SUGARBEET TOLERANCE FROM STINGER HL ALONE AND IN MIXTURES

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Summary

1. Increasing the Stinger HL rate from 1.8 to 3.2 fl oz/A increased malformation injury 0 to 7 days after the repeat Stinger HL application but did not reduce root yield or sucrose content.
2. Two-times S-metolachlor or Select Max mixed with Stinger HL, Roundup PowerMax3 and ethofumesate increase sugarbeet injury and affected certain yield perimeters.
3. We encourage applicators to consider environmental conditions at application and make the appropriate adjustment.

Introduction

Stinger HL (clopyralid) is a very important herbicide for sugarbeet growers due to its activity on four families of plant species, acteracea or the aster, daisy or sunflower family, fabaceae or the legumes family, polygonaceae or knotweed or smartweed family and the solanacea or nightshade family. Stinger HL is very effective for control of plants in these families including common ragweed, biennial wormwood, Canada thistle, and nightshade, as examples. Stinger HL does not provide control of waterhemp or common lambsquarters.

Several challenges compromise Stinger HL use. First, Stinger HL, like other auxin mimic herbicides, is often applied below labeled rates. Second, some believe Stinger HL causes sugarbeet injury under warm and humid conditions, especially once sugarbeet reach the 6-lf stage. Third, the window of application is narrow, cotyledon to 8-lf stage. Sugarbeet growers attending the 2024 Production Seminars identified glyphosate resistant (GR) common ragweed at their most important weed control challenge on 2% of the acres or 12,493 aces. However, 22% identified common ragweed as the first or second most important weed in Crookston and EGF factory districts. Further, we have observed extended common ragweed germination and emergence patterns, especially in 2024 and 2025. An extended emergence window requires growers make two Stinger HL applications in sugarbeet. In many cases Stinger HL will be applied in mixtures with other herbicides.

Our 'best practices' for Stinger HL application are Stinger HL at 2.4 fl oz/A with a single application timed to common ragweed less than 2-inch in diameter. We suggest 2-times Stinger HL at 1.8 fl oz/A at the 2-lf and 8-lf application. Finally, we suggest timing Stinger HL application to ragweed size rather than sugarbeet stage. Thus, you may need to separate glyphosate and Stinger HL application if you want to delay termination nurse crop to 4-lf sugarbeet. The objectives of this research were: a) to evaluate sugarbeet tolerance, root yield and % sucrose content from 2-times Stinger HL in sugarbeet at 3 Stinger HL use rates or b) to evaluate sugarbeet tolerance, root yield and % sucrose content from Stinger HL mixed with Roundup PowerMax3 alone, Stinger HL and Roundup PowerMax3 mixed with Select Max or Stinger HL and Roundup PowerMax3 mixed with S-metolachlor.

Materials and Methods

A tolerance experiment was conducted at Crookston, Brushvale, and Prinsburg, MN and Prosper, ND in 2025. The experimental area was prepared for planting by applying the appropriate fertilizer and conducting tillage across the experimental area at each location. Herbicide treatments were applied POST (Table 1). All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002XR nozzles (XR TeeJet® Flat Fan Spray Tips; TeeJet® Technologies, Glendale Heights, IL) pressurized with CO2 at 40 psi to the center four rows of six row plots 40 feet in length.

Sugarbeet stand was collected by counting the number of sugarbeet in 10-ft row in rows 3 and 4 of the plot when sugarbeet were at the 2- to 4-lf stage. Visible sugarbeet malformation and growth reduction was evaluated as 'sugarbeet injury' approximately 7 and 14 days after treatment (DAT) using a 0 to 99% injury scale (0% denoting no

Table 1. Herbicide treatments, herbicide rate, and sugarbeet stage at application.

Trt Num	Postemergence herbicide[ab]	Rate	Sugarbeet stage
		(fl oz/A)	(lf stage)
1	Stinger HL + RUPM3 / Stinger HL + RUPM3	1.8 + 25 / 1.8 + 25	2 / 6-8
2	Stinger HL + RUPM3 / Stinger HL + RUPM3	2.4 + 25 / 2.4 + 25	2 / 6-8
3	Stinger HL + RUPM3 / Stinger HL + RUPM3	3.2 + 25 / 3.2 + 25	2 / 6-8
4	Stinger HL + Select Max + RUPM3/ Stinger HL +Select Max + RUPM3	2.4 + 10 + 25 / 2.4 + 10 + 25	2 / 6-8
5	Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	2.4 + 16 + 6 + 25 / 2.4 + 16 + 6 + 25	2 / 6-8
6	Ethofumesate / Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	96 / 2.4 + 16 + 6 + 25 / 2.4 + 16 + 6 + 25	2 / 6-8
7	RUPM3 + etho / RUPM3 + etho	25 + 6 / 25 + 6	2 / 6-8

[a]Stinger HL was mixed with Roundup PowerMax3 plus Prefer 90 NIS and Amsol liquid AMS at 0.25% v/v and 2.5% v/v. Stinger HL was mixed with Roundup PowerMax3 and Select Max with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v. Stinger HL, Roundup PowerMax3, *S*-metolachlor and ethofumesate were mixed with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v.
[b]Abbreviations: RUPM3=Roundup PowerMax3; etho=ethofumesate

sugarbeet injury and 99% denoting complete loss of sugarbeet stature). All evaluations were a visible estimate of injury in the four treated rows compared with the adjacent, two-row, untreated strip. At harvest, sugarbeet was defoliated, harvested mechanically from the center two rows of each plot, and weighed. A root 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) or the Quality Lab at Southern Minnesota Beet Sugar Cooperative (Renville, MN). Experiments were a randomized complete block design with six replications. Data were combined across the Crookston, Brushvale and Prinsburg locations since variance were similar with these three experiments. We elected not to use the Brushvale experiment in our combined analysis due to variation attributed to sugarbeet stand. Data from the Brushvale experiment are in separate tables Data was analyzed using the GLIMMIX procedure in Statistical Analysis Software (SAS 9.4) (Cary, NC).

Results

Stinger HL mixed with Roundup PowerMax3, vegetative tolerance. We observed greater malformation and growth reduction injury from Stinger HL mixed with Roundup PowerMax3 1 to 7 days after application C (DAAC) than 9 to 14 DAAC (Table 2, Figures 1 and 2). In general, malformation and growth reduction injury were similar but greater with Stinger HL at 2.4 and 3.1 fl oz/A than with Stinger HL at 1.8 fl oz/A. Evaluation was visible injury using a 0% to 100% scale. I considered 10%, 20% and 30% malformation minor, just an increase in intensity of leaf curling. Values of 40% and 50% were more significant and affect how future leaves unroll. Sometimes I will observe leaf damage attributed to the inability of leaves to unroll. Scores of 60% or 70% was damage that may affect petioles. Sometimes we see bent petioles or leaves on the ground. Growth reduction was greater or tended to be greater with 2-times Stinger HL at 2.4 and 3.2 fl oz/A mixed with Roundup PowerMax3 (Table 2, Figure 4).

Table 2. Visible percent growth reduction and malformation in response to treatment, averaged across Crookston and Prinsburg, MN and Prosper, ND, 2025.[a]

Treatment[b]	Rate	Growth Reduction	Malforma-tion	Growth Reduction	Malforma-tion
	fl oz/A	--(1 to 7 DAAC)--		--(9 to 14 DAAC)--	
Stinger HL + RUPM3 / Stinger HL + RUPM3	1.8+25/1.8+25	11 e	21 d	5 c	9 c
Stinger HL + RUPM3 / Stinger HL + RUPM3	2.4+25/2.4+25	11 de	28 bc	13 b	19 b
Stinger HL + RUPM3 / Stinger HL + RUPM3	3.2+25/3.2+25	17 cd	32 b	11 b	21 b
Stinger HL + Select Max + RUPM3/ Stinger HL +Select Max + RUPM3	2.4+10+25/ 2.4+10+25	21 c	26 cd	16 b	19 b
Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	2.4+16+6+25/ 2.4+16+6+25	29 b	49 a	29 a	34 a
Ethofumesate / Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	96/2.4+16+6+25/ 2.4+16+6+25	37 a	49 a	29 a	33 a
RUPM3 + etho / RUPM3 + etho	25+6/25+6	6 e	2 e	4 c	1 d
P-Value		<0.0001	<0.0001	<0.0001	<0.0001

[a]Means followed by the same alphabetical letter within columns are not significantly different at the 0.05 alpha level.
[b]Stinger HL was mixed with Roundup PowerMax3 plus Prefer 90 NIS and Amsol liquid AMS at 0.25% v/v and 2.5% v/v. Stinger HL was mixed with Roundup PowerMax3 and Select Max with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v. Stinger HL, Roundup PowerMax3, S-metolachlor and ethofumesate were mixed with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v.

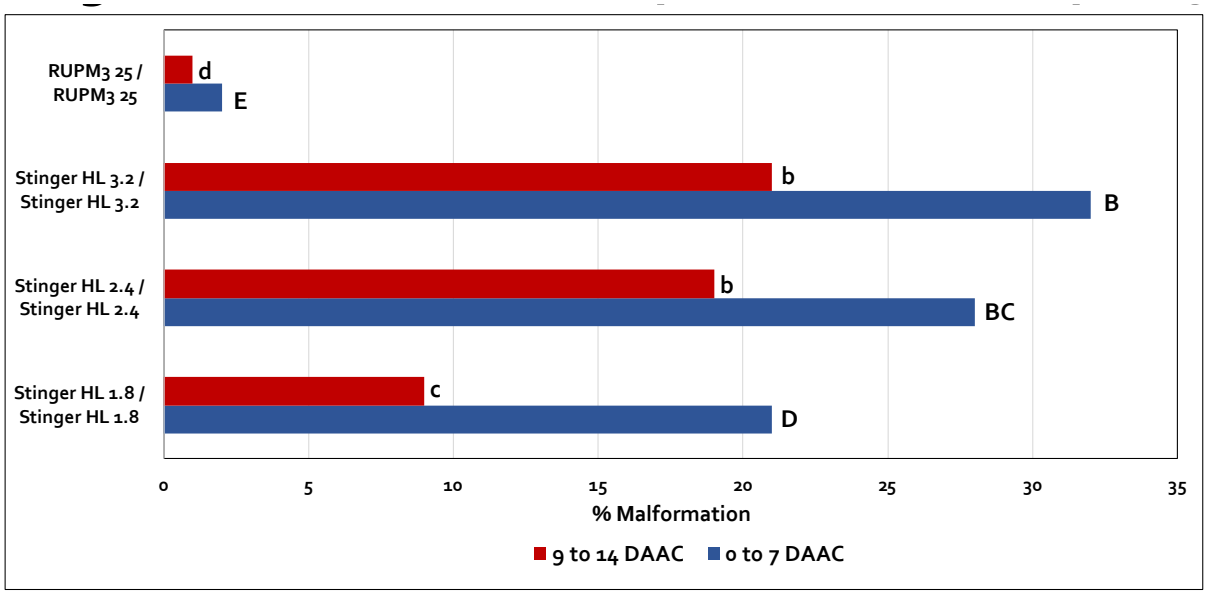

Figure 1. Visible malformation injury from Stinger HL mixed with Roundup PowerMax3, averaged across Crookston and Prinsburg, MN and Prosper, ND, 2025.

However, growth reduction injury was less than malformation injury.

Stinger HL and Roundup PowerMax3 mixed with Select Max or S-metolachlor, vegetative tolerance. Sugarbeet malformation and growth reduction injury increased with S-metolachlor was mixed with Stinger HL, Roundup PowerMax3 and ethofumesate (Table 2, Figure 2). Malformation injury was damage to the petioles and affected the ability of new sugarbeet leaves to unroll. Injury was less 9 to 14 DAAC but still was greater than 30%.

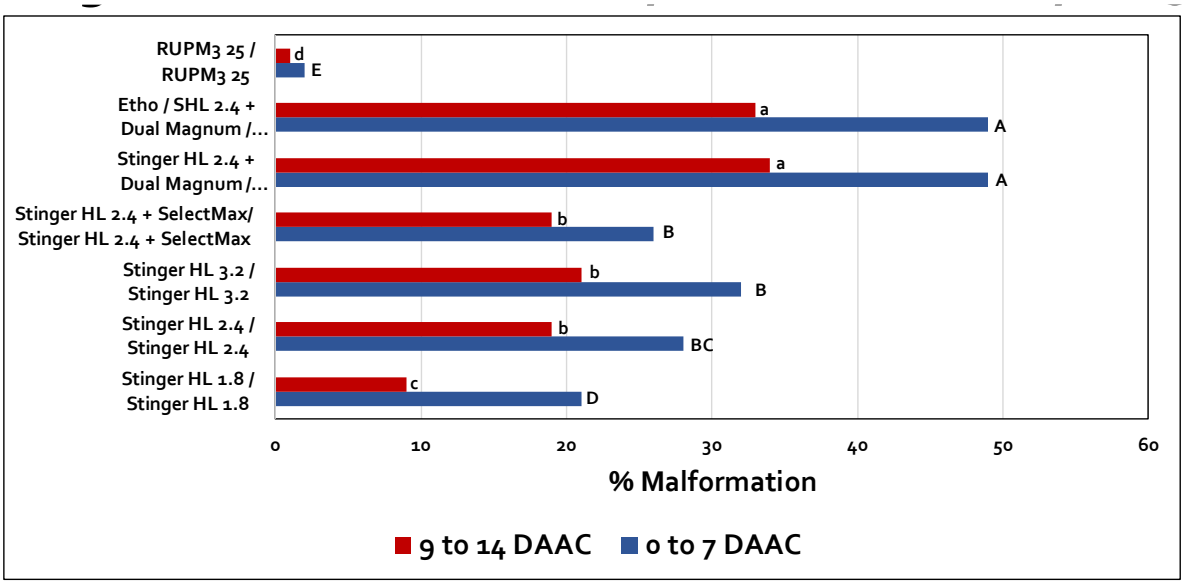

Figure 2. Visible malformation injury from Stinger HL and Roundup PowerMax3 alone or mixed with Select Max and *S*-metolachlor, averaged across Crookston and Prinsburg, MN and Prosper, ND, 2025.

Figure 3. Visible malformation injury captured June 11, 2025 or 16 DAAB and 1 DAAC, Prinsburg, MN. Image includes treatment number. Note degree of malformation damage in images 1 to 3 and 4 to 7. Image 7 is the Roundup PowerMax3 control.

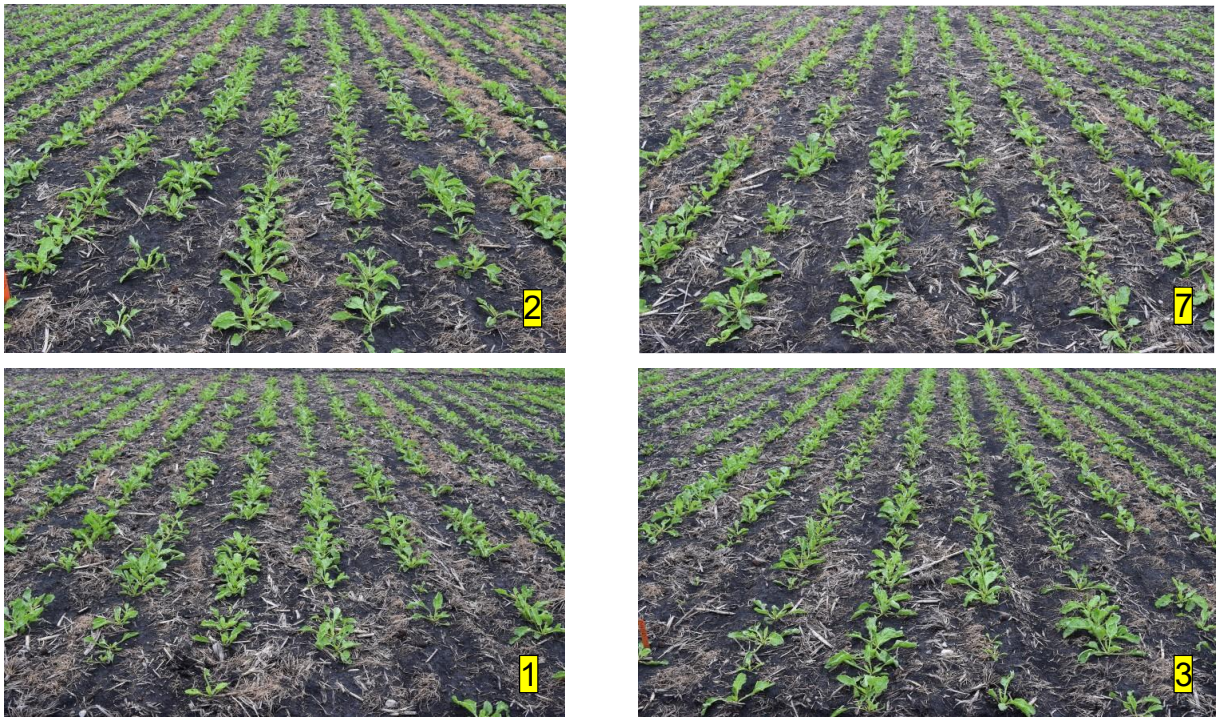

Figure 4. Growth reduction injury captured June 12, 2025 or 2 DAAC, Prinsburg, MN, 2025. Image includes treatment number.

Stinger HL mixed with Roundup PowerMax3, yield paramters. Sugarbeet root yield was not influenced by Stinger HL rate (Table 3). We did observe a numeric decrease in root yield as the Stinger HL rate increased from 2-times 1.8, 2.4 and 3.1 fl oz/A. However, the 2-times Stinger HL at 2.4 fl oz/A provided root yield numerically greater than the 2-times Roundup PowerMax3 control. We observed no statistical differences in sucrose content or recoverable sucrose per acre as the 2-times Stinger HL rate with Roundup PowerMax3 increased from 1.8 to 3.1 fl oz/A.

Stinger HL and Roundup PowerMax3 mixed with Select Max or S-metolachlor, yield parameters. Root yield and recoverable sucrose per acre were less when 2-times *S*-metolachlor was mixed with Stinger HL, Roundup PowerMax3 and ethofumesate (Table 3). *S*-metolachlor mixed with Stinger HL, Roundup PowerMax3 and ethofumesate also tended to reduce sucrose content. Select Max mixed with Stinger HL, Roundup PowerMax3 and ethofumesate did not reduce root yield or recoverable sucrose but reduced sucrose content.

Table 3. Sugarbeet stand and yield parameters in response to herbicide treatment, averaged across Crookston and Prinsburg, MN and Prosper, ND, 2025.[a]

Treatment	Rate	Sugarbeet Stand	Root Yield	Sucrose	Recoverable Sucrose
	fl oz/A	N/100 ft	Ton/A	%	lb/A
Stinger HL + RUPM3 / Stinger HL + RUPM3	1.8+25/1.8+25	46	28.3 a	15.96 ab	6739 a
Stinger HL + RUPM3 / Stinger HL + RUPM3	2.4+25/2.4+25	46	27.9 ab	15.98 a	6670 a
Stinger HL + RUPM3 / Stinger HL + RUPM3	3.2+25/3.2+25	47	27.0 ab	15.76abc	6724 a
Stinger HL + Select Max + RUPM3/ Stinger HL +Select Max + RUPM3	2.4+10+25/ 2.4+10+25	45	27.3 b	15.51 c	6322a
Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	2.4+16+6+25/ 2.4+16+6+25	48	26.1 c	15.68 bc	6081 c
Ethofumesate / Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	96/2.4+16+6+25/ 2.4+16+6+25	44	25.9 c	15.81abc	6006 c
RUPM3 + etho / RUPM3 + etho	25+6/25+6	48	27.4 ab	16.01 a	6646 ab
P-Value		0.8098	<0.0001	0.0108	<0.0001

[a]Means followed by the same alphabetical letter within columns are not significantly different at the 0.05 alpha level.
[b]Stinger HL was mixed with Roundup PowerMax3 plus Prefer 90 NIS and Amsol liquid AMS at 0.25% v/v and 2.5% v/v. Stinger HL was mixed with Roundup PowerMax3 and Select Max with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v. Stinger HL, Roundup PowerMax3, S-metolachlor and ethofumesate were mixed with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v.

Brushvale, MN. We observed more variation at our Brushvale, MN location and elected not to include these data into the combined analysis. Ethofumesate followed by Stinger HL mixed with Roundup PoweMax3, ethofumesate and S-metolachlor tended to cause the most sugarbeet vegetative injury. We also observed more malformation than growth reduction injury with Stinger HL and Roundup PowerMax3 were mixed with Select Max.

Root yield and recoverable sucrose per acre tended to corelate to sugarbeet stand. Sucrose content did not appear to be related to herbicide treatment.

Table 4. Visible percent growth reduction and malformation in response to treatment, Brushvale, MN, 2025.[a]

Treatment[b]	Rate	Growth Reduction	Malforma-tion	Growth Reduction	Malforma-tion
	fl oz/A	----(1 DAAC)----		----(12 DAAC)----	
Stinger HL + RUPM3 / Stinger HL + RUPM3	1.8+25/1.8+25	5	5 b	8 bcd	18 b
Stinger HL + RUPM3 / Stinger HL + RUPM3	2.4+25/2.4+25	10	12 ab	13 abc	21 b
Stinger HL + RUPM3 / Stinger HL + RUPM3	3.2+25/3.2+25	3	13 ab	18 ab	34 a
Stinger HL + Select Max + RUPM3/ Stinger HL +Select Max + RUPM3	2.4+10+25/ 2.4+10+25	5	13 ab	3 cd	18 b
Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	2.4+16+6+25/ 2.4+16+6+25	8	7 b	4 cd	12 bc
Ethofumesate / Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	96/2.4+16+6+25/ 2.4+16+6+25	15	20 a	23 a	20 b
RUPM3 + etho / RUPM3 + etho	25+6/25+6	0	3 b	0 d	4 c
P-Value		0.1171	0.0412	0.0026	0.0006

[a]Means followed by the same alphabetical letter within columns are not significantly different at the 0.1 alpha level.
[b]Stinger HL was mixed with Roundup PowerMax3 plus Prefer 90 NIS and Amsol liquid AMS at 0.25% v/v and 2.5% v/v. Stinger HL was mixed with Roundup PowerMax3 and Select Max with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v. Stinger HL, Roundup PowerMax3, S-metolachlor and ethofumesate were mixed with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v.

Table 5. Sugarbeet stand and yield parameters in response to herbicide treatment, Brushvale, ND, 2025.[a]

Treatment[b]	Rate	Sugarbeet Stand	Root Yield	Sucrose	Recoverable Sucrose
	fl oz/A	N/100 ft	Ton/A	%	lb/A
Stinger HL + RUPM3 / Stinger HL + RUPM3	1.8+25/1.8+25	24	23.7	16.3	4632
Stinger HL + RUPM3 / Stinger HL + RUPM3	2.4+25/2.4+25	21	21.1	16.2	3807
Stinger HL + RUPM3 / Stinger HL + RUPM3	3.2+25/3.2+25	20	20.1	16.6	3555
Stinger HL + Select Max + RUPM3/ Stinger HL +Select Max + RUPM3	2.4+10+25/ 2.4+10+25	25	25.2	16.5	5010
Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	2.4+16+6+25/ 2.4+16+6+25	23	23.2	16.7	4772
Ethofumesate / Stinger HL + *S*-metolachlor + etho + RUPM3/ Stinger HL + *S*-metolachlor + etho +RUPM3	96/2.4+16+6+25/ 2.4+16+6+25	23	23.2	16.2	4379
RUPM3 + etho / RUPM3 + etho	25+6/25+6	26	25.9	16.1	5151
LSD (0.10)		NS	NS	NS	NS

[a]Means followed by the same alphabetical letter within columns are not significantly different at the 0.1 alpha level.
[b]Stinger HL was mixed with Roundup PowerMax3 plus Prefer 90 NIS and Amsol liquid AMS at 0.25% v/v and 2.5% v/v. Stinger HL was mixed with Roundup PowerMax3 and Select Max with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v. Stinger HL, Roundup PowerMax3, S-metolachlor and ethofumesate were mixed with HSMOC at 1 pt/A and Amsol liquid AMS at 2.5% v/v.

Discussion

We observed malformation injury, especially following the repeat Stinger HL application. Malformation injury tended to increase with Stinger HL rate but was less 9 to 14 days after application. We did not observe loss of root yield, sucrose content or recoverable sucrose per acre. S-metolachlor mixed with Stinger HL, Roundup PowerMax3 and ethofumesate increased malformation injury as compared to Stinger HL, Roundup PowerMax3 and ethofumesate alone. We also measure less root yield and recoverable sucrose.

Does S-metolachlor increase malformation injury from Stinger HL, PowerMax3 and ethofumesate? We have previously reported that *S*-metolachlor mixed with Roundup PowerMax3 and ethofumesate, either alone or following ethofumesate and Dual Magnum PRE does not reduce root yield, sucrose content or recoverable sucrose per acre as compared to other treatments (Table 6). In greenhouse experiments we have observed that sugarbeet injury from Betamix and/or Lorsban are exacerbated by 'activators' such as a Stinger HL...under certain environmental conditions. Our first suggestion is to manage the adjuvants added to the spray tank. Injury might be related to the number and amount of formulated adjuvants in tank-mixtures. Second, we remind you that many of our tolerance experiments are conducted under trait neutral conditions and that these programs are effective in fields with weeds. All sugarbeet herbicides must be metabolized by sugarbeet. Metabolism is influenced by cool, wet and cloudy environmental conditions. We urge you to consider the conditions at application rather than compromising what is added to the spray tank.

Table 6. Yield parameters in response to herbicide treatments, multiple location yield experiment, 2021.[a]

Factor A PRE Herbicide	Factor B Postemergence Herbicide[b,c]	Root Yield	Sucrose	Recoverable Sucrose
		Ton/A	%	lb/A
No	glyphosate / glyphosate	37.9 a	15.9	10,415 a
No	*S*-metolachlor + etho / *S*-metolachlor + etho	36.0 a	15.8	10,033 a
PRE	glyphosate/glyphosate	37.9 a	15.7	10,215 a
PRE	*S*-metolachlor + etho / *S*-metolachlor + etho	36.9 a	15.7	10,133 a
P-Value		<0.0001	0.2402	<0.0001

[a]Means followed by the same alphabetical letter within columns are not significantly different at the 0.05 alpha level.
[b]Roundup PoweMax mixed with treatments.
[c]etho=ethofumesate.