Comparisons of tank-mix programs for control of glyphosate-resistant Palmer amaranth in RR soybean

Trial ID: 13S-CCP-CTS-02
Location: Cass County
Trial Year: 2013
Investigator: Dr. Bill Johnson
Study Director: Joe Ikley
Sponsor Contact: Valent - Eric Ott

General Trial Information

Study Director: Joe Ikley
Investigator: Dr. Bill Johnson

Title: Research Associate
Title: Professor

Discipline: H herbicide
Trial Status: F one-year/final
Initiation Date: 6/6/2013
Planned Completion Date: 8/31/2013
Completion Date: 8/13/2013

City: 12 Mile
Country: USA United States
State/Prov.: Indiana

Contacts

Study Director: Joe Ikley
Investigator: Dr. Bill Johnson

Organization: Purdue University
Organization: Purdue University

Address: 915 West State Street
Address: 915 West State Street

Phone No.: 765-494-0891
Phone No.: 765-494-4656

Mobile No.: 765-494-9091
Mobile No.: 765-494-9801

E-mail: jikley@purdue.edu
E-mail: wgj@purdue.edu

Crop Description

Crop 1: GLXMA Glycine max Soybean
Description: FG72

Planting Date: 6/6/2013
Planting Method: DIRDRI direct drilled

Depth, Unit: 2 IN
Row Spacing, Unit: 30 IN
Spacing Within Row, Unit: 2 IN
Soil Temperature, Unit: 70 F
Soil Moisture: SLIWET slightly wet, moist
Seed Bed: COARSE coarse

Pest Description

Pest 1 Type: W
Code: AMAPA Amaranthus palmeri
Common Name: Palmer amaranth
Description: GLY-RES

Site Design

Site Type: FIELD field
Experimental Unit: 1 PLOT plot
Tillage Type: CONTIL conventional-till
Study Design: RACOBL Randomized Complete Block (RCB)

Treated Plot Width: 10 FT
Treated Plot Length: 30 FT
Treated Plot Area: 300 FT2
Treatments: 7
Replications: 4

Maintenance

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Maintenance Product Name</th>
<th>Rate</th>
<th>Rate Unit</th>
<th>Tank Mix</th>
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<tbody>
<tr>
<td>1.</td>
<td>6/6/2013</td>
<td>LIBERTY</td>
<td>48</td>
<td>FL OZ/A</td>
<td>no</td>
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</table>

Field Prep./Maintenance:
USED LIBERTY TO BURN OFF EXISTING PALMER

Soil Description

Description Name: Bloomfield Loamy Fine Sand
Texture: LFS loamy fine sand
Soil Name: Bloomfield Loamy Fine Sand
Soil Drainage: E excellent
### Application Description

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application Date:</strong></td>
<td>6/7/2013</td>
<td>7/2/2013</td>
</tr>
<tr>
<td><strong>Appl. Start Time:</strong></td>
<td>12:00</td>
<td>10:00</td>
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<tr>
<td><strong>Appl. Stop Time:</strong></td>
<td>1:30</td>
<td>11:00</td>
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<tr>
<td><strong>Application Method:</strong></td>
<td>SPRAY</td>
<td>SPRAY</td>
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<tr>
<td><strong>Application Timing:</strong></td>
<td>PREPRE</td>
<td>POSPOS</td>
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<tr>
<td><strong>Application Placement:</strong></td>
<td>SOIL</td>
<td>BROADC</td>
</tr>
<tr>
<td><strong>Applied By:</strong></td>
<td>Spaunhorst</td>
<td>Legleiter</td>
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<tr>
<td><strong>Air Temperature, Unit:</strong></td>
<td>70 F</td>
<td>61 F</td>
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<tr>
<td><strong>% Relative Humidity:</strong></td>
<td>70</td>
<td>82</td>
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<tr>
<td><strong>Wind Velocity, Unit:</strong></td>
<td>5 MPH</td>
<td>3 MPH</td>
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<td><strong>Wind Direction:</strong></td>
<td>N</td>
<td>NNE</td>
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<tr>
<td><strong>Dew Presence (Y/N):</strong></td>
<td>N no</td>
<td>Y yes</td>
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<td><strong>Soil Temperature, Unit:</strong></td>
<td>72 F</td>
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<td><strong>Soil Moisture:</strong></td>
<td>SLIWET</td>
<td>WET</td>
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<tr>
<td><strong>% Cloud Cover:</strong></td>
<td>75</td>
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### Crop Stage At Each Application

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<tr>
<td><strong>Crop 1 Code, BBCH Scale:</strong></td>
<td>GLXMA BSoy</td>
<td>GLXMA BSoy</td>
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<td><strong>Stage Scale Used:</strong></td>
<td>BBCH</td>
<td>BBCH</td>
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<tr>
<td><strong>Stage Majority, Percent:</strong></td>
<td>00</td>
<td>13</td>
</tr>
<tr>
<td><strong>Stage Minimum, Percent:</strong></td>
<td>12</td>
<td>13</td>
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<tr>
<td><strong>Stage Maximum, Percent:</strong></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>Height, Unit:</strong></td>
<td>5 IN</td>
<td></td>
</tr>
<tr>
<td><strong>Height Minimum, Maximum:</strong></td>
<td>4 6</td>
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</table>

### Pest Stage At Each Application

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Pest 1 Code, Type, Scale:</strong></td>
<td>AMAPA W</td>
<td>AMAPA W</td>
</tr>
<tr>
<td><strong>Stage Majority, Percent:</strong></td>
<td>32G</td>
<td></td>
</tr>
<tr>
<td><strong>Stage Minimum, Percent:</strong></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Stage Maximum, Percent:</strong></td>
<td>34G</td>
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<tr>
<td><strong>Height, Unit:</strong></td>
<td>2.5 IN</td>
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</tr>
<tr>
<td><strong>Height Minimum, Maximum:</strong></td>
<td>0.5 4</td>
<td></td>
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<tr>
<td><strong>Density, Unit:</strong></td>
<td>20 YD2</td>
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## Application Equipment

<table>
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<tr>
<td><strong>Appl. Equipment:</strong></td>
<td>CO2 Backpack</td>
<td>CO2 Backpack</td>
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<tr>
<td><strong>Equipment Type:</strong></td>
<td>SPRBAC</td>
<td>SPRBAC</td>
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<tr>
<td><strong>Operation Pressure, Unit:</strong></td>
<td>17 PSI</td>
<td>17 PSI</td>
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<tr>
<td><strong>Nozzle Type:</strong></td>
<td>Flat Fan</td>
<td>Flat Fan</td>
</tr>
<tr>
<td><strong>Nozzle Size:</strong></td>
<td>XR11002</td>
<td>XR11002</td>
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<tr>
<td><strong>Nozzle Spacing, Unit:</strong></td>
<td>15 IN</td>
<td>15 IN</td>
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<tr>
<td><strong>Nozzles/Row:</strong></td>
<td>8</td>
<td>8</td>
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<tr>
<td><strong>Boom Length, Unit:</strong></td>
<td>10 FT</td>
<td>10 FT</td>
</tr>
<tr>
<td><strong>Boom Height, Unit:</strong></td>
<td>18 IN</td>
<td>18 IN</td>
</tr>
<tr>
<td><strong>Ground Speed, Unit:</strong></td>
<td>3 MPH</td>
<td>3 MPH</td>
</tr>
<tr>
<td><strong>Carrier:</strong></td>
<td>H2O</td>
<td>H2O</td>
</tr>
<tr>
<td><strong>Water Hardness (ppm CaCO3):</strong></td>
<td>150</td>
<td>150</td>
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<tr>
<td><strong>Spray Volume, Unit:</strong></td>
<td>15 GAL/AC</td>
<td>15 GAL/AC</td>
</tr>
<tr>
<td><strong>Mix Size, Unit:</strong></td>
<td>1.8 Liters</td>
<td>1.8 Liters</td>
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<tr>
<td><strong>Propellant:</strong></td>
<td>CO2</td>
<td>CO2</td>
</tr>
<tr>
<td><strong>Tank Mix (Y/N):</strong></td>
<td>N no</td>
<td>N no</td>
</tr>
</tbody>
</table>

**Date** 8/13/2013  **By** Ikley  **Notes** Crop was destroyed prior to taking final efficacy ratings.

**Trial Comments**
### Comparisons of tank-mix programs for control of glyphosate-resistant Palmer amaranth in RR soybean

**Trial ID**: 13S-CCP-CTS-02  
**Protocol ID**: 13S-CCP-CTS-02  
**Location**: Cass County  
**Year**: 2013  
**Project ID**: 64.01  
**Investigator**: Dr. Bill Johnson  
**Study Director**: Joe Ikeray  
**Sponsor**: Valent - Eric Ott

#### Product quantities required for listed treatments and applications of trials included in this table:

<table>
<thead>
<tr>
<th>Treatment Name</th>
<th>Form Conc</th>
<th>Form Type</th>
<th>Lot Code</th>
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</thead>
<tbody>
<tr>
<td>Valor</td>
<td>51 %</td>
<td>WG</td>
<td></td>
</tr>
<tr>
<td>Untreated Check</td>
<td>2 oz/a</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Roundup Powermax</td>
<td>4.5 LBAE/GAL</td>
<td>SL 1260 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>3.4 LBA/GAL</td>
<td>4.9 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>COC</td>
<td>100 %</td>
<td>SL 1.67 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>V-10206</td>
<td>2 LBA/GAL</td>
<td>EC 220 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>3.4 LBA/GAL</td>
<td>SL 4.9 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>COC</td>
<td>100 %</td>
<td>SL 1.67 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>Cobra</td>
<td>2 LBA/GAL</td>
<td>EC 220 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>Roundup Powermax</td>
<td>4.5 LBAE/GAL</td>
<td>SL 1260 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>3.4 LBA/GAL</td>
<td>SL 4.9 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>COC</td>
<td>100 %</td>
<td>SL 1.67 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>Warrant</td>
<td>3 LBA/GAL</td>
<td>EC 1260 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>Roundup Powermax</td>
<td>4.5 LBAE/GAL</td>
<td>SL 1260 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>3.4 LBA/GAL</td>
<td>SL 4.9 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>COC</td>
<td>100 %</td>
<td>SL 1.67 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>Dual II Magnum</td>
<td>7.64 LBAE/GAL</td>
<td>SL 1430 g ai/ha</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>3.4 LBA/GAL</td>
<td>SL 4.9 % v/v</td>
<td>B POSPOS</td>
</tr>
<tr>
<td>COC</td>
<td>100 %</td>
<td>SL 1.67 % v/v</td>
<td>B POSPOS</td>
</tr>
</tbody>
</table>

* *Per area* calculations based on spray volume= 15 gal/ac, mix size= 1.8 liters (mix size basis).  
* *Per volume* calculations use spray volume= 15 gal/ac, mix size= 1.8 liters.
## Purdue University Weed Science

Comparisons of tank-mix programs for control of glyphosate-resistant Palmer amaranth in RR soybean

<table>
<thead>
<tr>
<th>Trial ID: 13S-CCP-CTS-02</th>
<th>Location: Cass County</th>
<th>Trial Year: 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol ID: 13S-CCP-CTS-02</td>
<td>Investigator: Dr. Bill Johnson</td>
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</tr>
<tr>
<td>Project ID: 64.01</td>
<td>Study Director: Joe Ikle</td>
<td>Sponsor Contact: Valent - Eric Ott</td>
</tr>
</tbody>
</table>

### Means Table

<table>
<thead>
<tr>
<th>Pest Type</th>
<th>Pest Code</th>
<th>Pest Scientific Name</th>
<th>GLXMA Soybean</th>
<th>GLXMA Glycine max</th>
<th>P Weed AMAPA Palmer amaranth</th>
<th>W Weed AMAPA Palmer amaranth</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Pak AMS</td>
<td>4.9 % v/v</td>
<td>1.67 % v/v</td>
<td>2.3 a</td>
<td>9 a</td>
<td>93 a</td>
<td>83 ab</td>
</tr>
<tr>
<td>V-10206</td>
<td>89 g a/ha</td>
<td>9 a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Palmer amaranth</td>
<td>1260 g ae/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobra</td>
<td>89 % v/v</td>
<td>1260 g ae/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roundup Powermax</td>
<td>89 g a/ha</td>
<td>93 a</td>
<td>83 ab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-Pak AMS</td>
<td>89 % v/v</td>
<td>1260 g ae/ha</td>
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</tr>
<tr>
<td>COC</td>
<td>1.67 % v/v</td>
<td>1260 g ae/ha</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

### LSD (P<.05)

- **LSD (P<.05)**: 6.0, 4.4, 19.1, 12.0
- **Standard Deviation**: 27.46, 27.46, 38.76, 38.76
- **CV**: 12.8, 12.8, 18.61, 18.61
- **Bartlett's X2**: 6.84, 6.84, 21.98, 21.98
- **P(Bartlett's X2)**: 0.144, 0.144, 0.002, 0.002
- **Skewness**: -0.1171, -0.1171, -1.0968, -1.0968
- **Kurtosis**: -1.6415, -1.6415, -0.9952, -0.9952

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.
Comparisons of tank-mix programs for control of glyphosate-resistant Palmer amaranth in RR soybean

Trial ID: 13S-CCP-CTS-02  
Location: Cass County  
Trial Year: 2013  
Protocol ID: 13S-CCP-CTS-02  
Investigator: Dr. Bill Johnson  
Study Director: Joe Ikley  
Sponsor Contact: Valent - Eric Ott

### Randomized Complete Block (RCB) AOV For GLXMA BSOY Glycine max Soybean PLOT C 7/8/2013 PHYGEN % 31 6 6 DA-B P 0 (Data Column 1)

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Prob(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>27</td>
<td>3774.107143</td>
<td></td>
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<tr>
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<td>15.178571</td>
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<td>0.4529</td>
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<td>298.214286</td>
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### Randomized Complete Block (RCB) AOV For GLXMA BSOY Glycine max Soybean PLOT C 7/16/2013 PHYGEN % 39 14 14 DA-B P 0 (Data Column 2)

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
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<tr>
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<td>550.000000</td>
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### Randomized Complete Block (RCB) AOV For W Weed AMAPA Amaranthus palmeri Palmer amaranth PLOT P 7/16/2013 PERCEN % 39 14 14 DA-B P 0 (Data Column 3)

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
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<th>Mean Square</th>
<th>F</th>
<th>Prob(F)</th>
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<td>40630.357143</td>
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### Randomized Complete Block (RCB) AOV For W Weed AMAPA Amaranthus palmeri Palmer amaranth PLOT P 8/6/2013 PERCEN % 60 35 35 DA-B P 0 (Data Column 4)

<table>
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<th>Source</th>
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<td>1175.000000</td>
<td>65.277778</td>
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</tbody>
</table>

Pest Type  
W, Weed, G-BYRW7, G-WedStg = Weed or volunteer crop  
Crop Code  
GLXMA, BSOY, Glycine max, = US  
Part Rated  
PLOT = plot  
C = Crop is Part Rated  
P = Pest is Part Rated  
Rating Type  
PHYGEN = phytotoxicity - general / injury  
PERCEN = percent  
Rating Unit  
% = percent  
ARM Action Codes  
P = Rating scale of 0 to 100 (e.g. % control or injury)