

WEED CONTROL IN GLYPHOSATE-RESISTANT SUGARBEET IN 2008

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Weeds continue to be named as one of the most serious production problems by respondents to the annual survey of sugarbeet producers in Minnesota and eastern North Dakota. Glyphosate-resistant sugarbeets were commercially available for the first time in Minnesota and eastern North Dakota in 2008. Nearly 45% of the sugarbeet acres were planted to glyphosate-resistant sugarbeets in Minnesota and eastern North Dakota in 2008.

The major objectives of research in 2008 were to evaluate control of volunteer Roundup Ready® crops in Roundup Ready sugarbeets with various conventional sugarbeet herbicides and to evaluate weed control from glyphosate applied alone at various application timings, in combination with conventional sugarbeet herbicides, and in sequence with conventional sugarbeet herbicides. Roundup Ready sugarbeets were not planted in any plots in 2008 due to failed negotiations of a research agreement between the University and Monsanto, and the sugarbeet seed companies. With no planted crop, maximum weed pressure was obtained at most locations with multiple late weed flushes. Therefore weed control ratings are reduced, but provide very accurate results for season-long weed control.

The Roundup Ready Crop study was conducted at one location, near Prosper, ND. The weed control studies were conducted at Cavalier, Kindred, and Mayville, ND. The studies are presented separately with materials and methods and an experimental summary in the above order. Glyphosate-resistant common ragweed is present at the Mayville, ND location. There were almost no weeds present in the Roundup Ready Crop study.

Control of Roundup Ready crops in Roundup Ready sugarbeet, Prosper, 2008.

Roundup Ready sugarbeet was not planted in the study. Roundup Ready canola, soybean and corn were seeded in separate 8 foot wide strips across the herbicide plots on May 7th. All herbicide treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 6.67 feet of 11 foot wide plots on June 19th and July 1st. On June 19th, the air temperature was 74°F, relative humidity was 39%, six inch soil temperature was 61°F, wind was 4 mph, cloud cover was 5%, soil moisture was good, canola was 4 leaf to 16 inches tall, soybean was 3-6 inches tall and corn was 2-4 leaf (4-8 inches tall). On July 1st, the air temperature was 87°F, relative humidity was 48%, six inch soil temperature was 80°F, wind was 3 mph, cloud cover was 10%, soil moisture was good, canola was flowering, soybean was 4-10 inches tall and corn was 4-7 leaf (8-14 inches tall). Control of Roundup Ready canola, soybean and corn was evaluated on July 2nd, July 15th and July 20th. All evaluations are a visual estimate of percent fresh weight reduction in the treated plot compared to the adjacent untreated strips.

Treatment*	Rate (lb ai/A)	July 2			July 15			July 20		
		Cano cntl	Soyb cntl	Corn cntl	Cano cntl	Soyb cntl	Corn cntl	Cano cntl	Soyb cntl	Corn cntl
		%	%	%	%	%	%	%	%	%
Glyt+AMS	1+2.5	0	0	0	0	0	0	0	0	0
Glyt+AMS+Tfsu	1+2.5+0.008	10	15	14	11	43	28	6	31	19
Glyt+AMS+Tfsu+P90	1+2.5+0.008+0.25%	23	23	45	24	58	65	14	39	55
Glyt+AMS+Tfsu+MSO	1+2.5+0.008+1.5%	48	56	80	40	81	81	25	74	69
Glyt+AMS+Tfsu+DestinyHC	1+2.5+0.008+1%	46	45	81	40	76	77	22	71	67
Glyt+AMS+Clpy	1+2.5+0.03	0	81	0	0	87	0	0	95	0
Glyt+AMS+Clpy	1+2.5+0.06	0	89	0	0	100	0	0	100	0
Glyt+AMS+Clpy+P90	1+2.5+0.03+0.25%	0	82	0	0	97	0	0	96	0
Glyt+AMS+Clpy+MSO	1+2.5+0.03+1.5%	3	82	0	1	97	0	0	97	0
Glyt+AMS+Clpy+DestinyHC	1+2.5+0.03+1%	0	82	0	0	97	0	0	99	0
Glyt+AMS+CletM	1+2.5+0.03	0	0	95	0	0	100	0	0	99
Glyt+AMS+CletM	1+2.5+0.06	0	0	98	0	0	100	0	0	96
Glyt+AMS+CletM+P90	1+2.5+0.03+0.25%	0	0	93	0	0	100	0	0	93
Glyt+AMS+CletM+MSO	1+2.5+0.03+1.5%	0	0	96	0	0	100	0	0	96
Glyt+AMS+CletM+DestinyHC	1+2.5+0.03+1%	0	0	95	0	0	100	0	0	96
Glyt+AMS+Quiz-T	1+2.5+0.03	0	0	99	0	0	100	0	0	100
Glyt+AMS+Quiz-T	1+2.5+0.06	0	0	100	0	0	100	0	0	94
Glyt+AMS+Quiz-T+P90	1+2.5+0.03+0.25%	0	0	98	0	0	100	0	0	93
Glyt+AMS+Clet	1+2.5+0.03	0	0	71	0	0	73	0	0	68
Glyt+AMS+Clet	1+2.5+0.06	0	0	94	0	0	100	0	0	97
Glyt+AMS+Clet+P90	1+2.5+0.03+0.25%	0	0	86	0	0	94	0	0	86
Glyt+AMS+De&Ph&Et+Tfsu	1+2.5+0.33+0.008	53	58	33	57	80	63	43	69	40
Glyt+AMS+De&Ph&Et+Tfsu+P90	1+2.5+0.33+0.008+0.25%	47	60	51	44	77	61	28	68	44
Glyt+AMS+De&Ph&Et+Tfsu+MSO	1+2.5+0.33+0.008+1.5%	61	67	75	60	83	81	46	76	67
Glyt+AMS+De&Ph&Et+Tfsu+DestinyHC	1+2.5+0.33+0.008+1%	59	70	70	53	84	75	48	79	60
Untreated Check	0	0	0	0	0	0	0	0	0	0
EXP MEAN		13	31	57	13	41	61	9	38	55
C.V. %		33	19	12	42	8	10	59	11	12
LSD 5%		6	8	10	7	4	8	7	6	9
LSD 1%		8	11	13	10	6	11	10	8	12
# OF REPS		4	4	4	4	4	4	4	4	4

*Glyt=Roundup WeatherMax formulation of glyphosate (1.0lbae/A=28floz/A); Tfsu=UpBeet; Clpy=Stinger; Quiz-T=Targa formulation of quizalofop; CletM=Select Max; Clet=Select formulation of clethodim; P90=Premier 90 non-ionic surfactant from West Central; MSO=methylated seed oil from Loveland; DestinyHC=methylated seed oil from Winfield; AMS=Am-Stik liquid ammonium sulfate from West Central; Cano=canola; Soyb=soybean.

Experiment continued on next page.

Control of Roundup Ready crops in Roundup Ready sugarbeet, Prosper, 2008. (Continued)

Summary: On July 2nd, after the first application, maximum control of all three crops was usually obtained from the addition of MSO with Tfsu (UpBeet) or De&Ph&Et (Progress) plus UpBeet. There was no difference with Stinger rates or adjuvants for control of soybean, although the highest rate provided the greatest control. Quiz-T (Targa) controlled the most corn. Rate and adjuvant was important for improving control of corn with Clet (Select 2EC).

On July 20th, 19 days after the last application, maximum control of canola was obtained with Progress (0.33 lb ai/A) plus UpBeet (0.008 lb ai/A) in combination with MSO, DestinyHC, or no additional adjuvant. The addition of NIS caused a reduction in canola control with this herbicide combination. There was no difference in soybean control based upon Stinger rates or adjuvants, although the highest rate of Stinger provided complete control. The addition of MSO and DestinyHC to UpBeet and Progress plus UpBeet maximized soybean control compared to NIS or no adjuvant, although not to the level of Stinger. There was no difference in control of corn with Targa, Select MAX, and the maximum rate of Select 2EC. However, corn control was reduced when NIS was included with the Select 2EC and further reduced if no adjuvant was included. UpBeet and Progress plus UpBeet in combination with MSO or DestinyHC maximized control of corn compared to NIS and no adjuvant, although not as effective as the ACCase inhibiting herbicides.

Sugarbeet weed control, Cavalier, 2008. Roundup Ready sugarbeets were not planted in the study. Soil was tilled and preemergence ethofumesate was applied May 1. Postemergence treatments were applied May 27, June 3, June 16, June 23 and June 30. All treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 6.67 feet of 11 foot wide plots. Powell amaranth/redroot pigweed, kochia, common lambsquarters, common mallow and pale smartweed control were evaluated July 13 and July 28. All evaluations are a visual estimate of percent fresh weight reduction in the treated plot compared to the adjacent untreated strips.

Date of Application	May 1	May 27	June 3	June 16	June 23	June 30
Time of Day	3:30 pm	1:30 pm	10:30 am	11:30 am	10:45 am	11:00 am
Air Temperature (°F)	62	60	62	68	75	81
Relative Humidity (%)	10	12	27	41	35	40
Soil Temp. (°F at 6")	44	50	54	55	64	66
Wind Velocity (mph)	16	5	11	3	6	7
Cloud Cover (%)	60	5	95	0	80	50
Soil Moisture	Good	Good	Good	Good	Good	Good
Powell amaranth / Redroot Pigweed	PRE	Cot	Cot-2 leaf	Cot-6 leaf	2-8 leaf	4-10 leaf
Kochia	PRE	0.25-0.5" diameter	0.25-1" diameter	0.5" diam. - 3" tall	4-6 inches tall	10-14 inch. tall
Common Lambsquarters	PRE	Cot-2 leaf	2-8 leaf	2-5" tall	4-8" tall	12-16"
Common Mallow	PRE	Cot	Cot-2 leaf	2-6 leaf	4-8 leaf	4-8" tall
Pale Smartweed	PRE	Cot	2-4 leaf	2-6 leaf	6-10 leaf	6-10" tall

Summary: On July 13th, ethofumesate + glyphosate followed by glyphosate and Outlook and UpBeet combined with glyphosate improved control of Powell amaranth and redroot pigweed. On July 28th, Outlook and UpBeet combined with glyphosate still improved control of Powell amaranth and redroot pigweed. Glyphosate applied on June 3rd and June 30th provided the greatest control of kochia, common lambsquarters, common mallow, pale smartweed, and Powell amaranth and redroot pigweed. Two applications of conventional herbicides followed by glyphosate provided nearly the same control of kochia, common lambsquarters, common mallow, pale smartweed, and Powell amaranth and redroot pigweed. Glyphosate applied on June 3rd and June 30th controlled more Powell amaranth and redroot pigweed compared to three glyphosate applications because the larger weed biomass on June 3rd created a mulch layer that reduced germination of pigweed species. Glyphosate controlled more kochia and common mallow compared to conventional herbicides applied only.

Experiment continued on the next page.

Sugarbeet weed control, Cavalier, 2008. (Continued)

July 13 Evaluation

Treatment	(Date of Application)	Rate	Poam Rrpw cntl %	Kocz cntl %	Colq cntl %	Coma cntl %	Pasw cntl %
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27, June 3, 16, 23)	0.08+0.004+0.03+0.03+1.5%	68	28	77	78	80
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.12+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3, 16)	0.16+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.25+0.004+0.03+0.03+1.5%	73	38	89	84	86
De&Ph&Et+Tfsu+Clpy+CletM	(May 27)	0.25+0.008+0.06+0.03					
De&Ph&Et+Tfsu+Clpy+CletM	(June 3, 16)	0.33+0.008+0.06+0.03					
De&Ph&Et+Tfsu+Clpy+CletM	(June 23)	0.5+0.008+0.06+0.03	91	69	99	79	95
Ethofumesate(PRE)	(May 1)	3.75					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.12+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3, 16)	0.16+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.25+0.004+0.03+0.03+1.5%	82	65	92	82	84
Glyphosate+AMS	(May 27, June 16)	1+2.5	61	92	89	95	93
Glyphosate+AMS	(May 27, June 23)	1+2.5	86	99	95	100	100
Glyphosate+AMS	(June 3, 23)	1+2.5	86	100	96	98	100
Glyphosate+AMS	(June 3, 30)	1+2.5	98	99	98	99	100
Glyphosate+AMS	(May 27, June 16, 30)	1+2.5	95	100	99	99	100
Ethofumesate (POST)	(May 27)	3.75	21	20	23	20	19
Etho+Glyt+AMS	(May 27)	3.75+1+2.5					
Glyt+AMS	(June 23)	1+2.5	90	99	99	97	98
Glyt+AMS	(May 27)	1+2.5					
Glyt+AMS+Dime	(June 16)	1+2.5+0.98	74	92	91	94	89
Glyt+AMS+Tfsu	(June 3, 23)	1+2.5+0.008	94	99	98	98	99
Glyt+AMS+Clpy	(June 3, 23)	1+2.5+0.06	85	98	99	98	99
Glyt+AMS	(June 3)	1+2.5					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.5+0.015+0.09+0.08+1.5%	69	72	87	85	94
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3)	0.25+0.008+0.06+0.06+1.5%					
Glyt+AMS	(June 23)	1+2.5	86	98	98	96	100
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.16+0.008+0.06+0.06+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 16)	0.25+0.008+0.06+0.06+1.5%					
Glyt+AMS	(June 30)	1+2.5	96	98	98	99	100
Glyt+AMS	(May 27, June 16)	1+2.5					
Glyt+AMS+Headline	(June 30)	1+2.5+0.1	95	100	98	99	99
Glyt+AMS	(May 27, June 16)	1+2.5					
Glyt+AMS+SuperTin	(June 30)	1+2.5+0.25	95	100	99	97	100
EXP MEAN			81	82	91	89	91
C.V. %			3	5	5	5	5
LSD 5%			3	6	7	6	6
LSD 1%			4	8	9	8	8
# OF REPS			4	4	4	4	4

*Glyt=Roundup WeatherMAX; De&Ph&Et=Progress; Tfsu=UpBeet; Clpy=Stinger; CletM>Select Max; Etho=Nortron; Dime=Outlook; AMS=Am-Stik liquid ammonium sulfate from West Central; MSO=methylated seed oil from Loveland; Poam&Rrpw=Powell amaranth and redroot pigweed.

Experiment continued on the next page.

Sugarbeet weed control, Cavalier, 2008. (Continued)

July 28 Evaluation

Treatment	(Date of Application)	Rate (lb ai/A)	Poam Rrpw cntl %	Kocz cntl %	Colq cntl %	Coma cntl %	Pasw cntl %
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27, June 3, 16, 23)	0.08+0.004+0.03+0.03+1.5%	44	21	61	68	84
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.12+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3, 16)	0.16+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.25+0.004+0.03+0.03+1.5%	45	30	81	70	78
De&Ph&Et+Tfsu+Clpy+CletM	(May 27)	0.25+0.008+0.06+0.03					
De&Ph&Et+Tfsu+Clpy+CletM	(June 3, 16)	0.33+0.008+0.06+0.03					
De&Ph&Et+Tfsu+Clpy+CletM	(June 23)	0.5+0.008+0.06+0.03	77	49	94	59	88
Ethofumesate (PRE)	(May 1)	3.75					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.12+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3, 16)	0.16+0.004+0.03+0.03+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.25+0.004+0.03+0.03+1.5%	59	44	91	54	86
Glyphosate+AMS	(May 27, June 16)	1+2.5	28	81	81	90	87
Glyphosate+AMS	(May 27, June 23)	1+2.5	62	91	89	95	95
Glyphosate+AMS	(June 3, 23)	1+2.5	63	95	95	88	96
Glyphosate+AMS	(June 3, 30)	1+2.5	85	95	94	94	93
Glyphosate+AMS	(May 27, June 16, 30)	1+2.5	77	96	91	91	93
Ethofumesate (POST)	(May 27)	3.75	15	16	18	19	13
Etho+Glyt+AMS	(May 27)	3.75+1+2.5					
Glyt+AMS	(June 23)	1+2.5	66	91	93	88	92
Glyt+AMS	(May 27)	1+2.5					
Glyt+AMS+Dime	(June 16)	1+2.5+0.98	48	78	86	86	86
Glyt+AMS+Tfsu	(June 3, 23)	1+2.5+0.008	76	88	92	93	93
Glyt+AMS+Clpy	(June 3, 23)	1+2.5+0.06	65	86	92	93	97
Glyt+AMS	(June 3)	1+2.5					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 23)	0.5+0.015+0.09+0.08+1.5%	40	44	88	93	91
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 3)	0.25+0.008+0.06+0.06+1.5%					
Glyt+AMS	(June 23)	1+2.5	67	88	91	92	97
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(May 27)	0.16+0.008+0.06+0.06+1.5%					
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 16)	0.25+0.008+0.06+0.06+1.5%					
Glyt+AMS	(June 30)	1+2.5	85	94	93	96	97
Glyt+AMS	(May 27, June 16)	1+2.5					
Glyt+AMS+Headline	(June 30)	1+2.5+0.1	77	94	92	93	97
Glyt+AMS	(May 27, June 16)	1+2.5					
Glyt+AMS+SuperTin	(June 30)	1+2.5+0.25	78	95	94	91	97
EXP MEAN			61	72	85	82	87
C.V. %			8	10	8	8	7
LSD 5%			7	10	9	9	8
LSD 1%			9	14	12	13	11
# OF REPS			4	4	4	4	4

*Glyt=Roundup WeatherMAX; De&Ph&Et=Progress; Tfsu=UpBeet; Clpy=Stinger; CletM>Select Max; Etho=Nortron; Dime=Outlook; AMS=Am-Stik liquid ammonium sulfate from West Central; MSO=methylated seed oil from Loveland; Poam&Rrpw=Powell amaranth and redroot pigweed; Kocz=kochia; Colq=lambsquarters; Coma=common mallow; Pasw=pale smartweed.

Sugarbeet weed control, Kindred, 2008. Sugarbeets were not planted in this study. Soil was tilled and preemergence ethofumesate was applied May 8. Postemergence treatments were applied May 22, May 29, June 17, June 24 and July 1. All treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 6.67 feet of 11 foot wide plots. Ladysthumb, wild buckwheat and redroot pigweed were evaluated July 15 and July 29. All evaluations are a visual estimate of percent fresh weight reduction in the treated plot compared to the adjacent untreated strips.

Date of Application	May 8	May 22	May 29	June 17	June 24	July 1
Time of Day	10:00 am	12:15 pm	11:00 am	9:00 am	10:45 am	11:00 am
Air Temperature (°F)	49	67	61	69	83	81
Relative Humidity (%)	24	24	50	40	42	40
Soil Temp. (°F at 6")	44	52	53	56	66	66
Wind Velocity (mph)	4	11	12	5	2	7
Cloud Cover (%)	100	10	100	0	0	50
Soil Moisture	Good	Good	Good	Good	Good	Good
Ladysthumb	PRE	Cot	Cot-1 leaf	Cot-6 leaf	2-8 leaf	2 leaf-5"
Wild Buckwheat	PRE	Cot-1 leaf	Cot-2 leaf	Cot-10 lf	4-12 leaf	Vining
Redroot Pigweed	PRE	Cot	Cot-1 leaf	Cot-6 leaf	2-8 leaf	4-10 leaf

Summary: Based upon the July 29th evaluation, Outlook, UpBeet, and Stinger combined with glyphosate improved ladysthumb control compared to glyphosate applied alone at the same application timings. UpBeet combined with glyphosate improved wild buckwheat control compared to glyphosate applied alone at the same application timings. Glyphosate applied three times provided the greatest (92%) wild buckwheat control. Ethofumesate applied POST with and without glyphosate and Outlook and Upbeet combined with glyphosate improved control of Powell amaranth and redroot pigweed (Rrpw) compared to glyphosate applied alone at the same application timings. Ethofumesate applied PRE and followed by the mid-rate of conventional sugarbeet herbicides controlled ladysthumb, wild buckwheat, Powell amaranth, and redroot pigweed similarly to glyphosate applied lastly on July 7th two and three times and greater than glyphosate applied on May 22nd followed by June 17th and May 29th followed by June 24th. Conventional sugarbeet herbicides applied on May 29th followed by glyphosate improved ladysthumb and wild buckwheat control compared to glyphosate applied at the same application timings.

Experiment continued on next page.

Sugarbeet weed control, Kindred, 2008. (Continued)

Treatment*	(Date of Application)	Rate (lb ai/A)	July 15			July 29		
			Lath cntl %	Wibw cntl %	Rrpw cntl %	Lath cntl %	Wibw cntl %	Rrpw cntl %
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 22, 29, June 17, 24)		0.08+0.004+0.03+0.03+1.5%	63	79	38	62	63	39
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 22)		0.12+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 29, June 17)		0.16+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 24)		0.25+0.004+0.03+0.03+1.5%	67	88	44	67	72	41
De&Ph&Et+Tfsu+Clpy+CletM (May 22)		0.25+0.008+0.06+0.03						
De&Ph&Et+Tfsu+Clpy+CletM (May 29, June 17)		0.33+0.008+0.06+0.03						
De&Ph&Et+Tfsu+Clpy+CletM (June 24)		0.5+0.008+0.06+0.03	80	85	75	75	75	56
Ethofumesate (PRE) (May 8)		3.75						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 22)		0.12+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 29, June 17)		0.16+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 24)		0.25+0.004+0.03+0.03+1.5%	94	95	90	90	89	87
Glyphosate+AMS (May 22, June 17)		1+2.5	77	79	38	75	75	28
Glyphosate+AMS (May 22, June 24)		1+2.5	75	73	66	82	75	48
Glyphosate+AMS (May 29, June 24)		1+2.5	74	88	56	72	70	53
Glyphosate+AMS (May 29, July 1)		1+2.5	86	80	96	94	88	92
Glyphosate+AMS (May 22, June 17, July 1)		1+2.5	97	95	85	91	92	73
Ethofumesate (POST) (May 22)		3.75	45	15	90	28	10	69
Etho+Glyt+AMS (May 22)		3.75+1+2.5						
Glyt+AMS (June 24)		1+2.5	87	76	83	86	69	66
Glyt+AMS (May 22)		1+2.5						
Glyt+AMS+Dime (June 17)		1+2.5+0.98	90	85	90	87	78	83
Glyt+AMS+Tfsu (May 29, June 24)		1+2.5+0.008	89	88	85	87	83	80
Glyt+AMS+Clpy (May 29, June 24)		1+2.5+0.06	83	92	64	82	76	39
Glyt+AMS (May 29)		1+2.5						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 24)		0.5+0.015+0.09+0.08+1.5%	60	92	41	59	75	39
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 29)		0.25+0.008+0.06+0.06+1.5%						
Glyt+AMS (June 24)		1+2.5	86	86	70	84	82	56
De&Ph&Et+Tfsu+Clpy+CletM+MSO (May 22)		0.16+0.008+0.06+0.06+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 17)		0.25+0.008+0.06+0.06+1.5%						
Glyt+AMS (July 1)		1+2.5	89	81	93	90	83	81
Glyt+AMS (May 22, June 17)		1+2.5						
Glyt+AMS+Headline (July 1)		1+2.5+0.1	97	94	88	91	89	74
Glyt+AMS (May 22, June 17)		1+2.5						
Glyt+AMS+SuperTin (July 1)		1+2.5+0.25	98	96	96	96	95	95
EXP MEAN			81	82	73	79	76	63
C.V. %			8	7	12	8	11	19
LSD 5%			9	9	13	9	12	17
LSD 1%			12	11	17	12	16	23
# OF REPS			4	4	4	4	4	4

*Glyt=Roundup WeatherMAX; De&Ph&Et=Progress; Tfsu=UpBeet; Clpy=Stinger; CletM=Select Max; Etho=Nortron; Dime=Outlook; AMS=Am-Stik liquid ammonium sulfate from West Central; MSO=methylated seed oil from Loveland; Lath=ladythumb; Wibw=wild buckwheat.

Sugarbeet weed control, Mayville, 2008. Roundup Ready sugarbeet was not planted in this study. Soil was tilled and preemergence ethofumesate was applied May 1st. Postemergence treatments were applied on June 4th, June 13th, June 20th, June 26th and July 3rd. All treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 6.67 feet of 11 foot wide plots. Glyphosate + AMS at 1.5 lb ae/A + 1.7 lbs/A was sprayed over the entire experiment on August 7th. Common ragweed and common lambsquarters were evaluated on June 20th, July 17th, July 30th and October 8th. Volunteer soybean was evaluated October 8th. All evaluations are a visual estimate of percent fresh weight reduction in the treated plot compared to the adjacent untreated strips.

Date of Application	May 1	June 4	June 13	June 20	June 26	July 3
Time of Day	10:30 am	12:45 pm	9:00 am	10:45 am	9:15 am	9:00 am
Air Temperature (°F)	50	65	61	76	76	67
Relative Humidity (%)	30	50	44	29	39	40
Soil Temp. (°F at 6")	42	58	55	68	71	66
Wind Velocity (mph)	17	3	10	15	0	2
Cloud Cover (%)	100	100	60	0	95	30
Soil Moisture	Good	Good	Good	Good	Good	Good
Common Ragweed	---	Cot-4 leaf	Cot-8 leaf	4lf-3"tall	4lf-6"tall	6lf-8"tall
Common Lambsquarters	---	Cot-6 leaf	Cot-10 lf	6lf-3"tall	6lf-6"tall	6lf-8"tall

Summary: On June 20th, ethofumesate (3.75 lb ai/A) plus glyphosate improved control of common lambsquarters compared to a single application of glyphosate. As time progresses, common lambsquarters control declined with little advantage to adding ethofumesate to glyphosate. Full rates of conventional sugarbeet herbicides applied four times provided the same control as glyphosate applied lastly on July 3rd.

Based upon the July 30th evaluation, common ragweed was not controlled with glyphosate at this location even with three glyphosate applications. Therefore, glyphosate-resistant common ragweed biotypes exist within this common ragweed population. Glyphosate applied three times provided greater common ragweed control compared to two glyphosate applications, demonstrating glyphosate resistance is low-level. Ethofumesate plus glyphosate followed by glyphosate and glyphosate followed by glyphosate plus Outlook improved common ragweed control compared to glyphosate applied twice at the same times, although control was fair and poor, respectively. The number of applications and the rate of Stinger influenced common ragweed control. Stinger applied four times at 0.06 lb ae/A controlled all common ragweed while two applications of Stinger at 0.06 lb ae/A only controlled 90% of common ragweed. Single applications of Stinger even at high rates and two applications of Stinger at low rates controlled even fewer common ragweed.

On October 8th, common ragweed control was similar for all glyphosate treatments applied prior to July 4th, although still ineffectively controlled. This was due to an August 7th application of glyphosate at 1.5 lb ae/A as the common ragweed was beginning to flower. Only treatments including Stinger provided effective control of volunteer Roundup Ready soybeans at this location. Ethofumesate applied POST controlled 55% of volunteer Roundup Ready soybeans. Common lambsquarters control was the same for all treatments and nearly complete after the August 7th glyphosate application.

Experiment continued on next page.

Sugarbeet weed control, Mayville, 2008. (Continued)

Treatment*	(Date of Application)	Rate (lb ai/A)	June 20		July 17		July 30	
			Cora cntl %	Colq cntl %	Cora cntl %	Colq cntl %	Cora cntl %	Colq cntl %
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 4, 13, 20, 26)	0.08+0.004+0.03+0.03+1.5%	94	82	100	71	99	51
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 4)	0.12+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 13, 20)	0.16+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 26)	0.25+0.004+0.03+0.03+1.5%	97	95	100	91	96	78
De&Ph&Et+Tfsu+Clpy+CletM	(June 4)	0.25+0.008+0.06+0.03						
De&Ph&Et+Tfsu+Clpy+CletM	(June 13, 20)	0.33+0.008+0.06+0.03						
De&Ph&Et+Tfsu+Clpy+CletM	(June 26)	0.5+0.008+0.06+0.03	99	99	100	98	100	84
Ethofumesate(PRE)	(May 1)	3.75						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 4)	0.12+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 13, 20)	0.16+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 26)	0.25+0.004+0.03+0.03+1.5%	98	93	98	95	96	74
Glyphosate+AMS	(June 4, 20)	1+2.5	87	89	51	89	34	74
Glyphosate+AMS	(June 4, 26)	1+2.5	89	89	75	94	53	74
Glyphosate+AMS	(June 13, 26)	1+2.5	73	98	65	89	51	69
Glyphosate+AMS	(June 13, July 3)	1+2.5	70	99	63	100	54	93
Glyphosate+AMS	(June 4, 20, July 3)	1+2.5	86	93	84	100	70	89
Ethofumesate (POST)	(June 4)	3.75	78	89	33	85	26	67
Etho+Glyt+AMS	(June 4)	3.75+1+2.5						
Glyt+AMS	(June 26)	1+2.5	96	100	84	95	70	85
Glyt+AMS	(June 4)	1+2.5						
Glyt+AMS+Dime	(June 20)	1+2.5+0.98	84	88	69	98	44	82
Glyt+AMS+Tfsu	(June 13, 26)	1+2.5+0.008	71	98	74	94	61	70
Glyt+AMS+Clpy	(June 13, 26)	1+2.5+0.06	81	100	98	94	90	71
Glyt+AMS	(June 13)	1+2.5						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 26)	0.5+0.015+0.09+0.08+1.5%	76	100	89	95	78	81
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 13)	0.25+0.008+0.06+0.06+1.5%						
Glyt+AMS	(June 26)	1+2.5	89	82	95	88	81	71
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 4)	0.16+0.004+0.03+0.03+1.5%						
De&Ph&Et+Tfsu+Clpy+CletM+MSO	(June 20)	0.25+0.004+0.03+0.03+1.5%						
Glyt+AMS	(July 3)	1+2.5	85	79	93	97	79	83
Glyt+AMS	(June 4, 20)	1+2.5						
Glyt+AMS+Headline	(July 3)	1+2.5+0.1	85	88	85	100	70	83
Glyt+AMS	(June 4, 20)	1+2.5						
Glyt+AMS+SuperTin	(July 3)	1+2.5+0.25	87	88	84	99	72	87
EXP MEAN			85	92	81	93	70	77
C.V. %			5	6	10	5	9	9
LSD 5%			6	7	12	7	9	10
LSD 1%			8	10	15	9	12	14
# OF REPS			4	4	4	4	4	4

*Glyt=Roundup WeatherMAX formulation of glyphosate (1.0 lb ae/A = 28 fl oz/A of WeatherMAX); De&Ph&Et=Progress formulation of desmedipham & phenmedipham & ethofumesate; Tfsu=UpBeet formulation of triflurosulfuron; Clpy=Stinger formulation of clopyralid; CletM=Select Max formulation of clethodim; Etho=Nortron formulation of ethofumesate; Dime=Outlook formulation of dimethenamid-P; AMS=Am-Stik liquid ammonium sulfate from West Central; MSO=methylated seed oil from Loveland; Cora=common ragweed; Colq=lambquarters.

Experiment continued on next page.

Sugarbeet weed control, Mayville, 2008. (Continued)

Treatment*	(Date of Application)	Rate (lb ai/A)	October 8		
			Soyb cntl %	Cora cntl %	Colq cntl %
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 4, 13, 20, 26)		0.08+0.004+0.03+0.03+1.5%	96	98	99
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 4)		0.12+0.004+0.03+0.03+1.5%			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 13, 20)		0.16+0.004+0.03+0.03+1.5%			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 26)		0.25+0.004+0.03+0.03+1.5%	100	96	99
De&Ph&Et+Tfsu+Clpy+CletM (June 4)		0.25+0.008+0.06+0.03			
De&Ph&Et+Tfsu+Clpy+CletM (June 13, 20)		0.33+0.008+0.06+0.03			
De&Ph&Et+Tfsu+Clpy+CletM (June 26)		0.5+0.008+0.06+0.03	96	98	97
Ethofumesate(PRE) (May 1)		3.75			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 4)		0.12+0.004+0.03+0.03+1.5%			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 13, 20)		0.16+0.004+0.03+0.03+1.5%			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 26)		0.25+0.004+0.03+0.03+1.5%	96	91	99
Glyphosate+AMS (June 4, 20)		1+2.5	0	61	99
Glyphosate+AMS (June 4, 26)		1+2.5	0	63	99
Glyphosate+AMS (June 13, 26)		1+2.5	0	59	99
Glyphosate+AMS (June 13, July 3)		1+2.5	0	60	99
Glyphosate+AMS (June 4, 20, July 3)		1+2.5	0	59	99
Ethofumesate (POST) (June 4)		3.75	55	55	99
Etho+Glyt+AMS (June 4)		3.75+1+2.5			
Glyt+AMS (June 26)		1+2.5	38	63	99
Glyt+AMS (June 4)		1+2.5			
Glyt+AMS+Dime (June 20)		1+2.5+0.98	0	56	99
Glyt+AMS+Tfsu (June 13, 26)		1+2.5+0.008	0	58	99
Glyt+AMS+Clpy (June 13, 26)		1+2.5+0.06	96	89	99
Glyt+AMS (June 13)		1+2.5			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 26)		0.5+0.015+0.09+0.08+1.5%	96	81	99
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 13)		0.25+0.008+0.06+0.06+1.5%			
Glyt+AMS (June 26)		1+2.5	93	81	99
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 4)		0.16+0.004+0.03+0.03+1.5%			
De&Ph&Et+Tfsu+Clpy+CletM+MSO (June 20)		0.25+0.004+0.03+0.03+1.5%			
Glyt+AMS (July 3)		1+2.5	93	71	99
Glyt+AMS (June 4, 20)		1+2.5			
Glyt+AMS+Headline (July 3)		1+2.5+0.1	0	60	99
Glyt+AMS (June 4, 20)		1+2.5			
Glyt+AMS+SuperTin (July 3)		1+2.5+0.25	0	65	99
EXP MEAN			45	72	99
C.V. %			19	8	1
LSD 5%			12	8	NS
LSD 1%			16	10	NS
# OF REPS			4	4	4

*Glyt=Roundup WeatherMAX formulation of glyphosate (1.0 lb ae/A = 28 fl oz/A of WeatherMAX); De&Ph&Et=Progress formulation of desmedipham & phenmedipham & ethofumesate; Tfsu=UpBeet formulation of triflurosulfuron; Clpy=Stinger formulation of clopyralid; CletM=Select Max formulation of clethodim; Etho=Nortron formulation of ethofumesate; Dime=Outlook formulation of dimethenamid-P; AMS=Am-Stik liquid ammonium sulfate from West Central; MSO=methylated seed oil from Loveland; Cora=common ragweed; Colq=lambquarters.