WATERHEMP CONTROL FROM SOIL RESIDUAL PREEMERGENCE AND POSTEMERGENCE HERBICIDES, CONTINUED IN 2023

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Summary

1. Outlook applied early postemergence reduced sugarbeet final stand.
2. PRE followed by split layby program improved waterhemp control as compared with the split layby program alone.

Introduction

Peters et al. (2023) concluded rainfall is critical for activating soil residual herbicides and achieving satisfactory waterhemp control from soil residual herbicides in previous reports. This research reinforces that a strategy to layer soil residual herbicides, starting at planting and after sugarbeet has emerged, is our best program for controlling waterhemp in sugarbeet. Finally, this research demonstrated excellent sugarbeet safety from the chloroacetamide herbicides. We have consistently stated the three chloroacetamide active ingredients commercially available in sugarbeet, Outlook, *S*-metolachlor products and Warrant, are equally effective at providing waterhemp control, and that the differences in waterhemp control among chloroacetamide products are minor. A continuation of this work was conducted in 2023. We wanted to incorporate our waterhemp control practices from the mid- to southern Red River Valley to the Northern Red River Valley.

Objective

The objective of this experiment was to demonstrate a weed control system for waterhemp control in sugarbeet in the Northern Red River Valley.

Materials and Methods

An experiment was conducted near Drayton, ND in 2023. Treatments are listed in Table 1. The experimental area was prepared for planting by fertilizing and conducting tillage across the experimental area. Sugarbeet was planted on May 13, seeded in 22-inch rows at a population and seed spacing commercially accepted by sugarbeet growers in the Red River Valley. Treatments were applied with a bicycle sprayer in 17 gpa spray solution through XR8002 flat fan nozzles pressurized with CO_2 at 35 psi to the center four rows of six row plots 40 feet in length.

Table 1. Herbicide treatment, rate, and application timing, Drayton, ND, 2023.

Herbicide Treatment PRE	Residual Herbicide Treatment POST[a]	Rate (fl oz/A)	Sugarbeet stage (lvs)
No	PowerMax3 + etho / Ultra Blazer[b]	25 + 6 / 16	2 / 6-8
No	Outlook / Outlook	12 / 12	2 / 6-8
No	Dual Magnum / Dual Magnum	17.6 / 17.6	2 / 6-8
No	Dual Magnum / Outlook	17.6 / 12	2 / 6-8
Yes[c]	PowerMax3 + etho / Ultra Blazer	25 + 6 / 16	PRE/ 2 / 6-8
Yes	Outlook / Outlook	12 / 12	PRE/ 2 / 6-8
Yes	Dual Magnum / Dual Magnum	17.6 / 17.6	PRE/ 2 / 6-8
Yes	Dual Magnum / Outlook	17.6 / 12	PRE/ 2 / 6-8

[a]Roundup PowerMax3 at 25 fl oz/A + ethofumesate at 6 fl oz/A + Destiny HC High Surfactant Methylated Oil Concentrate (HSMOC) at 1.5 pt/A and Amsol Liquid AMS at 2.5% v/v applied with POST applications not containing Ultra Blazer.
[b]Ultra Blazer applied with Prime Oil Crop Oil Concentrate (COC) at 1.5 pt/A.
[c]Ethofumesate + Dual Magnum at 2.0+0.5 pt/A PRE.

Visible sugarbeet growth reduction injury was evaluated using a 0 to 100% scale (with 0% representing no visible injury and 100% as complete loss of plant / stand) approximately 14 and 21 days (+/- 3 days) following the 6-8 leaf application. Sugarbeet stand was measure by counting the number of sugarbeet in a 10 ft row in rows three and four of a six-row plot. Stand counts were collected June 14 or the same day as visible sugarbeet assessment. Visible waterhemp control was evaluated using a 0 to 100% scale (0% indicating no control and 100% indicating complete

weed control) and was collected 30, 51, and 66 days after planting. Experimental design was randomized complete block with four replications in a factorial treatment arrangement, factors being use of PRE herbicide (no/yes) and POST herbicide treatments. Data were analyzed with the ANOVA procedure of ARM, version 2023.5 software package.

Results and Discussion

The experiment at Drayton, ND was planted to "dry" seedbed moisture. After planting, the site received 0.25-inch of rain over 12 days after planting (DAP) (Table 2). Rain events that followed both planting and herbicide applications were sporadic with low accumulation. As a result, sugarbeet stands were variable at this location. We elected to apply herbicide POST treatments prior to full sugarbeet stands since activating rainfall was sparse. Our logic was we would need a second rain event to activate soil residual herbicides if we waited for the initial rain event to enable completion of final stand. Further, this application timing also allowed us to evaluate how soil residual herbicides affect sugarbeet germination and stand.

Table 2. Herbicide application dates, sugarbeet growth stage and cumulative rainfall the first 10 days following herbicide application, Drayton, ND, 2023.

	Drayton, ND[a]		
Herbicide Treatment	**Herbicide Application Dates**	**Sugarbeet Growth Stage**	**Rainfall**
		--lvs--	--inch--
PRE Application	May 15	PRE	0.25
EPOST Application	May 31	2-4	0.49
POST Application	June 15	6-8	4.83[b]
		Total:	**5.57**

[a]Precipitation data collected from nearby weather stations operated by North Dakota Agricultural Weather Network (NDAWN).
[b]Rainfall amount of 4.53" reported on the 10th day following POST application.

Sugarbeet stand ranged from 80 to144 plants per 100-feet of row across plots, reflecting the dry conditions (Table 3). There was no significant sugarbeet stand differences from PRE or no PRE (125 vs.126 sugarbeet per 100-ft, no PRE vs. PRE, averaged across POST treatment). However, Outlook followed by Outlook POST significantly reduced stand or tended to reduce stand as compared with the other POST treatments, following no PRE and PRE treatments, respectively.

Sugarbeet injury ranged from 0% to 20%, 14 days after application B (DAAB) and 0% to 53%, 20 days after application C (DAAC) (Table 3). Injury assessment might have been influenced by stand challenges. However, the greatest sugarbeet injury observed was bronzing phenotype and growth reduction from applications with Ultra Blazer, with or without a PRE applied. Sugarbeet injury tended to increase POST treatments following a PRE; however, was not significantly different compared with no PRE. POST treatments with Outlook followed by Outlook resulted in sugarbeet injury statistically comparable to treatments with Ultra Blazer POST.

Table 3. Sugarbeet stand and visible injury in response to PRE and POST treatment, Drayton, ND, 2023.[a]

Herbicide Treatment PRE	Residual Herbicide Treatment POST[b]	Rate	Sugarbeet Stand	Sugarbeet Injury 14 DAAB[c]	Sugarbeet Injury 20 DAAC
		----fl oz/A----	--per 100 ft--	---------%---------	
No	PowerMax3 + etho / Ultra Blazer[d]	25 + 6 / 16	135 a	0 a	38 bc
No	Outlook / Outlook	12 / 12	80 b	3 a	22 ab
No	Dual Magnum / Dual Magnum	17.6 / 17.6	140 a	4 a	0 a
No	Dual Magnum / Outlook	17.6 / 12	143 a	5 a	8 a
Yes[e]	PowerMax3 + etho / Ultra Blazer	25 + 6 / 16	144 a	0 a	53 c
Yes	Outlook / Outlook	12 / 12	100 ab	20 b	40 bc
Yes	Dual Magnum / Dual Magnum	17.6 / 17.6	123 ab	0 a	18 ab
Yes	Dual Magnum / Outlook	17.6 / 12	135 a	5 a	0 a
LSD (0.10)			**44**	**10**	**25**

[a]Means within a rating timing that do not share any letter are significantly different by the LSD at the 10% level of significance.
[b]Roundup PowerMax3 at 25 fl oz/A + ethofumesate at 6 fl oz/A + Destiny HC High Surfactant Methylated Oil Concentrate (HSMOC) at 1.5 pt/A and Amsol Liquid AMS at 2.5% v/v applied with POST application not containing Ultra Blazer.
[c]DAAB = Days after application B; DAAC = Days after application C.
[d]Ultra Blazer applied with Prime Oil Crop Oil Concentrate (COC) at 1.5 pt/A.
[e]Ethofumesate + Dual Magnum at 2+0.5 pt/A PRE.

Sugarbeet growers and agriculturalist frequently ask about applying Outlook mixed with glyphosate and ethofumesate when the majority of sugarbeet in field have reached the 2-lf stage, but when sugarbeet have not reached a full stand. In most situations, a rain event is in the weather forecast and the producer wants to "hook a rain." My reply is: "Are you satisfied with current stand in field, not knowing the fate of sugarbeet following Outlook application?" Outlook sprayed on the soil surface and not rainfall activated will not affect sugarbeet left to emerge. However, the fate of sugarbeet in the event that an activating rain occurred following Outlook application was not known. These data suggest that Outlook does affect sugarbeet germination and emergence. In contrast, *S*-metoachlor products have greater sugarbeet tolerance which is the reason why Dual Magnum is approved for use preemergence using the 24(c) local needs label in Minnesota and North Dakota.

Waterhemp control ranged from 85% to 99%, 14 DAAB and 87% to 97%, 20 DAAC (Table 4). Treatments with Outlook alone, Dual Magnum alone, or Dual Magnum followed by Outlook controlled waterhemp, even in a dry year. We did not observe waterhemp control differences between layby treatments. This could be contributed to the lack of rain following planting (Table 2).

Table 4. Waterhemp control in response to PRE and POST treatment, Drayton, ND, 2023.[a]

Herbicide Treatment PRE	Residual Herbicide Treatment POST[b]	Rate	Waterhemp Control 14 DAAB[c]	Waterhemp Control 20 DAAC
		----fl oz/A----	----------%----------	
No	PowerMax3 + etho / Ultra Blazer[c]	25 + 6 / 16	85 b	88 ab
No	Outlook / Outlook	12 / 12	95 ab	96 ab
No	Dual Magnum / Dual Magnum	17.6 / 17.6	93 ab	87 b
No	Dual Magnum / Outlook	17.6 / 12	96 a	94 ab
Yes[e]	PowerMax3 + etho / Ultra Blazer	25 + 6 / 16	98 a	95 ab
Yes	Outlook / Outlook	12 / 12	98 a	97 a
Yes	Dual Magnum / Dual Magnum	17.6 / 17.6	99 a	97 a
Yes	Dual Magnum / Outlook	17.6 / 12	99 a	94 ab
LSD (0.10)			**10**	**9**

[a]Means within a rating timing that do not share any letter are significantly different by the LSD at the 10% level of significance.
[b]Roundup PowerMax3 at 25 fl oz/A + ethofumesate at 6 fl oz/A + Destiny HC High Surfactant Methylated Oil Concentrate (HSMOC) at 1.5 pt/A and Amsol Liquid AMS at 2.5% v/v applied POST application not containing Ultra Blazer.
[c]DAAB = Days after application B; DAAC = Days after application C.
[d]Ultra Blazer applied with Prime Oil Crop Oil Concentrate (COC) at 1.5 pt/A.
[e]Ethofumesate + Dual Magnum at 2+0.5 pt/A PRE.

We observed a significant increase in waterhemp control when a PRE was applied as compared with no PRE (Table 4). This has been a common observation in the southern Red River Valley, especially in years with May sugarbeet plantings. However, this experiment echoed our historical results that a PRE followed by the split layby program will provide increased waterhemp control across the Red River Valley as a whole, even in a dry year, as compared to the split layby program, alone.

Conclusion

There was a very high amount of variability across the experiment due to lack of rain; however, we did continue to observe that the best weed control strategy for waterhemp is layered soil residual herbicides, starting with a PRE followed by split layby application. The three chloroacetamide herbicides available in sugarbeet are equally effective at providing waterhemp control. We observed dry conditions creating open furrow with exposed sugarbeet seed, well past planting date, which provides difficulty in quantifying whether stand loss was due to lack of rainfall or herbicide application. We would like to further investigate the results from Outlook followed by Outlook and strengthen the findings of the impact it had on sugarbeet stand.

Acknowledgement

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References

Peters TJ, Lystad AL and Mettler D (2023) Waterhemp control from soil residual, pre-emergence, and post-emergence herbicides in 2022. Sugarbeet Res Ext Rep. 53: 12-17