Soybean Weed Control

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Weed Management History

“The farmer has many problems.”

New Technologies Available

- **Enlist E3 Soybean**
  - Glyphosate + Glufosinate+ 2,4-D
  - Been waiting for ~3 years
  - Limited varieties available
  - **Enlist Duo**
    - Glyphosate + 2,4-D Choline
    - Limited Tankmixes
  - **Enlist One**
    - 2,4-D Choline
    - Numerous Tankmixes
    - Glufosinate (Liberty) is allowed
  - Check Enlisttankmix.com
  - Training Required – currently online
  - Neighboring cotton very sensitive
  - Stewardship is **KEY**

- **Liberty Link GT27 Soybean**
  - Glyphosate + Glufosinate+ Isoxaflutole
  - Approved for import last year
  - Limited varieties available
  - Alite 27 (Isoxaflutole) not yet labeled for PRE or POST
  - Can use both glufosinate (Liberty) and glyphosate POST
  - No training required
Enlist Recommendations

• Residuals still key regardless of technology at planting and early POST

• Check website (Enlist.com) to select residual that is allowed tankmix

• Enlist Duo, Enlist One or glufosinate should be sprayed when pigweeds are small and actively growing

• If pigweed population is heavy and/or >4in tall tankmix Enlist One and allowed glufosinate formulation

• Previous research on PPO-rs pigweed shows rate response with Enlist One. Use the full labeled rate (2pts)

• Enlist One: 6 pints total from burndown through R2

• Enlist Duo: 4.75pt/A, 14.25 pints total, burndown through R2
Liberty Link GT27 (Alite 27) Recommendations

• Residuals still key regardless of technology at planting and early POST

• Manage like Liberty Link beans but also tolerant to Roundup

• Glyphosate plus glufosinate provides control of most problematic weeds.

• Need residuals to reduce pigweed numbers for glufosinate

• Glufosinate works best on small <5in pigweed when sprayed 2 hours after sunrise to 2 hours prior to sunset

• 65 total ounces of Liberty per season

• Emergence to bloom (R1)
PPO-Resistant Palmer amaranth 2019?
Top Herbicides Used for Palmer Pigweed Control in Soybean

- Roundup
- Flexstar
- Valor
- Authority
- Sharpen
- Liberty
- Dual
- Warrant
- Zidua
- Classic

- Sonic
- Surveil
- Blazer
- Pursuit
- Cobra
- Metribuzin
- Gramoxone
- Prowl
- Treflan
- Scepter

- 2,4-D (Enlist One, Duo)
- Dicamba (Xtendimax etc.)
- LL27, Alite 27 (HPPD)
  - Waiting for Alite 27 label
What is left for PPO-resistant Palmer Pigweed Control in Soybean

- Roundup
- Flexstar
- Valor
- Authority
- Sharpen
- Liberty
- Dual
- Warrant
- Zidua
- Classic

- Sonic
- Surveil
- Blazer
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PRE Programs on PPO-Resistant Palmer Amaranth (26 to 28 DAT)

Product (oz/A)

<table>
<thead>
<tr>
<th>Product</th>
<th>Product (oz/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sonic (4.5)</td>
<td>2,14</td>
</tr>
<tr>
<td>Sonic (3)</td>
<td>2,14</td>
</tr>
<tr>
<td><strong>Dual Mag (16)</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td>Valor SX (2)</td>
<td>14</td>
</tr>
<tr>
<td>Valor XLT (3)</td>
<td>2,14</td>
</tr>
<tr>
<td>Surveil (2.8)</td>
<td>2,14</td>
</tr>
<tr>
<td>Authority MTZ (15)</td>
<td>5,14</td>
</tr>
<tr>
<td>Sonic (6)</td>
<td>2,14</td>
</tr>
</tbody>
</table>

(Across 10 trials 2016)
PRE Programs on PPO-Resistant Palmer Amaranth (26 to 28 DAT)

(Product (oz/A)
- Canopy+Cinch (6+16)
  - 2, 5, 15
- Trivence (8)
  - 2, 5, 14
- Canopy+Zidua (6+1.5)
  - 2, 5, 15
- Envive+Zidua (3.5+1.5)
  - 2, 14, 15
- Envive+Valor+Zidua (2+1+1.5)
  - 2, 14, 15
- Trivence+Zidua (8+1.5)
  - 2, 5, 14, 15
- Canopy+Boundary (2.25+24)
  - 2, 5, 15
- Zidua+Tricor (2.5+6)
  - 5, 15
- Verdict+Zidua+Tricor (5+2.5+6)
  - 5, 14, 15

(Across 10 trials 2016)
Must start with a robust PRE (2 effective MOA)

Valor SX 2oz

Metribuzin 6oz+
Verdict 5oz + Zidua 2.5oz

28 days after planting
Untreated Check   1x Dimethenamid

0%   14 DAT   90%

1x SMOC   70%
Crawfordsville

Drone Images

28 DAT

- Untreated
- 1/4x SMOC
- 1/2x SMOC
- 1x SMOC
Pigweed Control 28 DAT
Chloroacetamides

Marion LSD- 15
Marianna LSD- 17
Pigweed Control 28 DAT
Chloroacetamides

Marion LSD- 19
Tillar LSD- 29
# Palmer amaranth

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>14 DAT</th>
<th>28 DAT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stand Count</td>
<td>Control</td>
</tr>
<tr>
<td>S-metolachlor</td>
<td>46 B</td>
<td>60 B</td>
</tr>
<tr>
<td>Acetochlor</td>
<td>12 A</td>
<td>84 A</td>
</tr>
<tr>
<td>Dimethenamid-P</td>
<td>21 AB</td>
<td>80 A</td>
</tr>
</tbody>
</table>

For each timing, means within a column followed by the same lowercase letter are not statistically different based on Fisher’s protected LSD (0.05).

Each herbicide tested across 0.25x, 0.5x, and 1x of labeled use rate.

Stand counts shown as percentage of nontreated control.
<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Stand Count % of Control</th>
<th>Control %</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-metolachlor</td>
<td>9 A</td>
<td>95 A</td>
</tr>
<tr>
<td>Acetochlor</td>
<td>6 A</td>
<td>95 A</td>
</tr>
<tr>
<td>Dimethenamid-P</td>
<td>1 A</td>
<td>98 A</td>
</tr>
</tbody>
</table>

*aFor each timing, means within a column followed by the same lowercase letter are not statistically different based on Fisher’s LSD (0.05).

*Each herbicide tested across 0.25x, 0.5x, and 1x of labeled use rate.

*Stand counts shown as percentage of nontreated control.
Conclusion After 3 Years Field Research on PPO-resistant Pigweed Populations

• PPO Herbicides: Valor, Reflex, Authority, Sharpen will provide some level of residual control ~60%

• Single modes of action are not effective
  • Apply 2 effective residual herbicides at planting
  • Metribuzin plus Anthem/Zidua

• 14 days overlapping of residuals provided best level of protection: Outlook or Warrant in POST apps

• Metabolic RS in pigweed is SCARY!

• Increased tolerance/RS to metolachlor and maybe others with these pigweed populations.
  • Do not use Dual alone as PRE. Boundary 1 qrt/A
Numerous diversified strategies available

Long term, answer won’t come from a jug!

• Incorporate multiple techniques involving both non-chemical and chemical
  • Crop rotation
  • Planting dates
  • Seeding method / row spacing
  • Application technologies
  • Optimizing applications
  • Cover crops
  • Deep tillage
  • Seedbank management / Zero Tolerance
  • Harvest Weed Seed Control
    • Narrow windrow burning
    • Harrington Seed Destructor
Soybean CIPAR
MG II and MG IV Regions

Herbicide Strategy
- PRE + POST
- POST-only

Seeding Rate
- Low
- Moderate
- High

Row Width
- ≤ 15"
- ≥ 30"

For more detailed information, please scan the QR code to the left.
## End-of-Season Pigweed Growth & Reproduction

<table>
<thead>
<tr>
<th>Factor</th>
<th>MG IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Density</td>
</tr>
<tr>
<td></td>
<td>plants m(^{-2})</td>
</tr>
<tr>
<td>Row width</td>
<td></td>
</tr>
<tr>
<td>≤ 15”</td>
<td>—</td>
</tr>
<tr>
<td>≥ 30”</td>
<td>—</td>
</tr>
<tr>
<td>Seeding rate (seeds ac(^{-1}))</td>
<td></td>
</tr>
<tr>
<td>70,000</td>
<td>—</td>
</tr>
<tr>
<td>130,000</td>
<td>—</td>
</tr>
<tr>
<td>190,000</td>
<td>—</td>
</tr>
<tr>
<td>Herbicide strategy</td>
<td></td>
</tr>
<tr>
<td>PRE + POST</td>
<td>—</td>
</tr>
<tr>
<td>POST-only</td>
<td>—</td>
</tr>
<tr>
<td>ANOVA</td>
<td></td>
</tr>
<tr>
<td>RW</td>
<td>NS</td>
</tr>
<tr>
<td>SR</td>
<td>NS</td>
</tr>
<tr>
<td>RW*SR</td>
<td>NS</td>
</tr>
<tr>
<td>HS</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>RW*HS</td>
<td>NS</td>
</tr>
<tr>
<td>SR*HS</td>
<td>NS</td>
</tr>
<tr>
<td>RW<em>SR</em>HS</td>
<td>0.0203</td>
</tr>
</tbody>
</table>
Optimizing Applications

Efficacy

Drift reduction
How far will particles go?

<table>
<thead>
<tr>
<th>Droplet</th>
<th>Diameter (in µm)</th>
<th>Time to fall 10 ft</th>
<th>Travel distance in 3 mph wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fog</td>
<td>5</td>
<td>66 min</td>
<td>15,840 ft</td>
</tr>
<tr>
<td>Very fine</td>
<td>20</td>
<td>4.2 min</td>
<td>1,100 ft</td>
</tr>
<tr>
<td>Fine</td>
<td>100</td>
<td>10 sec</td>
<td>44 ft</td>
</tr>
<tr>
<td>Medium</td>
<td>240</td>
<td>6 sec</td>
<td>28 ft</td>
</tr>
<tr>
<td>Coarse</td>
<td>400</td>
<td>2 sec</td>
<td>8.5 ft</td>
</tr>
<tr>
<td>Fine rain</td>
<td>1,000</td>
<td>1 sec</td>
<td>&lt; 5 ft</td>
</tr>
</tbody>
</table>

Source: *Herbicide Spray Drift*, NDSU Extension
Droplet Size vs. Coverage

Cutting Droplet Size in Half
Results in Eight Times the Number of Droplets
Carrier Volume Effect on Weed Control

5 GPA

Liberty

20 GPA
Carrier Volume Effect on Weed Control

5 GPA

20 GPA

Dicamba
TTI11004 @ 40 PSI

10 GPA  
12 MPH

15 GPA  
8 MPH

20 GPA  
6 MPH
Droplet Size Effect on Weed Control

Liberty®
5 GPA
14 DAA
Droplet Size Effect on Weed Control

Dicamba

5 GPA

14 DAA

Control

150 µm

300 µm

450 µm

600 µm

750 µm

900 µm
Summary & Implications

Spray droplet size impacts weed control!

- There appears to be a critical droplet size after which control is lost (for both contact and systemic herbicides)...

- ...We must find alternative methods for particle drift mitigation other than increasing droplet size.

- Increasing spray volume can help increase coverage and buffer the effect of increasing droplet size.

For additional information regarding optimum droplet sizes for weed control across other herbicide solutions please scan the above QR code.
Think outside of the box!

- Spread of resistance
- Additions to the soil seedbank
Which field had the glyphosate-resistant pigweed?
Integrated Harrington Seed Destructor

Our IHSD at Newport on JD 9760 STS
Moisture can be a problem
2019 Thoughts

• Spray early (PRE), use multiple MOA’s, RESIDUALS!
  • Provides POST application flexibility
  • Reduces resistance selection pressure
  • Gives the crop a competitive advantage

• Prepare for herbicide resistance even if not there (yet)

• Use diverse strategies
  • New trait/herbicide technologies
  • Cultural practices
  • Optimize applications
  • System approach

Do the little things, they add up!
Questions?

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www.Arkansas-crops.com