

# WATERHEMP CONTROL IN SOYBEAN AT RENVILLE, MN IN 2016

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The objective of this study was to evaluate control of glyphosate-resistant waterhemp in soybean by using residual herbicides.

## MATERIALS AND METHODS

Experiments were conducted on natural populations of waterhemp near Renville, Minnesota in 2016. Plot area was worked by the cooperating farmer with a Demco field cultivator equipped with rolling baskets on May 7, 2016. ‘NK 08RR’ soybean from Syngenta was seeded 1.25 inches deep in 30 inch rows at 140,000 seeds per acre on May 7. Preemergence (PRE) herbicide treatments were applied May 9 and early-postemergence (EPOST) treatments were applied at soybean first trifoliate on June 8. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO<sub>2</sub> at 30 psi to the center two rows of four row plots 30 feet in length in a field with moderate to heavy levels of glyphosate-resistant waterhemp. Ammonium sulfate (AMS) in all treatments was a liquid formulation from Winfield Solutions called N-Pak AMS. Non-ionic surfactant (NIS) in all treatments was a product from West Central called Prefer 90.

Soybean injury was evaluated June 22. Waterhemp control was evaluated June 8 and June 22. All evaluations were a visual estimate of percent fresh weight reduction in the two treated rows compared to the adjacent untreated strip. Experimental design was randomized complete block with 4 replications. Data were analyzed with the ANOVA procedure of ARM, version 2016.4 software package.

**Table 1. Application information for soybean trial near Renville, MN in 2016.**

Application code	A	B
Date	May 9	June 8
Time of Day	9:00 AM	2:15 PM
Air Temperature (F)	57	79
Relative Humidity (%)	61	34
Wind Velocity (mph)	13	6
Wind Direction	SE	SE
Soil Temp. (F at 6")	54	70
Soil Moisture	Good	Good
Cloud Cover (%)	100	75
Sugarbeet stage (avg)	PRE	V1
Waterhemp	-	1-3'

## RESULTS AND DISCUSSION

Crop safety evaluations on June 22 indicate slight crop injury, but by the beginning of August no evidence of injury remain; thus, no further crop safety evaluations were taken. The early season crop injury could be attributed to substantial rainfall (1.41 inches between May 9 and 11) immediately following the application of PRE treatments with increased herbicide in the soil solution allowing for increased uptake into the soybean.

The field did contain low populations of other weed species such as Eastern Black Nightshade, Venice Mallow, Common Mallow, Lambsquarters, Horseweed, and various grasses, but all treatments were effective in controlling these other species; thus, only waterhemp will be discussed in this article.

Soil-applied herbicides differ in duration of residual activity and can be layered to reduce the emergence of glyphosate-resistant waterhemp. Waterhemp at this location was late to emerge and only plants less than 4 inches tall were present at the time of the EPOST application. Waterhemp grew rapidly over the next two months and plants ten feet in height could be found in the untreated strips by early August. Preemergence treatments included Authority MTZ at 12 oz, Sharpen + Warrant at 1 fl oz and 24 fl oz, respectively, Spartan at 8 fl oz, and Verdict at 7.5 fl oz

(Table 2). All PRE treatments fb EPOST Roundup PowerMax at 32 fl oz gave 90% to 100% waterhemp control on June 22 while EPOST Roundup PowerMax without a PRE gave only 55% control at the June 22 evaluation. Dual II Magnum at 27 fl oz, Warrant at 24 fl oz, and Zidua at 2.5 oz were applied EPOST (Table 2) in a tank mix with Roundup PowerMax at 32 fl oz. These EPOST treatments used alone, and not in combination with a PRE herbicide, provided 69, 74, and 50% end of season waterhemp control, respectfully (Table 2). The PRE and EPOST treatments were then factored across the treatment list resulting in 12 additional PRE + EPOST combinations. These combinations, on average, provided 98% end of season waterhemp control (Table 2). Overall, a PRE treatment alone averaged 95% end of season waterhemp control compared to 64% from EPOST treatments alone, while the PRE + EPOST combination treatments provided 98% end of season waterhemp control (Table 2).

**Table 2. Soybean injury and waterhemp control from pre emergence and postemergence herbicide applications near Renville, MN in 2016.**

Treatment <sup>a</sup>	Rate	App. Code <sup>b</sup>	Sglt Injury	Waterhemp Control	
			June 22	June 8 <sup>c</sup>	June 22
	oz/A* or fl oz/A			%	
PMax <sup>d</sup>	32	B	1	41	55
Authority MTZ / PMax	12* / 32	A / B	3	83	90
Authority MTZ / Dual+PMax	12* / 27+32	A / B	20	88	93
Authority MTZ / Warrant+PMax	12* / 24+32	A / B	8	97	99
Authority MTZ / Zidua+PMax	12* / 2.5*+32	A / B	13	99	98
Sharpen+Warrant / PMax	1+24 / 32	A / B	9	99	98
Sharpen+Warrant / Dual+PMax	1+24 / 27+32	A / B	10	96	99
Sharpen+Warrant / Warrant+PMax	1+24 / 24+32	A / B	11	90	90
Sharpen+Warrant / Zidua+PMax	1+24 / 2.5*+32	A / B	20	94	95
Spartan / PMax	8 / 32	A / B	3	99	100
Spartan / Dual+PMax	8 / 27+32	A / B	18	99	100
Spartan / Warrant+PMax	8 / 24+32	A / B	4	99	100
Spartan / Zidua+PMax	8 / 2.5*+32	A / B	9	98	100
Verdict <sup>e</sup> / PMax	7.5 <sup>e</sup> / 32	A / B	14	96	93
Verdict / Dual+PMax	7.5 / 27+32	A / B	11	99	100
Verdict / Warrant+PMax	7.5 / 24+32	A / B	8	99	100
Verdict / Zidua+PMax	7.5 / 2.5*+32	A / B	21	99	100
Dual+PMax	27+32	B	14	16	69
Warrant+PMax	24+32	B	6	21	74
Zidua+PMax	2.5*+32	B	16	20	50
Zidua / Warrant+PMax	2.5* / 24+32	B	13	97	98
<b>LSD (0.05)</b>			<b>12</b>	<b>19</b>	<b>18</b>

<sup>a</sup>PRE treatment applications contained no additional adjuvants. All EPOST treatments tank mixed with Roundup PowerMax contained Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v. The Roundup PowerMax alone treatment contained Prefer 90 NIS at 0.25% v/v plus N-Pak AMS at 2.5% v/v.

<sup>b</sup>Application codes refer to the information in Table 1.

<sup>c</sup>Evaluations on June 8<sup>th</sup> taken by two individuals than averaged.

<sup>d</sup>PMax=Roundup PowerMax; Dual=Dual II Magnum.

<sup>e</sup>Off label rate for one-time application; 5 fl oz/A rate per application is the label.

## CONCLUSION

The results indicate a PRE, or PRE + EPOST, treatment provides significantly better end of season weed control than an EPOST or glyphosate alone treatment which only provided 55% end of season waterhemp control (Table 2). Excluding EPOST only treatments, residual herbicides alone, or in combination, applied prior to weed emergence provided an average of 97% end of season waterhemp control. The use of residual herbicides in soybean will be critical for managing glyphosate resistant waterhemp and other broadleaf weeds in the future. The results suggest that glyphosate as a single mode of action is no longer a viable option in controlling diverse populations of waterhemp, and that EPOST applications of residual herbicides in a tank mix with glyphosate without a PRE residual herbicide will not provide adequate control of emerged waterhemp.