**GIANT RAGWEED AND WATERHEMP CONTROL IN SOYBEAN AT RENVILLE, MN IN 2019**

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Objective was to evaluate glyphosate-resistant giant ragweed and waterhemp control in dicamba tolerant soybean with preemergence and early-postemergence conventional residual herbicide combinations that include at least 2 different active ingredients.

**MATERIALS AND METHODS**

Experiments were conducted on natural glyphosate-resistant giant ragweed and waterhemp populations near Renville, Minnesota in 2019. Plot area was worked by Next Gen Ag with field cultivator at 3” depth. ‘GT/DT’ soybean from Beck was seeded 1.25 inches deep in 30-inch rows at 140,000 seeds per acre on May 17. Preemergence (PRE) herbicide treatments were applied May 21 and early-postemergence (EPOST) treatments were applied at soybean second trifoliate (V2) on June 17 (Table 1). Treatments applied with bicycle sprayer in 15 GPA spray solution through AIXR11002 air-induction flat fan nozzles pressurized with CO2 at 25 psi to the center two rows of four row plots 35 feet in length. Field area had low to moderate and moderate levels of glyphosate-resistant giant ragweed and waterhemp populations, respectively. Ammonium sulfate (AMS) in Roundup PowerMax containing treatments was a liquid formulation from Winfield Solutions called Class Act NG. Crop Oil Concentrate (COC) was added to Cobra containing treatments.

Giant ragweed control was evaluated June 17, July 4, July 17, August 1, and August 18. Waterhemp control was evaluated July 4, July 17, August 1, and August 18. Soybean yield was evaluated as mid-season pod count estimates on October 18. Giant ragweed and waterhemp evaluations were a visual estimate of percent fresh weight reduction in center two treated rows compared to adjacent untreated strips. Experimental design was randomized complete block with 4 replications. Data were analyzed with GLM procedure of SAS (Statistical Analysis Software 2019, version 9.4, SAS Institute, Inc.) at alpha=0.05 and differences are determined with 95% confidence.

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| **Table 1. Application information for Renville soybean trial in 2019.** |
| Location | Renville |
| Application Code | A | B |
| Date | May 21 | June 17 |
| Time of Day | 7:00 AM | 9:30 AM |
| Air Temperature (F) | 49 | 68 |
| Relative Humidity (%) | 77 | 56 |
| Wind Velocity (mph) | 8 | 10 |
| Wind Direction | SE | NW |
| Soil Temp. (F at 6”) | 48 | 64 |
| Soil Moisture | Very Wet | Fair |
| Cloud Cover (%) | 100 | 100 |
| Soybean Growth Stage (avg) | - | V2 |
| Giant Ragweed Height | - | 4-6” |
| Waterhemp Height | - | 2-4” |

**RESULTS AND DISCUSSION**

Giant ragweed pressure was anticipated to be severe based on 2018 pictures and evaluations; however, either due to environment or timing pressure was considered moderate to low. Waterhemp pressure was not initially anticipated in the trial area based off of 2018 evaluations; however, waterhemp did appear in a moderate level infestations, so notes were taken for percent control and data were analyzed.

Giant ragweed control was 100% for all PRE fb EPOST treatments suggesting both Xtendimax and FirstRate were sufficient tools in controlling giant ragweed in a residual herbicide lay-by approach (Table 2). Preemergence applications of Sharpen + Zidua and Xtendimax provided only 50% control of giant ragweed compared to the untreated check which provided 25% “control” and is evidence a weak giant ragweed population.

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| **Table 2. Giant ragweed control in soybean in 2019.** |
|  |  | **App.** | **Giant Ragweed Control** | **Soybean** |
| **Treatmenta** | **Rate** | **Codeb** | **B+0c** | **B+15** | **B+30** | **B+45** | **B+60** | **Yield** |
|  | oz/A\* or fl oz/A |  | ----------------------%---------------------- | Bu/A |
| Sharpen+Zidua | 1+2.5\* | A | 50 | 75 | 75 | 65 | 50 | 65 |
| Sharpen+Zidua / FirstRate | 1+2.5\* / 0.3\* | A / B | 100 | 100 | 100 | 100 | 100 | 62 |
| Sharpen+Zidua / Xtendimax | 1+2.5\* / 22 | A / B | 100 | 100 | 100 | 100 | 100 | 63 |
| Sharpen+Zidua / FirstRate+Xtendimax | 1+2.5\* / 0.3\*+22 | A / B | 75 | 100 | 100 | 100 | 100 | 60 |
| Authority First | 6\* | A | 100 | 100 | 100 | 100 | 100 | 58 |
| Authority First / FirstRate | 6\* / 0.3\* | A / B | 100 | 100 | 100 | 100 | 100 | 66 |
| Authority First / Xtendimax | 6\* / 22 | A / B | 85 | 100 | 100 | 100 | 100 | 59 |
| Authority First / FirstRate+Xtendimax | 6\* / 0.3\*+22 | A / B | 100 | 100 | 100 | 100 | 100 | 65 |
| Xtendimax | 22 | A | 80 | 50 | 50 | 50 | 50 | 62 |
| Xtendimax / FirstRate | 22 / 0.3\* | A / B | 100 | 100 | 100 | 100 | 100 | 58 |
| Xtendimax / Xtendimax | 22 / 22 | A / B | 97.5 | 100 | 100 | 100 | 100 | 67 |
| Xtendimax / FirstRate+Xtendimax | 22 / 0.3\*+22 | A / B | 100 | 100 | 100 | 100 | 100 | 58 |
| FirstRate | 0.3\* | B | 50 | 75 | 75 | 75 | 75 | 63 |
| Xtendimax | 22 | B | 100 | 100 | 100 | 100 | 100 | 53 |
| FirstRate+Xtendimax | 0.3\*+22 | B | 75 | 100 | 100 | 100 | 100 | 57 |
| Cobra+COC | 10+24 | B | 67.5 | 100 | 100 | 90 | 87.5 | 52 |
| Flexstar | 16 | B | 75 | 100 | 100 | 100 | 100 | 61 |
| Roundup Powermax+Class Act NG | 64+2.5%v/v | B | 75 | 100 | 100 | 100 | 80 | 62 |
| Untreated Check | - | - | 80 | 50 | 50 | 50 | 25 | 55 |
|  **LSD (0.1)** |  |  | **40** | **29** | **29** | **29** | **31** | **NS** |

aPRE treatment applications contained no additional adjuvants.

bApplication codes refer to the information in Table 1.

cB+[number]=Days after “B” application.

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| **Table 3. Waterhemp control in soybean in 2019.** |
|  |  | **App.** | **Waterhemp Control** | **Soybean** |
| **Treatmenta** | **Rate** | **Codeb** | **B+15c** | **B+30** | **B+45** | **B+60** | **Yield** |
|  | oz/A\* or fl oz/A |  | -----------------%----------------- | Bu/A |
| Sharpen+Zidua | 1+2.5\* | A | 100 | 100 | 98 | 99 | 65 |
| Sharpen+Zidua / FirstRate | 1+2.5\* / 0.3\* | A / B | 100 | 98 | 95 | 100 | 62 |
| Sharpen+Zidua / Xtendimax | 1+2.5\* / 22 | A / B | 100 | 98 | 99 | 99 | 63 |
| Sharpen+Zidua / FirstRate+Xtendimax | 1+2.5\* / 0.3\*+22 | A / B | 100 | 98 | 98 | 100 | 60 |
| Authority First | 6\* | A | 55 | 75 | 63 | 62 | 58 |
| Authority First / FirstRate | 6\* / 0.3\* | A / B | 73 | 70 | 70 | 79 | 66 |
| Authority First / Xtendimax | 6\* / 22 | A / B | 100 | 96 | 98 | 99 | 59 |
| Authority First / FirstRate+Xtendimax | 6\* / 0.3\*+22 | A / B | 100 | 90 | 93 | 93 | 65 |
| Xtendimax | 22 | A | 0 | 0 | 20 | 4 | 62 |
| Xtendimax / FirstRate | 22 / 0.3\* | A / B | 5 | 18 | 23 | 15 | 58 |
| Xtendimax / Xtendimax | 22 / 22 | A / B | 100 | 81 | 80 | 74 | 67 |
| Xtendimax / FirstRate+Xtendimax | 22 / 0.3\*+22 | A / B | 95 | 78 | 75 | 69 | 58 |
| FirstRate | 0.3\* | B | 43 | 53 | 35 | 26 | 63 |
| Xtendimax | 22 | B | 100 | 73 | 85 | 77 | 53 |
| FirstRate+Xtendimax | 0.3\*+22 | B | 87 | 64 | 44 | 42 | 57 |
| Cobra+COC | 10+24 | B | 100 | 95 | 99 | 99 | 52 |
| Flexstar | 16 | B | 100 | 74 | 80 | 95 | 61 |
| Roundup Powermax+Class Act NG | 64+2.5%v/v | B | 41 | 38 | 40 | 15 | 62 |
| Untreated Check | - | - | 0 | 18 | 13 | 8 | 55 |
|  **LSD (0.1)** |  |  | **24** | **24** | **24** | **18** | **NS** |

aPRE treatment applications contained no additional adjuvants.

bApplication codes refer to the information in Table 1.

cB+[number]=Days after “B” application.

Waterhemp control averaged 100% in treatments that included Sharpen+Zidua PRE regardless of EPOST application. Contrary, Authority First and Xtendimax PRE only applications provided 62 and 4% waterhemp control, respectively, which would be expected. Authority First is not an effective product on waterhemp, whereas Xtendimax is effective on waterhemp post-emergence, unfortunately as a residual that washes out easily from rain and an application timing coinciding with multiple inches of rainfall the efficacy was depleted. Multiple EPOST only treatments were made and the impact on waterhemp control was fascinating, but not unexpected. Glyphosate provided least control of a glyphosate-resistant waterhemp population followed, in a descending order, by FirstRate, FirstRate+Xtendimax, Xtendimax, Flexstar, and Cobra+COC at 15, 26, 42, 77, 95, and 99%, respectfully, compared to the untreated check at 8% waterhemp control. FirstRate+Xtendimax EPOST applications in combination with PRE applications tended to be 5% less effective (with the exception of the Sharpen+Zidua PRE combination where no EPOST control was required) compared to Xtendimax only EPOST applications in combination with PRE applications suggesting tank mixes of Xtendimax and FirstRate result in antagonism.

Soybean yield was not significant, thus, will not be discussed.

**CONCLUSION**

Giant ragweed population severity was disappointing and the only conclusion that could be drawn from the data was evidence suggesting one mode of action was not sufficient for giant ragweed control and a PRE fb EPOST lay-by residual herbicide management system should be followed.

A moderate waterhemp infestation was strong enough to create impactful control ratings and differentiate between treatments, yet not strong enough to significantly impact soybean yield. Sharpen+Zidua at 1 fl oz+2.5 oz, respectfully, averaged 99.5% waterhemp control regardless of EPOST application and should be a PRE residual program strongly considered for waterhemp control. Authority First and Xtendimax PRE applications are not recommend for waterhemp control. The waterhemp population was proven glyphosate-resistant. FirstRate applied at EPOST was not effective, and FirstRate+Xtendimax applied EPOST resulted in antagonism as compared to Xtendimax applied alone EPOST. Cobra and Flexstar herbicides applied EPOST proved effective indicating a low presence of PPO resistant waterhemp populations.