Introduction

- Horseweed is an annual broadleaf weed basically germinating in the fall or spring season; therefore, can easily escape from management practices (Buhler and Owen 1997).
- The commercialization of glyphosate-tolerant crops in late 1990’s resulted in the increased adoption of reduced tillage practices and more reliance on glyphosate for POST weed control favoring evolution of glyphosate-resistant weeds including horseweed (Heap 2016).
- The evolution of glyphosate-resistant (GR) as well as multiple herbicide-resistant horseweed biotypes in the US have reduced the potential herbicide options for GR horseweed control, specifically in soybean.

Hypothesis

- Fall or spring tillage or burndown herbicide application followed by PRE and POST herbicide applications will provide season long control of GR horseweed compared with only fall or spring tillage or burndown herbicides.

Objective

- To evaluate the efficacy of fall or spring tillage or burndown herbicide programs applied alone or in combination with PRE or POST herbicide applications for the management of GR horseweed in soybean.

Materials & Methods

Location – Havelock Farm (Rainfed), Lincoln, Nebraska.

Treatment Information –

<table>
<thead>
<tr>
<th>Herbicide/Tillage</th>
<th>Timing</th>
<th>Rate (g a ha⁻¹)</th>
<th>Application Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-d ester</td>
<td>Fall/Spring Burndown</td>
<td>560</td>
<td>Fall-Nov 5 2014, Spring-April 25 2015, Fall-Nov 12 2015, Spring-April 22 2016</td>
</tr>
<tr>
<td>Carfentrazone-ethyl</td>
<td>Fall/Spring Burndown</td>
<td>13.2</td>
<td>&quot;</td>
</tr>
<tr>
<td>Sulfentrazone + Mefthozzin</td>
<td>PRE</td>
<td>473</td>
<td>May 22 2015, May 23 2016</td>
</tr>
<tr>
<td>Fomesafen</td>
<td>POST</td>
<td>198</td>
<td>June 18 2015, June 24 2016</td>
</tr>
<tr>
<td>Cloransulam</td>
<td>POST</td>
<td>17.7</td>
<td>&quot;</td>
</tr>
<tr>
<td>Tillage</td>
<td>Fall/Spring</td>
<td>&quot;</td>
<td>Fall-Nov 5 2014, Spring-April 25 2015, Fall-Nov 12 2015, Spring-April 22 2016</td>
</tr>
</tbody>
</table>

Treatment Application –

- Tillage during fall/spring was done using rotor-tiller (Fig 1B).
- Herbicide treatments were applied with a CO₂- pressurized backpack fitted with AIXR 110015 flat-fan nozzles calibrated to deliver 140 L ha⁻¹ at 276 kPa.

Data Collection and Statistical Analysis –

- GR horseweed control estimates (0-100%), weed density at 14 and 18 weeks after (WA)-fall, 4 WA-spring, 2 and 4 WA-PRE, and 3 and 6 WA-POST applications, aboveground weed biomass at 6 WA-POST, and soybean yield at maturity were recorded.
- Data were analyzed in SAS (9.3) using Proc GLIMMIX.
- Means separated using Fisher’s protected LSD at alpha=0.05.

Results and Discussion

- Spring tillage and/or burndown herbicides as well as fall tillage provided similar GR horseweed control (>80%); however, fall burndown controlled horseweed <70% at 4 WA-spring tillage/herbicide burndown applications.
- Fall/spring tillage and/or burndown herbicide applications fb POST only or PRE fb POST controlled GR horseweed >85% at 6 WA-POST.
- GR horseweed management program included with tillage applications provided greater control (285%) and plant density reduction (295%) compared to herbicide burndown applications <85%, respectively, throughout the season (Fig 5A & C).
- Horseweed plant density was reduced >85% with fall/spring tillage and/or burndown herbicide applications fb PRE and POST or only POST, as well as with fall and spring tillage applied alone at 3 WA-POST (Fig 2B). Similarly, Brown and Whitwell (1988) have reported higher control and density reduction of horseweed with fall/spring tillage.
- Fall/spring tillage and/or burndown herbicide applications fb POST only or PRE fb POST and fall/spring tillage applied alone provided similar soybean yield (1094 to 1454 kg ha⁻¹) (Fig 4B).

Conclusions

- The integrated weed management program including spring/fall tillage followed by different sites-of-action PRE residuals and POST herbicides is the key for effective management of GR horseweed.

Future Research

- To evaluate the effect of different cover crops species along with tillage and herbicide programs on control and emergence of GR horseweed and other weed species.

Literature Cited