NPM

Cropping Systems Weed Science
UNIVERSITY OF WISCONSIN-MADISON

Soybean PRE Herbicide Evaluation in Challenging Soils

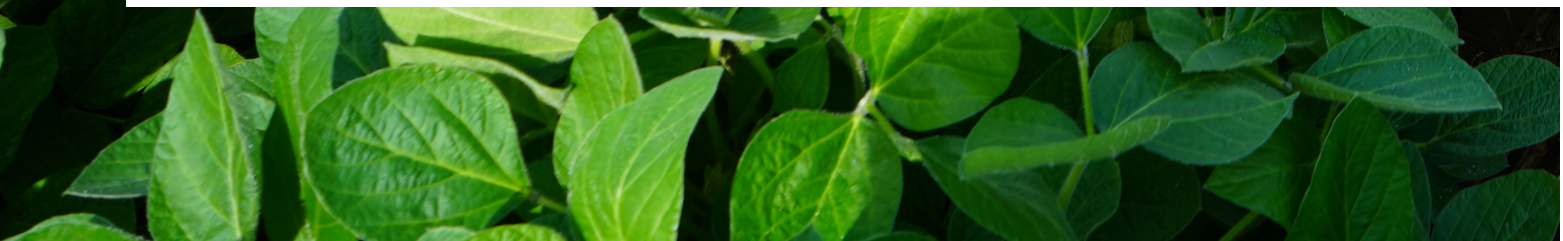
Authors: Kolby Grint, Daniel H. Smith & Jamie Patton, NPM Program; Scott Reuss, Marinette County Extension, Nick Arneson & Rodrigo Werle, Cropping Systems Weed Science, University of Wisconsin-Madison Division of Extension

The use of effective preemergence (PRE) herbicides represents the foundation of chemical control programs targeting troublesome small-seeded annual weeds such as common lambsquarters, waterhemp, redroot pigweed, and foxtail. Herbicide label restrictions for coarse textured soils (sands, loamy sand, and sandy loam soils) with low organic matter (OM) and/or high pH challenge herbicide selection and application rates. Reduced rates of PRE herbicides are typically required due to the risks of herbicide loss to the environment and/or crop safety under such soil conditions which occur in many Wisconsin fields (Table 1). There has been limited information from research conducted in Wisconsin evaluating the performance of PRE herbicides in such soil conditions. Thus, the objective of this study was to investigate the efficacy of multiple PRE herbicides for residual weed control in soybean grown in coarse textured soils with low soil organic matter and high pH.

Table 1. Comparison of typical versus adjusted herbicide rates for commonly used soybean preemergence herbicides when used in soil conditions that require lower use rates. Herbicide labels should be consulted for specific product restrictions and application rates prior to application.

Herbicide product	Active ingredient(s)	SOA group	Typical PRE rate	Adjusted rate for coarse soils	Actual rate applied*	Reason
Pursuit	imazethapyr	2	4 fl oz/A	4 fl oz/A	4 fl oz/A	None
Tricor DF	metribuzin	5	1/2 -1 -1/6 lb/A	Do not use	8 oz wt/A	Soil texture (coarse) & OM (<2.0%) & high pH (>7.5)
Spartan	sulfentrazone	14	12 oz/A	4.5-6 oz/A	4.5 fl oz/A	Soil Texture (coarse) & OM (<1.5%)
Valor SX	flumioxazin	14	2-3 oz/A	2-3 oz/A	3 oz wt/A	None
Dual II Magnum	S-metolachlor	15	2.0-2.6 pt/A	1.33 pt/A	21.28 fl oz/A	Soil texture (coarse)
Outlook	dimethenamid-P	15	18-21 fl oz/A	12-14 fl oz/A	14 fl oz/A	Soil texture (coarse) & OM (<3.0%)
Warrant	acetochlor	15	1.25-2.0 qt/A	1.25-1.6 qt/A	48 fl oz/A	Soil texture (coarse) & OM (<1.5%)
Zidua	pyroxasulfone	15	4.0-5.75 fl oz/A	2.5-3.5 fl oz/A	2.1 fl oz/A	Soil texture (coarse)
Fierce	flumioxazin + pyroxasulfone	14 +15	3-3.75 oz/A	3-3.75 oz/A	3 oz/A	None
Broadaxe XC	sulfentrazone + S-metolachlor	14 +15	32-38.7 fl oz/A	19-25 fl oz/A	25 fl oz/A	Soil texture (coarse) & OM (<1.5%)
Authority Assist	sulfentrazone + imazethapyr	14 + 2	12 fl oz/A	6-8 fl oz/A	6 fl oz/A	Soil texture (coarse) & OM (1-2%)
Authority First	sulfentrazone + cloransulam-methyl	14 + 2	8.00 oz/A	6.45 oz/A	4 oz/A	OM (≤3%)

* Actual rate applied based on label requirements for coarse textured soils.



On-farm field experiments were conducted at three field locations in 2021 and 2022 to evaluate the efficacy of commonly used soybean PRE herbicides on problematic weeds in soil conditions that required lower herbicide use rates (Table 2). Visual weed control data ranging from 0% (no control) to 100% (complete control) of the predominant weed species at each research location were collected 50 days after treatment (DAT) and are presented herein.

Table 2. Field information of on-farm sites where the experiments were conducted.

Location	Year	Soil Series	Soil Texture	Soil OM%	pH	Crop Row Spacing
Chippewa	2022	Scott Lake	Sandy loam	1.8%	5.9	15″
Shawano	2021	Wainola	Loamy fine sand	1.8%	8.1	30″
Waupaca	2022	Rosholt	Sandy loam	1.5%	5.9	15″

Waterhemp Control Efficacy

Treatments that provided effective (>90%) waterhemp (*Amaranthus tuberculatus*) control at 50 DAT and that were consistently effective across locations include Spartan, Valor SX, Fierce, Broadaxe XC, Authority Assist, and Authority First (only used at Chippewa and Waupaca). Pursuit (imazethapyr alone) was ineffective for controlling waterhemp across locations (<30% average control achieved). This was expected given the widespread occurrence of waterhemp resistance to imazethapyr and other group 2 herbicides. Poor waterhemp control with imazethapyr and other group 2 herbicides was also observed in another Wisconsin experiment evaluating soybean PRE herbicides in silt loam soils (see; Residual Control of Waterhemp with Pre-emergence Herbicides in Soybean).

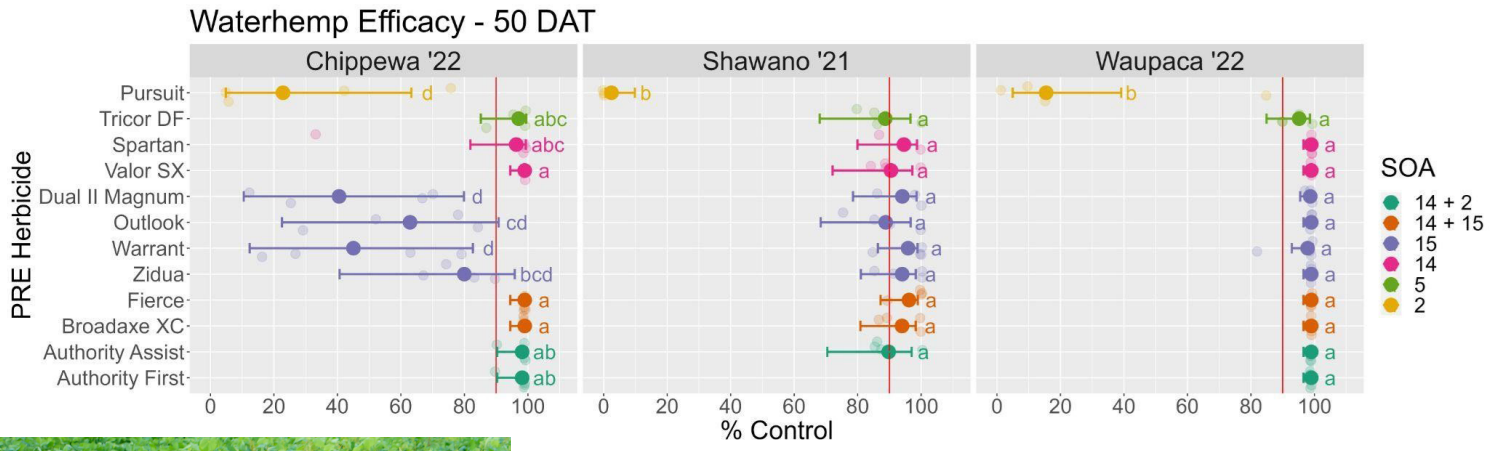
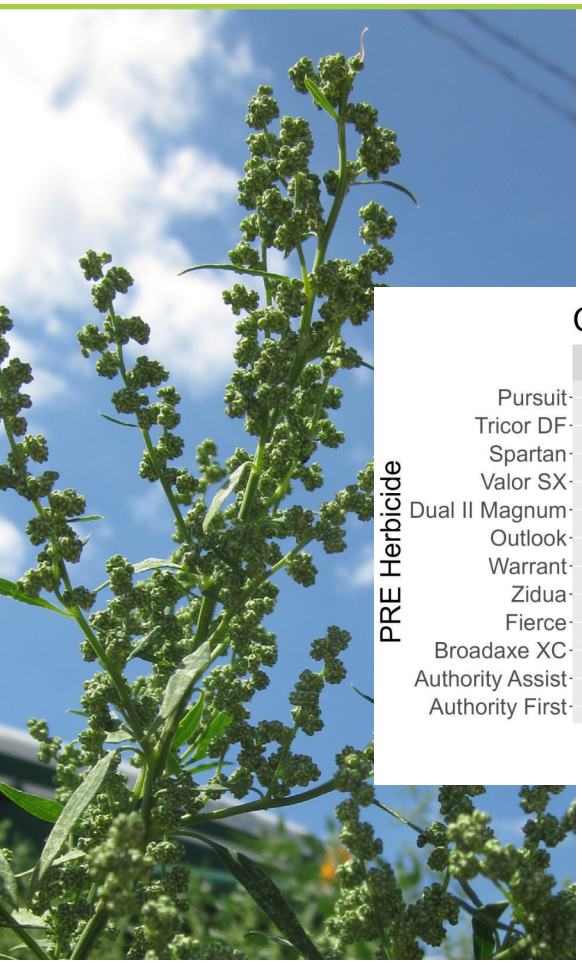


Figure 1. Waterhemp efficacy 50 days after treatment (DAT) in field experiments conducted in 2021 and 2022 in Chippewa, Shawano, and Waupaca Counties in Wisconsin. Large points represent means, error bars represent 95% confidence intervals, the vertical red line represents 90% control, and jittered points represent actual data points. Based on ANOVA results, means were separated using the Dunn-Sidak correction. Points with similar letters within each location are not statistically different at $\alpha = 0.05$.



Common Lambsquarters Control Efficacy

Common lambsquarters (*Chenopodium album*) was present at the Shawano and Waupaca locations. Treatments that provided effective (>90%) common lambsquarters control at 50 DAT and that were consistently effective between locations include Pursuit, Tricor DF, Spartan, Valor SX, Fierce, Broadaxe XC, and Authority Assist. Authority First also provided a high level of control (>90%) but was only used at the Waupaca location.

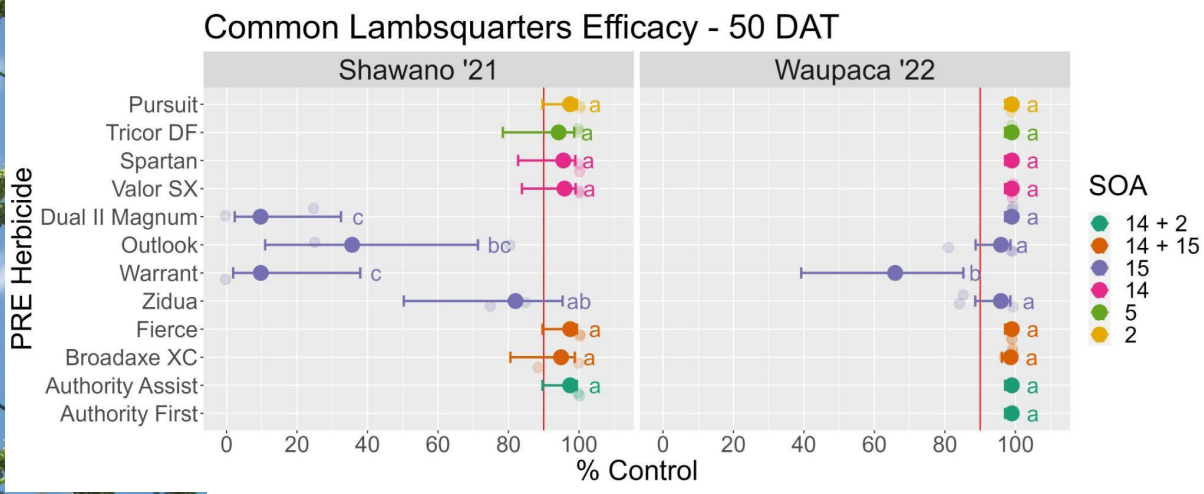


Figure 2. Common lambsquarters efficacy 50 days after treatment (DAT) in field experiments conducted in 2021 and 2022 in Shawano and Waupaca Counties in Wisconsin. Large points represent means, error bars represent 95% confidence intervals, the vertical red line represents 90% control, and jittered points represent actual data points. Based on ANOVA results, means were separated using the Dunn-Sidak correction. Points with similar letters within each location are not statistically different at $\alpha = 0.05$

Marestail Control Efficacy

Spring-emerging marestail (aka horseweed; *Erigeron canadensis*) were only abundant at the Waupaca location. Effective residual control of spring-emerging marestail control was achieved with Tricor DF and Authority First. Average marestail control was below 90% for all other products evaluated.

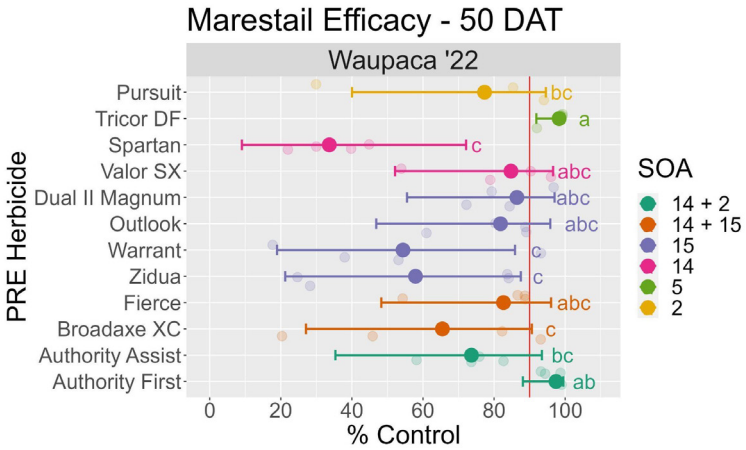


Figure 3. Marestail efficacy 50 days after treatment (DAT) in field experiments conducted in 2022 in Waupaca County in Wisconsin. Large points represent means, error bars represent 95% confidence intervals, the vertical red line represents 90% control, and jittered points represent actual data points. Based on ANOVA results, means were separated using the Dunn-Sidak correction. Points with similar letters are not statistically different at $\alpha = 0.05$

Grass Weed Control Efficacy

A mix of grass weeds were present at the Chippewa location, including giant foxtail (*Setaria faberi*), yellow foxtail (*Setaria pumila*), and woolly cupgrass (*Eriochloa villosa*). Effective grass control (>90%) was achieved with Valor SX, Dual II Magnum, Fierce, and Broadaxe XC. Average grass control was below 90% for all other products evaluated.

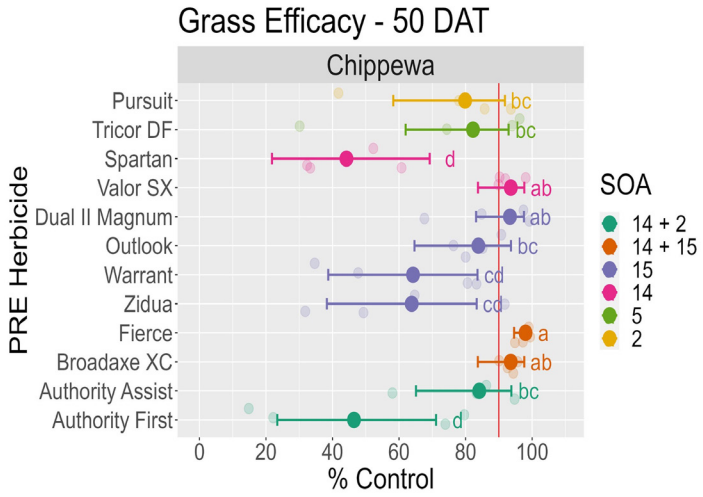


Figure 4. Grass efficacy 50 days after treatment (DAT) in a field experiment conducted in 2022 in Chippewa County in Wisconsin. Large points represent means, error bars represent 95% confidence intervals, the vertical red line represents 90% control, and jittered points represent actual data points. Based on ANOVA results, means were separated using the Dunn-Sidak correction. Points with similar letters are not statistically different at $\alpha = 0.05$

Acknowledgments

We greatly appreciate all the producers and agronomists that collaborated on this project. Thank you to our host farmers and local expert agronomists for providing great insight in trial design and implementation.

Crop Response

No major soybean injury from preemergence herbicide treatments was detected in this study.

Conclusions

These experiments highlight the importance of proper PRE herbicide selection. None of the products evaluated had an average efficacy greater than 90% across all weed species and/or locations. It is highly encouraged that products are selected that can best achieve effective control based on the predominant weed species and specific soil conditions present in each field.

Extension
UNIVERSITY OF WISCONSIN–MADISON

University of Wisconsin-Madison, College of Agricultural and Life Sciences. An equal opportunity action employer, University of Wisconsin provides equal opportunities in employment and programming, including Title IX requirements.

NPM
11/2022

This publication is available from the Nutrient and Pest Management Program. For more information, email us at npm@hort.wisc.edu or visit our website at ipcm.wisc.edu