

EFFICACY OF ‘RESCUE’ HERBICIDES IN SUGARBEET

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The objective of this trial was to evaluate ‘rescue’ control of waterhemp using herbicides in sugarbeet. Rescue applications of herbicides are made after an initial herbicide application fails to provide adequate weed control. This is often the situation when glyphosate resistance is first observed in weeds in a field and the initial application of glyphosate failed to provide adequate weed control.

MATERIALS AND METHODS

An experiment was conducted near Lake Lillian, MN in 2017. The seedbed was prepared using a ‘s-tine’ field cultivator. Crystal ‘M380’ was seeded in 22-inch rows at 60,500 seeds per acre on May 8. Post emergence (POST) treatments were applied June 6 and 20. All herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO₂ at 40 psi to the center four rows of six row plots 40 feet in length.

A similar experiment was conducted near Moorhead, MN in 2017. The seedbed was prepared using a Kongskilde ‘s-tine’ field cultivator equipped with rolling baskets on May 10. Hillehog ‘HM4022RR’ sugarbeet was seeded in 22-inch rows at 60,560 seeds per acre on May 11 with a John Deere 1700XP 6-row planter. POST treatments were applied June 29 and July 7. All herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO₂ at 35 psi to the center four rows of six row plots 40 feet in length.

All weed control evaluations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Experimental design was randomized complete block with 4 replications for each trial. Data were analyzed with the ANOVA procedure of ARM, version 2017.4 software package.

Table 1. Application information for trials at Lake Lillian and Moorhead, MN in 2017.

	Lake Lillian, MN		Moorhead, MN	
	A	B	A	B
Date	June 6	June 20	June 29	July 7
Time of Day	10:00 AM	9:45 AM	10:30 AM	9:30 AM
Air Temperature (F)	78	70	70	75
Relative Humidity (%)		48	69	57
Wind Velocity (mph)	10	11	0	6
Wind Direction	SE	N	NE	E
Soil Temp. (F at 6")		71	69	70
Soil Moisture	Good	Good	Good	Good
Cloud Cover (%)	0	10	95	0
Next Rainfall (amount)	June 11 (1.0")	June 28 (1.0")	July 4	July 18
Sugarbeet Stage	4 leaf	8 leaf	10-12 leaf	14-16 leaf
Waterhemp	4 inch	6 inch	2.5 inch	5 inch
Common Lambsquarters	4 inch	6 inch	4 inch	6 inch

SUMMARY

Lake Lillian

Waterhemp showed an intermediate level of glyphosate resistance. Roundup PowerMax (glyphosate) at 28 fl oz/A fb Roundup PowerMax at 28 fl oz + Ethofumesate 4 SC (ethofumesate) at 6 fl oz + Destiny HSMOC at 1.5 pt/A +

N-Pak AMS at 2.5 % v/v gave only 63% and 50% waterhemp control at 6 and 16 days after application (DAT) B, respectively (Table 2). At 16 DAT, neither UpBeet (triflurosulfuron) at 1 oz/A, Ethofumesate 4 SC at 12 fl oz/A, or a combination of both herbicides gave greater than 25% control of waterhemp. The lack of waterhemp control from UpBeet at 1 oz/A suggests the population may also have been resistant to ALS herbicides. No 'rescue' treatment tested gave acceptable control of waterhemp.

Table 2. Waterhemp and common lambsquarters control from rescue herbicides at Lake Lillian, MN in 2017.

Treatment	Rate/A	Appl ¹	June 26	July 6	July 6
			waterhemp	waterhemp	lambsquarters
			-----% control-----		
UpBeet + MSO	1 oz + 1.5 pt	B	3	18	0
Ethofumesate 4SC + MSO	12 fl oz + 1.5 pt	B	8	25	8
UpBeet + Ethofumesate 4SC + MSO	1 oz + 12 fl oz + 1.5 pt	B	3	20	10
Roundup PowerMax fb	28 fl oz fb	A			
Roundup PowerMax+ Ethofumesate + N-Pak AMS + Destiny HC	28 fl oz + 6 fl oz + 2.5 % v/v + 1.5 pt	B	63	50	100
LSD (0.05)			11	15	4

¹Appl= Application code listed in Table 1.

Common lambsquarters control was 100% from the treatment containing Roundup PowerMax at 16 DAT (Table 2). UpBeet failed to provide any lambsquarters control. Ethofumesate 4 SC and the combination of UpBeet + Ethofumesate gave 10% or less lambsquarters control.

Moorhead

Sugarbeet injury was generally negligible from herbicides applied. Betamix at 3 pt/A gave 10% to 15% visual injury at 8 and 17 DAT (Table 3) even though sugarbeet were 14 to 16 leaf at application. Injury symptoms were necrotic spots on leaves. All other treatments gave 10% or less injury.

Waterhemp showed an intermediate level of glyphosate resistance. Control from two applications of Roundup PowerMax + Ethofumesate was 78% at 8 days after the second application but only 22% at 17 days after the second application. Treatments containing Betamix provided control ranging from 28% to 40% at 8 DAT but declined to 13% to 36% at 17 DAT. At 17 DAT, those treatments that were a tank-mix of two herbicides tended to give better control than individual herbicides, though no treatment gave greater than 36% control (Betamix + Ethofumesate). No treatment tested provided adequate control of waterhemp.

Common lambsquarters control ranged from 0 to 48% control at 17 DAT from treatments not containing Roundup. Two applications of Roundup PowerMax + Ethofumesate gave 100% common lambsquarters control at 17 DAT.

Table 3. Sugarbeet injury and waterhemp and common lambsquarters control from rescue herbicides at Moorhead, MN in 2017.

Treatment	Rate/A	Appl ¹	-----July 15-----			-----July 24-----		
			sgbt	wahe	colq	sgbt	wahe	colq
			-----%-----					
Betamix	3 pt	B	10	28	45	15	13	18
UpBeet	1 oz	B	8	10	3	0	8	0
Ethofumesate 4SC	12 fl oz	B	0	18	15	8	25	33
Betamix + UpBeet	3 pt + 1 oz	B	8	40	45	8	33	20
Betamix + Ethofumesate 4SC	3 pt + 12 fl oz	B	8	23	30	10	36	30
UpBeet + Ethofumesate 4SC	1 oz + 12 fl oz	B	0	10	23	0	30	43

Betamix + UpBeet + Ethofumesate 4SC	3 pt + 1 oz + 12 fl oz	B	8	30	38	5	33	48
Roundup PowerMax+ Ethofumesate fb	28 fl oz + 6 fl oz fb	A	0	78	100	0	22	100
Roundup PowerMax+ Ethofumesate	28 fl oz + 6 fl oz	B						
LSD (0.05)			NS	24	24	8	18	12

CONCLUSIONS

Treatments that did not contain Roundup PowerMax failed to provide adequate control of waterhemp, regardless of herbicide combination or location. Two applications of Roundup PowerMax failed to provide adequate waterhemp control at 16 DAT at either location. Making 'rescue' applications of POST herbicides to control waterhemp that survived a previous POST application will likely result in little to no improvement in waterhemp control in sugarbeet.

Common lambsquarters control was near perfect at both locations from two applications of Roundup PowerMax. All 'rescue' treatments tested failed to provide greater than 48% lambsquarters control at 16 DAT. However, nearly all herbicides evaluated provided some control. This suggests that, if used in conjunction with glyphosate, these herbicides may help delay the onset of glyphosate resistance in common lambsquarters.