Multi-State Evaluation of Electrocution for Control of Escaped Weeds in Soybean

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Introduction

- The increase in herbicide-resistant weeds has led to a greater interest in IWM.
- Early electrocution systems were commonly used and have been previously researched in specialty crops (Diprose et al. 1985).
- More recent work has shown the potential for late season weed management in soybean (Schreier et al. 2022).
- The Weed Zapper™ is a common, commercially-available implement currently in use primarily by many organic and specialty crop growers.

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How the Weed Zapper™ Works:

- Copper boom attached to front of tractor which electrocutes any plant that it contacts
- <110,000 watt generator attached to back of tractor
- Up to 15,000 volts translocating through plants contacted

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Objectives and Hypotheses

<u>Objectives</u>

1) Determine the efficacy of weed electrocution on different weed species, at different tractor speeds, and across different sites in the North Central region.

2) Compare efficacy of weed electrocution to other alternative rescue treatments available commercially.

<u>Hypotheses</u>

1) Weed species will respond differently to electrocution.

2) Weed electrocution will perform similarly to other rescue treatment options.

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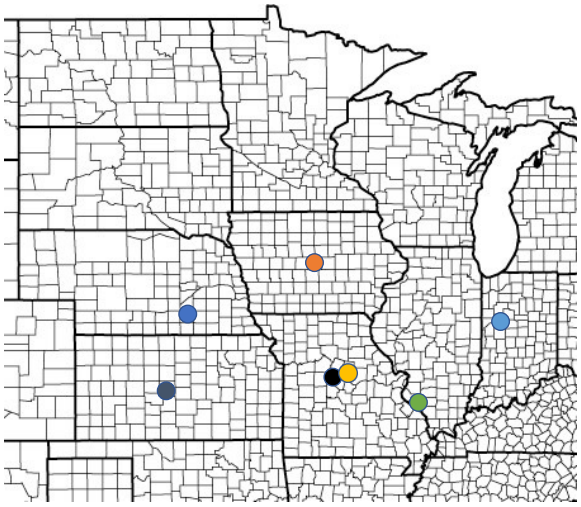
Trial Locations: 2021 and 2022



13 site-years at 7 locations:

- Ames, Iowa
- Columbia, Missouri
- Boonville, Missouri
- Carbondale, Illinois
- Great Bend, Kansas
- Harvard, Nebraska
- Lafayette, Indiana

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Materials and Methods

- All experiments contained target weed species that exceeded the height of the soybean canopy
- Individual plots minimum of 3 x 15 m
- Treatments were conducted in a RCB design with 4 replications
- Number of treatments varied with the resources available at each location, but always included:
  - Speed: 3 vs 5 mph
  - Comparison rescue treatment

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Materials and Methods:

- Weed density, height, growth stage and plant moisture collected prior to electrocution
- Visual injury ratings taken 7 and 14 days after treatment (DAT), and at end of season
- Statistical Analyses: SAS PROC GLIMMIX, means separated using Fisher's protected LSD, $P<0.05$

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Alternative Rescue Treatments for Comparison

Photo Credit: Mizzou Weed Science; www.rowshaver.com; Struve Family Farms Organics

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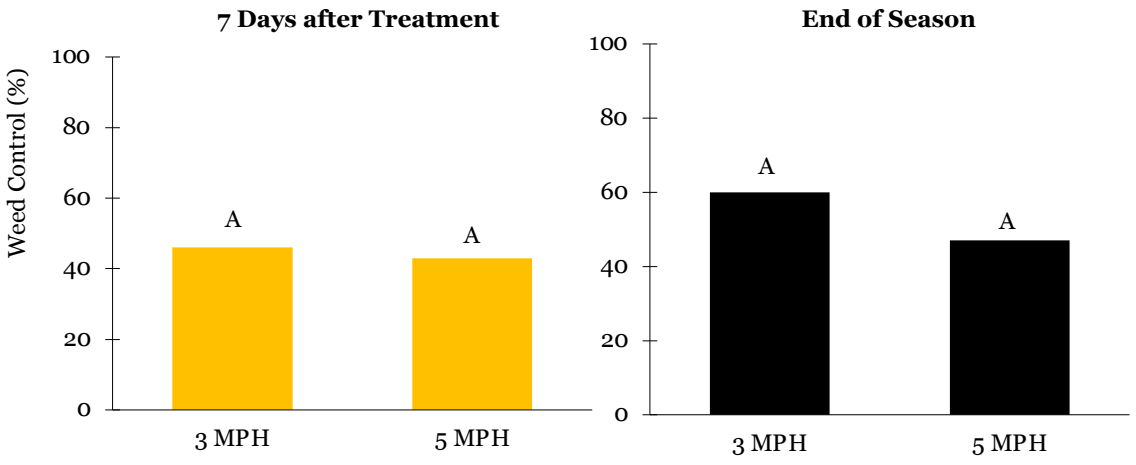
Influence of the Speed of Electrocution on Weed Control



*Data summarized across all sites, years, and weed species.
**Bars followed by the same letter are not different, LSD <0.05

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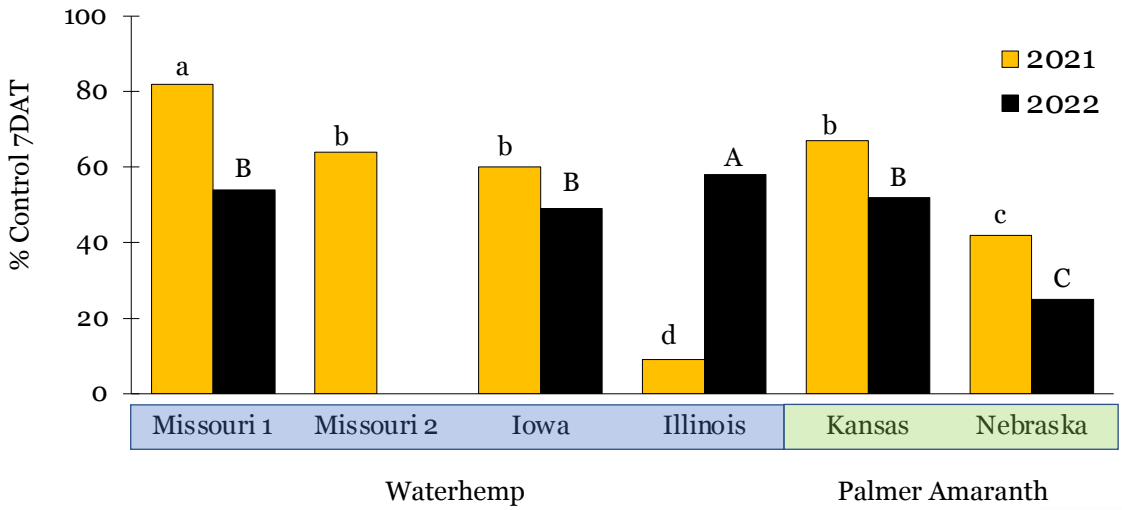
Response of *Amaranthus* Species To Electrocution



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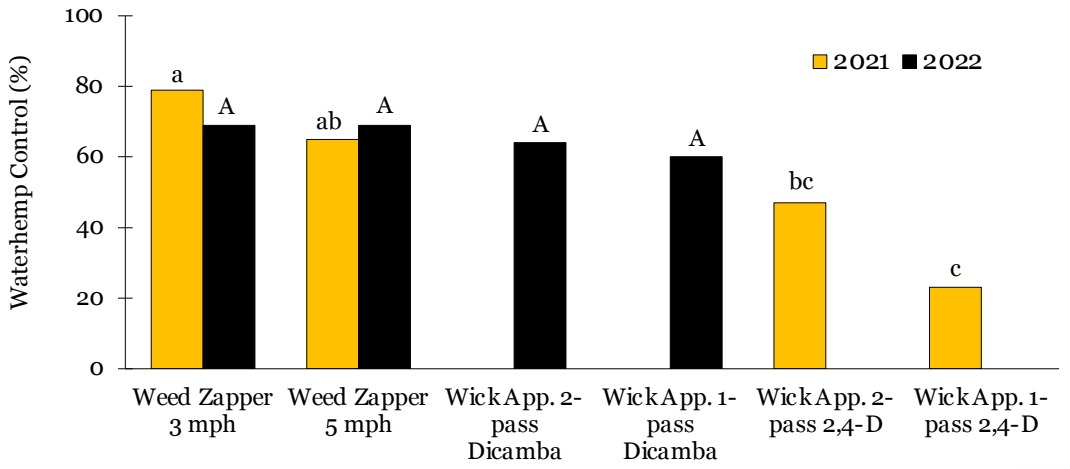
Effect of Rescue Treatments on End of Season Waterhemp Control (Columbia, Missouri)



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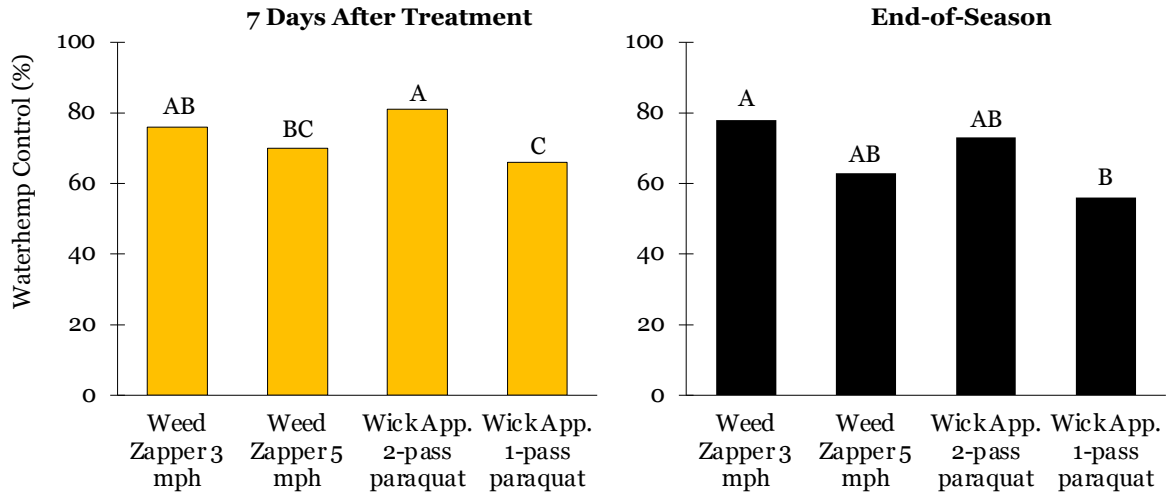
Effect of Rescue Treatments on Waterhemp Control (Boonville, Missouri 2021)



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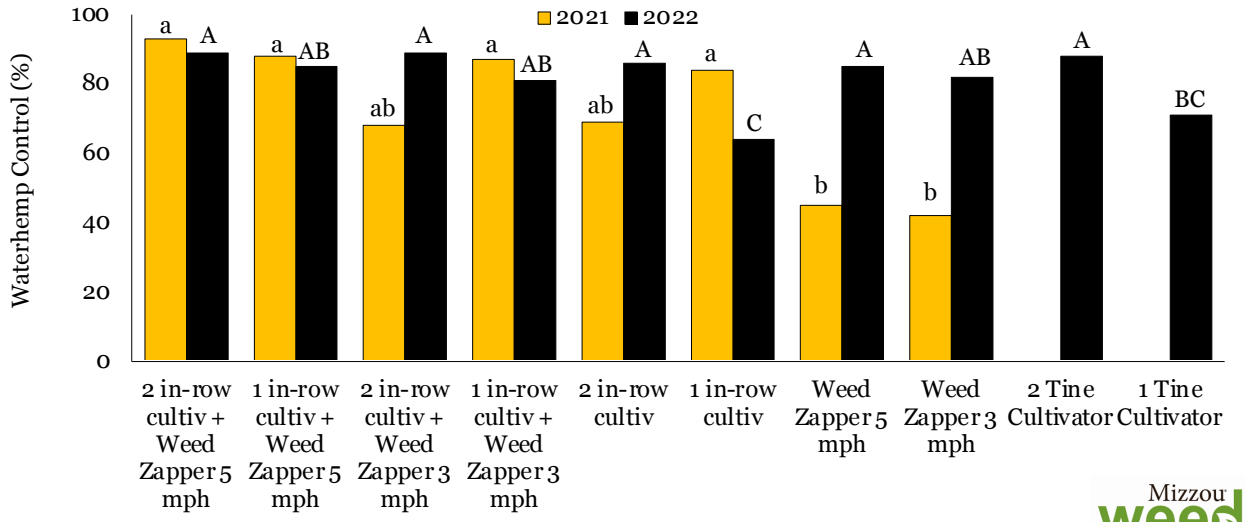
Effect of Rescue Treatments on End-of-Season Waterhemp Control (Carbondale, Illinois)



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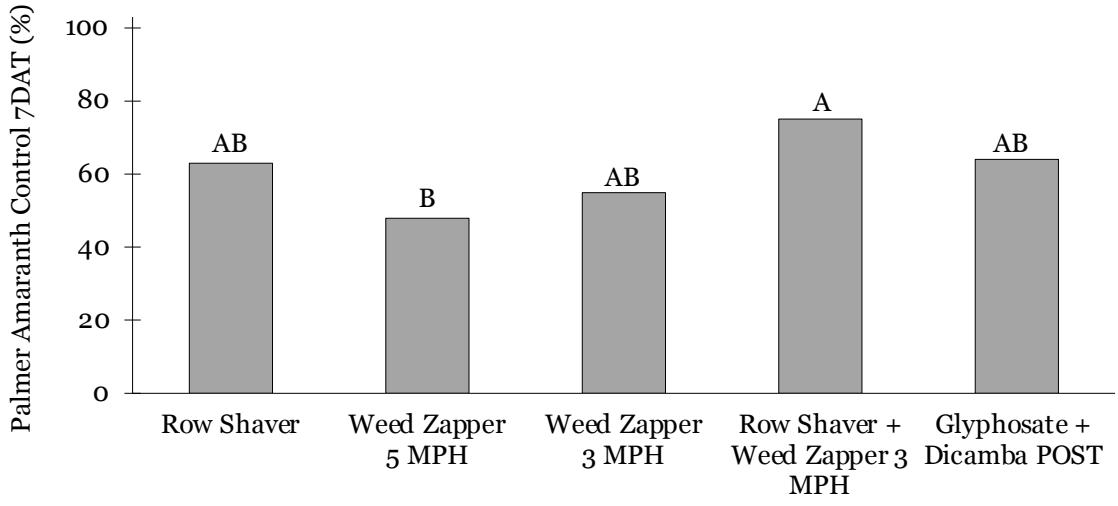
Effect of Rescue Treatments on Palmer Amaranth Control (Great Bend, Kansas)



*No effect of year therefore data combined across 2021 and 2022.
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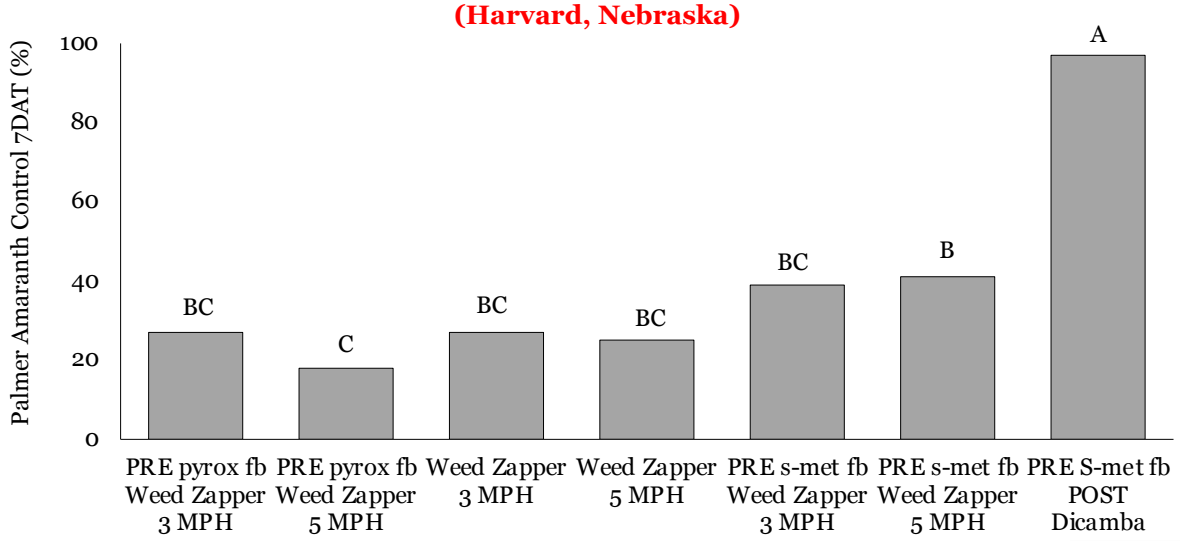
Effect of Rescue Treatments on Palmer Amaranth Control
(Harvard, Nebraska)



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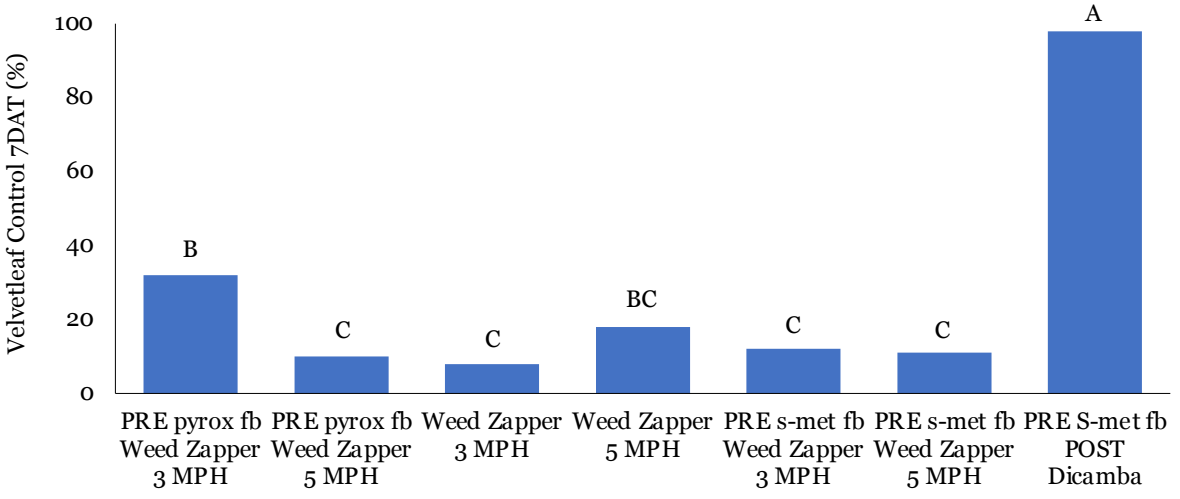
Effect of Rescue Treatments on Velvetleaf Control
(Harvard, Nebraska)



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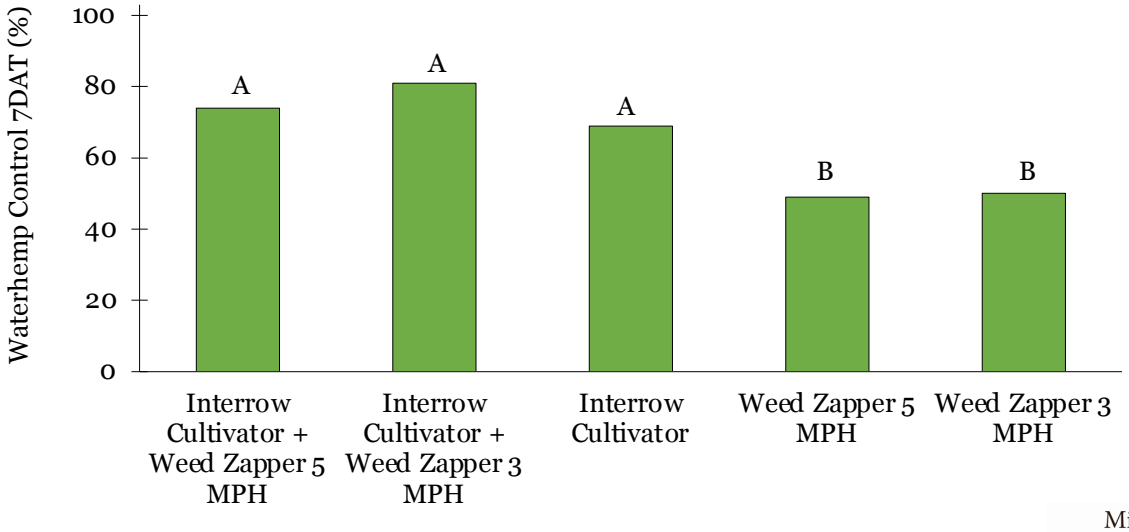
Effect of Rescue Treatments on Waterhemp Control (Ames, Iowa)



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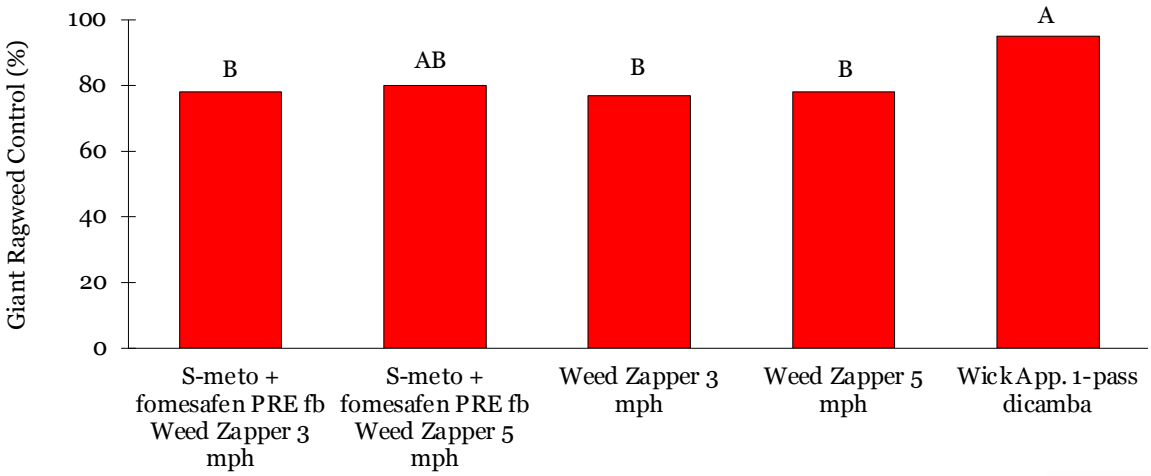
Effect of Rescue Treatments on End of Season Giant Ragweed Control (Lafayette, Indiana)



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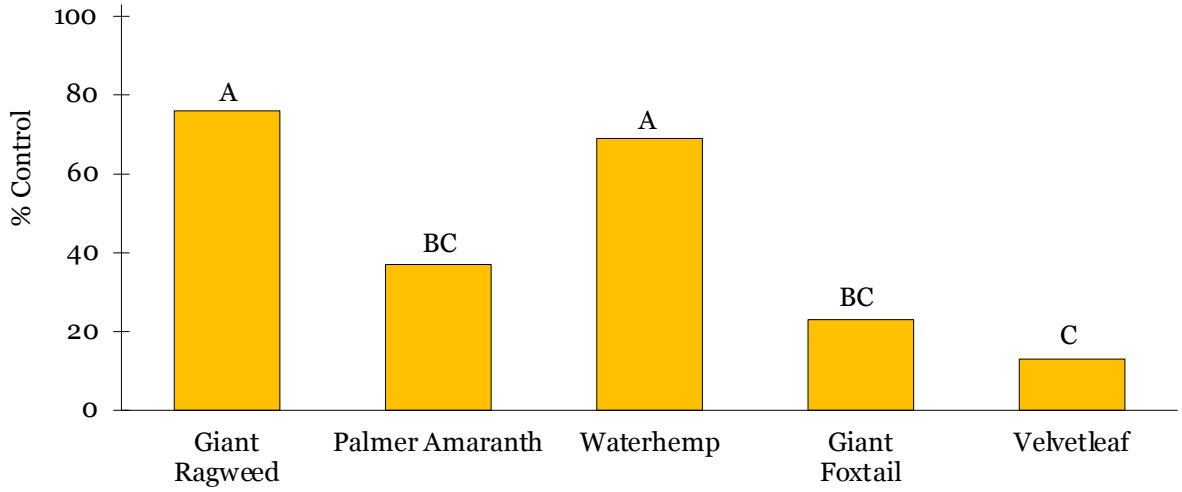
Effect of Electrocution on End of Season Weed Control



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Conclusions

- Speed of electrocution did not affect efficacy
- Electrocution provided highest control of giant ragweed = waterhemp > Palmer amaranth = giant foxtail > velvetleaf
- Other rescue treatments (inter-row cultivation or mowing, rope wick herbicide application) generally performed similarly or better than electrocution on the weed escapes evaluated in this research
- Additional research is needed to understand reasons for the variability in control across locations and/or to increase the overall effectiveness of electrocution on weed escapes

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Acknowledgements

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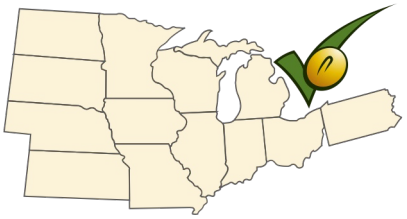
MISSOURI SOYBEANS

NCSRP NORTH CENTRAL SOYBEAN RESEARCH PROGRAM



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Undergraduate Workers

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