Post-Emergence Control of Velvetleaf in Popcorn

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INTRODUCTION

Popcorn production
- Nebraska is the number one producer of popcorn in the United States
- 160 million kg on 30,000 hectares and 45% of the U.S. supply (NASS 2016)
- Popcorn is more sensitive to herbicides than field corn (Edenfield and Allen 2005)
- Research gap around weed control in popcorn

Velvetleaf (Abutilon theophrasti Medik.)
- Can emerge throughout the summer escaping PRE residuals
- Long-term problem in crop production
  - Seeds can remain viable for up to *50 years* (Warwick and Black 1988) with up to 43% germination after *39 years* (Toole and Brown 1946)
- *S*-metolachlor and/or atrazine is often used PRE in popcorn
  - *Only partial control of velvetleaf*

OBJECTIVE & HYPOTHESIS

Objective: To evaluate the efficacy of POST herbicides for controlling 15 or 30 cm tall velvetleaf in popcorn
Hypothesis: Effective herbicides are available for late season control of 15 to 30 cm tall velvetleaf that will not injure popcorn

MATERIALS & METHODS

Treatment design and field details
- A field experiment was conducted in 2018 at the University of Nebraska–Lincoln South Central Agricultural Laboratory near Clay Center, NE
- A split-plot design with 2 application timings (15 and 30 cm velvetleaf) main plots and 11 POST herbicides (Table 1.)
- *S*-metolachlor/atrazine (Bicep II Magnum) was applied at 2470 g ai ha^{-1} to achieve only partial control of velvetleaf on April 30.
- 15 cm velvetleaf applications were applied on June 8 (V6)
- 30 cm velvetleaf applications were applied on June 22 (V9)

Data Collection
- Visual estimations of velvetleaf control 0% (no injury) to 100% (complete plant death)
- Velvetleaf density
- Velvetleaf biomass (35 days after 30 cm applications)
  - Biomass reduction compared to the non-treated control
- Popcorn yield harvested September 27

Data Analysis
- Data analysis was preformed in R software
- ANOVA was conducted and means separated using Fisher's LSD test

Table 1. POST Herbicide Treatments

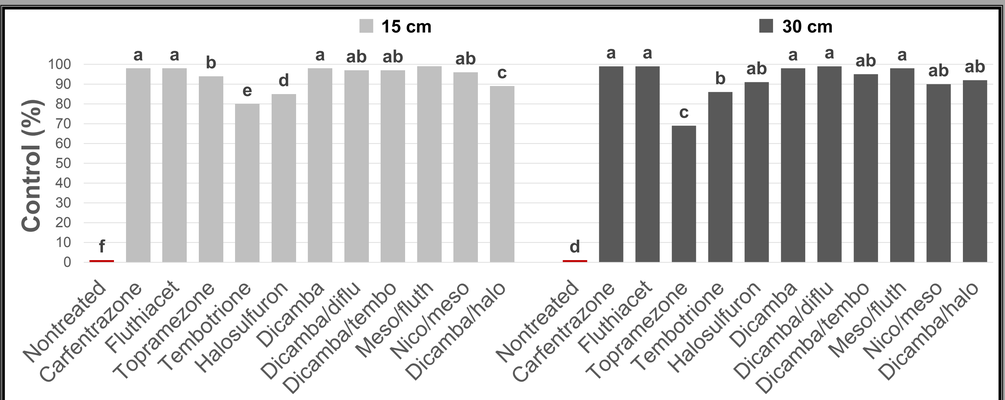
POST herbicide	Trade name	Rate (g ai ha^{-1})
Nontreated control	---	---
Carfentrazone	Aim	17.5
Fluthiacet	Cadet	7.2
Topramezone	Impact	24.5
Tembotrione	Laudis	76
Halosulfuron	Permit	165
Dicamba	DiFlexx	560
Dicamba/diflufenzopyr	Status	392
Dicamba/tembotrione	DiFlexx DUO	597
Mesotrione/fluthiacet	Solstice	2.8
Nicosulfuron/mesotrione	Revlin Q	118
Dicamba/halosulfuron	Yukon	190

Figure 1. Nontreated control (*S*-metolachlor/atrazine PRE)

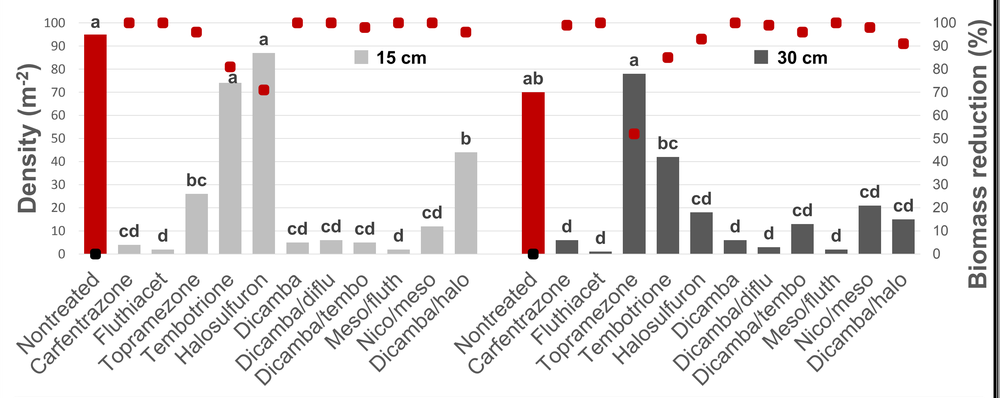
Figure 2. Dicamba injury (560 g ai ha^{-1}) [~15 cm/V6]

Figure 3. Velvetleaf control 28 d after fluthiacet (7.2 g ai ha^{-1}) [~15 cm/V6]

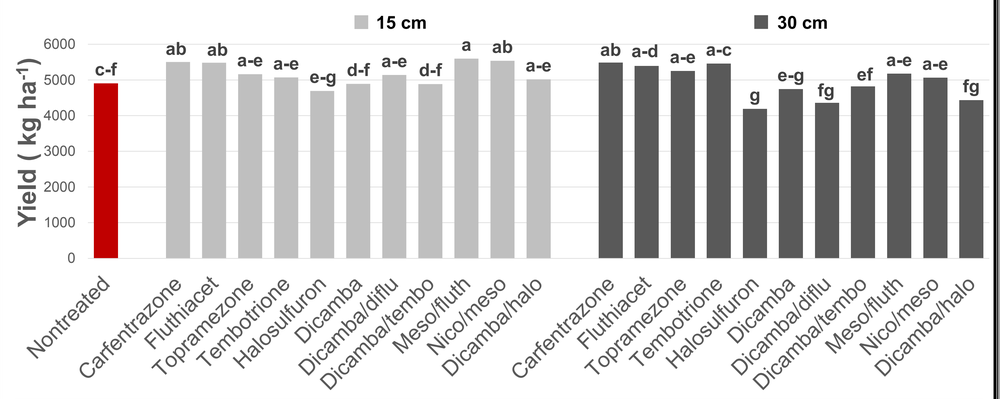
RESULTS & DISCUSSION



- Topramezone, tembotrione, halosulfuron, and dicamba/halosulfuron did not provide adequate control of velvetleaf for 15 cm
- Topramezone and tembotrione for 30 cm provided <90% control



- Tembotrione and halosulfuron did not reduce velvetleaf density for 15 cm
- Topramezone and dicamba/halosulfuron resulted in high densities for 15 cm
- Topramezone and tembotrione resulted in high densities for 30 cm



- Halosulfuron, dicamba, dicamba/tembotrione, and dicamba/halosulfuron yielded ≤ 5,000 kg ha^{-1} for 15 cm
- Halosulfuron, dicamba, dicamba/diflufenzopyr, dicamba/tembotrione, and dicamba/halosulfuron yielded ≤ 5,000 kg ha^{-1} for 30 cm

CONCLUSIONS & FUTURE RESEARCH

- Applications when velvetleaf was 15 cm resulted in similar control, density, biomass reduction, and grain yield as 30 cm applications for most herbicide programs
- Halosulfuron and tembotrione did not provide adequate control, biomass reduction, or density reduction of 15 cm velvetleaf
- Topramezone and tembotrione resulted in little control, biomass reduction and density reduction when applied to 30 cm velvetleaf
- Dicamba alone or in premix and halosulfuron resulted in ≤ 5,000 kg ha^{-1} for 15 and 30 cm velvetleaf, likely due to higher lodging observed from these herbicides

Future research
- This study will be repeated in 2018
- Hybrid differences may affect the response to herbicide injury (lodging) observed

LITERATURE CITED

- Edenfield and Allen (2005) N. Cent. Weed Sci. Soc. Abstr 60:91
- [USDA] US Department of Agriculture (2016) Washington, DC: U.S. Department of Agriculture
- Toole and Brown (1946) Final results of the buried seed experiment. J. Agric. Res. 72:201-210
- Warwick and Black (1988) The biology of Canadian weeds. 90. Can. J. Plant Sci. 68:1069-1085