

# SUGARBEET TOLERANCE AND WATERHEMP CONTROL FROM ULTRA BLAZER IN A WEED MANAGEMENT PROGRAM

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## Summary

1. Ultra Blazer (acifluorfen) must be applied alone or with glyphosate postemergence (POST) at the 6 leaf sugarbeet stage or greater.
2. Preemergence (PRE) applications did not affect sugarbeet injury, root yield, % sucrose, or recoverable sucrose from Roundup PowerMax, ethofumesate, Ultra Blazer and/or Dual Magnum.
3. Ultra Blazer in a waterhemp management program caused significant sugarbeet injury and reduced root yield and recoverable sucrose compared with Roundup PowerMax and Dual Magnum and/or ethofumesate.
4. Ultra Blazer is best used as a tool to control escaped waterhemp; NOT as part of a weed control program.
5. Waterhemp control results support Ultra Blazer application to control waterhemp escapes.

## Introduction

Sugarbeet tolerance and waterhemp control from POST Ultra Blazer applications were investigated in 2019 and 2020. Two conclusions of this research were realized. First, Ultra Blazer applied at 16 fl oz/A should be timed to 6 leaf or greater sugarbeet. Ultra Blazer applied before the 6 leaf sugarbeet stage causes necrosis and stature reduction that reduces root yield and recoverable sucrose. Second, sugarbeet tolerance or waterhemp control from Ultra Blazer is influenced by adjuvant type and herbicide mixture with Ultra Blazer. We observed greater waterhemp control from Ultra Blazer mixtures with Roundup PowerMax, Stinger, and/or ethofumesate than from these herbicides applied individually. Previous research indicates Ultra Blazer postemergence provides effective control of other broadleaf weeds including kochia, redroot pigweed, palmer amaranth, and Pennsylvania smartweed.

Ultra Blazer may fit best in a weed management program with glyphosate, ethofumesate, and a chloroacetamide herbicide timed at the 6-lf sugarbeet stage or mixed with glyphosate and timed to the 8- to 12-lf stage. 2021 experiments were directed to explore both tolerance and weed control from Ultra Blazer as either a component in a weed management program or a treatment to control escape waterhemp.

## Objectives

2021 objectives are a) determine if sugarbeet tolerate Ultra Blazer when applied in a waterhemp control program with Roundup PowerMax, ethofumesate, and Dual Magnum at the 6-lf sugarbeet stage; and b) evaluate sugarbeet tolerance and waterhemp control from Ultra Blazer mixtures with Roundup PowerMax, ethofumesate, Dual Magnum, and/or Stinger at the 6- to 8-lf sugarbeet stage.

## Materials and Methods

### *Sugarbeet Tolerance*

Experiments conducted in 2021 near Crookston, Hendrum, Norcross, and Murdock, MN evaluated sugarbeet tolerance from Ultra Blazer as a component in the waterhemp management program. The experimental area was prepared for planting by applying the appropriate fertilizer and tillage. Sugarbeet was seeded in 22-inch rows at about 62,000 seeds per acre with 4.6 inch spacing between seeds. Treatments shown in Table 1 were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO<sub>2</sub> at 40 psi to the center four rows of six row plots 40 feet in length.

Visible sugarbeet necrosis, malformation, and growth reduction were evaluated as sugarbeet injury using a 0 to 100% injury scale with 0% denoting no sugarbeet injury and 100% denoting complete loss of sugarbeet stature. All evaluations were a visual estimate of injury in the four treated rows compared to the adjacent, two-row, untreated strip. At harvest, sugarbeet was defoliated, harvested mechanically from the center two rows of each plot, and weighed. A sugarbeet sample (about 20 lbs) was collected from each plot and analyzed for sucrose content and sugar loss to molasses by American Crystal Sugar Company (East Grand Forks, MN). Experimental design was randomized complete block with six replications in a factorial treatment arrangement with factors being

preemergence and postemergence herbicide. Data were analyzed in this report as a RCBD with the ANOVA procedure of ARM, version 2021.2 software package.

**Table 1. Herbicide treatment, rate, and application timing, sugarbeet tolerance.**

<b>Factor A</b> <b>PRE Herbicide</b>	<b>Factor B</b> <b>Postemergence Herbicide</b>	<b>Rate (fl oz/A)</b>	<b>Sugarbeet stage</b> <b>(lf)</b>
No	Roundup PowerMax <sup>a</sup> + etho <sup>b</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	2 / 6-8
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	2 / 6-8
No	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer <sup>c</sup>	28 + 6 / 28 + 16	2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax <sup>a</sup> + etho / Roundup PowerMax + etho	8 + 32 / 28 + 6 / 28 + 6	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	8 + 32 / 2 + 6 + 16 / 28 + 6 + 16	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer	8 + 32 / 28 + 6 / 28 + 16	PRE / 2 / 6-8

<sup>a</sup>Roundup PowerMax + ethofumesate applied with Destiny HC HSMOC at 1.5 pt/A and Amsol Liquid AMS at 2.5 % v/v.

<sup>b</sup>etho = ethofumesate.

<sup>c</sup>Ultra Blazer applied with Prefer 90 non-ionic surfactant at 0.125% v/v.

#### *Ultra Blazer Efficacy*

Efficacy experiments were conducted on natural populations of waterhemp in sugarbeet grower fields near Moorhead, Glyndon, and Blomkest, MN in 2021. We elected not to include the Moorhead site in this summary due to poor early season sugarbeet development. All treatments (Table 2) were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO<sub>2</sub> at 40 psi to the center four rows of six row plots 40 feet in length.

Visible sugarbeet necrosis, malformation, and growth reduction were evaluated as sugarbeet injury using a 0 to 100% injury scale with 0% denoting no sugarbeet injury and 100% denoting complete loss of sugarbeet stature. Weed control was also evaluated as percent biomass reduction. All evaluations were a visual estimate of injury or control in the four treated rows compared to the adjacent, two-row, untreated strip. Experimental design was a randomized complete block design with four replications in a factorial treatment arrangement with factors being preemergence and postemergence herbicides. Data were analyzed in this report as a RCBD with the ANOVA procedure of ARM, version 2021.2 software package.

**Table 2. Herbicide treatment, rate, and application timing, sugarbeet efficacy.**

Factor A PRE Herbicide	Factor B POST Herbicide	Rate (fl oz /A)	Sugarbeet stage (lf)
No	Roundup PowerMax <sup>a</sup> + etho <sup>b</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	2 / 6-8
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	2 / 6-8
No	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer <sup>c</sup>	28 + 6 / 28 + 16	2 / 6-8
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	28 + 6 + 16 / 28 + 16 + 16	2 / 6-8
No	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + etho	8 + 32 / 28 + 6 / 28 + 6	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	38 + 32 / 28 + 6 + 16 / 28 + 6 + 16	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer	8 + 32 / 28 + 6 / 28 + 16	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	8 + 32 / 28 + 6 + 16 / 28 + 16 + 16	PRE / 2 / 6-8
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	8 + 32 / 28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	PRE / 2 / 6-8

<sup>a</sup>Roundup PowerMax + ethofumesate applied with Destiny HC HSMOC at 1.5 pt/A and Amsol Liquid AMS at 2.5 % v/v.

<sup>b</sup>etho = ethofumesate.

<sup>c</sup>Ultra Blazer applied with Prefer 90 non-ionic surfactant at 0.125% v/v.

## Results

### *Sugarbeet Tolerance*

Sugarbeet injury, root yield, % sucrose, and recoverable sucrose from herbicide treatments applied POST were not affected by PRE treatment (Tables 3 and 4). Sugarbeet injury occurred 7 and 14 days after treatment (DAT) from Roundup PowerMax plus ethofumesate and Dual Magnum as well as Roundup PowerMax plus Ultra Blazer and Dual Magnum compared with Roundup PowerMax plus ethofumesate alone; however, sugarbeet injury from Roundup PowerMax plus ethofumesate and Dual Magnum was the same as Roundup PowerMax plus ethofumesate alone by 21 DAT. Sugarbeet injury at 7, 14, and 21 DAT was always greater when Ultra Blazer was mixed with Roundup PowerMax and Dual Magnum.

Treatments containing Ultra Blazer reduced root yield and recoverable sucrose as compared with Roundup PowerMax plus ethofumesate or Roundup PowerMax plus ethofumesate and Dual Magnum (Table 4). However, sucrose content was not affected by Ultra Blazer. These results indicate that Ultra Blazer applied as part of a weed management program reduces sugarbeet stature, root yield, and recoverable sucrose.

**Table 3. Sugarbeet injury of necrosis and growth reduction in response to herbicide treatment, averaged across four locations, 2021.<sup>a</sup>**

PRE Herbicide	POST Herbicide	Rate	Sugarbeet Injury		
			7 DAT <sup>b</sup>	14 DAT	21 DAT
		----fl oz /A----	-----%-----		
No	Roundup PowerMax + etho <sup>c</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	3 a	2 a	3 a
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	16 + 6 + 28 / 16 + 6 + 28	11 bc	9 b	6 a
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Ultra Blazer + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	44 d	42 c	32 b
Etho+Dual Magnum	Roundup PowerMax + etho / Roundup PowerMax + etho	32 + 8 / 28 + 6 / 28 + 6	4 ab	1 a	2 a
Etho+Dual Magnum	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	32 + 8 / 28 + 6 + 16 / 28 + 6 + 16	13 c	8 b	7 a
Etho+Dual Magnum	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Ultra Blazer + Dual Magnum	32 + 8 / 28 + 6 + 16 / 28 + 16 + 16	50 d	43 c	35 b
<b>P-Value</b>			<b>&lt;0.0001</b>	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>

<sup>a</sup>Means within a rating timing that do not share any letter are significantly different by the LSD at the 5% level of significance.

<sup>b</sup>DAT = days after treatment.

<sup>c</sup>etho = ethofumesate.

**Table 4. Sugarbeet root yield, % sucrose, and recoverable sucrose in response to herbicide treatment across four locations, 2021.<sup>a</sup>**

PRE Herbicide	POST Herbicide	Rate	Root Yield	Sucrose	Recoverable Sucrose
			-Ton/A-	--%--	---lb/A---
		----fl oz/A----			
No	Roundup PowerMax + etho <sup>c</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	38 a	15.9	10, 423 a
No	Roundup PowerMax + etho + Dual Magnum <sup>d</sup> / Roundup PowerMax + etho + Dual Magnum	16 + 6 + 28 / 16 + 6 + 28	36 a	15.8	10, 040 a
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Ultra Blazer + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	32 b	15.5	8,713 b
Etho+Dual Magnum	Roundup PowerMax + etho / Roundup PowerMax + etho	32 + 8 / 28 + 6 / 28 + 6	38 a	15.7	10, 223 a
Etho+Dual Magnum	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	32 + 8 / 28 + 6 + 16 / 28 + 6 + 16	37 a	15.7	10, 141 a
Etho+Dual Magnum	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Ultra Blazer + Dual Magnum	32 + 8 / 28 + 6 + 16 / 28 + 16 + 16	32 b	15.6	8, 507 b
<b>P-Value</b>			<b>&lt;0.0001</b>	<b>0.2402</b>	<b>&lt;0.0001</b>

<sup>a</sup>Means within a rating timing that do not share any letter are significantly different by the LSD at the 5% level of significance.

<sup>b</sup>DAT = days after treatment.

<sup>c</sup>etho = ethofumesate.

#### *Ultra Blazer Efficacy*

The experiment at Moorhead, MN had poor stands and sporadic weeds, especially early in the growing season. Due to variability, discussion will focus on results from Blomkest and Glyndon experiments.

Sugarbeet injury at Glyndon was greater than Blomkest (Table 5). Daily maximum air temperature was 75°F and 82°F on May 31 and June 1, respectively, but increased to greater than 90°F on June 3, the date of the POST

application at Glyndon. Daily maximum air temperatures averaged above 90°F through June 10 at Glyndon, MN which likely contributed to sugarbeet injury. Sugarbeet injury was not limited to only treatments containing Ultra Blazer. Multiple applications of Roundup PowerMax plus ethofumesate and Dual Magnum at the 2- and 6-lf stage caused more injury than Roundup PowerMax plus ethofumesate at the 2-lf stage followed by Roundup PowerMax plus ethofumesate at the 6-lf stage.

**Table 5. Sugarbeet injury from tank mixtures with Ultra Blazer, 14 DAT, Glyndon and Blomkest, MN, 2021.<sup>a</sup>**

PRE Herbicide	POST Herbicide <sup>b</sup>	Rate	Sugarbeet Injury	
			Glyndon	Blomkest
			-----%-----	
No	Roundup PowerMax + etho <sup>c</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	0 d	4 c
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	15 cd	8 c
No	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer <sup>d</sup>	28 + 6 / 28 + 16	72 ab	33 b
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	28 + 6 + 16 / 28 + 16 + 16	84 a	43 ab
No	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	86 a	45 ab
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + etho	8 + 32 / 28 + 6 / 28 + 6	12 d	0 c
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	8 + 32 / 28 + 6 + 16 / 28 + 6 + 16	29 c	6 c
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer	8 + 32 / 28 + 6 / 28 + 16	64 b	35 b
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	8 + 32 / 28 + 6 + 16 / 28 + 16 + 16	86 a	41 ab
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	8 + 32 / 28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	86 a	49 a
<b>LSD (0.10)</b>			<b>16</b>	<b>13</b>

<sup>a</sup>Means within location not sharing any letters are significantly different by the LSD at the 10% level of significance.

<sup>b</sup>Roundup PowerMax + ethofumesate applied with Destiny HC HSMOC at 1.5 pt/A and Amsol Liquid AMS at 2.5 % v/v.

<sup>c</sup>etho = ethofumesate.

<sup>d</sup>Ultra Blazer treatments applied with Prefer 90 non-ionic surfactant at 0.25% v/v.

Sugarbeet injury from treatments containing Ultra Blazer were greater than treatments containing Roundup PowerMax, ethofumesate, and/or Dual Magnum at Blomkest. However, injury was similar among treatments containing Roundup PowerMax, ethofumesate, and Dual Magnum. The addition of Stinger to Roundup PowerMax plus Ultra Blazer and Dual Magnum did not increase sugarbeet injury as compared with Roundup PowerMax plus Ultra Blazer and Dual Magnum alone. PRE herbicide did not affect sugarbeet injury.

Ultra Blazer improved waterhemp control compared with Roundup PowerMax plus ethofumesate alone or Roundup PowerMax mixtures with ethofumesate and Dual Magnum at Blomkest, but only improved waterhemp control compared with Roundup PowerMax plus ethofumesate in the absence of a PRE at Glyndon (Table 6). Blomkest was much drier than Glyndon, especially in April and May. Similar waterhemp control was observed from Ultra Blazer mixtures with Roundup PowerMax or Ultra Blazer mixtures with Roundup PowerMax and Dual Magnum at both locations. Waterhemp control was numerically greatest when Ultra Blazer was mixed with Roundup PowerMax,

Dual Magnum, and Stinger. However, this treatment also caused the most sugarbeet injury at Blomkest (Table 5). Waterhemp control results support Ultra Blazer applied POST to control waterhemp escapes.

Glyphosate provided excellent common lambsquarters control at Glyndon and Blomkest (data not presented).

**Table 6. Waterhemp control from tank mixtures with Ultra Blazer, 14 DAT, Blomkest and Glyndon, MN, 2021.<sup>a</sup>**

PRE Herbicide	Postemergence Herbicide <sup>b</sup>	Rate	Waterhemp Control	
			Glyndon	Blomkest
		--fl oz/A--	-----%-----	
No	Roundup PowerMax + etho <sup>c</sup> / Roundup PowerMax + etho	28 + 6 / 28 + 6	85 b	65 e
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	28 + 6 + 16 / 28 + 6 + 16	94 ab	69 de
No	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer <sup>d</sup>	28 + 6 / 28 + 16	90 ab	90 ab
No	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	28 + 6 + 16 / 28 + 16 + 16	98 a	94 a
No	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	99 a	93 ab
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + etho	8 + 32 / 28 + 6 / 28 + 6	93 ab	83 bc
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + etho + Dual Magnum	8 + 32 / 28 + 6 + 16 / 28 + 6 + 16	99 a	78 cd
Dual Magnum + ethofumesate	Roundup PowerMax + etho / Roundup PowerMax + Ultra Blazer	8 + 32 / 28 + 6 / 28 + 16	96 ab	94 ab
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum / Roundup PowerMax + Dual Magnum + Ultra Blazer	8 + 32 / 28 + 6 + 16 / 28 + 16 + 16	98 a	95 a
Dual Magnum + ethofumesate	Roundup PowerMax + etho + Dual Magnum + Stinger / Roundup PowerMax + Dual Magnum + Ultra Blazer + Stinger	8 + 32 / 28 + 6 + 16 + 3 / 28 + 16 + 16 + 3	99 a	98 a
<b>LSD (0.10)</b>			<b>12</b>	<b>11</b>

<sup>a</sup>Means within a location not sharing any letter are significantly different by the LSD at the 10% level of significance.

<sup>b</sup>Roundup PowerMax + ethofumesate applied with Destiny HC HSMOC at 1.5 pt/A and Amsol Liquid AMS at 2.5 % v/v.

<sup>c</sup>etho = ethofumesate.

<sup>d</sup>Ultra Blazer treatments applied with Prefer 90 non-ionic surfactant at 0.25% v/v.

### Conclusion

Ultra Blazer applied with Roundup PowerMax and Dual Magnum increased visual sugarbeet injury and reduced root yield and recoverable sucrose as compared with Roundup PowerMax plus ethofumesate alone or in mixtures with Dual Magnum. Thus, we strongly discourage UPL or agriculturalists from recommending the tank mix of Ultra Blazer with Roundup PowerMax and Dual Magnum. Dual Magnum was the only chloroacetamide used in this experiment and it is possible the results may not translate to mixtures with Outlook or Warrant. However, our research indicates sugarbeet injury increases when oil-based formulations are mixed with Ultra Blazer.

These experiments support Ultra Blazer application to control waterhemp escapes. Ultra Blazer has been shown most effective on waterhemp less than 2-inches tall. Ultra Blazer improved waterhemp control compared with Roundup PowerMax plus ethofumesate alone and improved control from Roundup PowerMax mixtures with ethofumesate and Dual Magnum in an environment where rainfall to incorporate soil residual herbicides was lacking. Waterhemp control numerically was greatest when Ultra Blazer was mixed with Roundup PowerMax, Dual

Magnum, and Stinger. However, this treatment caused the most sugarbeet injury at Blomkest. Waterhemp control results support Ultra Blazer application to control waterhemp escapes.