Timing of Herbicide Applications and/or Tillage Affects Control of Glyphosate-Resistant Horseweed in Soybean

Parminder S. Chahal* and Amit J. Jhala
University of Nebraska-Lincoln
*Email: parminder.chahal@huskers.unl.edu

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 –

Herbicide/Tillage	Timing	Rate (g ai ha^{-1})	Application Date	
			2014-15	2015-16
2,4-d ester	Fall/Spring Burndown	560	Fall- Nov 5 2014 Spring- April 25 2015	Fall- Nov 12 2015 Spring- April 22 2016
Carfentrazone-ethyl	Fall/Spring Burndown	13.2	”	”
Sulfentrazone plus Metribuzin	PRE	473	May 22 2015	May 23 2016
Fomesafen	POST	198	June 18 2015	June 24 2016
Cloransulam	POST	17.7	”	”
Tillage	Fall/Spring	-	Fall- Nov 5 2014 Spring- April 25 2015	Fall- Nov 12 2015 Spring- April 22 2016

Treatment Application –

- Tillage during fall/spring was done using roto-tiller (Fig 1B).
- Herbicide treatments were applied with a CO_2- pressurized backpack fitted with AIXR 110015 flat-fan nozzles calibrated to deliver 140 L ha^{-1} at 276 kPa.

Fig 1. GR horseweed density data collection at 14 WA-Fall (A) and 4 WA-Spring (C), and spring tillage application during April 2016 (B)

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.

The letters of significance in Fig. 2A&B represent comparison among same week after treatment data or among bars of same color

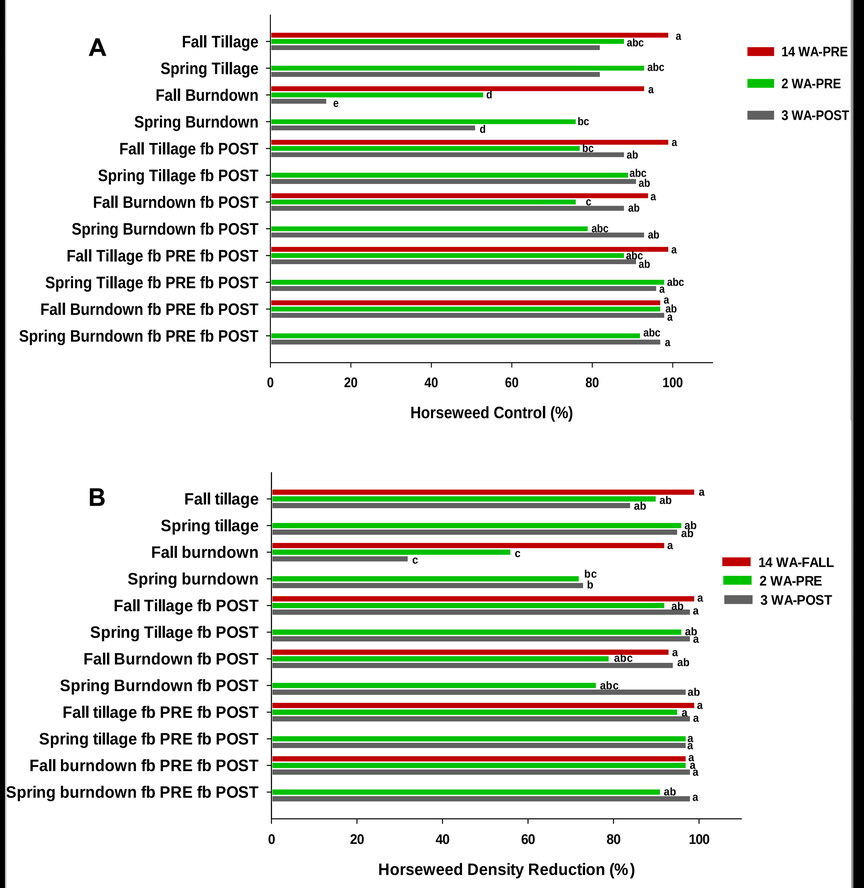

Fig 2. Effect of different herbicide/tillage treatments on GR horseweed Control (A), and Density Reduction (B) at 14 weeks after (WA)-Fall tillage/burndown, 2 WA-PRE, and 3 WA-POST application

Fig 3. Control of GR horseweed with fall or spring burndown herbicides and/or tillage applied alone or followed by PRE at 2 WA-PRE

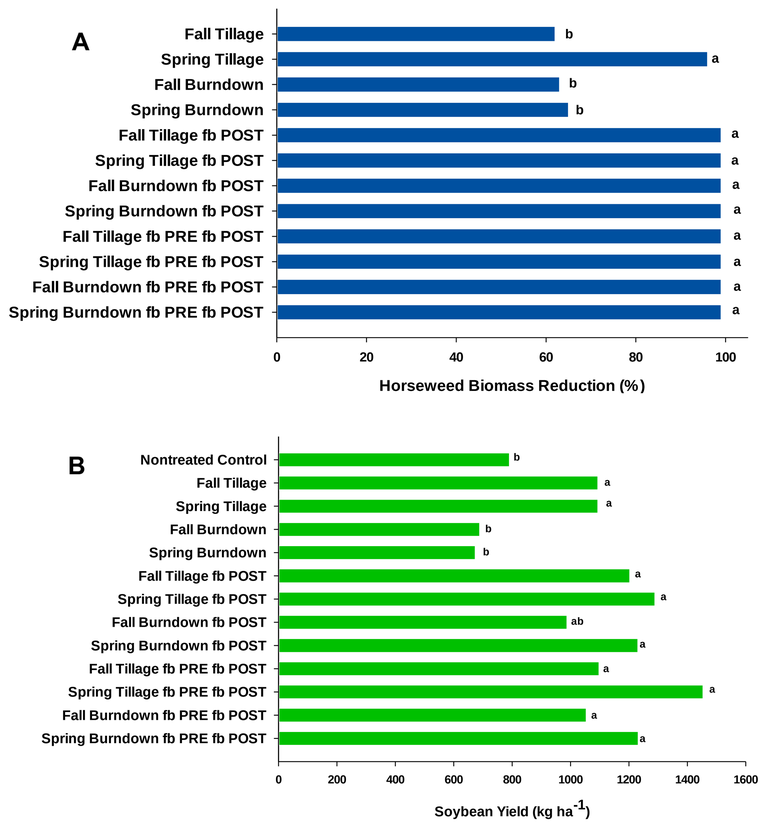

Fig 4. Effect of different herbicide/tillage treatments on GR horseweed biomass reduction at 6 WA-POST (A), and Soybean Yield (kg ha^{-1}) at harvest (B)

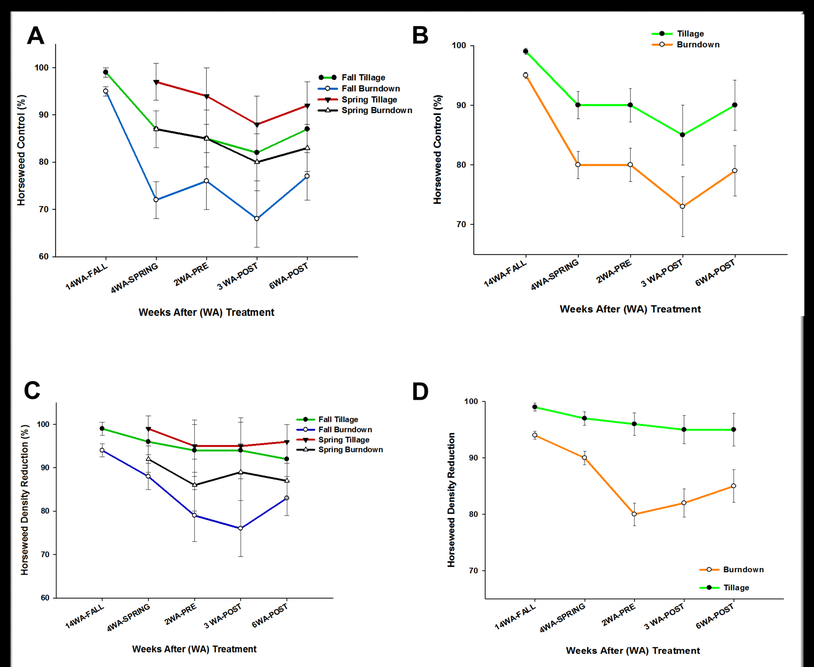

Fig 5. Comparison of burndown herbicides /tillage timings (A & C), and herbicide burndown vs tillage (B & D) for GR horseweed control and density reduction

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 (≥85%) and plant density reduction (≥95%) 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

- Buhler DD, Owen MDK (1997) Emergence and survival of horseweed (*Conyza Canadensis*). Weed Sci 45:98-101
- Brown SM, Whitwell T (1988) Influence of tillage on horseweed, *Conyza Canadensis*. Weed Technol 2:269-270
- Heap I (2016) Herbicide resistant horseweed globally. http://www.weedscience.org/Summary/Species.aspx Accessed: Nov 25 2016