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Herbicide programs for control of a five-way herbicide resistant waterhemp population in Xtendflex or Enlist E3 soybean

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Waterhemp is one of the most problematic weed species in soybean production in the Midwestern United States. The introduction of soybean varieties resistant to 2,4-D, dicamba, and/or glufosinate has enabled the use of these herbicides to improve control

of weeds like waterhemp. This study evaluated the control of a multiple-resistant waterhemp population by looking at different herbicide active ingredients and application timings.

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1. What was the primary objective of this study?

- a. Identify effective herbicide programs for controlling multiple-resistant waterhemp.
- b. Compare irrigation system strategies for improving water use efficiency in row crops.
- c. Evaluate nitrogen management practices for optimizing soybean growth and yield outcomes.
- d. Study soybean planting date effects on emergence timing, development, and final yield performance.

2. The waterhemp population evaluated in this study was resistant to how many herbicide groups?

- a. Three.
- b. Four.
- c. Five.
- d. Six.

3. Which herbicide groups were included in the resistance profile of the waterhemp population?

- a. Groups 1, 3, 7, 10, and 15.
- b. Groups 2, 3, 6, 8, and 14.
- c. Groups 2, 4, 5, 9, and 14.
- d. Groups 4, 9, 10, 12, and 27.

4. Two soybean trait platforms were evaluated in this study. Which were they?

- a. Roundup Ready and LibertyLink.
- b. XtendFlex and Enlist E3.
- c. Clearfield and LibertyLink.
- d. Roundup Ready 2 and Xtend.

5. Soybean injury from POST herbicide applications exceeded 10% in at least one year of the study.

- a. True.
- b. False.

6. What was the general effect of two-pass herbicide programs compared with one-pass programs?

- a. Reduced weed control compared with single-pass herbicide application programs.
- b. No measurable difference in overall waterhemp control across treatment programs.
- c. Increased crop injury without improving overall waterhemp control effectiveness.
- d. Increased waterhemp control by at least 30%.

7. In 2021, which herbicide program strategy tended to be more effective?

- a. PRE-only programs.
- b. POST-POST programs.

- c. Single POST applications.
- d. No herbicide programs.

8. In 2022, which herbicide program strategy performed better?

- a. POST-only programs.
- b. Single-pass programs.
- c. PRE-POST programs.
- d. No difference among programs.

9. Which factor contributed to differences in herbicide performance between 2021 and 2022?

- a. Hybrid maturity.
- b. Soil texture.
- c. Rainfall.
- d. Row spacing.

10. Rainfall shortly after PRE application can influence herbicide activation and effectiveness.

- a. True.
- b. False

11. Which auxin herbicides were compared in the study?

- a. Dicamba and 2,4-D.
- b. Dicamba and atrazine.
- c. Glufosinate and glyphosate.
- d. Mesotrione and atrazine.

12. What trend was observed regarding dicamba performance in 2022?

- a. It outperformed all other herbicides.
- b. It had no activity.
- c. It was less effective than 2,4-D.
- d. It caused excessive crop injury.

13. There was a significant interaction between soybean variety and herbicide treatment on yield.

- a. True.
- b. False.

14. What was the typical timing of the first POST application?

- a. At planting.
- b. Seven days after planting.
- c. At flowering.
- d. 28–29 days after planting.

15. Based on the study, what is the most effective strategy for managing multiple-resistant waterhemp?

- a. Use a single POST herbicide application.
- b. Rely on dicamba alone.
- c. Avoid PRE herbicides.
- d. Use two-pass herbicide programs that include 2,4-D tank mixed with glufosinate.

16. Which application timing combination defines a PRE–POST herbicide program?

- a. Two applications after crop emergence.
- b. One application at flowering and one at maturity.
- c. One application before crop emergence followed by one after emergence.
- d. Two applications before planting.

17. In addition to using two–pass herbicide programs, another best management practice (BMP) for controlling troublesome weeds includes

- a. the use of herbicides from multiple effective mode of action groups.
- b. the use of herbicides from the same mode of action group.
- c. mowing.
- d. spraying the same herbicide multiple times.

18. Which herbicide mode of action is associated with glufosinate, a key component in some treatments?

- a. Group 2 (ALS inhibitor).
- b. Group 4 (synthetic auxin).
- c. Group 9 (EPSPS inhibitor).
- d. Group 10 (glutamine synthetase inhibitor).

19. Which of the following best describes why multiple modes of action are recommended for managing herbicide–resistant waterhemp?

- a. To reduce application costs.
- b. To increase soybean yield potential directly.

- c. To delay further resistance development and improve control.
- d. To simplify herbicide programs.

20. What was a common characteristic of the most effective herbicide programs in this study?

- a. Use of a single herbicide with high rate.
- b. Reliance on glyphosate alone.
- c. Inclusion of multiple effective herbicide sites of action applied in sequence.
- d. Application only at late reproductive stages.

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