

Impact of cereal rye cover crop termination time, soybean planting time, and residual herbicide on giant ragweed (*Ambrosia trifida*) control in Nebraska and Wisconsin



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Introduction

- Giant ragweed, an early-emerging and competitive species is ranked as one of the most troublesome weeds in soybean cropping systems.
- In Wisconsin, giant ragweed has an extended emergence window throughout the season, while in Nebraska, a short emergence window is observed (Kaur et al., 2016; Striegel et al., 2021).
- Farmers across the US Upper Midwest are planting soybeans earlier in the season and/or adopting cereal rye (*Secale cereale* L.) cover crop (CC) thus research is warranted to better understand the impact of such management practices on giant ragweed development, ecology, and management.

Objective

- Determine the impact of soil management, including cereal rye CC adoption, soybean planting time, and PRE herbicide application on time to first POST application for giant ragweed control.

Hypotheses

- 1) Early planted soybeans will require a first POST application earlier in the season.
- 2) The increase in CC biomass and use of PRE will reduce giant ragweed density at the time of first POST.

Materials and Methods

- Soybean studies were established in two years, 2021 and 2022, near Janesville, WI, and Lincoln, NE, Corn-Soybean rotation.
- Treatments consisted of a 4x2x2 factorial in a randomized complete block design with 4 replications:
- **Soil management:** conventional tillage (chisel-plow in the fall and field cultivator in the spring), no-till, and two fall-planted cereal rye treatments (early terminated, 10-14 days before planting and late terminated within 3 days after planting).
- **Soybean planting time:** Early (late April – early May) and Late (late May).
- **Preemergence herbicide:** absence (No PRE) or application (PRE) of sulfentrazone (280 g ai ha⁻¹) + cloransulam (36 g ai ha⁻¹).
- There were four CC termination times, early and late termination for each time of soybean planting.
- CC biomass residue (kg ha⁻¹) was evaluated at the time of each termination and dried at 50°C until constant weight.
- POST application was triggered when ~50% of giant ragweed plants within each treatment reached ~10 cm in height and consisted of 2,4-D (1,066 g ae ha⁻¹) + glyphosate (1,262 g ae ha⁻¹).
- Giant ragweed density (plants m⁻²) was enumerated at the time of first POST application.
- Data subjected to ANOVA (α : 0.05) and means compared with LSD test (α : 0.05).

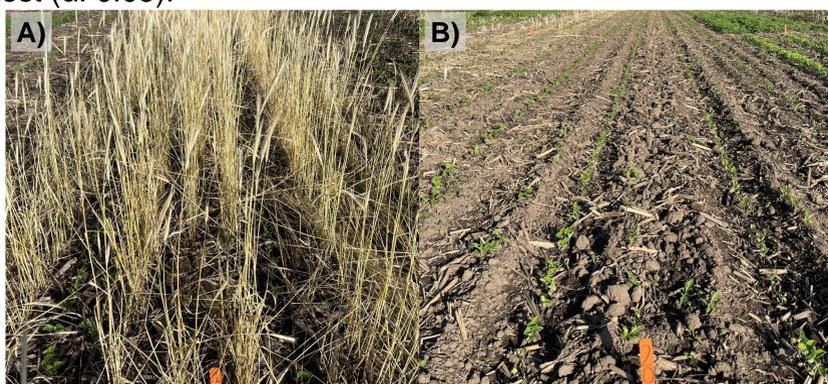


Figure 1: A) late terminated cereal rye CC (planting green) in late planted soybeans (06/01/22). B) tillage treatment in late planted soybeans (06/01/22). Pictures taken on 06/14/22 at Janesville, WI.

Results

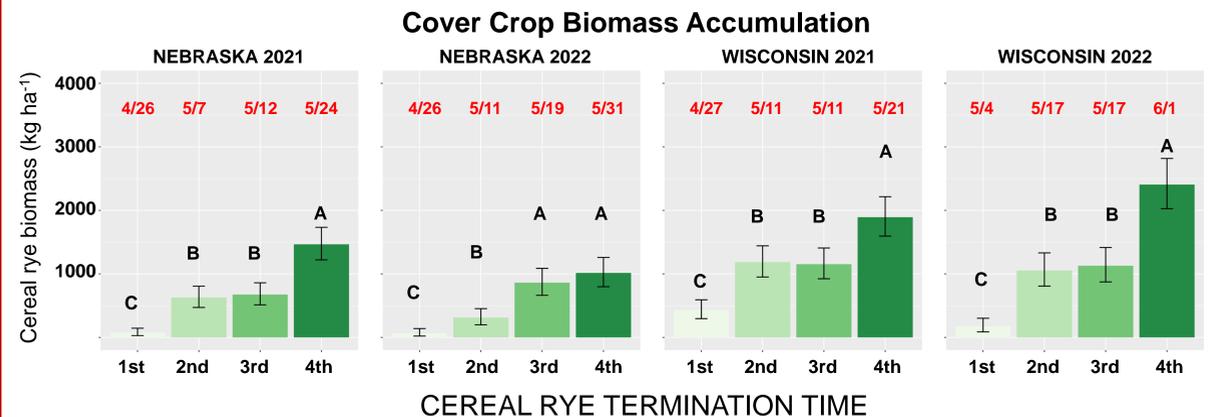


Figure 2. Cereal rye CC biomass (kg ha⁻¹) accumulation at termination time across site-years. The dates in red represent the time of termination for each treatment. Error bars represent the 95% confidence intervals. Means followed by the same letters do not differ statistically by the LSD test (α : 0.05).

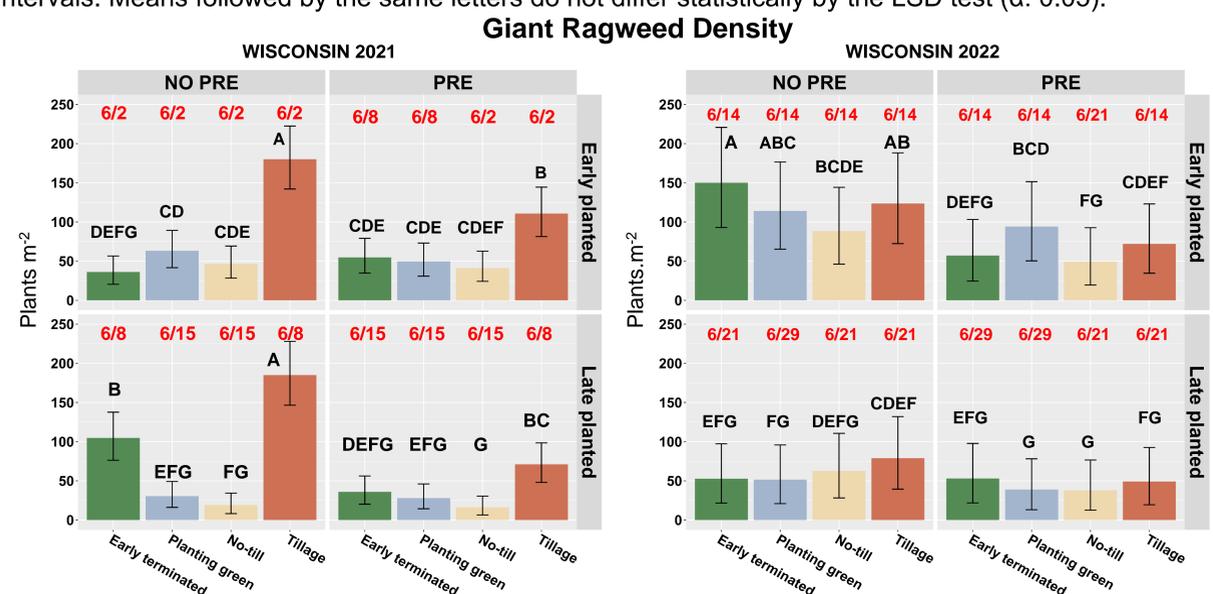


Figure 3. Giant ragweed density (plants m⁻²) at time of first POST application, by planting time and herbicide treatment for the 2021 and 2022 seasons at Janesville, WI. Due to the extended emergence window, only Wisconsin giant ragweed density data are presented in this poster. The dates in red represent the time when first POST application was triggered for each treatment. Error bars represent the 95% confidence intervals. Means followed by the same letters do not differ statistically by the LSD test (α : 0.05).

Discussion

- Delaying cereal rye termination in the spring by 3 to 4 weeks allowed the cover crop to accumulate four times more biomass when compared to the earliest time of termination (Figure 2).
- In Wisconsin, early-planted soybean treatments were the first to require the first POST application compared to late-planted soybean treatments (Figure 3).

Conclusion

- In 2021, tillage treatments were amongst the first to require the POST and had between 70 and 185% higher giant ragweed density when compared to the other treatments (Figure 3).
- PRE and CC did not impact giant ragweed density as initially hypothesized.

Future Directions

- The study will be replicated in 2023 at the same locations.
- Additional studies are being conducted to better understand the relationship between cereal rye biomass accumulation and giant ragweed suppression.

References

- Kaur, S., Werle, R., Sandell, L., & Jhala, A. J. (2016). Spring-tillage has no effect on the emergence pattern of glyphosate-resistant giant ragweed (*Ambrosia trifida* L.) in Nebraska. *Canadian Journal of Plant Science*, 96(5), 726–729.
- Striegel, S., Oliveira, M. C., DeWerff, R. P., Stoltenberg, D. E., Conley, S. P., & Werle, R. (2021). Influence of postemergence dicamba/glyphosate timing and inclusion of acetochlor as a layered residual on weed control and soybean yield. *Frontiers in Agronomy*, 3(December), 1–13.

Acknowledgments

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