

WATERHEMP CONTROL AND SOYBEAN CROP SAFETY FROM INCREASING PRE-EMERGENCE ONLY RESIDUAL MICRO-RATES COMBINATIONS IN 2021

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Objective was to evaluate waterhemp control and soybean crop safety across eight different genetics from one micro-rate PRE only residual combination at incremental rates to determine the most effective and safe micro-rate combination on glyphosate-resistant waterhemp populations.

MATERIALS AND METHODS

Experiments were conducted on natural glyphosate-resistant waterhemp populations near Renville, Minnesota, in 2021. Plot area was worked by Next Gen Ag with field cultivator at 3” depth. Four rows of eight different soybean varieties were seeded north and south at 1.25 inches deep in 30-inch rows at 150,000 seeds per acre on April 28 (Table 1). Preemergence (PRE) herbicide treatments were applied east and west across soybean varieties April 29 in four replications (Figure 1, Table 2, Table 3). Treatments were 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 high levels of glyphosate-resistant waterhemp populations. No adjuvants used.

Waterhemp control was evaluated May 13, May 28, June 17 and June 30 at 14, 30, 50, and 63 days after treatment “A” (DAA) (Table 1). 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 a split-plot arrangement and 4 replications. Data were analyzed with GLM procedure of SAS (Statistical Analysis Software 2021, version 10.0, SAS Institute, Inc.) at alpha=0.10 and differences are determined with 90% confidence in repeatability.

Table 1. Soybean varietal sensitivity to variable micro-rate champion rates variety list.

TRT ¹	Product	TRT	Product
1	Golden Harvest – GH1362E3	5	Beck’s Hybrids – BE1665XF
2	Golden Harvest – GH1944E3	6	Pioneer – P09T62LL
3	Golden Harvest – GH2011E3	7	Pioneer – P11A55E3
4	Credenz – CZ1660LLGT	8	Pioneer – P15A09X

¹TRT=Treatment number.

Figure 1. Soybean Varietal Sensitivity to Variable Micro-Rate Champion Rates Plot Layout.

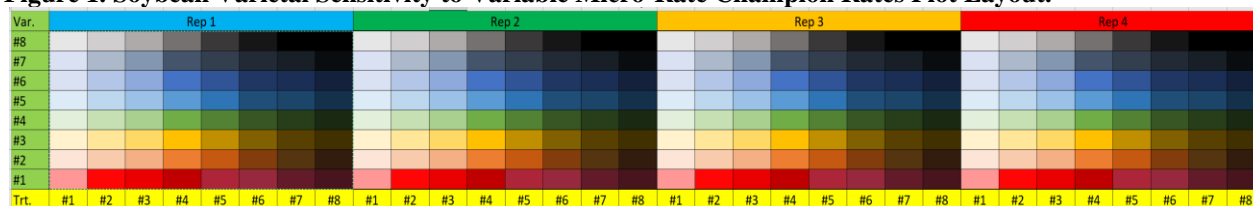


Table 2. Soybean varietal sensitivity to variable micro-rate champion rates treatment list.

TRT ¹	Product	Rate Fl oz OR oz*	App. Code	Avg Ratio ²	Cost/A
1	Blanket + Valor SX + Warrant + Flexstar	5 + *1.25 + 24 + 6.5	A	0.62	\$22.05
2	Blanket + Valor SX + Warrant + Flexstar	6 + *1.5 + 30 + 7.5	A	0.75	\$26.61
3	Blanket + Valor SX + Warrant + Flexstar	7 + *1.75 + 36 + 8.5	A	0.88	\$31.14
4	Blanket + Valor SX + Warrant + Flexstar	8 + *2 + 40 + 10	A	1.00	\$35.48
5	Blanket + Valor SX + Warrant + Flexstar	9 + *2 + 44 + 11	A	1.08	\$38.61
6	Blanket + Valor SX + Warrant + Flexstar	10 + *2 + 48 + 12	A	1.15	\$41.78
7	Blanket + Valor SX + Warrant + Flexstar	11 + *2 + 56 + 14	A	1.27	\$46.29
8	Blanket + Valor SX + Warrant + Flexstar	12 + *2 + 64 + 16	A	1.37	\$50.81

¹TRT=Treatment number.

²Avg Ratio=Average ratio of 4 components in relation to base treatment #4.

Table 3. Application information for Renville soybean trial in 2021.

Location	Renville
Application Code	A
Date	April 29
Time of Day	9:30 AM
Air Temperature (F)	66
Relative Humidity (%)	26
Wind Velocity (mph)	9
Wind Direction	NW
Soil Temp. (F at 6")	48
Soil Moisture	Good
Cloud Cover (%)	5
Soybean Growth Stage (avg)	-
Lambsquarters Height	-
Waterhemp Height	-

RESULTS AND DISCUSSION

Accumulated rainfall between 27 days after application was 0.40 inches, well below average, which resulted in abnormally dry conditions. As a result, soybean emergence was erratic, waterhemp emergence was delayed until 28 days after planting, and lambsquarters (a cool season, early emerging weed) became well established. First significant rainfall (0.90 inches) occurred 28 days after application and activated residual herbicides. Accumulated rainfall from "A" application (April 29) to trial conclusion (June 30) was 3.3 inches, also abnormally dry. Lack of rainfall, intense waterhemp pressure, and drought stress impact on waterhemp created a "worst case" scenario for evaluating residual herbicide treatments. Lack of rainfall also resulted in no crop injury and such evaluations were foregone after the 22 DAT evaluation.

Table 4. Waterhemp control, Renville, MN.

Treatment ^a	Rate oz/A* or fl oz/A	Waterhemp Control				Rate Ratio	App. Code ^b	Trt. Cost
		A+14 ^c	A+30	A+50	A+63			
		-----%-----				of 1X		\$/A
Blanket + Valor SX + Warrant + Flexstar	5 + *1.25 + 24 + 6.5	100	100	65	59	0.62	A	22.05
Blanket + Valor SX + Warrant + Flexstar	6 + *1.5 + 30 + 7.5	100	100	70	69	0.75	A	26.61
Blanket + Valor SX + Warrant + Flexstar	7 + *1.75 + 36 + 8.5	100	100	81	83	0.88	A	31.14
Blanket + Valor SX + Warrant + Flexstar	8 + *2 + 40 + 10	100	100	90	93	1.00	A	35.48
Blanket + Valor SX + Warrant + Flexstar	9 + *2 + 44 + 11	100	100	90	93	1.08	A	38.61
Blanket + Valor SX + Warrant + Flexstar	10 + *2 + 48 + 12	100	100	93	95	1.15	A	41.78
Blanket + Valor SX + Warrant + Flexstar	11 + *2 + 56 + 14	100	100	85	93	1.27	A	46.29
Blanket + Valor SX + Warrant + Flexstar	12 + *2 + 64 + 16	100	100	95	95	1.37	A	50.81
LSD (0.1)		0	0	9	18			

^aPRE treatment applications contained no additional adjuvants.

^bApp. Code refer to data in table 3.

^cA+[number]=Days after "A" application.

Waterhemp control at A+14 (May 13) and A+30 (May 28) was evaluated as overall weed control due to delayed waterhemp emergence as a result of drought conditions (Table 4). Overall weed control averaged 100% and can be attributed to drought conditions preventing weed emergence rather than residual activity of treatments. Rainfall of 0.90 inches occurred on May 27 and initiated a majority of waterhemp emergence.

Waterhemp control at A+50 (June 17) ranged from 65-95% and averaged 83.6% and demonstrated effects of residual herbicide activation on 2" emerged, or emerging waterhemp (Table 4). Rate ratios at, or above, 1.00 provided effective waterhemp control greater than 85%.

Waterhemp control at A+63 (June 30) ranged from 59-95% and averaged 85.0% and demonstrated an average 1.4% increase in control compared to A+50 (Table 4). Waterhemp control at A+63 increased at ratios equal to or greater than 0.88 compared to A+50 evaluations and decreased at the 0.75 and 0.62 ratios by 1% and 6%, respectively. Rate ratios at or above 1.00 provided 93% or greater waterhemp control at soybean canopy as PRE only applications.

CONCLUSION

Rainfall of greater than 0.40 inches within 30 days of PRE application is required for effective (>85% waterhemp control) activation for most soil residual herbicides. A single rainfall event of 1.0 inches is likely to achieve that goal. A single, effective rainfall event increased residual herbicide activity on small emerged or emerging waterhemp. PRE only treatment ratios of 1.00 or greater achieve 93% or greater end of season waterhemp control.

PRE only treatment ratio of 1.00 was hypothesized to be most efficient based on 2020 preliminary research and the outcome of this study supports the hypothesis. However, there are data in other 2021 supporting studies that suggest the 0.75 ratio rates may also provide acceptable waterhemp control of 94%. The same study supports the 1.00 ratio rate that provided 95% waterhemp control.

Crop safety of the 0.75 micro-rate ratio treatment has the products being applied at 50% (Blanket), 50% (Valor SX), 47% (Warrant), and 47% (Flexstar) of max single application rates for a fine textured soil with greater than 3% organic matter (Table 4). However, the grower should be aware that the micro-rates combination product rates may fall below the recommended label threshold in a similar environment. Valor SX can be applied with Warrant at 2 ounces per acre according to label. Valor SX can be applied with Warrant at 2 ounces per acre according to label, however be aware “splash up” rain events may result in some crop injury. Flexstar label only lists tank mix partners for POST applications, however, as PRE there is no risk of tissue injury or burn. Growers on more coarse soils with reduced organic matter, although rates of the four tank mix products are on label, should experiment on reduced acres in year one in the event of synergistic crop injury.

Growers should consider applying the PRE only residual micro-rates treatment as a potential cost and time saving one-time application in years with average early rainfall. A PRE only application of Blanket (8) + Valors SX (2) + Warrant (40) + Flexstar (10) provided 93% waterhemp control at soybean canopy for an estimated \$35.48. However, in years with below average early rainfall the grower must be prepared to utilize a glufosinate or 2, 4-D EPOST application as a rescue on glyphosate-resistant waterhemp populations. Volunteer corn control or fungicide applications may also require a second trip over the field, however, these applications, although optional, should be more affordable without the need to tank mix additional residual herbicides.

The PRE only residual micro-rates program allows the grower an opportunity to “wait-and-see” what other necessary inputs will be required rather than trying to predict the unknown. This program is also universal across all soybean genetics minimizing tank cleanout events for operations that grow multiple herbicide tolerant soybean genetics. Based on a 2021 supporting study the PRE only residual micro-rates program is affordable and may provide necessary waterhemp control for \$21.43/A in ideal environmental conditions compared to the cost of multiple post-emergent applications, herbicides, and adjuvants. Crop safety of micro-rate PRE combinations will continue to be evaluated, however, at the reduced product rates the program should logically be considered safe in soybean. Next Gen Ag LLC is not liable for any decisions made on the basis of this study or publication.