32 oz/acre), and Endigo (0.0805 lb ai/acre) did not reduce numbers below that of the Cooperative Extension Service threshold. Plant bug numbers at 7 DAT-1 were above threshold in all treatments except for Transform (0.047 and 0.0703 lb ai/acre), Bidrin 8 (0.5 lb ai/acre), Endigo (0.0805 lb ai/acre), Cobalt Advanced (25 and 40 oz/acre), and Lorsban Advanced (32 oz/acre). While populations continued to increase in the UTC, Transform (0.047 and 0.0703 lb ai/acre), Endigo (0.0805 lb ai/acre), and Lorsban Advanced (24 oz/acre) + Karate (2 oz/acre) continued to control plant bug numbers 10 DAT-1. All treatments reduced plant bug numbers compared to the UTC at 5 DAT-2. All treatments reduced TPB below threshold except for Lorsban Advanced (24 and 32 oz/acre). Transform (0.047 and 0.0703 lb ai/acre), and Endigo (0.0805 lb ai/acre) controlled plant bug numbers better than all other treatments at 11 DAT-2. However, Transform (0.047 and 0.0703 lb ai/acre) were the only treatments below the Cooperative Extension Service threshold. Transform (0.0703 lb ai/acre) and Acephate (1 lb ai/acre) had a higher yield than the UTC and Transform at a lower rate (0.047 lb ai/acre). Yield ranged from 40.5 to 282.3 lint lbs/acre above the UTC.

In PB12-2011, 3 DAT-1, Diamond (6 oz/ a), Endigo (4.5 oz/acre), CMT 4586 (8 oz/acre), and Leverage (2.8 oz/acre) + Non-ionic Surfactant (NIS) (0.25% v/v) reduced plant bug numbers lower than the UTC, while CMT 4586 and Leverage (8 and 2.8 oz/acre, respectively) reduced plant bug numbers below the Cooperative Extension Service threshold (Table 2). At 7 days after the first application, Diamond + Alias F (6 and 1 oz/acre, respectively) and Diamond + Alias 4F (6 and 2 oz/acre, respectively), Diamond (6 oz/acre), Alias 4F (2 oz/acre), Endigo (4.5 oz/acre), and CMT 4586 (8 oz/acre) reduced plant bug numbers lower than the UTC; all of which were below the Cooperative Extension Service threshold except for Diamond (6 oz/acre). At 4 DAT-2, all treatments reduced plant bug numbers below the UTC. At 7 DAT-2, all treatments had fewer plant bugs than the UTC. Diamond + Alias F (6 and 0.5 oz/acre, 6 and 1 oz/acre, 6 and 2 oz/acre, respectively), Diamond (6 oz/acre), Endigo (4.5 oz/acre), CMT 4586 (8 oz/
acre), and Leverage (2.8 oz/acre) + NIS (0.25% v/v) reduced plant bug numbers below the Cooperative Extension Service threshold. At 11 DAT-2, all treatments reduced plant bugs below the UTC. No treatments reduced plant bug numbers below threshold. Diamond + Alias 4F (6 and 0.5 oz/acre, 6 and 1 oz/acre, 6 and 2 oz/acre, respectively) had a higher yield than the UTC. Yield ranged from 143.4 to 470.4 lint lbs/acre above the UTC.

In PB13-2011, 3 DAT, plant bug numbers in all treatments were lower than the UTC, while Athena (8 and 12 oz/acre), Brigade (6.4 oz/acre), Brigade + Bidrin (6.4 oz/acre each), Brigade + Diamond (6.4 oz/acre each), Carbine (2.3 oz/acre), Centric (2 oz/acre), and Orthene (0.75 lb/acre) were all below the Cooperative Extension Service threshold (Table 3). At 8 DAT, all treatments remained lower than the UTC. Only Brigade + Bidrin (6.4 oz/acre each), Brigade + Diamond (6.4 oz/acre each), Carbine (2.3 oz/acre), and Orthene (0.75 lb/acre) remained below the Cooperative Extension Service threshold. Brigade (6.4 oz/acre) had a higher yield than the UTC. Yield ranged from -86.6 to 244.7 lint lbs/acre in relation to yield in the UTC.

**PRACTICAL APPLICATION**

These trials indicate the difficulty in controlling plant bug numbers with existing insecticides and emphasize the need for new classes of insecticides to achieve acceptable control levels of this pest.

**ACKNOWLEDGMENTS**

We would like to thank the Cotton State Support Committee and Cotton Inc. for their support.

**LITERATURE CITED**

Table 1. PB3-2011 Tarnished plant bug data per 10 row feet at 3, 7, 10 days after first application, and 5, 11 days after second application, yield data.

<table>
<thead>
<tr>
<th>Treatment Name</th>
<th>7/15 3 DAT-1</th>
<th>7/19 7 DAT-1</th>
<th>7/22 10 DAT-1</th>
<th>7/27 5 DAT-2</th>
<th>8/2 11 DAT-2</th>
<th>Season Total</th>
<th>Yield lint lb/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>12.0 a¹</td>
<td>11.0 a</td>
<td>14.3 a</td>
<td>18.5 a</td>
<td>29.5b</td>
<td>85.3 a</td>
<td>1247.8 b</td>
</tr>
<tr>
<td>Transform 0.047 lb ai/acre</td>
<td>3.3 bc</td>
<td>2.8 bc</td>
<td>3.3 de</td>
<td>1.8 e</td>
<td>4.3d</td>
<td>15.3 d</td>
<td>1288.3 b</td>
</tr>
<tr>
<td>Transform 0.0703 lb ai/acre</td>
<td>1.8 c</td>
<td>1.5 c</td>
<td>1.5 e</td>
<td>1.3 e</td>
<td>5.3d</td>
<td>11.3 d</td>
<td>1530.1 a</td>
</tr>
<tr>
<td>Bidrin 8 0.5 lb ai/acre</td>
<td>1.3 c</td>
<td>3.0 bc</td>
<td>7.3 bcd</td>
<td>3.0 de</td>
<td>15.5cd</td>
<td>30.0 bcd</td>
<td>1349.8 ab</td>
</tr>
<tr>
<td>Acephate 1 lb ai/acre</td>
<td>1.5 c</td>
<td>8.8 ab</td>
<td>8.3 bcd</td>
<td>4.0 de</td>
<td>15.5cd</td>
<td>38.0 bc</td>
<td>1510.5 a</td>
</tr>
<tr>
<td>Endigo 0.0805 lb ai/acre</td>
<td>6.5 b</td>
<td>2.8 bc</td>
<td>4.8 cde</td>
<td>2.0 de</td>
<td>7.3d</td>
<td>23.3 cd</td>
<td>1413.8 ab</td>
</tr>
<tr>
<td>Cobalt Advanced 25 fl oz/acre</td>
<td>3.3 bc</td>
<td>5.8 abc</td>
<td>8.8 bcd</td>
<td>5.0 cd</td>
<td>26.3bc</td>
<td>49.0 b</td>
<td>1339.3 ab</td>
</tr>
<tr>
<td>Cobalt Advanced 40 fl oz/acre</td>
<td>5.3 bc</td>
<td>5.3 abc</td>
<td>9.3 abc</td>
<td>2.0 de</td>
<td>24.3bc</td>
<td>46.0 b</td>
<td>1420.3 ab</td>
</tr>
<tr>
<td>Lorsban Advanced 24 fl oz/acre</td>
<td>6.5 b</td>
<td>8.3 ab</td>
<td>10.8 ab</td>
<td>8.0 b</td>
<td>34.5b</td>
<td>68.0 a</td>
<td>1364.1 ab</td>
</tr>
<tr>
<td>Lorsban Advanced 32 fl oz/acre</td>
<td>6.3 b</td>
<td>3.8 bc</td>
<td>7.0 bcd</td>
<td>7.0 bc</td>
<td>51.3a</td>
<td>75.3 a</td>
<td>1409.9 ab</td>
</tr>
<tr>
<td>Lorsban Advanced 24 fl oz/acre + Karate 2 fl oz/acre</td>
<td>3.8 bc</td>
<td>6.0 abc</td>
<td>4.5 cde</td>
<td>1.3 e</td>
<td>24.3bc</td>
<td>39.8 bc</td>
<td>1372.0 ab</td>
</tr>
</tbody>
</table>

¹Means in a column followed by the same letter are not significantly different (P = 0.05).
Table 2. PB12-2011 Tarnished plant bug data per 10 row feet 3, 7 days after first application and 4, 7, 11 days after second application; yield data.

<table>
<thead>
<tr>
<th>Treatment Name</th>
<th>7/28 3 DAT-1</th>
<th>8/1 7 DAT-1</th>
<th>8/5 4 DAT-2</th>
<th>8/8 7 DAT-2</th>
<th>8/12 11 DAT-2</th>
<th>Season Total</th>
<th>Yield lint lb/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>15.8 a&lt;sup&gt;1&lt;/sup&gt;</td>
<td>11.3</td>
<td>30.0 a</td>
<td>30.0 a</td>
<td>54.0 a</td>
<td>141.0 a</td>
<td>1071.4 b</td>
</tr>
<tr>
<td>Diamond 6 oz/acre + Alias 4F 0.5 oz/acre</td>
<td>11.0 ab</td>
<td>8.3 ab</td>
<td>5.5 b</td>
<td>3.5 bcd</td>
<td>9.0 c</td>
<td>37.3 bcd</td>
<td>1427.5 a</td>
</tr>
<tr>
<td>Diamond 6 oz/acre + Alias 4F 1.0 oz/acre</td>
<td>8.8 ab</td>
<td>4.5 b</td>
<td>2.8 b</td>
<td>3.0 cd</td>
<td>9.5 c</td>
<td>28.5 d</td>
<td>1437.3 a</td>
</tr>
<tr>
<td>Diamond 6 oz/acre + Alias 4F 2 oz/acre</td>
<td>8.0 ab</td>
<td>5.0 b</td>
<td>4.3 b</td>
<td>4.3 bcd</td>
<td>13.0 c</td>
<td>34.5 cd</td>
<td>1541.8 a</td>
</tr>
<tr>
<td>Diamond 6 oz/acre</td>
<td>7.5 b</td>
<td>6.0 b</td>
<td>2.8 b</td>
<td>1.8 d</td>
<td>8.0 c</td>
<td>26.0 d</td>
<td>1291.9 ab</td>
</tr>
<tr>
<td>Alias 4F 2.0 oz/acre</td>
<td>10.0 ab</td>
<td>3.8 b</td>
<td>7.5 b</td>
<td>6.3 bc</td>
<td>27.5 b</td>
<td>55.0 b</td>
<td>1251.1 ab</td>
</tr>
<tr>
<td>Endigo 4.5 oz/acre</td>
<td>6.0 b</td>
<td>5.5 b</td>
<td>3.3 b</td>
<td>4.8 bcd</td>
<td>10.0 c</td>
<td>29.5 d</td>
<td>1404.6 ab</td>
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<tr>
<td>CMT 4586 8 oz/acre</td>
<td>5.8 b</td>
<td>5.5 b</td>
<td>4.0 b</td>
<td>6.8 bc</td>
<td>28.5 b</td>
<td>50.5 bc</td>
<td>1327.9 ab</td>
</tr>
<tr>
<td>Leverage 2.8 oz/acre + COC 1% v/v</td>
<td>8.3 ab</td>
<td>7.8 ab</td>
<td>6.8 b</td>
<td>7.5 b</td>
<td>14.0 c</td>
<td>44.3 bcd</td>
<td>1215.2 ab</td>
</tr>
<tr>
<td>Leverage 2.8 oz/acre + NIS 0.25% v/v</td>
<td>5.0 b</td>
<td>8.5 ab</td>
<td>4.0 b</td>
<td>4.8 bcd</td>
<td>21.0 bc</td>
<td>43.3 bcd</td>
<td>1296.8 ab</td>
</tr>
</tbody>
</table>

<sup>1</sup>Means in a column followed by the same letter are not significantly different (P = 0.05).
<table>
<thead>
<tr>
<th>Treatment Name</th>
<th>7/27 3 DAT</th>
<th>8/1 8 DAT</th>
<th>Season Total</th>
<th>Yield lint lb/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>12.0 a¹</td>
<td>22.5 a</td>
<td>34.5 a</td>
<td>1440.6 ab</td>
</tr>
<tr>
<td>Athena 8 oz/acre</td>
<td>5.0 bc</td>
<td>13.0 bc</td>
<td>18.0 bc</td>
<td>1577.8 ab</td>
</tr>
<tr>
<td>Athena 12 oz/acre</td>
<td>5.8 bc</td>
<td>9.0 bcd</td>
<td>14.8 bcd</td>
<td>1478.1 ab</td>
</tr>
<tr>
<td>Brigadier 2 6.4 oz/acre</td>
<td>8.3 b</td>
<td>6.8 cd</td>
<td>15.0 bcd</td>
<td>1470.0 ab</td>
</tr>
<tr>
<td>Brigade 6.4 oz/acre</td>
<td>3.0 c</td>
<td>7.5 bcd</td>
<td>10.5 cd</td>
<td>1354.0 b</td>
</tr>
<tr>
<td>Brigade 6.4 oz/acre + Bidrin 6.4 oz/acre</td>
<td>3.8 c</td>
<td>4.0 d</td>
<td>7.8 d</td>
<td>1602.3 ab</td>
</tr>
<tr>
<td>Brigade 6.4 oz/acre + Diamond 6.4 oz/acre</td>
<td>3.0 c</td>
<td>2.5 d</td>
<td>5.5 d</td>
<td>1685.3 a</td>
</tr>
<tr>
<td>Carbine 2.3 oz/acre</td>
<td>5.8 bc</td>
<td>5.8 cd</td>
<td>11.5 bcd</td>
<td>1523.9 ab</td>
</tr>
<tr>
<td>Tri-Max Pro 1.5 oz/acre</td>
<td>6.8 bc</td>
<td>14.5 b</td>
<td>21.3 b</td>
<td>1412.8 ab</td>
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<tr>
<td>CENTRIC 2 oz/acre</td>
<td>5.0 bc</td>
<td>7.8 bcd</td>
<td>12.8 bcd</td>
<td>1554.9 ab</td>
</tr>
<tr>
<td>Orthene 0.75 lb/acre</td>
<td>5.3 bc</td>
<td>5.8 cd</td>
<td>11.0 cd</td>
<td>1528.8 ab</td>
</tr>
</tbody>
</table>

¹Means in a column followed by the same letter are not significantly different (P = 0.05).