

# Waterhemp Research Update

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**2020 Northwest IL Agronomy Summit**



**Cropping Systems Weed Science**  
UNIVERSITY OF WISCONSIN-MADISON



## Cropping Systems Weed Science

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CHEMICAL COMPANIES



**BRIEN HYBRIDS**

# Outline

- Waterhemp resistance in WI
- Systems approach – corn
- Soil residual herbicides – corn
- System approach – Xtend soybeans
- Soil residual herbicides – soybeans



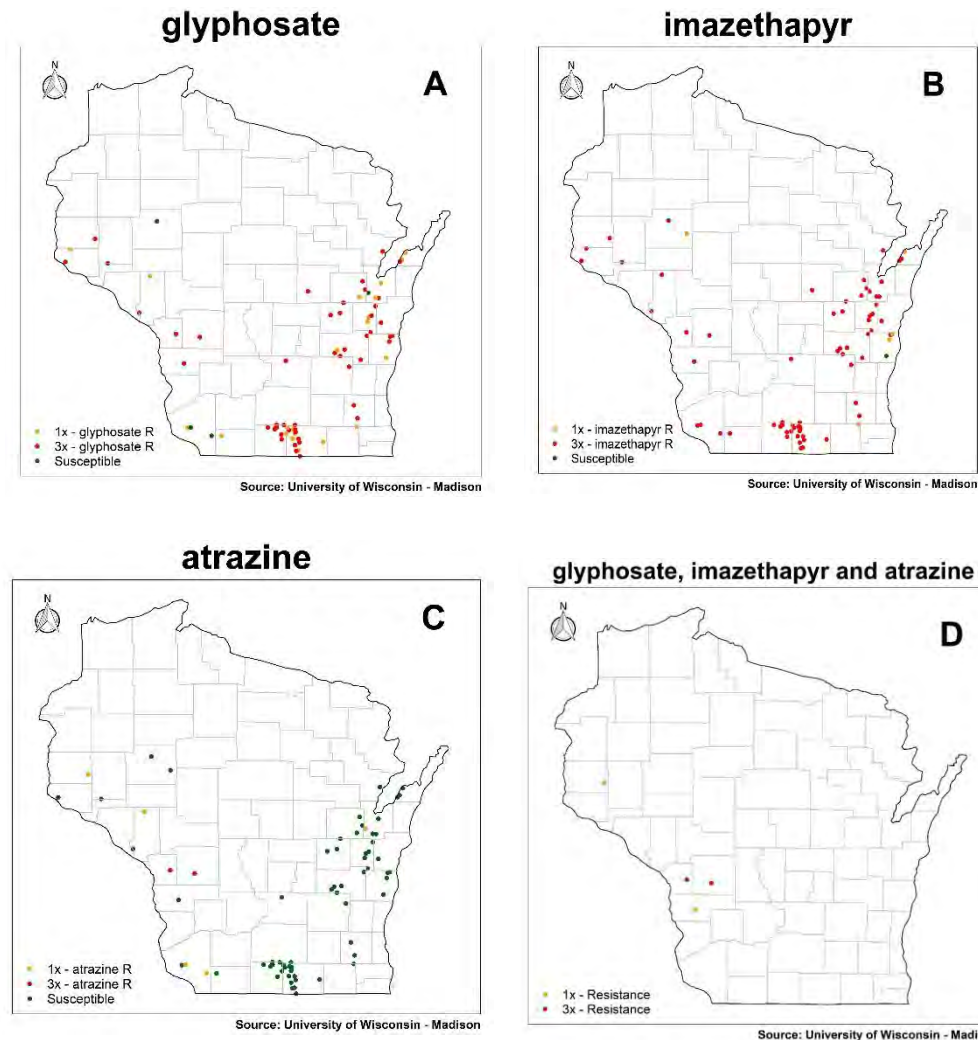
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# Waterhemp Resistance in WI: Preliminary Results

Treatment	Populations Screened	Resistant Populations	% Resistant Populations
1x Glyphosate	86	82	95%
3x Glyphosate	86	60	70%
1x Imazethapyr	82	79	96%
3x Imazethapyr	82	75	91%
1x Atrazine	80	8	10%
3x Atrazine	80	2	3%



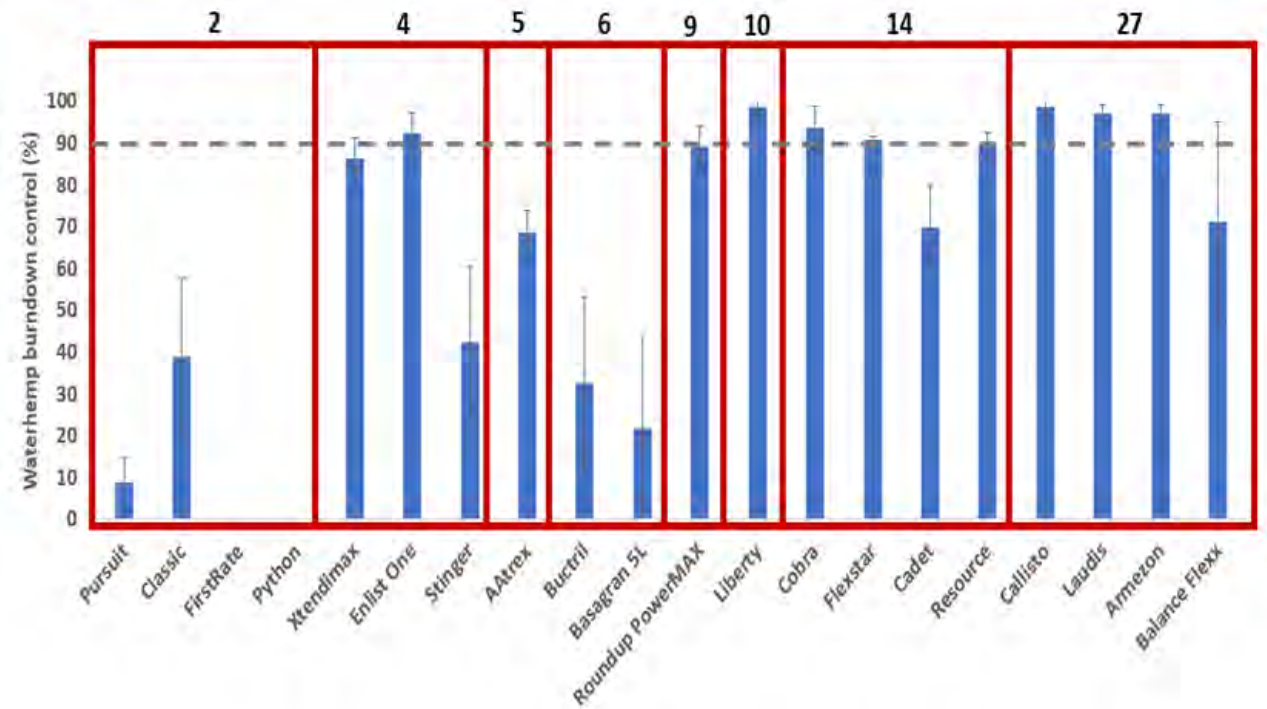
MS Research: Felipe Faleco, UW-Madison WiscWeeds Program



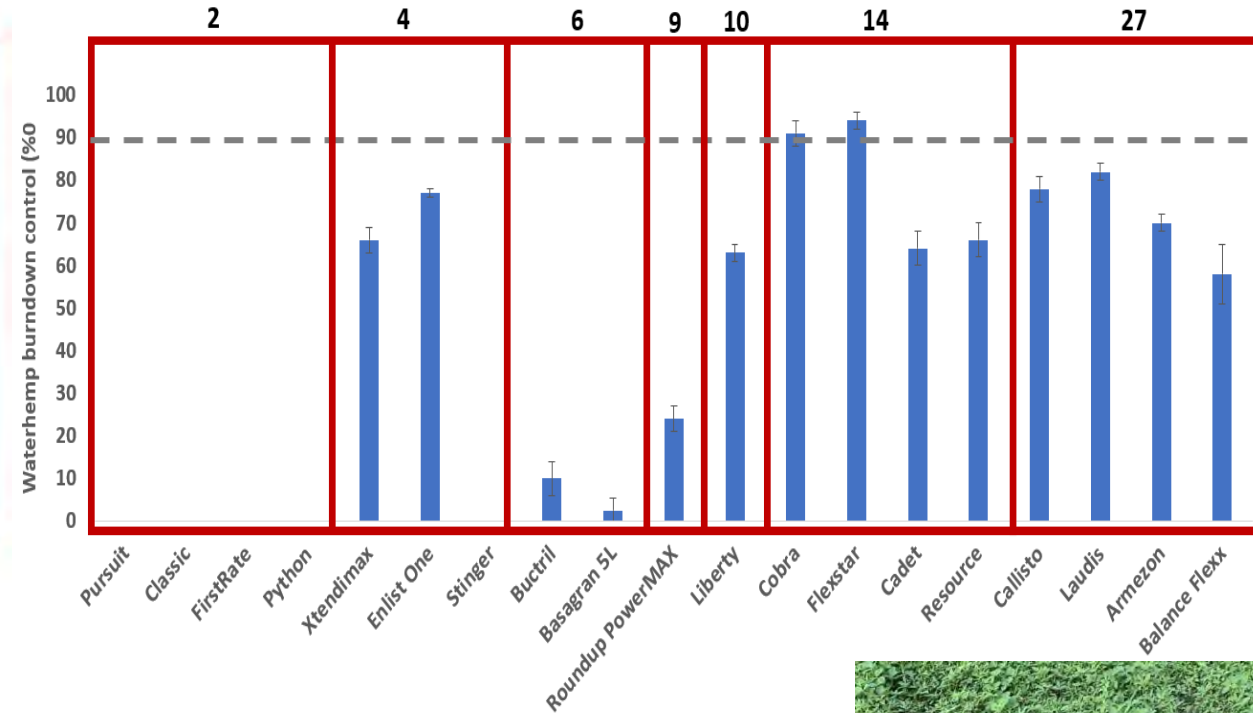
**Figure 1:** Distribution of waterhemp populations in Wisconsin according to their resistance level. Maps generated by Dr. Maxwell Oliveira.

# Waterhemp Burndown Control 14 DAT

## Lancaster, WI 2019



## Brooklyn, WI 2019



# Systems Approach to Weed Control: Corn

- 6 trial locations
  - ❑ 2018: Arlington and Janesville, WI
  - ❑ 2019: Arlington, Brooklyn, Janesville, and Lancaster, WI
- Locations managed with conventional tillage
- 12 treatments plus a non-treated control (NTC)
- RCBD, 4 replications per location






# Treatment List

- Compared 4 herbicide systems using portfolios from three companies
  1. PRE only
  2. Early POST applied at V2 corn grown stage
  3. PRE followed by (*fb*) POST applied at V4
  4. PRE *fb* by POST with an additional layered residual herbicide applied at V4

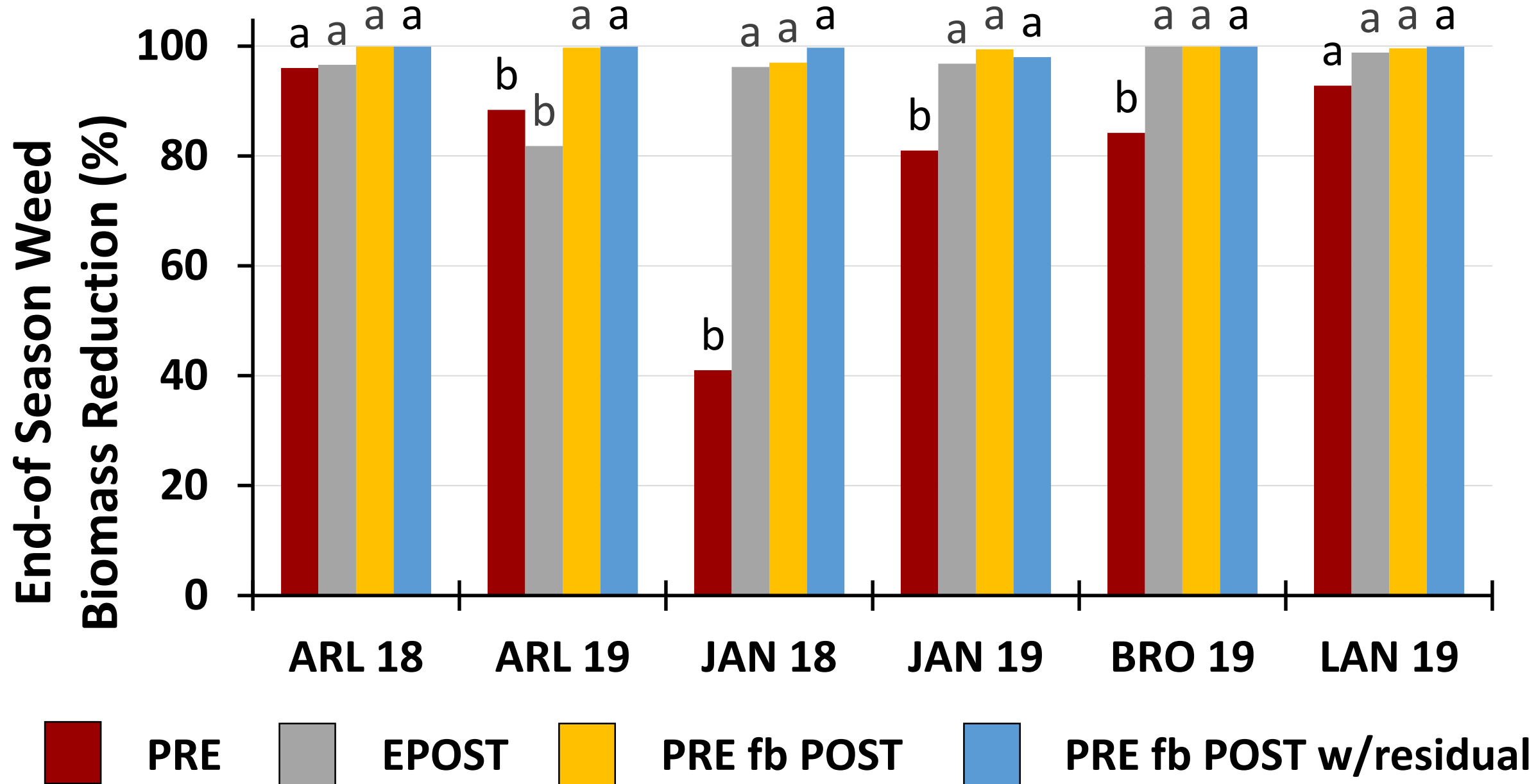


# Treatment List

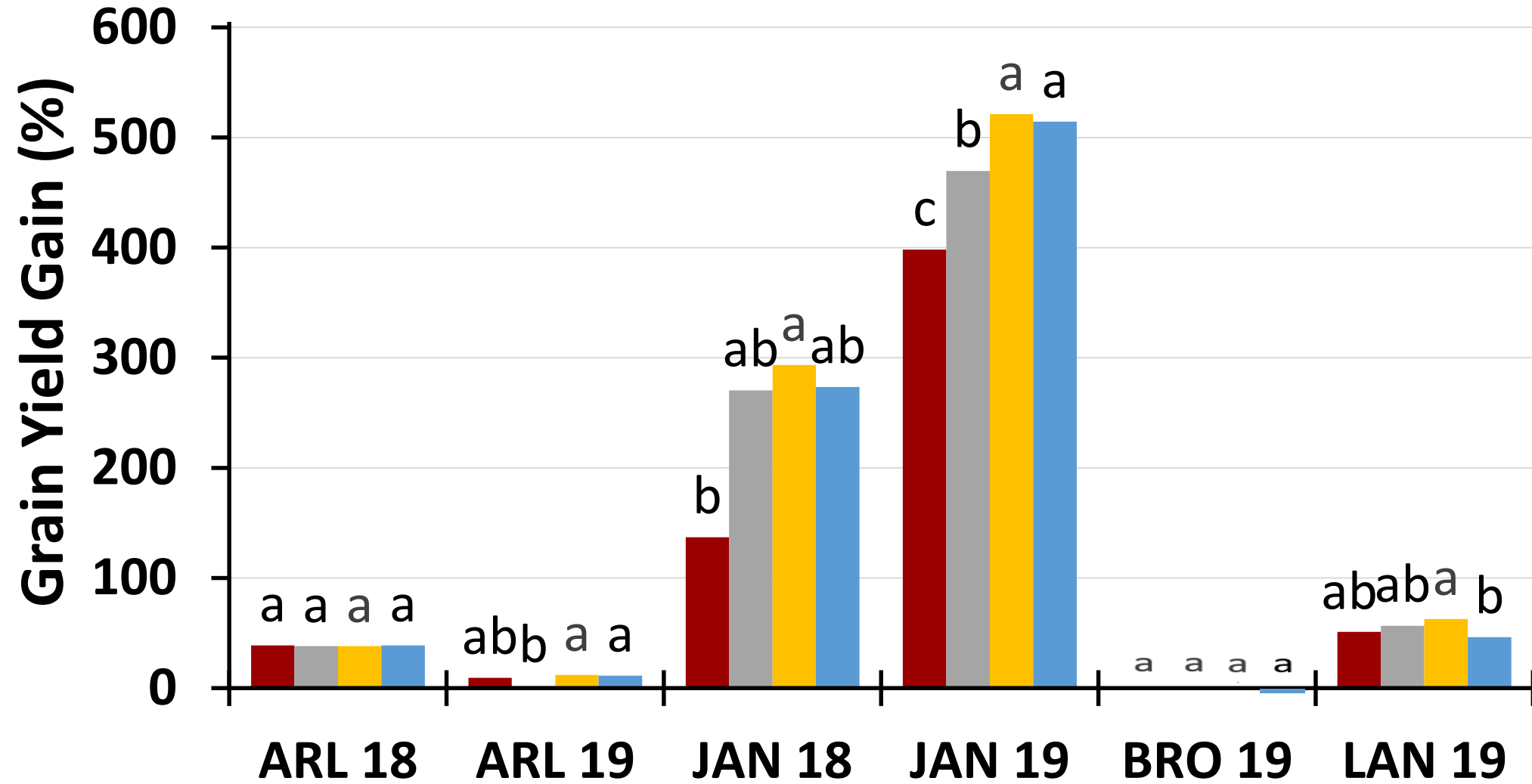
	<u>PRE</u>	<u>Early POST</u>	<u>PRE fb POST</u>	<u>PRE fb POST with Residual</u>
	Harness Max 75 fl oz/acre	Diflexx Duo* 28 fl oz/acre	Diflexx* 8 fl oz/acre	Diflexx Duo* 28 fl oz/acre
	Acuron Flexi 2.25 qt/acre	Halex GT 4 pt/acre + Clarity 8 fl oz/acre	Clarity* 8 fl oz/acre	Halex GT 3.6 pt/acre + Clarity 8 fl oz/acre
	Surestart II 2.5 pt/acre	RealmQ 4 oz/acre + Clarity 8 fl oz/acre*	Clarity* 8 fl oz/acre	RealmQ 4 oz/acre + Clarity 8 fl oz/acre*

\* Tank mix with Roundup Powermax 30 fl oz/acre

# End of Season Weed Biomass Reduction

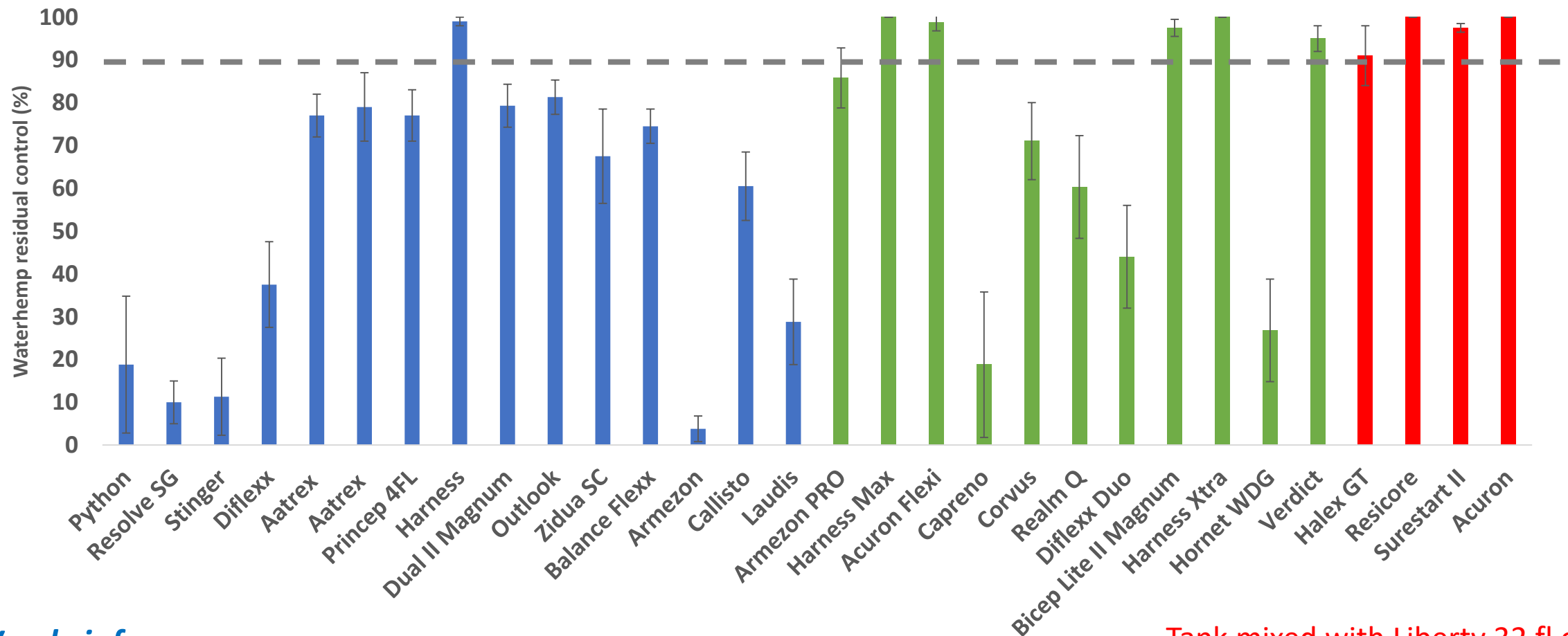


# Grain Yield Gain



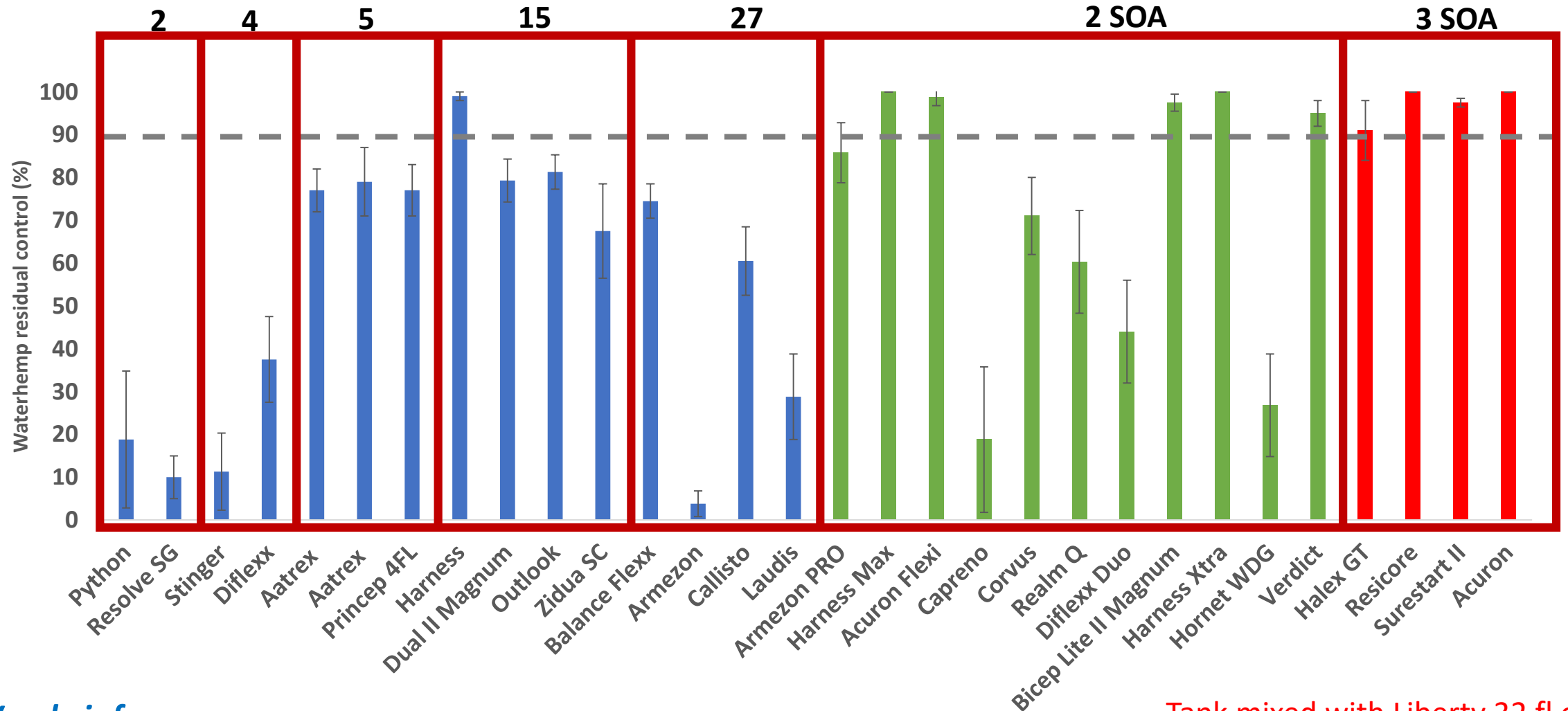
# Waterhemp Residual Control

## 25 DAT (corn, V6-V7 stage) – Brooklyn, WI



# Waterhemp Residual Control

## 25 DAT (corn, V6-V7 stage) – Brooklyn, WI



**Objective:** Determine optimum post-emergence (POST) timing of glyphosate + dicamba in RR2X soybeans and evaluate the value of layered residual POST approach in these systems.

*MS Research: Sarah Striegel, UW-Madison WiscWeeds Program*

# Systems Approach for Weed Control in Dicamba-Resistant Soybeans in Wisconsin



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# Materials and Methods

- Eight treatments organized in a RCBD, 4 replications
- 3 x 2 Factorial with 2 controls – nontreated (NTC) and PRE-only
  - 3 POST application timings: E POST (V1-V2), M POST (V3-V4), L POST (V5-V6)
  - 2 levels of layered residual POST: Present or absent
- Blanket PRE (except NTC) of Valor SX at 3 oz/ac.
- POST Xtendimax with Vaporgrip® (22 fl oz./ac.) + Roundup Powermax (28 fl oz./ac.)
  - With/without layered residual POST – Warrant (1.5 qt/ac.)
  - Included non-AMS water conditioner (1% v/v) and drift reducing agent (Intact at 0.5% v/v)
- Treatments applied according to standard small-plot research techniques



# Materials and Methods

- In-season weed biomass ( $\text{g/m}^2$ ) and weed height (cm) collected at each POST application time
- 28 days after last POST application
  - Weed Biomass ( $\text{g/m}^2$ ) collected
- Grain yield (bu/ac.)
- Target weed seed production
  - Sampled two plants per plot, end-of-season weed density used to estimate seeds produced/ $\text{m}^2$
- Data analyzed in R version 3.5.3

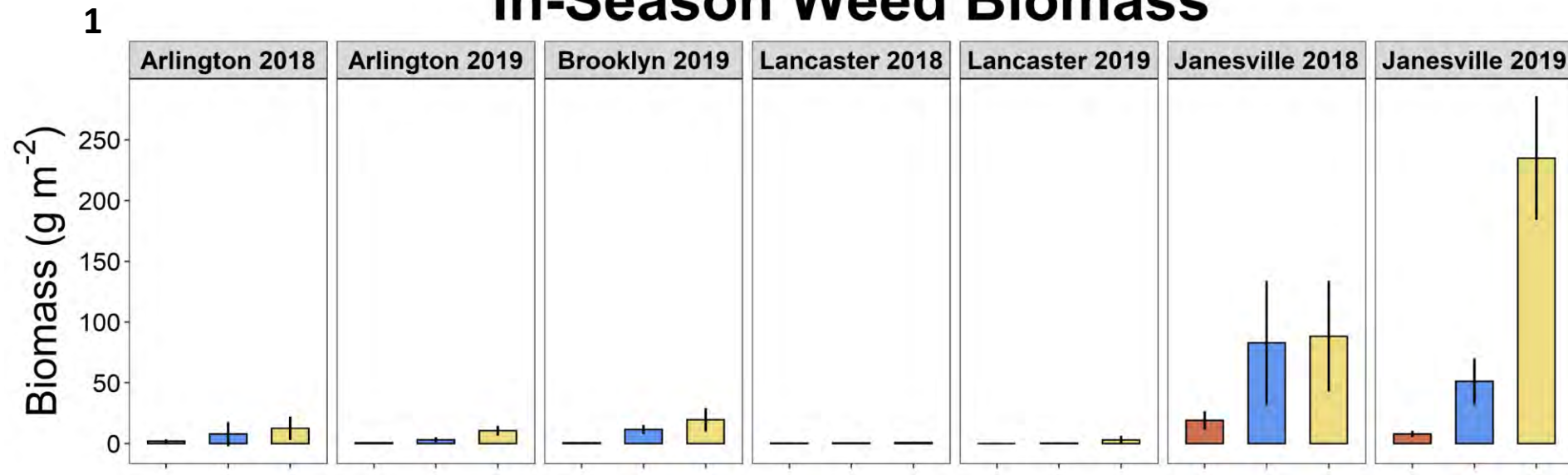


# Materials and Methods

- 7 site-years
  - Arlington, Janesville, Lancaster (18/19), and Brooklyn (19)
- RR2X soybeans planted in 30" spacing, at 140k seeds/ac. for most sites
  - Sites were planted from mid-May to early June
- Weed species spectrum was site-specific



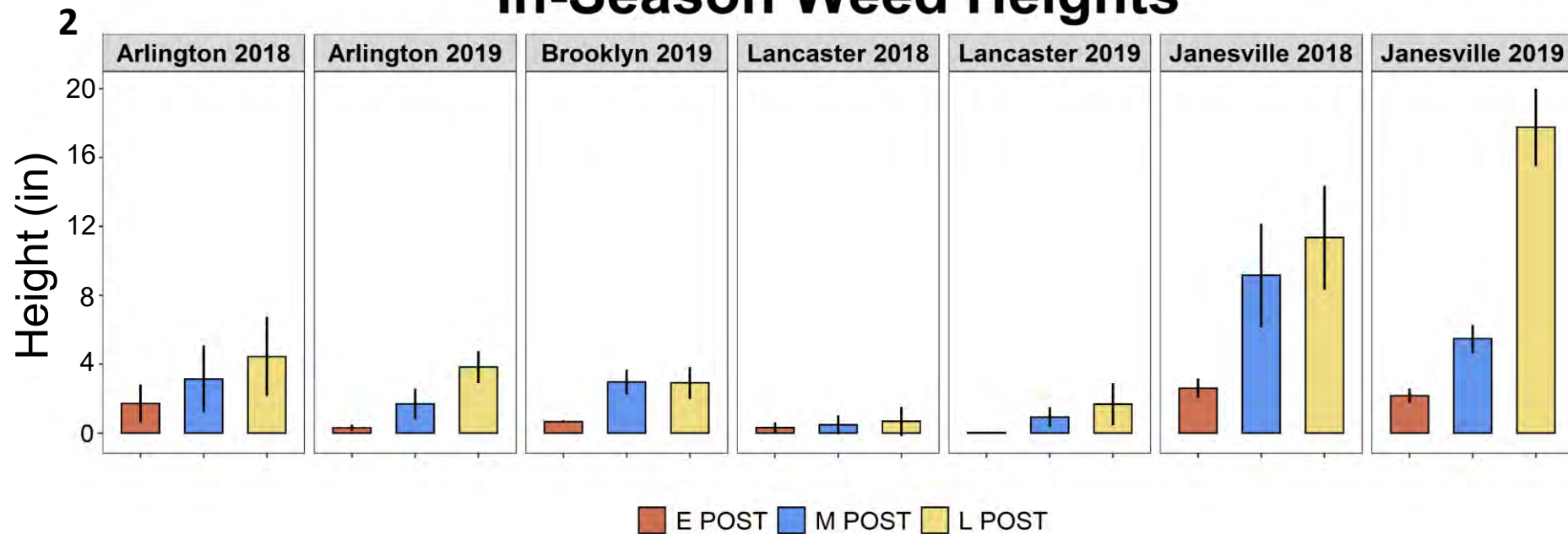
# In-Season Weed Biomass



POST by days after planting (DAP):

- E POST = 21-31
- M POST = 32-43
- L POST = 38-51

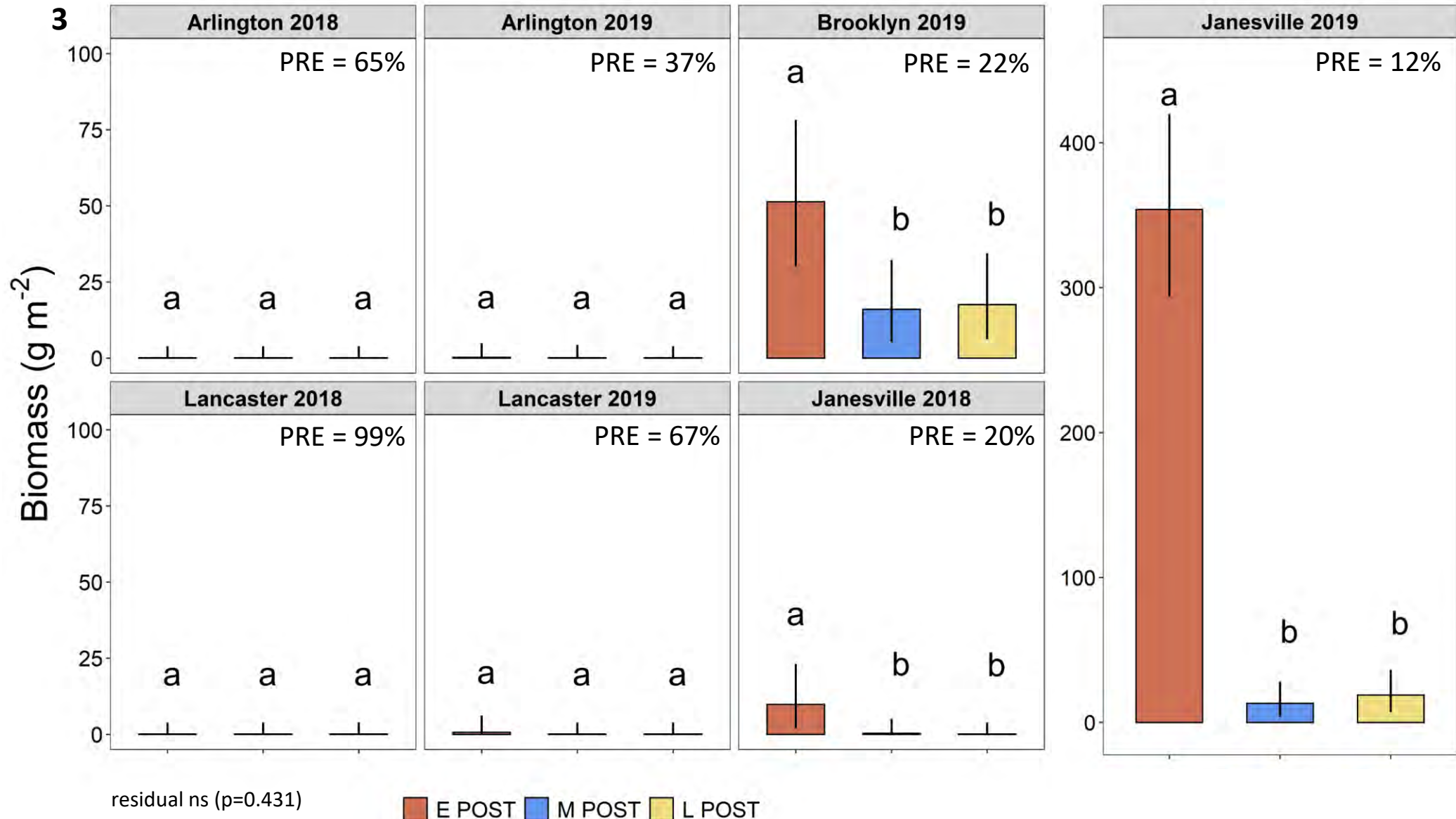
# In-Season Weed Heights



Figures 1 and 2. Error bar indicates upper and lower limits of 95% confidence interval built around the mean.



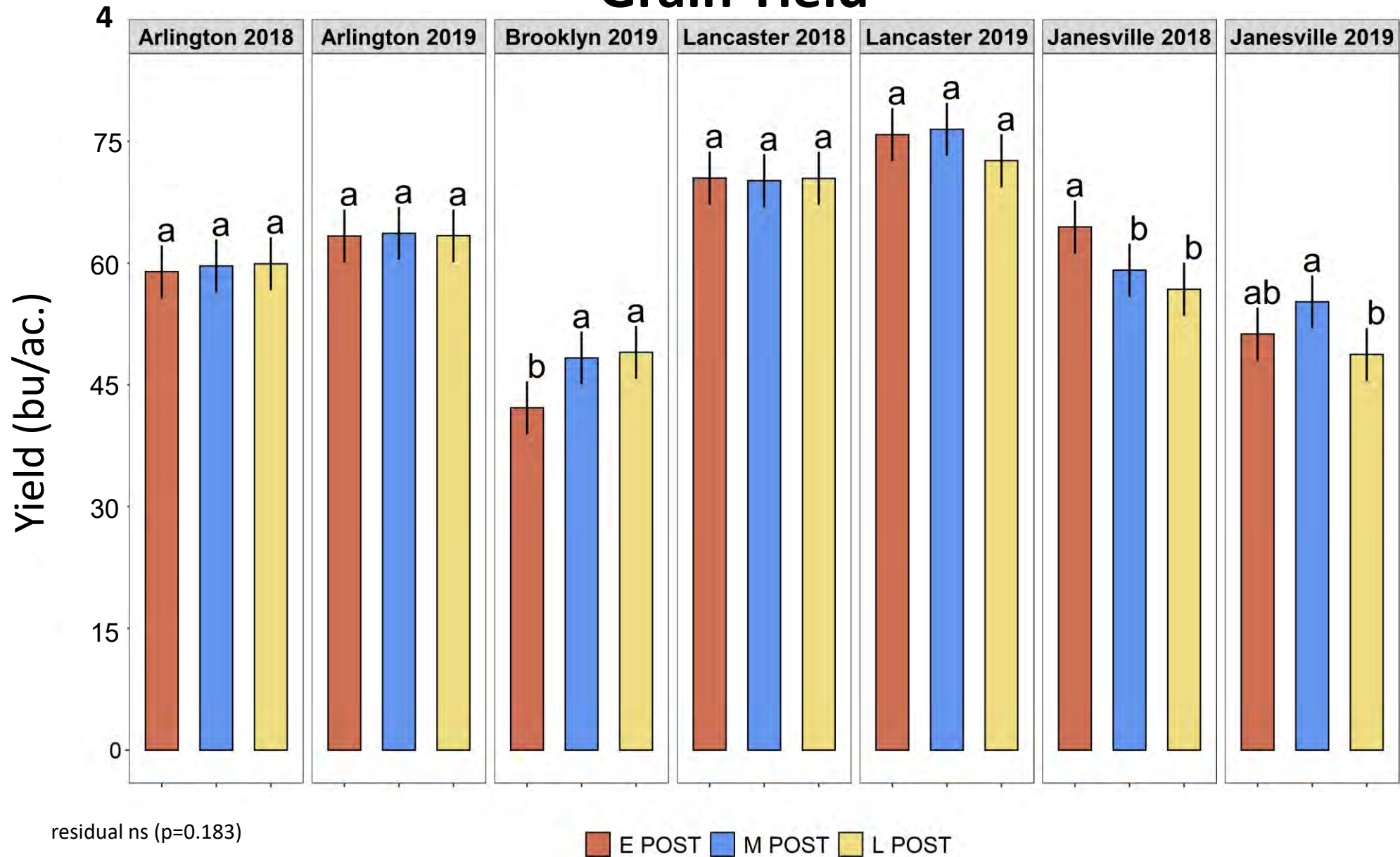
# End-of-Season Weed Biomass



**Figure 3.** Bars that share a letter within a site-year are not significantly different at  $\alpha=0.05$ . Error bar indicates upper and lower limits of 95% confidence interval built around the mean. Mean % biomass controlled by PRE is listed in upper right corner for each site-year.



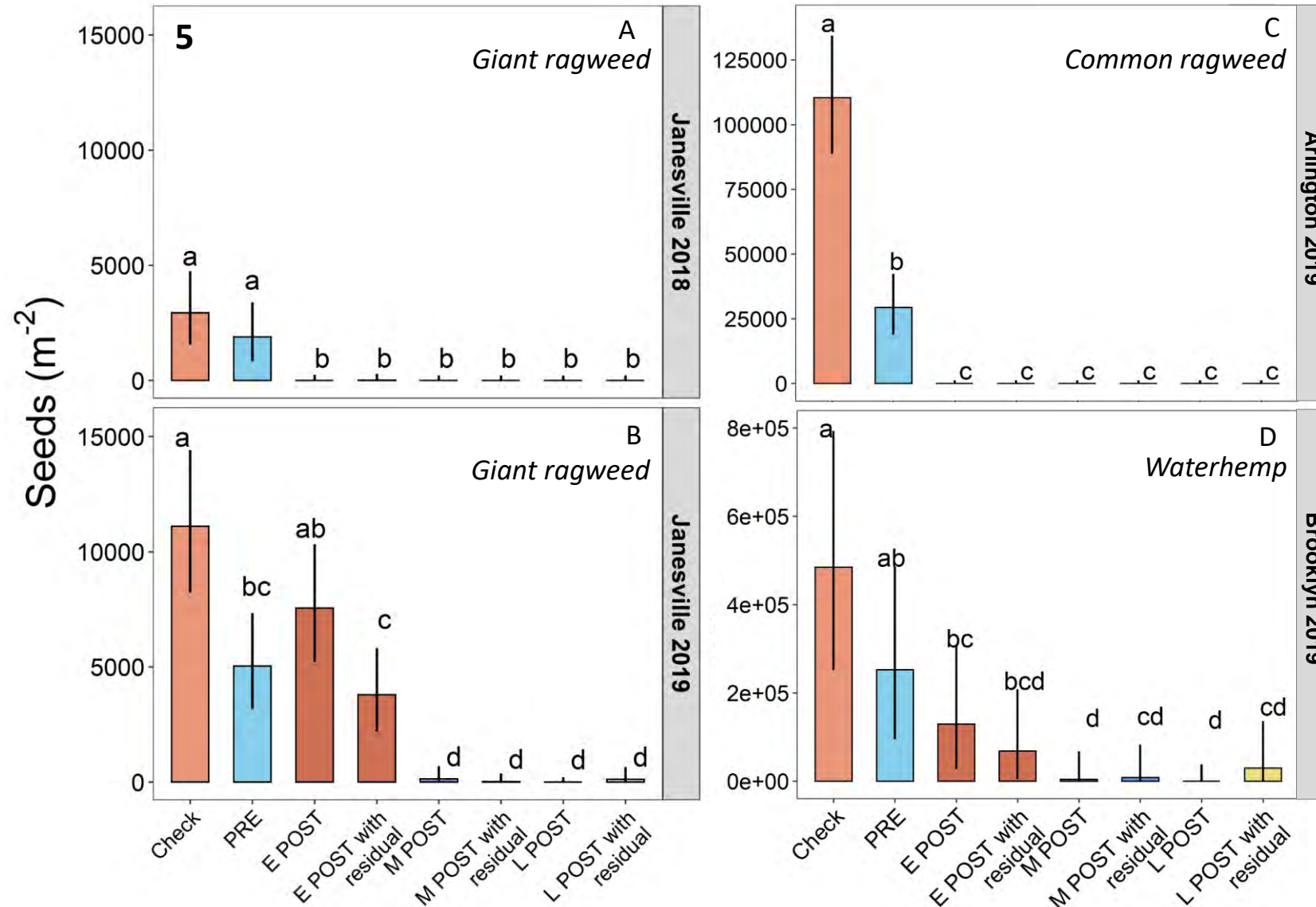
# Grain Yield



**Figure 4.** Bars that share a letter within a site-year are not significantly different at  $\alpha=0.05$ . Error bar indicates upper and lower limits of 95% confidence interval built around the mean.



# Weed Seed Production



**Figure 5, a-d.** Bars that share a letter within a site-year are not significantly different at  $\alpha=0.05$ . Error bar indicates upper and lower limits of 95% confidence interval built around the mean.



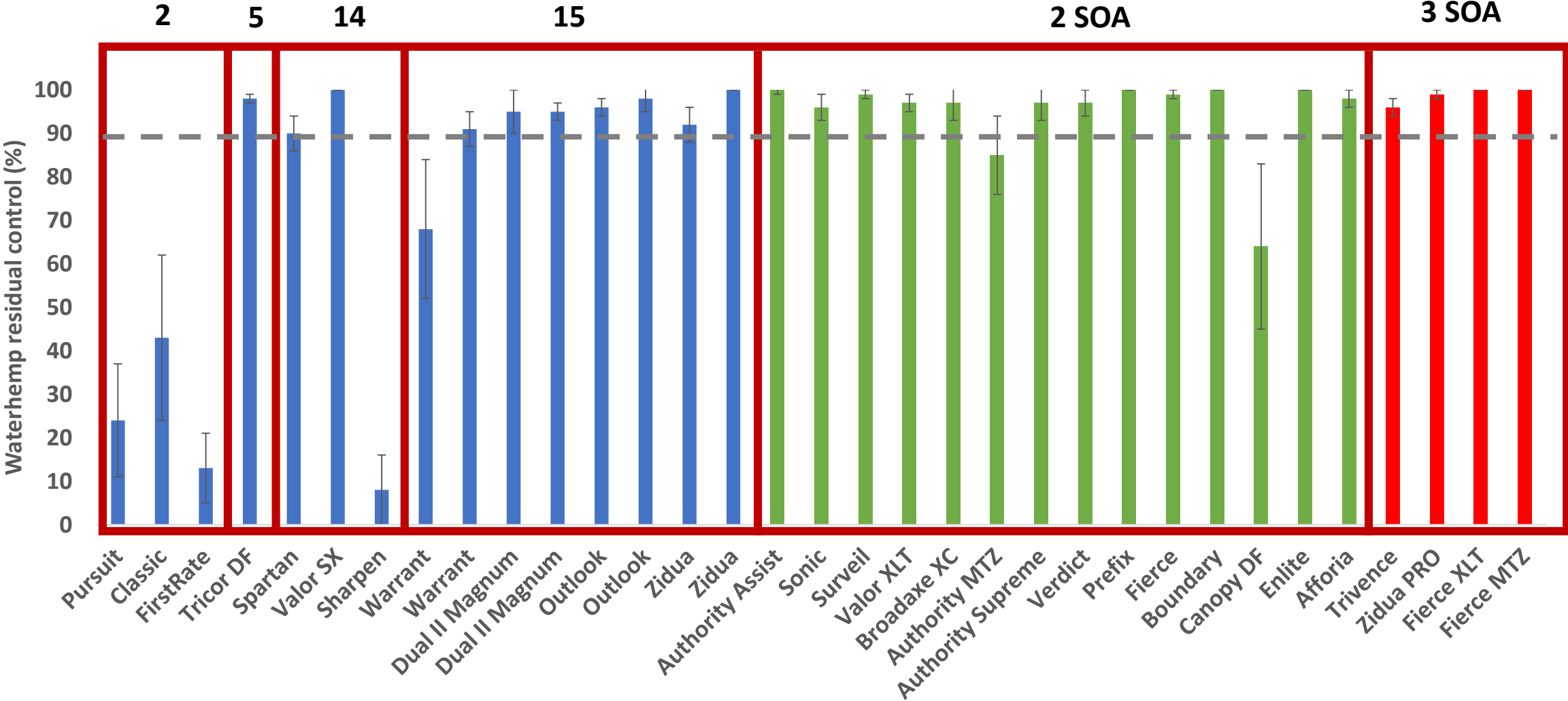
# Summary

- Addition of Warrant as layered residual POST did not enhance weed control or grain yield for these site-years
- Across site-years, M POST (V3-V4) application timing optimized weed biomass reduction, weed seed fecundity and crop grain yield
  - M POST occurred 32-43 DAP across site-years



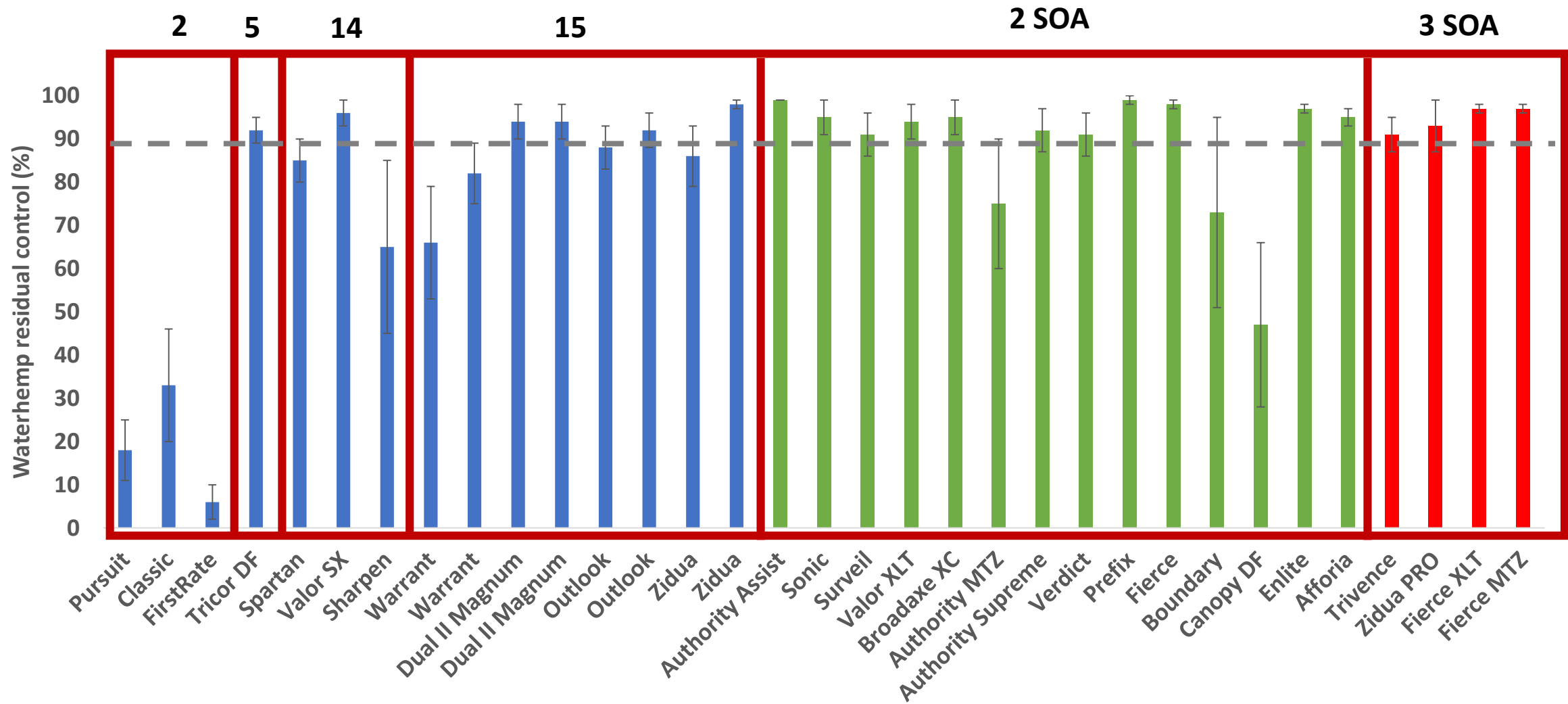
# Waterhemp Residual Control 25 DAT (soybean, V3 stage)

## Lancaster, WI 2018



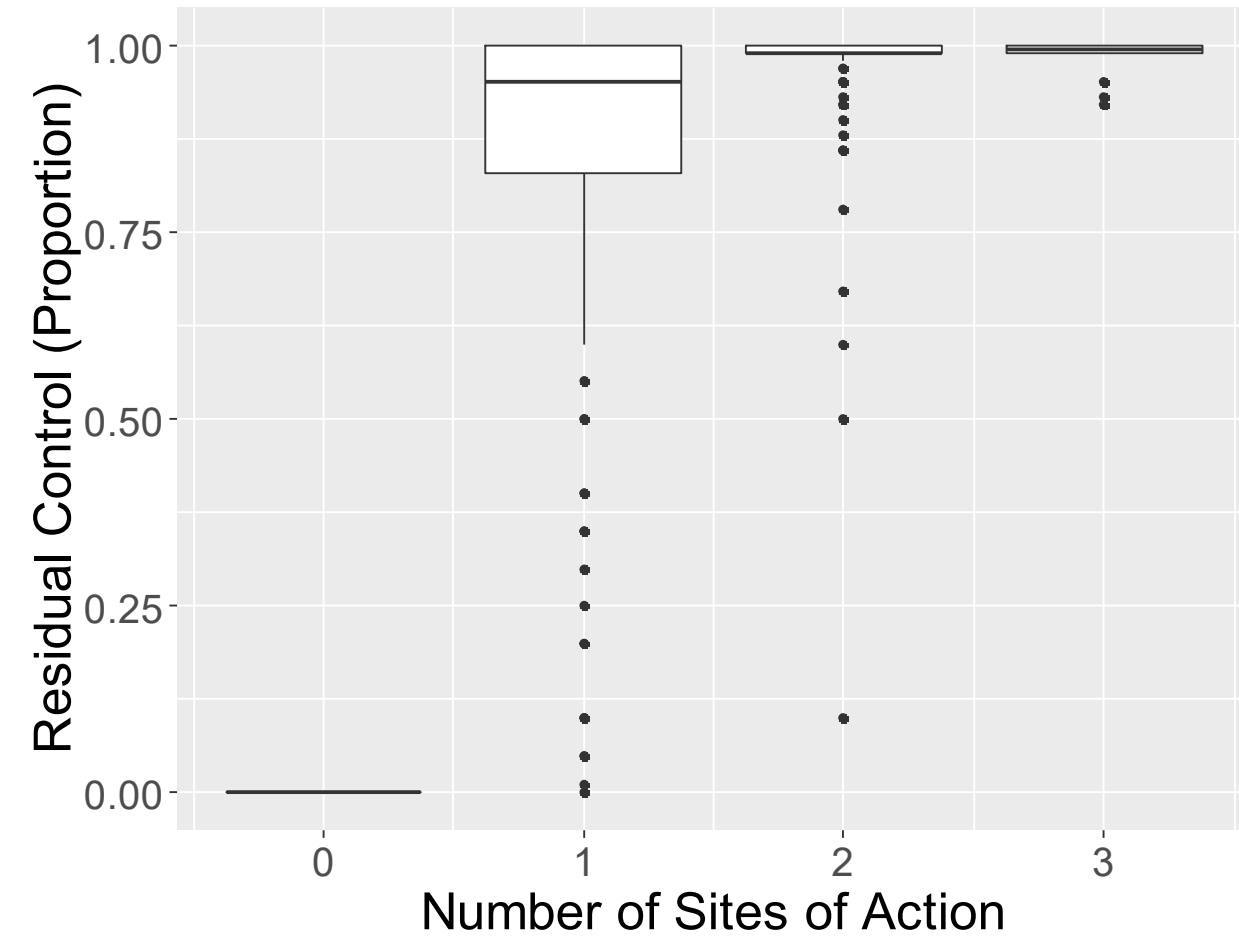
# Waterhemp Residual Control 50 DAT (soybean, R1 stage)

## Lancaster, WI 2018

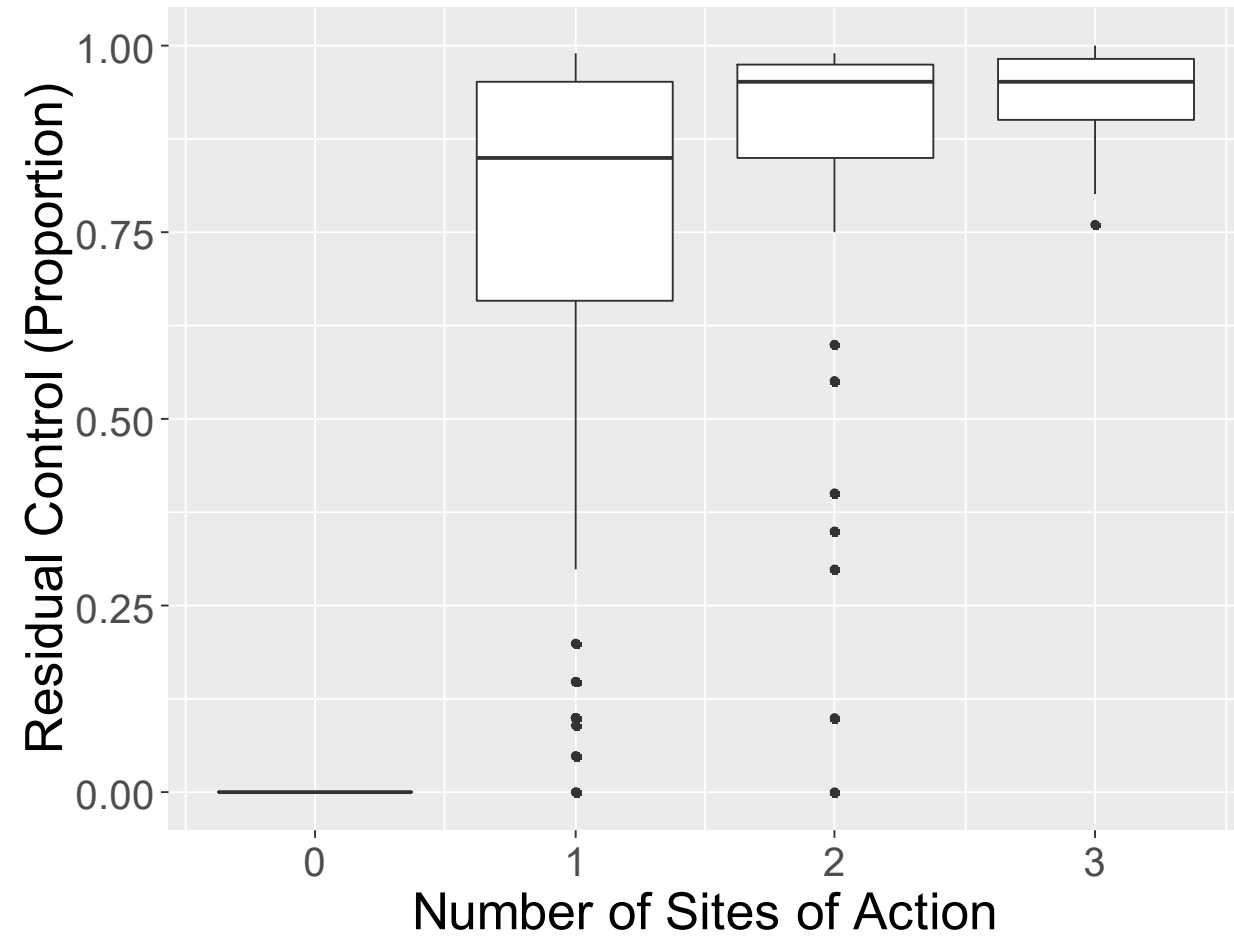


# Visualizing Relative Residual Control – SOA comparison

Residual Waterhemp Control - 25 DAT



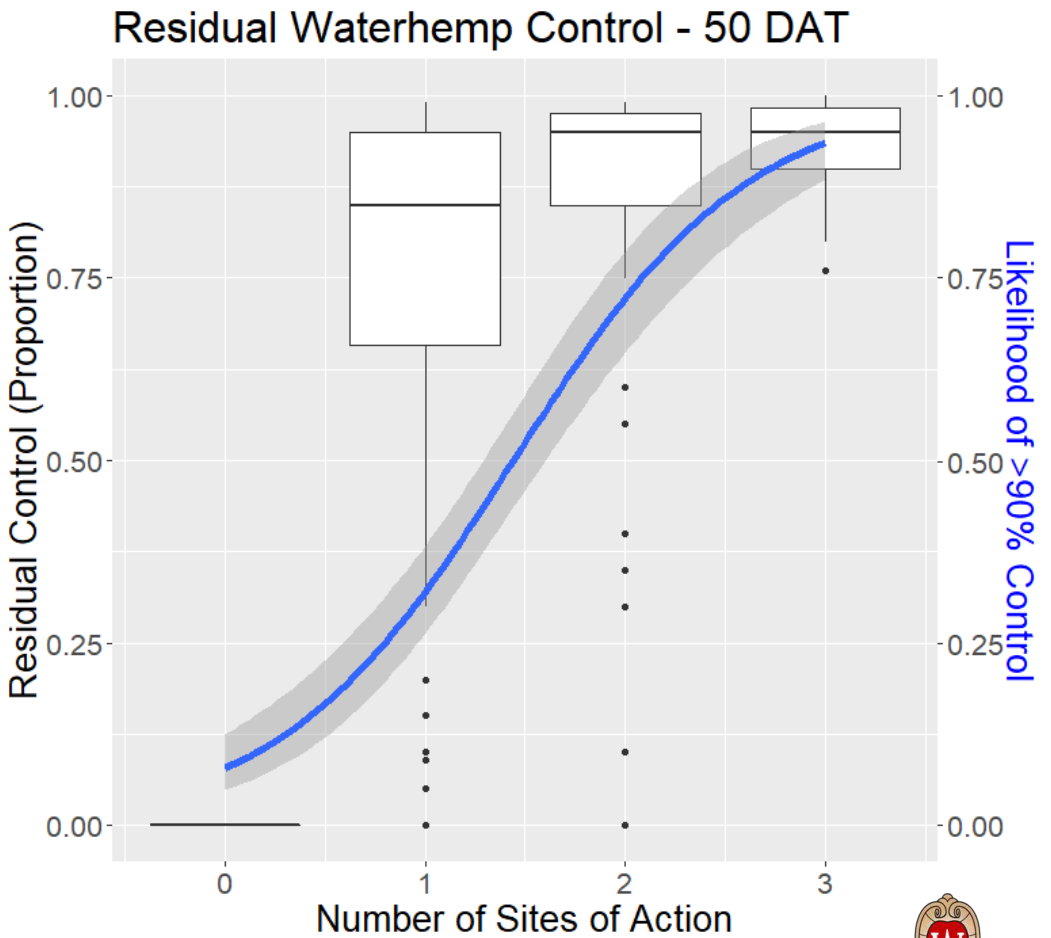
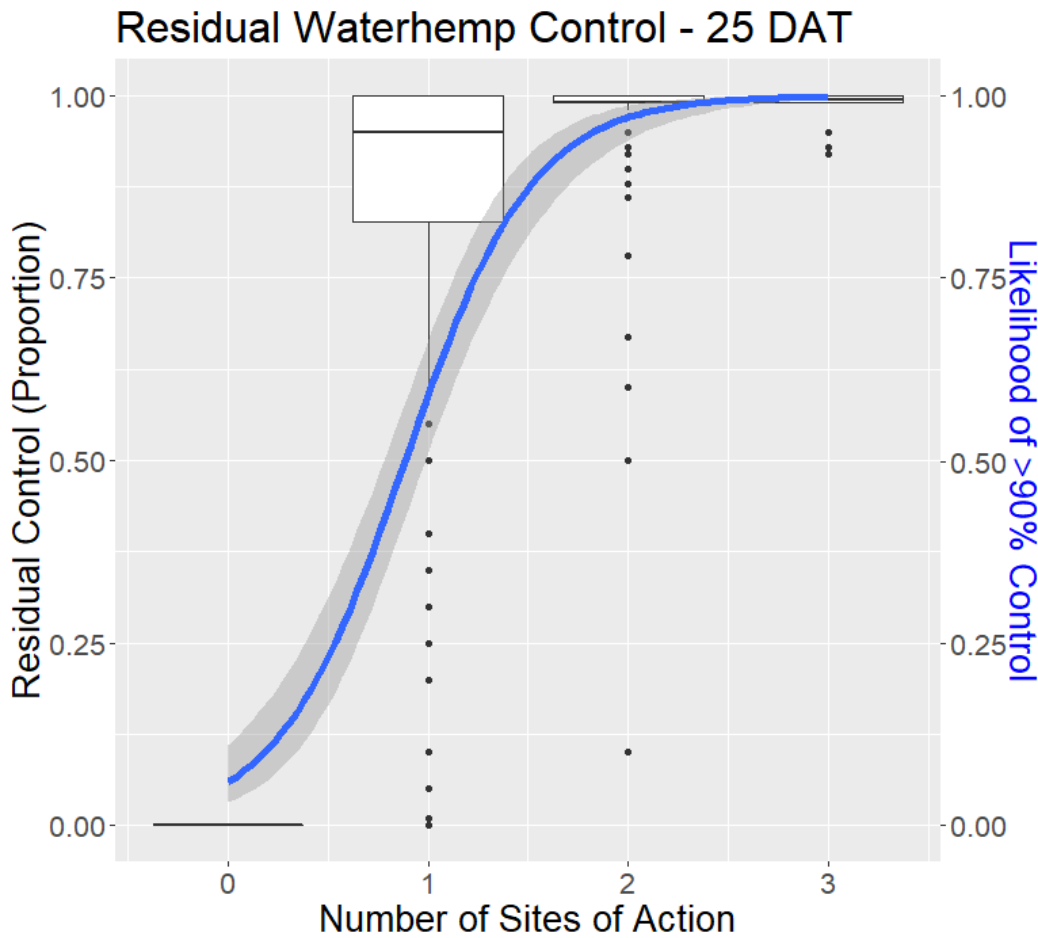
Residual Waterhemp Control - 50 DAT



- Boxplots indicate visual control (0 = no control or 0%; 1 = complete control or 100%)

Waterhemp residual control with PRE-emergence soybean herbicides containing one or multiple sites of action at 25 and 50 days after treatment (DAT). Data from the “WiscWeeds Waterhemp Management Challenge: Comparison of Soil Residual Soybean Herbicides Study” (30 herbicide treatments evaluated in 2018 and 2019 at UW Lancaster Ag Research Station, WI).

Besides postponing herbicide resistance evolution, PRE-emergence herbicides containing multiple Sites of Action (SOA) **also increase the likelihood of successful waterhemp control in soybeans:**



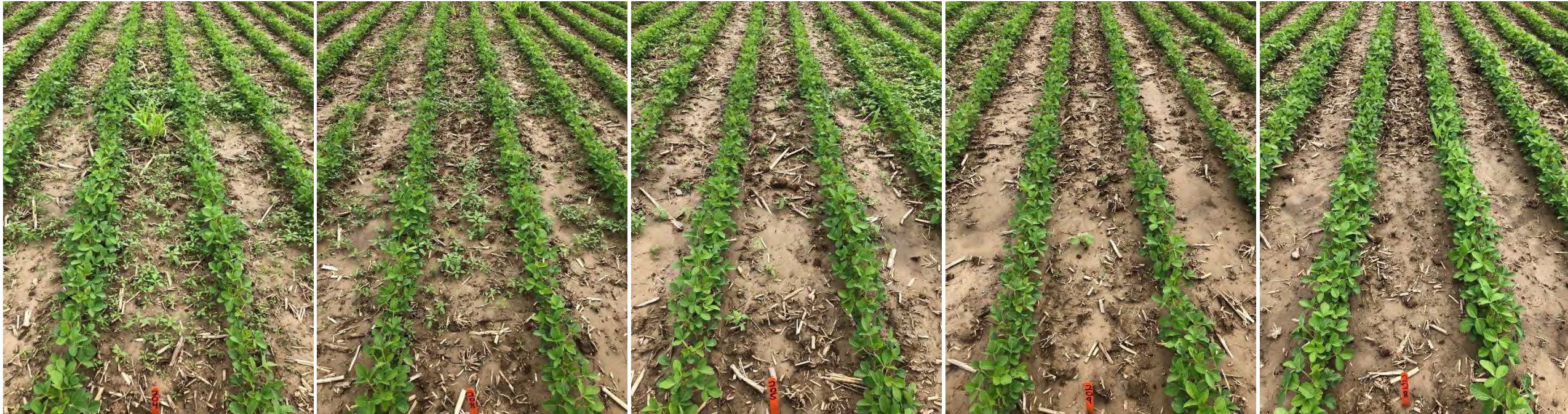
- Boxplots indicate visual control (0 = no control or 0%; 1 = complete control or 100%)
- Blue line represents the likelihood of EFFECTIVE waterhemp control given the number of SOA (>90%)



Waterhemp residual control with PRE-emergence soybean herbicides containing one or multiple sites of action at 25 and 50 days after treatment (DAT). Data from the “WiscWeeds Waterhemp Management Challenge: Comparison of Soil Residual Soybean Herbicides Study” (30 herbicide treatments evaluated in 2018 and 2019 at UW Lancaster Ag Research Station, WI).

# Waterhemp Control 25 DAT (V3)

## Lancaster, WI - 2018



**Trt 1. Untreated Control**

**0% ( $\pm 0\%$ )**

**Trt 2. Pursuit (4 fl oz)**

**Group 2  
24% ( $\pm 13\%$ )**

**Trt 8. Sharpen (1 fl oz)**

**Group 14  
83% ( $\pm 8\%$ )**

**Trt 15. Zidua (1.5 oz)**

**Group 15  
92% ( $\pm 4\%$ )**

**Trt 32. Zidua PRO (6 fl oz oz)**

**Groups 2+14+15  
99% ( $\pm 1\%$ )**

Pursuit (4 fl oz)  
Sharpen (1 fl oz)  
Zidua (2 oz)



# Take-Home

## **Waterhemp:**

- Soil residual herbicides are crucial for successful control
- Programs with multiple SOA are more likely to result in successful control

## **Dicamba:**

- Dicamba injury followed wind direction (during and after [0-72hrs?])
- Spray early in the season & avoid spraying under adverse conditions

# Thanks!

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# Questions?

