Control of Glyphosate-Resistant Palmer Amaranth in Isoxaflutole/Glufosinate-Resistant Soybean in Nebraska

Introduction

- Palmer amaranth (Amaranthus palmeri S. Wats.) is one of the most problematic and troublesome weed species in U.S. agronomic cropping systems. A Palmer amaranth biotype resistant to glyphosate was reported in a grower’s field under corn-soybean rotation near Carleton, NE.
- Isoxaflutole is a soil residual PRE herbicide labeled for control of broadleaf weeds, including Palmer amaranth.
- Development of a soybean variety resistant to isoxaflutole and glufosinate has provided additional herbicide sites of action for control of herbicide-resistant weeds in soybean.

Objective

To evaluate isoxaflutole and glufosinate based herbicide programs for the management of glyphosate-resistant Palmer amaranth in isoxaflutole/glufosinate-resistant soybean.

Materials & Methods

- Treatments in the experiment were laid out in a randomized complete block arrangement with four replications including a nontreated control.
- PRE herbicides were applied at planting on May 10, 2018.
- Early-POST and late-POST herbicides were applied at 6 and 9 weeks after planting.
- Visual estimations of Palmer amaranth control, density, and soybean yield were recorded.
- PROC GLIMMIX procedure in SAS 9.4 was used to conduct multiple comparison ANOVA analysis.

Table 1. Herbicide Programs

<table>
<thead>
<tr>
<th>Code</th>
<th>PRE</th>
<th>Rate (g ai ha⁻¹)</th>
<th>Early-POST</th>
<th>Rate (g ai ha⁻¹)</th>
<th>Late-POST</th>
<th>Rate (g ai ha⁻¹)</th>
<th>Trade Name</th>
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<td>...</td>
<td>Balance Bean &amp; Liberty</td>
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<td>4</td>
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<td>--</td>
<td>glufosinate</td>
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<td>...</td>
<td>...</td>
<td>Liberty</td>
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<td>--</td>
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<td>657</td>
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<td>sulfentrazone</td>
<td>657</td>
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<td>215+105</td>
<td>glufosinate</td>
<td>657</td>
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<td>...</td>
<td>Edna PRO + Balance Bean &amp; Liberty</td>
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<td>isoxaflutole</td>
<td>105+657</td>
<td>Balance Bean &amp; Liberty &amp; Liberty</td>
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</table>

Results

Figure 1. Control of resistant Palmer amaranth 14 d after PRE

Figure 2. Control of resistant Palmer amaranth 14 d after early-POST

Figure 3. Density reduction 14 d after early-POST

Figure 4. Control of resistant Palmer amaranth 21 d after late-POST

Figure 5. Soybean yield at harvest

Discussion

- 14 d after PRE: Isoxaflutole applied alone provided 88% control; isoxaflutole tank-mixed with sulfentrazone/pyroxasulfone, lumioxazin/sulfentrazone, or imazethapyr/sulfentrazone/pyroxasulfone provided 76 to 99% control.
- 14 d after early-POST: Herbicides in 14 d after PRE followed by POST of glufosinate provided similar control (91 to 99%) to a single POST of glufosinate (96% control).
- Density reduction 14 d after early-POST: 63 to 100% when POST glufosinate was applied with or without PRE herbicide.
- All PRE herbicides followed by single or sequential applications of glufosinate provided 80 to 99% control.
- 21 d after late-POST: Isoxaflutole PRE provided 10% control and isoxaflutole POST followed by isoxaflutole early-POST provided 52% control; there was no application of glufosinate in these treatments.
- No soybean injury was observed from any herbicide program.
- Most herbicide programs provided similar yields to nontreated control.
  - Isoxaflutole tank-mixed with sulfentrazone/pyroxasulfone PRE followed by glufosinate early-POST provided a greater yield of 2,294 kg ha⁻¹ compared to other herbicide programs and the nontreated control (954 to 1,037 kg ha⁻¹).

Conclusions & Future Research

- Results from this study indicate that there are herbicide programs available for effective control of glyphosate-resistant Palmer amaranth in isoxaflutole/glufosinate-resistant soybean.
- Herbicide programs should include a PRE herbicide application and a single or sequential POST application of glufosinate for most effective control of glyphosate-resistant Palmer amaranth.
- This field study will be repeated in the 2019 growing season.