Performance of Preemergence Herbicides on Waterhemp Control in Soybean

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Abstract
The battle against waterhemp is complicated mainly because of its extended emergence period (early May until August). Preemergence (PRE) soil residual herbicides serve as a foundation for managing waterhemp, but require follow-up treatments with effective postemergence (POST) products due to late-emerging plants. Group 15 herbicides (HG 15) are commonly used for PRE waterhemp control. However, an increased selection pressure from these herbicides used in corn-soybean rotations has resulted in the evolution of HG 15 resistance in waterhemp populations, recently documented in Illinois. Those populations were resistant to one or more of these products including s-metolachlor, dimethenamid-P, pyroxasulfone, and acetochlor. Waterhemp resistance to HG 15 has not been confirmed yet in Iowa; however, it is important to proactively protect the value of these products for waterhemp control in soybean fields.

Disciplines
Agricultural Science | Agriculture

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April 17, 2020

The battle against waterhemp is complicated mainly because of its extended emergence period (early May until August). Preemergence (PRE) soil residual herbicides serve as a foundation for managing waterhemp, but require follow-up treatments with effective postemergence (POST) products due to late-emerging plants. Group 15 herbicides (HG 15) are commonly used for PRE waterhemp control. However, an increased selection pressure from these herbicides used in corn-soybean rotations has resulted in the evolution of HG 15 resistance in waterhemp populations, recently documented in Illinois. Those populations were resistant to one or more of these products including s-metolachlor, dimethenamid-P, pyroxasulfone, and acetochlor. Waterhemp resistance to HG 15 has not been confirmed yet in Iowa; however, it is important to proactively protect the value of these products for waterhemp control in soybean fields.

Efficacy of residual herbicides in a field varies from year to year due to environmental factors such as temperature and rainfall. Some herbicides perform better than others in variable environmental conditions. With increasing frequency of wet springs, as in 2019, some PRE herbicides break down early in the season resulting in inadequate residual control of waterhemp, a scenario that imposes a greater selection pressure on POST products. To preserve the value of POST herbicides, the main goals of a PRE product are to reduce the density and size of weeds at the time of POST herbicide application.

To evaluate the performance of commonly used HG 15 herbicides (pyroxasulfone, S-metolachlor, dimethenamid-P, and acetochlor) on waterhemp in Iowa soybean fields, an analysis on weed control data collected from herbicide evaluation trials was conducted by the Weed Science program at Iowa State University Research Farms from 2015 to 2019. Efficacy of HG 14 (flumioxazin), sulfentrazone) and HG 5 (metribuzin) on waterhemp
control was also compared over the 5-year period. Products used in the analysis were applied alone as PRE at the labeled field use rates.

Figure 1. Box and whisker plots showing the variability in waterhemp control at 3 weeks after application of key PRE-emergence herbicides used in soybean over the last five years (2015-2019) in trials conducted by the ISU Weed Science program at the Research Farms. Boxes represent the middle 50% of the data. Whiskers above and below the box represent upper 25% and lower 25% of the data. The blue line within each plot represents the median of data, while the diamond represents the average percent control over the 5-year period.

Among the HG 15 herbicides tested in soybean, pyroxasulfone provided the most consistent waterhemp control over the 5-year period (smaller size Box; Figure 1), with >95% control 50 percent of the time. The lowest level of control with pyroxasulfone was 88% at three weeks after application. Waterhemp control was more variable (bigger size boxes) with s-metolachlor, dimethenamid-P, and acetochlor. Although these three HG 15 herbicides provided 82% or more control 50% of the time, the lowest control fell below 50%.

Sulfentrazone (HG 14) and metribuzin (HG 5) provided more consistent (smaller size box) PRE waterhemp control compared to flumioxazin (HG 14) over the 5-year period. Although flumioxazin was very effective on waterhemp (>95% control 50% of the time), control fell below 60% in one out of the five years. These results indicate that while all the
PRE herbicides selected can provide effective residual control of waterhemp in soybean, pyroxasulfone, sulfentrazone, and metribuzin provided the most consistent early-season control over the 5-year period.

Farmers who have soybean fields with heavy waterhemp pressure should consider applying HG 5 and HG 14-based PRE products as premixes or in combination with HG 15 to give more consistent early-season residual weed control and manage glyphosate- and PPO-resistant waterhemp. HG 14 resistant is fairly common in Iowa fields, and while sulfentrazone and flumioxazin still have activity on resistant populations, it usually is shorter-lived than with susceptible populations. A follow-up application of HG 15 is recommended at the POST timing as part of a layered residual program in soybean. This strategy will aid in delaying emergence of waterhemp until soybean canopy closure when the crop will be more competitive, thereby reducing selection pressure on POST herbicides and reducing crop-weed competition and protecting against soybean yield losses.

Category:  Crop Production  Weeds  Herbicide Resistance

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Crop:
Soybean

Tags:  preemergence herbicides  residual activity  waterhemp  herbicide resistance management

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