This or That? Looking into Late Cereal Rye Cover Crop Termination Techniques in Wisconsin Soybean Systems

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Glyphosate was the best option for cereal rye termination when planting soybeans green into high-biomass rye.

Introduction

- Weed management programs utilizing high-biomass cereal rye (*Secale cereale L.*) as a cover crop in Wisconsin soybean (*Glycine max [L.] Merr.*) systems are increasing in popularity.
- Effective cereal rye termination in planting green scenarios is crucial to crop success (Vollmer et al. 2020).
- Many growers are now asking what non-glyphosate termination methods have comparable results to the control glyphosate alone provides while planting green into high biomass cereal rye cover crop.

Objective and Hypothesis

- **Objective:** Investigate chemical, mechanical, or combinations of the two on their efficacy of cereal rye cover crop termination and their effect on soybean yields.
- **Hypothesis:** Combinations of mechanical and chemical techniques involving ACCase inhibitors (group 1) will exhibit comparable cereal rye termination results than what glyphosate (group 9) provides.

Materials and Methods

Establishment

- Established in 2021 and 2022 in Arlington, WI
- RCBD with four replications and eight treatments
- Plot size: 9.1 by 3.0 m which included four rows of soybeans
- Fall established Aroostook variety cereal rye seeded at 67 kg ha^{-1}
- Enlist S20-LLGT27 variety soybeans planted at 76 cm row spacings
- Evaluated three herbicides: glyphosate (9) 1,269 g a.e. ha^{-1}, clethodim (1) 136 g a.i. ha^{-1}, and quizalofop (1) 92.5 g a.i. ha^{-1}
- Eight total treatments: preplant glyphosate, roller-crimper, and each of the herbicides without and with a roller-crimper at soybean planting

Data Collection

- Visual control of cereal rye assessed 21 DAT after the at-plant termination
- End-of-season soybean stand taken before harvest with two 1 m^{-1} counts
- Soybean yield collected at harvest with Almaco experimental plot combine
- ANOVA: 'glmmTMB' and 'emmeans' packages, R® statistical software. Means were separated according to Fisher's LSD at $\alpha = 0.05$ with error bars representing 95% confidence interval (CI)

Results and Discussion

- Biomass at preplant-termination averaged 6,963 and 5,120 kg ha^{-1} for 2021 and 2022, respectively
- Biomass at planting termination averaged 9,025 and 14,202 kg ha^{-1} for 2021 and 2022, respectively
- All treatments containing glyphosate exhibited >98% rye control, whereas the roller-crimper alone was <71% (Figure 1)
- ACCase-inhibitor treatments provided <57% rye control but improved to ~81% when the roller-crimper was included (Figure 1)

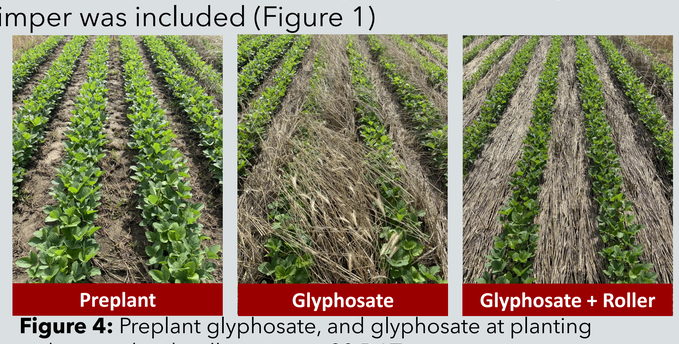

Figure 4: Preplant glyphosate, and glyphosate at planting without and with roller crimper 28 DAT

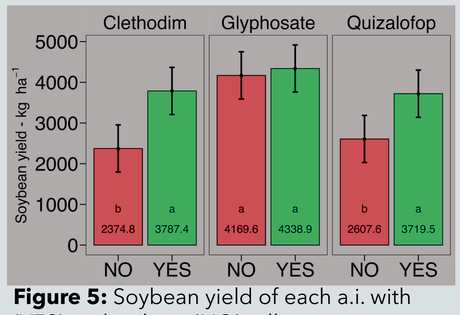

Figure 5: Soybean yield of each a.i. with (YES) and without (NO) roller-crimper

Figure 6: Clethodim without and with roller crimper 28 DAT

- Quizalofop and clethodim both showed a decrease in final soybean stand compared to control, 16 and 27%, respectively (Figure 2)
- In both 2021 and 2022, any treatment including glyphosate yielded the best out of all treatments (Figure 3 & 5)
- ACCase inhibitors do not control cereal rye at anthesis like glyphosate does (Figure 4 & 6)

Conclusions

- Terminations containing glyphosate provided the highest cereal rye control minimizing impact on soybean yield.
- Although roller crimper enhanced cereal rye termination with ACCase herbicides, complete termination was not achieved.

References

1. Vollmer, K. M., VanGessel, M. J., Johnson, Q. R., & Scott, B. A. (2020). Influence of cereal rye management on weed control in soybean. Frontiers in Agronomy, 2 doi:10.3389/fagro.2020.600568

Abbreviations

- "Cleth" – Clethodim
- "Quiz" – Quizalofop
- "R" – Roller-Crimper
- "Glyph" – Glyphosate

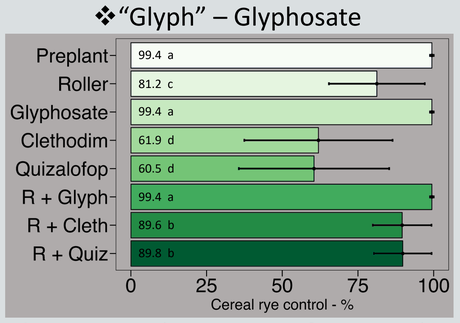

Figure 1: Visual percentage of rye control 21 DAT for both 2021 and 2022 (p-value < 0.001, $\alpha = 0.05$, 95% CI)

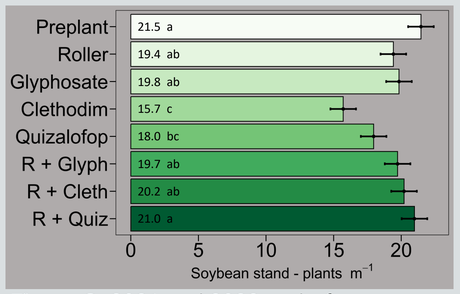

Figure 2: 2021 and 2022 end-of-season soybean stands from two 1m-counts (p-value < 0.001, $\alpha = 0.05$, 95% CI)

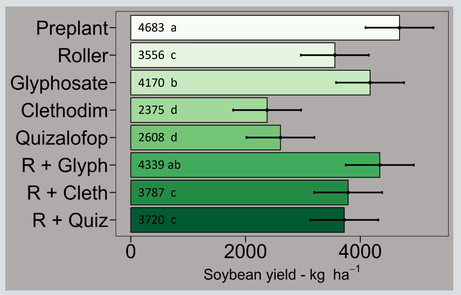

Figure 3: Soybean yield combined from 2021 and 2022 based on termination method (p-value < 0.001, $\alpha = 0.05$, 95% CI)

Future Direction

- Economical analysis of each practice to help growers determine which options will be feasible for their own operations.

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