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MANAGEMENT OF WATERHEMP WITH SOIL-APPLIED FOLLOWED BY POSTEMERGENCE HERBICIDES IN ROUNDUP READY® SUGARBEET AT HERMAN, MN IN 2013

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The objective of this study was to determine the effectiveness of soil-applied followed by postemergence herbicides on control of glyphosate-resistant and -susceptible waterhemp populations and the impact on sugarbeet yield and extractable sucrose.

MATERIALS AND METHODS

Urea fertilizer was applied at 143 lbs/A and incorporated with a Kongskilde 's-tine' field cultivator equipped with rolling baskets on May 10, 2013. 'Crystal 875RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 13. Sugarbeet was treated with Tachigaren and Poncho Beta at 45 grams and 5.07 fl oz of product, respectively, per 100,000 seeds. Counter 15G insecticide at 6 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 13, June 6 & 27, and July 10. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. Preplant-incorporated (PPI) treatments were incorporated 1.5 inches deep with a John Deere 8-foot 's-tine' field cultivator equipped with a spring-tooth harrow. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A, Inspire XT + Topsin at 7 + 10 fl oz/A, and Headline at 9 fl oz/A broadcast July 18, August 13 and 19, respectively. Sugarbeet was harvested September 18 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet stand was counted in the center two rows of plots on June 28 and September 18. Sugarbeet injury was evaluated on June 6. Waterhemp control was evaluated on June 6, July 23, and September 5. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E
Date	May 13	May 13	June 6	June 27	July 10
Time of Day	3:00 P	4:00 P	12:00 P	9:30 A	11:30 A
Air Temperature (F)	86	86	59	76	76
Relative Humidity (%)	29	29	58	45	56
Wind Velocity (mph)	5	5	6	10	3
Wind Direction	WSW	WSW	N	NW	NW
Soil Temp. (F at 6")	57	57	55	75	71
Soil Moisture	Fair	Fair	Good	Good	Good
Cloud Cover	50	50	100	5	40
Sugarbeet stage (avg)	PPI	PRE	cot-2 lf	12 lf	16 lf

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 88% waterhemp control at the September 5 evaluation. This level of control indicates the presence of some glyphosate resistant waterhemp. The addition of Betamix (desmedipham + phenmedipham; 0.65 + 0.65 lbai/gal), Ethofumesate 4SC (ethofumesate; 4 lbai/gal), and Destiny HC (a high surfactant methylated seed oil concentrate) to glyphosate increased waterhemp control to 95%. The addition of Outlook to the PowerMax+Ethofumesate+Betamix tank-mix did not significantly improve waterhemp control. Outlook was applied too late in the growing season to provide a measurable benefit. Outlook must be applied prior to waterhemp emergence. The application of a soil herbicide, regardless of rate tested, followed by three PowerMax applications gave 98% to 100% waterhemp control. Timely rains allowed for excellent herbicide activation and reduced rates of preemergence or pre-plant incorporated herbicide gave waterhemp control similar to full rates. In drier conditions it is questionable if reduced rates of these soil-applied herbicides would perform as well as the full rates.

No significant sugarbeet injury was observed by any herbicide treatments throughout the season. No difference was observed in sugarbeet stand at either date evaluated. Sugarbeet treated with herbicide did show significantly greater yield and extractable

sucrose per acre compared to the untreated check. There were some differences in yield and extractable sucrose among herbicide treatments, but it is uncertain as to what caused these differences. These differences appear random and may be caused by soil and environmental variability rather than from weed competition or herbicide injury.

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Herman, MN – 2013 (Carlson).

				June 6			July 23	Sept 5	June 28		September 18		
Trt No	Treatment Name	Rate Rate Unit	Appl Code	sgbt Inj	colq cntl	wahe cntl	wahe cntl	wahe cntl	sgbt stand	sbgt stand	sgbt yield	sgbt sucr	sgbt ext suc
				----------%----------					---no./100 ft---		ton/a	%	lb/a
1	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	92	88	215	208	26.3	16.8	8184
	N Pak AMS	2.5% v/v	CDE										
	NIS	0.25% v/v	CDE										
2	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	94	87	228	221	27.5	16.3	8302
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
3	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	98	95	223	222	24.7	17.0	7747
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
4	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	99	97	215	220	22.9	16.9	7145
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
5	Ro-Neet SB	3.6 pt/a	A	0	90	78	99	98	225	216	27.8	17.0	8744
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5% v/v	CDE										
	NIS	0.25% v/v	CDE										
6	Ro-Neet SB	3.6 pt/a	A	1	83	83	100	99	224	212	26.5	16.8	8217
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
7	Ro-Neet SB	3.6 pt/a	A	0	53	70	100	100	225	214	23.3	16.8	7296
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
8	Ro-Neet SB	3.6 pt/a	A	0	88	90	100	100	226	208	26.2	16.7	8093
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
9	Ro-Neet SB	5.3 pt/a	A	1	95	95	98	99	222	214	24.6	17.1	7783
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5% v/v	CDE										
	NIS	0.25% v/v	CDE										
10	Ro-Neet SB	5.3 pt/a	A	1	88	90	100	100	232	214	26.7	16.7	8285
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5% v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Herman, MN – 2013 (Carlson).

				June 6			July 23	Sept 5	June 28		September 18		
Trt No	Treatment Name	Rate Rate Unit	Appl Code	sgbt Inj	colq cntl	wahe cntl	wahe cntl	wahe cntl	sgbt stand	sbgt stand	sgbt yield	sgbt sucr	sgbt ext suc
				----------%----------					---no./100 ft---		ton/a	%	lb/a
11	Ro-Neet SB	5.3 pt/a	A	3	93	98	100	100	216	216	26.3	16.5	8023
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
12	Ro-Neet SB	5.3 pt/a	A	3	90	85	100	100	230	205	26.5	17.0	8385
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
13	Dual Magnum	1 pt/a	B	1	100	100	100	100	224	217	25.9	16.8	8055
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5 % v/v	CDE										
	NIS	0.25 % v/v	CDE										
14	Dual Magnum	1 pt/a	B	0	75	88	100	100	229	212	23.6	17.5	7686
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
15	Dual Magnum	1 pt/a	B	1	95	100	100	100	232	217	24.1	16.8	7900
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
16	Dual Magnum	1 pt/a	B	1	88	100	100	100	217	213	26.7	16.7	8262
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
17	Dual Magnum	1.5 pt/a	B	1	100	100	100	100	213	204	28.3	16.9	8816
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5 % v/v	CDE										
	NIS	0.25 % v/v	CDE										
18	Dual Magnum	1.5 pt/a	B	0	85	100	100	100	212	206	27.0	16.5	8262
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
19	Dual Magnum	1.5 pt/a	B	0	100	100	100	100	216	210	26.1	16.3	7854
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
20	Dual Magnum	1.5 pt/a	B	4	90	100	100	100	223	204	24.1	16.8	7515
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Herman, MN – 2013 (Carlson).

Trt No	Treatment Name	Rate Rate Unit	Appl Code	June 6 sgbt Inj	June 6 colq cntl	June 6 wahe cntl	July 23 wahe cntl	Sept 5 wahe cntl	June 28 sgbt stand	June 28 sbgt stand	September 18 sgbt yield	September 18 sgbt sucr	September 18 sgbt ext suc
				----------%----------					---no./100 ft---		ton/a	%	lb/a
	Destiny HC	1.5 pt/a	CDE										
21	Ethofumesate	5 pt/a	A	1	73	75	100	99	225	217	26.7	16.9	8341
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5 % v/v	CDE										
	NIS	0.25 % v/v	CDE										
22	Ethofumesate	5 pt/a	A	1	95	98	100	100	228	215	26.6	16.8	8279
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
23	Ethofumesate	5 pt/a	A	1	50	75	100	100	217	212	27.8	16.2	8311
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
24	Ethofumesate	5 pt/a	A	0	89	84	100	100	221	216	24.3	17.0	7717
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
25	Ethofumesate	7.5 pt/a	A	1	68	98	100	100	222	215	25.6	16.5	7761
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	N Pak AMS	2.5 % v/v	CDE										
	NIS	0.25 % v/v	CDE										
26	Ethofumesate	7.5 pt/a	A	0	100	100	100	100	221	214	27.0	16.9	8467
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
27	Ethofumesate	7.5 pt/a	A	0	93	100	100	100	231	215	25.1	17.3	8061
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
28	Ethofumesate	7.5 pt/a	A	0	93	98	100	100	227	217	27.1	16.7	8331
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E										
	Betamix	10 / 16 / 24 fl oz/a	C/D/E										
	Outlook	21 fl oz/a	D										
	Ethofumesate	4 fl oz/a	CDE										
	N Pak AMS	2.5 % v/v	CDE										
	Destiny HC	1.5 pt/a	CDE										
29	Untreated Check			0	0	0	0	0	215	185	15.7	16.8	4892
	LSD 5%			**NS**	**32.7**	**25.0**	**3.0**	**4.2**	**NS**	**NS**	**5.01**	**NS**	**1378**
	CV %			**247**	**32**	**23**	**2**	**3**	**5**	**6**	**14**	**3**	**12**

MANAGEMENT OF WATERHEMP WITH SOIL-APPLIED FOLLOWED BY POSTEMERGENCE HERBICIDES IN ROUNDUP READY® SUGARBEET AT MOORHEAD, MN IN 2013

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The objective of this study was to determine the effectiveness of soil-applied followed by postemergence herbicides on control of glyphosate-resistant and -susceptible waterhemp populations and the impact on sugarbeet yield and extractable sucrose.

MATERIALS AND METHODS

Plot area was worked with a Kongskilde 's-tine' field cultivator equipped with rolling baskets on May 17, 2013. 'Hilleshog 4022RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 17. Sugarbeet was treated with Tachigaren and Poncho Beta at 45 grams and 5.07 fl oz of product, respectively, per 100,000 seeds. Counter 20G insecticide at 8.9 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 17, June 12, and July 2 & 17. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. Preplant-incorporated (PPI) treatments were incorporated 1.5 inches deep with a John Deere 8-foot 's-tine' field cultivator equipped with a spring-tooth harrow. Quadris was broadcast at 16 fl oz/A June 13 to prevent Rhizoctonia root rot. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A and Headline EC at 9 fl oz/A broadcast July 29 and August 19, respectively. Sugarbeet was harvested September 26 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet stand was counted in the center two rows of plots on June 18, July 11, and September 26. Sugarbeet injury was evaluated on June 12, July 30, and August 13. Waterhemp control was evaluated June 12, July 30, August 13, and September 4. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E
Date	May 17	May 17	June 12	July 2	July 17
Time of Day	10:00 A	12:30 P	12:00 P	12:45 P	10:00 A
Air Temperature (F)	72	75	74	84	87
Relative Humidity (%)	39	32	65	32	63
Wind Velocity (mph)	2	3	3	4	2
Wind Direction	SE	SE	NE	NE	N
Soil Temp. (F at 6")	57	57	65	78	74
Soil Moisture	Good	Good	Good	Good	Good
Cloud Cover	60	80	98	40	15
Sugarbeet stage (avg)	PPI	PRE	2 lf	10 lf	15 lf
Waterhemp (untreated avg)	-	-	2 lf	18 inch	24 inch

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 53% waterhemp control at the September 4 evaluation. This level of control indicates the presence of glyphosate-resistant waterhemp. The addition of Betamix (desmedipham + phenmedipham; 0.65 + 0.65 lbai/gal), Ethofumesate 4SC (ethofumesate; 4 lbai/gal), and Destiny HC (a high surfactant methylated seed oil concentrate) to glyphosate increased waterhemp control to 83%. The addition of Outlook (dimethanamid-p; 6 lbai/gal) to the PowerMax+Ethofumesate+Betamix tank-mix improved waterhemp control in some treatments but not in others. Outlook must be applied prior to waterhemp emergence to provide any control. Outlook may have been applied too late in this study to show a consistent benefit from the lay-by herbicide. When combined across all postemergence (POST) combinations, PRE Dual Magnum (s-metolachlor; 7.62 lbai/gal) gave the greatest waterhemp control of 92% at both 1.0 and 1.5 pt/a. When combined across all POST combinations, waterhemp control in the absence of a soil applied herbicide was 72%. Ro-Neet SB (cycloate; 6 lbai/gal) at 5.6 pt/a and Ethofumesate 4SC (ethofumesate; 4 lb ai/gal) at 7.5 pt/a each gave 82% waterhemp control when averaged across all POST combinations.

Sugarbeet injury was observed from PRE Dual Magnum at both 1.0 and 1.5 pt/a rates. The greatest injury, 16%, was observed for the 1.5 pt/a rate when combinded across all POST combinations. Sugarbeet stand was also reduced from Dual Magnum at 1.5 pt/a compared to any other soil applied herbicide when combined across all POST combinations. Dual Magnum, when applied PRE at 1.0 pt/a, did not affect sugarbeet stand. No significant sugarbeet injury or stand reduction was observed from Ro-Neet SB or Ethofumesate 4SC at any rate tested. The addition of Betamix POST resulted in significant sugarbeet injury at the July 30 evaluation. However, this injury did not appear to affect sugarbeet yield or quality. Sugarbeet extractable sucrose yield was greater when the highest rate tested of each of Dual Magnum, Ro-Neet SB, and Ethofumesate 4SC was followed by three PowerMax applications, compared to three PowerMax applications alone. The addition of Ethofumesate at 4 fl oz/a to each PowerMax application also increased extractable sucrose compared to PowerMax alone.

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Moorhead, MN – 2013 (Carlson)

				June 12		July 30		Aug 13		Sept 4	Jun 18	Jul 11	September 26			
Trt No	Treatment Name	Rate Rate Unit	Appl Code	sgbt inj	wahe cntl	sgbt inj	wahe cntl	sgbt inj	wahe cntl	wahe cntl	sgbt stand	sgbt stand	sgbt stand	sgbt yield	sgbt sucr	sgbt ext sucr
				----------	----------	----------	%----------	----------	----------	----------	------no. / 100 ft------			ton/a	%	lb/a
1	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	52	0	51	53	173	163	155	22.5	13.8	5164
	N Pak AMS	2.5 % v/v	CDE													
	NIS	0.25 % v/v	CDE													
2	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	0	70	0	74	70	183	179	155	29.1	13.7	6595
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
3	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	7	87	1	87	83	185	179	181	27.9	13.9	6554
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
4	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E	0	0	7	87	0	83	81	183	187	176	29.2	14.0	6906
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Outlook	21 fl oz/a	D													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
5	Ro-Neet SB	3.6 pt/a	A	1	68	0	69	0	69	66	186	178	160	23.9	13.9	5675
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	N Pak AMS	2.5 % v/v	CDE													
	NIS	0.25 % v/v	CDE													
6	Ro-Neet SB	3.6 pt/a	A	0	54	0	84	0	83	82	181	175	166	31.1	13.7	7110
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
7	Ro-Neet SB	3.6 pt/a	A	3	56	7	89	1	86	83	169	165	150	28.0	13.6	6323
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
8	Ro-Neet SB	3.6 pt/a	A	0	59	7	93	0	94	91	182	178	159	29.9	13.7	6833
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Outlook	21 fl oz/a	D													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
9	Ro-Neet SB	5.3 pt/a	A	1	75	0	72	0	69	70	174	183	163	28.0	13.8	6443
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	N Pak AMS	2.5 % v/v	CDE													
	NIS	0.25 % v/v	CDE													

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Moorhead, MN – 2013 (Carlson)

				June 12		July 30		Aug 13		Sept 4	Jun 18	Jul 11	September 26			
Trt No	Treatment Name	Rate	Appl Code	sgbt inj	wahe cntl	sgbt inj	wahe cntl	sgbt inj	wahe cntl	wahe cntl	sgbt stand	sgbt stand	sgbt stand	sgbt yield	sgbt sucr	sgbt ext sucr
				---%							---no. / 100 ft---			ton/a	%	lb/a
10	Ro-Neet SB	5.3 pt/a	A	0	60	0	82	0	84	80	180	176	166	31.6	13.5	7081
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
11	Ro-Neet SB	5.3 pt/a	A	5	76	6	96	0	93	87	154	160	144	29.9	13.4	6644
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
12	Ro-Neet SB	5.3 pt/a	A	1	71	7	97	0	97	91	179	167	162	29.5	13.2	6445
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Outlook	21 fl oz/a	D													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
13	Dual Magnum	1 pt/a	B	3	78	0	87	0	81	80	163	161	168	31.9	13.5	7084
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	N Pak AMS	2.5 % v/v	CDE													
	NIS	0.25 % v/v	CDE													
14	Dual Magnum	1 pt/a	B	4	79	0	97	0	96	96	170	163	158	32.6	14.0	7795
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
15	Dual Magnum	1 pt/a	B	7	71	7	97	1	97	95	162	152	151	28.9	13.3	6330
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
16	Dual Magnum	1 pt/a	B	6	86	8	98	1	97	97	154	145	144	30.5	14.0	7228
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Outlook	21 fl oz/a	D													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
17	Dual Magnum	1.5 pt/a	B	14	79	0	84	0	85	82	150	160	142	30.1	13.8	6929
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	N Pak AMS	2.5 % v/v	CDE													
	NIS	0.25 % v/v	CDE													
18	Dual Magnum	1.5 pt/a	B	18	86	0	94	0	95	92	143	124	122	30.7	13.4	6749
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													
19	Dual Magnum	1.5 pt/a	B	16	81	8	95	0	97	95	147	152	143	28.7	13.6	6424
	RU PowerMax	32 / 24 / 22 fl oz/a	C/D/E													
	Betamix	10 / 16 / 24 fl oz/a	C/D/E													
	Ethofumesate	4 fl oz/a	CDE													
	N Pak AMS	2.5 % v/v	CDE													
	Destiny HC	1.5 pt/a	CDE													

Table 2. Management of Waterhemp with Soil-Applied Followed by Postemergence Herbicides in Roundup Ready® Sugarbeet – Moorhead, MN – 2013 (Carlson)

					June 12		July 30		Aug 13		Sept 4	Jun 18	Jul 11	September 26			
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	sgbt inj	wahe cntl	sgbt inj	wahe cntl	sgbt inj	wahe cntl	wahe cntl	sgbt stand	sgbt stand	sgbt stand	sgbt yield	sgbt sucr	sgbt ext sucr
					----------	----------	----------	----------	----------	----------	----------	------	------	------	------	------	------
					----------	----------	----------	%----------	----------	----------	----------	------	------	------	------	------	------
												------	------	------	------	------	------
												------	no. / 100 ft	------	------	------	------
20	Dual Magnum	1.5	pt/a	B	16	84	8	98	0	99	98	139	138	135	29.0	13.3	6361
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Betamix	10 / 16 / 24	fl oz/a	C/D/E													
	Outlook	21	fl oz/a	D													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
21	Ethofumesate	5	pt/a	A	0	63	0	79	0	80	78	158	166	135	27.6	13.1	5910
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	N Pak AMS	2.5	% v/v	CDE													
	NIS	0.25	% v/v	CDE													
22	Ethofumesate	5	pt/a	A	0	63	0	82	0	83	82	163	167	161	30.7	13.0	6517
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
23	Ethofumesate	5	pt/a	A	0	59	7	87	0	86	82	173	183	163	30.2	13.6	6743
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Betamix	10 / 16 / 24	fl oz/a	C/D/E													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
24	Ethofumesate	5	pt/a	A	2	64	7	94	1	93	89	180	173	166	28.1	13.8	6410
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Betamix	10 / 16 / 24	fl oz/a	C/D/E													
	Outlook	21	fl oz/a	D													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
25	Ethofumesate	7.5	pt/a	A	1	70	0	79	0	71	73	176	182	163	31.1	13.6	6985
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	N Pak AMS	2.5	% v/v	CDE													
	NIS	0.25	% v/v	CDE													
26	Ethofumesate	7.5	pt/a	A	0	80	0	92	0	90	85	185	169	165	32.1	13.7	7284
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
27	Ethofumesate	7.5	pt/a	A	0	76	9	89	0	87	84	185	176	166	28.9	14.0	6868
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Betamix	10 / 16 / 24	fl oz/a	C/D/E													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
28	Ethofumesate	7.5	pt/a	A	1	65	8	93	0	95	88	173	159	160	29.2	13.6	6597
	RU PowerMax	32 / 24 / 22	fl oz/a	C/D/E													
	Betamix	10 / 16 / 24	fl oz/a	C/D/E													
	Outlook	21	fl oz/a	D													
	Ethofumesate	4	fl oz/a	CDE													
	N Pak AMS	2.5	% v/v	CDE													
	Destiny HC	1.5	pt/a	CDE													
29	Untreated Check				0	0	0	0	0	0	0	174	-	21	0.0	0.0	0
	LSD 5%				**6.8**	**12.7**	**3.1**	**9.6**	**NS**	**10.0**	**10.8**	**24.1**	**26.3**	**26.6**	**3.72**	**0.76**	**935**
	CV %				**143**	**15**	**64**	**8**	**491**	**9**	**10**	**10**	**11**	**12**	**9**	**4**	**10**

MANAGEMENT OF WATERHEMP IN ROUNDUP READY® SUGARBEET - HERMAN, MN - 2013

Aaron L. Carlson

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The objective of this study was to evaluate sugarbeet injury weed control from preemergence (PRE) and postemergence (POST) herbicide use in Roundup Ready sugarbeet.

MATERIALS AND METHODS

Urea fertilizer was applied at 143 lbs/A and incorporated with a Kongskilde 's-tine' field cultivator equipped with rolling baskets on May 10, 2013. 'Crystal 875RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 13. Sugarbeet was treated with Tachigaren and Poncho Beta at 45 grams and 5.07 fl oz of product, respectively, per 100,000 seeds. Counter 15G insecticide at 6 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 13, June 6, 14, and 27, July 10 and 22. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. The 8" band application was made at planting with a planter mounted sprayer calibrated to deliver 12 gpa spray solution at 20 psi through an 8002 E flat fan nozzle. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A, Inspire XT + Topsin at 7 + 10 fl oz/A, and Headline at 9 fl oz/A broadcast July 18, August 1 and 19, respectively. Sugarbeet was harvested September 18 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet injury was evaluated on June 27. Waterhemp control was evaluated on June 27, July 23, August 6, and September 5. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E	F	G
Date	May 13	May 13	June 6	June 14	June 27	July 10	July 22
Time of Day	4:00 P	5:45 P	10:00 A	11:00A	12:45 P	11:35 A	10:15 A
Air Temperature (F)	86	91	58	73	81	73	74
Relative Humidity (%)	29	25	58	42	45	48	63
Wind Velocity (mph)	8	10	6	11	10	4	8
Wind Direction	WSW	WSW	N	SE	NW	NW	NNW
Soil Temp. (F at 6")	57	57	55	66	76	72	75
Soil Moisture	Fair	Fair	Good	Good	Good	Good	Good
Cloud Cover	50	50	100	100	5	5	30
Sugarbeet stage (avg)	8" Band (IF)	PRE	cot-2 lf	2-5 lf	12 lf	16 lf	canopy
Waterhemp (untreated avg)	-	-	cot-1 lf	cot-3 lf	5-6 lf / 10"	22" tall	36" tall

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 74% waterhemp control at the September 5 evaluation. This level of control indicates the presence of glyphosate-resistant waterhemp. Three applications of PowerMax that began when waterhemp were cotyledon to one leaf gave 74% waterhemp control which was greater than 68% waterhemp control from three applications of PowerMax that began when waterhemp were five to six leaf. Larger waterhemp were more difficult to control with glyphosate than smaller waterhemp. PowerMax at 28 fl oz followed by (fb) a micro-rate application of Betamix (desmedipham+phenmedipham; 0.65+0.65 lbai/gal) + Ethofumesate 4SC (ethofumesate; 4 lbai/gal) + UpBeet (triflusulfuron; 50%) + Stinger (clopyralid; 3 lbae/gal) + MSO (methylated seed oil) fb PowerMax at 28 fl oz fb Powermax at 22 fl oz gave 83% waterhemp control at the end of the growing season. This was not an adequate level of control. Three applications of Betamix + Ethofumesate + PowerMax gave 91% to 94% waterhemp control depending on Betamix rates applied. Broadcast applications of PRE Ethofumesate at either 3.5 pt/a or 7 pt/a gave 100% waterhemp control regardless of the POST herbicide system used. Excellent Ethofumesate activation was achieved from timely and adequate rainfall. Sugarbeet injury was observed June 27 from treatments where Betamix and Ethofumesate were applied POST, but this early season injury did not affect sugarbeet stand, nor did it appear to influence sugarbeet yield or quality.

Table 2. Management of Waterhemp in Sugarbeet – Herman, MN – 2013 (Carlson).

Trt No	Treatment Name	Rate	Rate Unit	Appl Code	June 27 sgbt inj	June 27 wahe cntl	July 23 wahe cntl	Aug 6 wahe cntl	Sept 5 wahe cntl	September 18 sgbt stand	September 18 sgbt yld	September 18 sgbt sucr	September 18 sgbt ext sucr
					----------	----------	%----------	----------	----------	#/100'	ton/a	%	lb/a
1	Untreated Check				0	0	0	0	0	172	8.3	12.5	2588
2	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	0	58	80	78	74	218	27.9	17.0	8855
	N Pak AMS	2.5	% v/v	CEF									
	NIS	0.25	% v/v	CEF									
3	Ethofumesate	3.5	pt/a	B	2	97	99	99	100	206	28.5	16.9	8938
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS	2.5	% v/v	CEF									
	NIS	0.25	% v/v	CEF									
4	RU PowerMax	28 / 28 / 22	fl oz/a	E/F/G	0	0	68	64	68	206	23.3	16.8	7281
	N Pak AMS	2.5	% v/v	EFG									
	NIS	0.25	% v/v	EFG									
5	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	7	90	88	88	83	210	27.2	16.8	8509
	Betamix	7.8	fl oz/a	D									
	Ethofumesate	4	fl oz/a	D									
	UpBeet	0.25	oz/a	D									
	Stinger	1.3	fl oz/a	D									
	MSO	1.5	% v/v	D									
	N Pak AMS	2.5	% v/v	CEF									
	NIS	0.25	% v/v	CEF									
6	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	0	65	92	95	88	220	25.3	17.2	8092
	Betamix	10.5 / 14.4	fl oz/a	E/F									
	Ethofumesate	5 / 7	fl oz/a	E/F									
	NIS	0.25	% v/v	C									
	N Pak AMS	2.5	% v/v	CEF									
	Destiny HC	1.5	pt/a	EF									
7	Ethofumesate	2	pt/a	B	3	99	100	100	100	212	26.6	16.9	8377
	Dual Magnum	1	pt/a	B									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	Betamix	10.5 / 14.4	fl oz/a	E/F									
	Ethofumesate	5 / 7	fl oz/a	E/F									
	NIS	0.25	% v/v	C									
	N Pak AMS	2.5	% v/v	CEF									
	Destiny HC	1.5	pt/a	EF									
8	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F	4	82	94	96	91	195	27.9	17.1	8824
	Ethofumesate	4	fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS	2.5	% v/v	CEF									
	Destiny HC	1.5	pt/a	CEF									
9	Ethofumesate	3.5	pt/a	B	3	99	100	100	100	215	26.4	17.1	8431
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F									
	Ethofumesate	4	fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS	2.5	% v/v	CEF									
	Destiny HC	1.5	pt/a	CEF									
10	Ethofumesate	7	pt/a	B	4	100	100	100	100	220	29.0	16.8	9053
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F									
	Ethofumesate	4	fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS	2.5	% v/v	CEF									
	Destiny HC	1.5	pt/a	CEF									
11	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F	4	86	97	97	94	225	28.2	16.9	8882
	Ethofumesate	4	fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS	2.5	% v/v	CEF									

Table 2. Management of Waterhemp in Sugarbeet – Herman, MN – 2013 (Carlson).

					June 27	July 23	Aug 6	Sept 5		September 18		
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	sgbt inj	wahe cntl	wahe cntl	wahe cntl	wahe cntl	sgbt stand	sgbt yld	sgbt sucr	sgbt ext sucr
					----------	----------	----------	%----------	----------	#/100'	ton/a	%	lb/a
12	Ethofumesate		3.5 pt/a	B	3	99	100	100	100	217	27.0	16.9	8523
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F									
	Ethofumesate		4 fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS		2.5 % v/v	CEF									
13	Ethofumesate		7 pt/a	B	5	100	100	100	100	212	27.6	16.9	8716
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	Ethofumesate		4 fl oz/a	CEF									
	N Pak AMS		2.5 % v/v	CEF									
14	Ethofumesate		7.5 pt/a	A	6	82	100	99	97	211	28.6	17.0	9041
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F									
	Ethofumesate		4 fl oz/a	CEF									
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F									
	N Pak AMS		2.5 % v/v	CEF									
	Destiny HC		1.5 pt/a	CEF									
		LSD 5%			**2.6**	**5.5**	**3.5**	**3.8**	**3.8**	**NS**	**3.6**	**NS**	**1165**
		CV %			**67**	**5**	**3**	**3**	**3**	**10**	**10**	**14**	**10**

MANAGEMENT OF WATERHEMP IN ROUNDUP READY® SUGARBEET - MOORHEAD, MN - 2013

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The objective of this study was to evaluate sugarbeet injury weed control from preemergence (PRE) and postemergence (POST) herbicide use in Roundup Ready sugarbeet.

MATERIALS AND METHODS

Plot area was worked with a Kongskilde 's-tine' field cultivator equipped with rolling baskets on May 17, 2013. 'Hilleshog 4022RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 17. Sugarbeet was treated with Tachigaren and Poncho Beta at 45 grams and 5.07 fl oz of product, respectively, per 100,000 seeds. Counter 20G insecticide at 8.9 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 17, June 12 and 18, July 2, 17, and 29. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. The 8" band application was made at planting with a planter mounted sprayer calibrated to deliver 12 gpa spray solution at 20 psi through an 8002 E flat fan nozzle. Quadris was broadcast at 16 fl oz/A June 13 to prevent Rhizoctonia root rot. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A and Headline EC at 9 fl oz/A broadcast July 29, August 19, respectively. Sugarbeet was harvested September 26 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet stand was counted in the center two rows of plots on June 18 and September 26. Sugarbeet injury was evaluated on June 12, July 30, and August 13. Waterhemp control was evaluated June 12, July 30, August 13, and September 4. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E	F	G
Date	May 17	May 17	June 12	June 18	July 2	July 17	July 29
Time of Day	10:00 A	12:30 P	10:00 A	10:10 A	3:15 P	4:00 P	12:30 P
Air Temperature (F)	72	75	73	72	90	85	74
Relative Humidity (%)	39	32	58	41	29	60	48
Wind Velocity (mph)	2	3	5	2	2	2	2
Wind Direction	SE	SE	NE	SW	NE	N	S
Soil Temp. (F at 6")	57	57	66	69	78	74	73
Soil Moisture	Good	Good	Good	Good	Good	Good	Good
Cloud Cover	60	80	98	2	50	15	80
Sugarbeet stage (avg)	8" band (IF)	PRE	2 lf	2-5 lf	10 lf	15 lf	canopy
Waterhemp (untreated avg)	-	-	2 lf	4-6 lf	18" tall	24" tall	40" tall

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 73% waterhemp control at the September 4 evaluation. This level of control indicates the presence of glyphosate-resistant waterhemp. Three applications of PowerMax that began when waterhemp were two leaf gave 73% waterhemp control which was greater than 62% waterhemp control from three applications of PowerMax that began when waterhemp were four to six leaf. Larger waterhemp were more difficult to control with glyphosate than smaller waterhemp. PowerMax at 28 fl oz followed by (fb) a micro-rate application of Betamix (desmedipham+phenmedipham; 0.65+0.65 lbai/gal) + Ethofumesate 4SC (ethofumesate; 4 lbai/gal) + UpBeet (triflusulfuron; 50%) + Stinger (clopyralid; 3 lbae/gal) + MSO (methylated seed oil) fb PowerMax at 28 fl oz fb Powermax at 22 fl oz gave 82% waterhemp control at the end of the growing season. This was not an adequate level of control. Three applications of Betamix + Ethofumesate + PowerMax gave 76% to 80% waterhemp control depending on Betamix rates applied. Broadcast applications of PRE Ethofumesate at either 3.5 pt/a or 7 pt/a gave 88% to 97% waterhemp control depending on the POST herbicide system used. PRE Ethofumesate always increased waterhemp control regardless of the POST herbicide system used. The greatest waterhemp control at 99% was from PRE Ethofumesate + Dual Magnum at 2pt/a + 1 pt/a, respectively, followed by (fb) PowerMax fb two applications of PowerMax + Betamix + Ethofumesate + Destiny HC (Trt 7).

Table 2. Management of Waterhemp in Sugarbeet – Moorhead, MN – 2013 (Carlson)

					June 12			July 30		Aug 13		Sept 4	Jun 18	September 26			
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	sgbt inj	colq cntl	wahe cntl	sgbt inj	wahe cntl	sgbt inj	wahe cntl	wahe cntl	sgbt stand	sgbt stand	sgbt yield	sgbt sucr	ext sucr
					----------%----------								#/100'	#/100'	ton/a	%	lb/a
1	Untreated Check				0	0	0	0	0	0	0	0	187	74	1.9	14.1	451
2	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	0	0	0	0	71	0	73	73	212	188	31.6	14.1	7454
	N Pak AMS	2.5	% v/v	CEF													
	NIS	0.25	% v/v	CEF													
3	Nortron	3.5	pt/a	B	0	14	16	0	93	0	92	93	204	181	35.6	13.6	8075
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
	NIS	0.25	% v/v	CEF													
4	RU PowerMax	28 / 28 / 22	fl oz/a	E/F/G	0	0	0	0	53	0	58	62	186	172	26.0	13.3	5787
	N Pak AMS	2.5	% v/v	EFG													
	NIS	0.25	% v/v	EFG													
5	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	0	0	0	0	82	0	83	82	206	187	31.7	13.5	7181
	Betamix	7.8	fl oz/a	D													
	Nortron	4	fl oz/a	D													
	UpBeet	0.25	oz/a	D													
	Stinger	1.3	fl oz/a	D													
	MSO	1.5	% v/v	D													
	N Pak AMS	2.5	% v/v	CEF													
	NIS	0.25	% v/v	CEF													
6	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F	0	0	0	6	76	0	81	83	196	182	31.3	14.0	7489
	Betamix	10.5 / 14.4	fl oz/a	E/F													
	Nortron	5 / 7	fl oz/a	E/F													
	NIS	0.25	% v/v	C													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	EF													
7	Nortron	2	pt/a	B	3	69	89	7	96	1	98	99	184	166	32.3	13.9	7657
	Dual Magnum	1	pt/a	B													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	Betamix	10.5 / 14.4	fl oz/a	E/F													
	Nortron	5 / 7	fl oz/a	E/F													
	NIS	0.25	% v/v	C													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	EF													
8	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F	0	0	0	7	82	2	81	80	180	167	29.8	14.4	7425
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	CEF													
9	Nortron	3.5	pt/a	B	0	59	69	7	87	2	93	91	193	189	32.0	13.4	7172
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F													
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	CEF													
10	Nortron	7	pt/a	B	0	64	83	6	95	1	96	97	186	171	32.8	13.5	7447
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F													
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	CEF													
11	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F	0	0	0	4	76	0	77	76	200	182	29.3	13.6	6605
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
12	Nortron	3.5	pt/a	B	1	53	73	2	92	0	91	91	183	182	32.7	13.1	7101
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F													
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													

Table 2. Management of Waterhemp in Sugarbeet – Moorhead, MN – 2013 (Carlson)

					June 12			July 30		Aug 13		Sept 4	Jun 18	September 26			
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	sgbt inj	colq cntl	wahe cntl	sgbt inj	wahe cntl	sgbt inj	wahe cntl	wahe cntl	sgbt stand	sgbt stand	sgbt yield	sgbt sucr	ext sucr
					----------	----------	----------	----------	%----------	----------	----------	----------	#/100'	#/100'	ton/a	%	lb/a
13	Nortron		7 pt/a	B	1	70	84	3	89	0	87	88	192	182	31.0	13.2	6708
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F													
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
14	Nortron	7.5	pt/a	A	11	20	38	8	80	1	81	85	167	156	31.1	14.2	7593
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F													
	Nortron	4	fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F													
	N Pak AMS	2.5	% v/v	CEF													
	Destiny HC	1.5	pt/a	CEF													
	LSD 5%				**1.9**	**14.0**	**15.5**	**2.2**	**12.4**	**NS**	**14.2**	**10.6**	**19.0**	**26.1**	**3.0**	**NS**	**939**
	CV %				**115**	**39**	**34**	**42**	**11**	**258**	**13**	**9**	**7**	**11**	**7**	**4**	**10**

MANAGEMENT OF KOCHIA WITH PREEMERGENCE FOLLOWED BY POSTEMERGENCE ETHOFUMESATE IN ROUNDUP READY® SUGARBEET – BARNEY, ND – 2013

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The objective of this study was to determine the effect of Ethofumesate 4SC applied PRE and/or POST in combination and/or in sequence with glyphosate on the control of kochia and on yield and quality of Roundup Ready sugarbeet.

MATERIALS AND METHODS

'BTS 81RR17' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 9. Sugarbeet was treated with Tachigaren at 45 grams per 100,000 seeds and NipsIT Suite. Counter 20G insecticide at 8.9 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 9 & 24, June 7 & 25, and July 8. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A, Inspire XT + Topsin at 7 + 10 fl oz/A, and Headline EC at 9 fl oz/A broadcast July 18, August 1, and August 19, respectively. Lorsban Advanced at 1 pt/A was applied July 18 and August 7 to control grasshopper. Sugarbeet was harvested September 17 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet stand was counted in the center two rows of plots on September 17. Sugarbeet injury was evaluated on June 7. No visible injury was observed in evaluations after June 7. Kochia control was evaluated June 7, July 8, 15, & 23, August 6, and September 4. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E
Date	May 9	May 24	June 7	June 25	July 8
Time of Day	1:40 P	8:30 A	1:30 P	1:15 P	12:30 P
Air Temperature (F)	64	52	71	81	87
Relative Humidity (%)	39	51	38	72	49
Wind Velocity (mph)	13	10	8	12	3
Wind Direction	N	SE	SW	SE	SE
Soil Temp. (F at 6")	55	50	70	70	75
Soil Moisture	Good	Good	Good	Wet	Good
Cloud Cover	5	70	75	70	75
Sugarbeet stage (avg)	PRE	cot	2 lf	9 lf	16 lf
Kochia (untreated avg)	-	cot	0.5" tall	13" tall	30 inch

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 74% kochia control at the September 4 evaluation. This indicated the presence of glyphosate-resistant kochia at this location. Four applications of PowerMax gave similar kochia control at 75%. The use of Ethofumesate 4 SC (ethofumesate; 4 lbai/gal) preemergence (PRE) at 2, 4, 6, or 7.5 pt/a followed by three applications of PowerMax did not improve kochia control compared to PowerMax alone. Applying Ethofumesate PRE at 6 pt/a or less followed by three applications of PowerMax + Ethofumesate at 1, 1.5, 2, or 3 pt/a did not improve kochia control compared to glyphosate alone. The only treatment that improved kochia control compared to PowerMax alone was four applications of PowerMax+Ethofumesate at 2 pt/a which gave 92% kochia control. Some sugarbeet injury was observed among treatments; however sugarbeet injury was not severe for any treatment.

Table 2. Management of Kochia with Preemergence Followed by Postemergence Ethofumesate in Roundup Ready® Sugarbeet – Barney, ND – 2013 (Carlson)

Trt No	Treatment Name	Rate Rate Unit	Appl Code	June 7 sgbt inj	June 7 kocz cntl	July 8 kocz cntl	July 8 colq cntl	Jul 15 kocz cntl	Jul 23 kocz cntl	Aug 6 kocz cnlt	Sept 4 kocz cnlt	September 17 sgbt stand	September 17 sgbt yield	September 17 sgbt sucr	September 17 sgbt ext suc
				----------%----------								#/100'	ton/a	%	lb/a
1	Untreated Check			0	0	0	0	0	0	0	0	8	0.0	0.0	0
2	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D	0	21	60	100	79	74	75	74	177	36.2	14.5	9159
	N Pak AMS	2.5 % v/v	BCD												
	NIS	0.25 % v/v	BCD												
3	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D	0	18	49	100	58	66	74	75	185	33.9	14.5	8564
	RU PowerMax	22 fl oz/a	E												
	N Pak AMS	2.5 % v/v	BCDE												
	NIS	0.25 % v/v	BCDE												
4	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D	3	37	52	100	76	76	71	65	179	31.8	13.9	7518
	Ethofumesate 4SC	1 pt/a	BCD												
	N Pak AMS	2.5 % v/v	BCD												
	Destiny HC	1.5 pt/a	BCD												
5	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D	4	66	67	100	84	91	92	92	175	34.5	14.3	8476
	RU PowerMax	22 fl oz/a	E												
	Ethofumesate 4SC	2 pt/a	BCDE												
	N Pak AMS	2.5 % v/v	BCDE												
	Destiny HC	1.5 pt/a	BCDE												
6	Ethofumesate 4SC	2 pt/a	A	1	30	60	99	74	73	69	60	163	30.1	13.4	6795
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	N Pak AMS	2.5 % v/v	BCD												
	NIS	0.25 % v/v	BCD												
7	Ethofumesate 4SC	4 pt/a	A	5	55	57	99	71	72	73	69	158	32.3	14.0	7824
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	N Pak AMS	2.5 % v/v	BCD												
	NIS	0.25 % v/v	BCD												
8	Ethofumesate 4SC	6 pt/a	A	3	46	73	99	87	84	82	83	156	36.2	13.9	8652
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	N Pak AMS	2.5 % v/v	BCD												
	NIS	0.25 % v/v	BCD												
9	Ethofumesate 4SC	7.5 pt/a	A	5	65	67	100	84	78	78	77	166	36.1	14.1	8680
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	N Pak AMS	2.5 % v/v	BCD												
	NIS	0.25 % v/v	BCD												
10	Ethofumesate 4SC	2 pt/a	A	3	60	60	100	69	71	70	72	174	33.3	14.3	8148
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	1 pt/a	BCD												
	Destiny HC	1.5 pt/a	BCD												
	N Pak AMS	2.5 % v/v	BCD												
11	Ethofumesate 4SC	2 pt/a	A	2	72	66	100	73	74	74	76	182	34.0	14.7	8661
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	2 pt/a	BCD												
	Destiny HC	1.5 pt/a	BCD												
	N Pak AMS	2.5 % v/v	BCD												
12	Ethofumesate 4SC	2 pt/a	A	8	69	66	100	79	77	72	75	159	34.1	14.7	8675
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	3 pt/a	BC												
	Destiny HC	1.5 pt/a	BC												
	N Pak AMS	2.5 % v/v	BCD												
13	Ethofumesate 4SC	2 pt/a	A	3	63	49	100	63	71	71	71	179	32.0	13.9	7451
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	RU PowerMax	22 fl oz/a	E												
	Ethofumesate 4SC	1 pt/a	BCDE												
	Destiny HC	1.5 pt/a	BCDE												
	N Pak AMS	2.5 % v/v	BCDE												
14	Ethofumesate 4SC	4 pt/a	A	6	56	64	100	70	74	71	71	164	31.4	14.3	7706
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	1 pt/a	BCD												
	Destiny HC	1.5 pt/a	BCD												
	N Pak AMS	2.5 % v/v	BCD												

Table 2. Management of Kochia with Preemergence Followed by Postemergence Ethofumesate in Roundup Ready® Sugarbeet – Barney, ND – 2013 (Carlson)

				June 7	July 8		Jul 15	Jul 23	Aug 6	Sept 4	September 17			
Trt No	Treatment Name	Rate	Appl Code	sgbt inj	kocz cntl	kocz cntl	colq cntl	kocz cntl	kocz cntl	kocz cnlt	kocz cnlt	sgbt stand	sgbt yield	sgbt sucr	sgbt ext suc
				----------%----------								#/100'	ton/a	%	lb/a
15	Ethofumesate 4SC	4 pt/a	A	3	68	72	100	84	80	81	81	169	36.9	13.5	8347
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	1 pt/a	BD												
	Ethofumesate 4SC	2 pt/a	C												
	Destiny HC	1.5 pt/a	BCD												
	N Pak AMS	2.5 % v/v	BCD												
16	Ethofumesate 4SC	4 pt/a	A	8	73	61	100	71	73	72	73	165	32.2	14.5	8052
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	2 pt/a	BC												
	Destiny HC	1.5 pt/a	BC												
	N Pak AMS	2.5 % v/v	BCD												
17	Ethofumesate 4SC	6 pt/a	A	6	74	58	100	74	69	70	67	172	31.7	13.8	7442
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	1 pt/a	BC												
	Destiny HC	1.5 pt/a	BC												
	N Pak AMS	2.5 % v/v	BCD												
18	Ethofumesate 4SC	6 pt/a	A	3	45	71	99	80	80	77	77	177	34.4	15.4	9021
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D												
	Ethofumesate 4SC	2 pt/a	C												
	Destiny HC	1.5 pt/a	C												
	N Pak AMS	2.5 % v/v	BCD												
	LSD 5%			**4.8**	**17.0**	**16.2**	**1.2**	**18.8**	**16.8**	**12.8**	**16.5**	**35.2**	**6.03**	**1.65**	**1612**
	CV %			**100**	**23**	**19**	**1**	**19**	**17**	**13**	**17**	**15**	**13**	**9**	**15**

MANAGEMENT OF KOCHIA IN ROUNDUP READY® SUGARBEET – BARNEY, ND – 2013

Aaron L. Carlson

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The objective of this study was to evaluate weed control and sugarbeet injury from preemergence (PRE) and postemergence (POST) herbicide use in Roundup Ready sugarbeet.

MATERIALS AND METHODS

'BTS 81RR17' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre on May 9. Sugarbeet was treated with Tachigaren at 45 grams per 100,000 seeds and NipsIT Suite. Counter 20G insecticide at 8.9 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 9, 24; June 3, 7, 25; and July 8. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. The 8" band application was made at planting with a planter mounted sprayer calibrated to deliver 12 gpa spray solution at 20 psi through an 8002 E flat fan nozzle. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A, Inspire XT + Topsin at 7 + 10 fl oz/A, and Headline EC at 9 fl oz/A broadcast July 18, August 1, and August 19, respectively. Lorsban Advanced at 1 pt/A was applied July 18 and August 7 to control grasshopper. Sugarbeet was harvested September 17 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Sugarbeet stand was counted in the center two rows of plots on September 17. Sugarbeet injury was evaluated on June 7 and July 8. Kochia control was evaluated June 7, July 8, and 23, August 6, and September 4. All 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. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D	E	F	G
Date	May 9	May 9	May 24	June 3	June 7	June 25	July 8
Time of Day	3:30 P	3:30 P	12:00 P	11:00 A	2:00 P	1:00 P	12:30 P
Air Temperature (F)	64	64	61	64	71	78	87
Relative Humidity (%)	39	39	41	46	38	70	49
Wind Velocity (mph)	13	13	12	7	8	11	3
Wind Direction	N	N	S	E	SW	SE	SE
Soil Temp. (F at 6")	55	55	54	58	70	70	75
Soil Moisture	Good	Good	Good	Good	Good	Wet	Good
Cloud Cover	5	5	98	95	75	70	75
Sugarbeet stage (avg)	8" Band (IF)	PRE	cot	cot-2 lf	2 lf	9 lf	16 lf
Kochia (untreated avg)	-	-	cot	0.5" tall	0.5" tall	13" tall	30 inch

SUMMARY

Three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) gave 69% kochia control at the September 4 evaluation. This level of control indicates the presence of glyphosate-resistant kochia. Six of the 13 treatments tested in this study gave significantly greater kochia control than three applications of PowerMax. PRE Ethofumesate 4SC (ethofumesate; 4 lbai/gal) at 7 pt/a followed by three applications of PowerMax + Betamix (desmedipham+phenmedipham; 0.65+0.65 lbai/gal) + Ethofumesate gave 88% control of kochia. This, however, was similar to the 86% kochia control from the same POST treatment but without PRE Ethofumesate. PRE Ethofumesate at 7 pt/a followed by three applications of PowerMax + Ethofumesate + Betamix at reduced rates + Destiny HC gave 83% control of kochia. Without PRE Ethofumesate, this POST treatment gave only 70% kochia control. This suggests that higher rates of Betamix give greater kochia control than lower rates of Betamix + Destiny HC when tank-mixed with PowerMax and Ethofumesate. No treatment tested in this study gave an acceptable level of kochia control. Sugarbeet injury was greatest on June 7 from PRE Ethofumesate at 7.5 pt/A applied in an 8" band. This application was made while the seed furrow was still open and the herbicide contact with the seed may be partially responsible for this injury. The sugarbeet injury symptomology was a club leaf appearance and slight stunting. No sugarbeet injury was observed at the July 8 evaluation.

Table 2. Management of Kochia in Roundup Ready® Sugarbeet – Barney, ND – 2013 (Carlson)

Trt No	Treatment Name	Rate	Rate Unit	Appl Code	June 7 sgbt inj	June 7 kocz cntl	July 8 sgbt inj	July 8 kocz cntl	July 8 colq cntl	Jul 23 kocz cntl	Aug 6 kocz cntl	Sep 4 kocz cntl	September 17 sgbt stand	September 17 sgbt yield	September 17 sgbt sucr	September 17 sgbt ext sucr
					----------	----------	----------	----------	----------	% ----------	----------	----------	#/100'	ton/a	%	lb/a
1	Untreated Check				0	0	0	0	0	0	0	0	16	0.0	0.0	0
2	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F		1	14	0	61	98	76	75	69	164	29.8	14.4	7176
	N Pak AMS	2.5 % v/v	CEF													
	NIS	0.25 % v/v	CEF													
3	Nortron	3.5 pt/a	B		3	40	0	61	98	76	76	71	157	29.9	13.9	6974
	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F													
	N Pak AMS	2.5 % v/v	CEF													
	NIS	0.25 % v/v	CEF													
4	RU PowerMax	28 / 28 fl oz/a	E/F		0	0	0	65	98	86	87	87	177	36.1	13.5	8113
	N Pak AMS	2.5 % v/v	EF													
	NIS	0.25 % v/v	EF													
	Betamix	4.6 pt/a	G													
	Nortron	2 pt/a	G													
	Stinger	1.3 fl oz/a	G													
	UpBeet	1 oz/a	G													
	MSO	1.5 %v/v	G													
5	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F		7	63	0	68	99	84	85	82	171	36.4	14.1	8542
	Betamix	7.8 fl oz/a	D													
	Nortron	4 fl oz/a	D													
	UpBeet	0.25 oz/a	D													
	Stinger	1.3 fl oz/a	D													
	MSO	1.5 % v/v	D													
	N Pak AMS	2.5 % v/v	CEF													
	NIS	0.25 % v/v	CEF													
6	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F		0	0	0	56	100	70	76	68	151	32.4	14.0	7750
	Betamix	10.5 / 14.4 fl oz/a	E/F													
	Nortron	5 / 7 fl oz/a	E/F													
	NIS	0.25 % v/v	C													
	N Pak AMS	2.5 % v/v	CEF													
	Destiny HC	1.5 pt/a	EF													
7	Nortron	2 pt/a	B		3	43	0	61	98	73	74	68	158	32.4	14.0	7551
	Dual Magnum	1 pt/a	B													
	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F													
	Betamix	10.5 / 14.4 fl oz/a	E/F													
	Nortron	5 / 7 fl oz/a	E/F													
	NIS	0.25 % v/v	C													
	N Pak AMS	2.5 % v/v	CEF													
	Destiny HC	1.5 pt/a	EF													
8	Betamix	7.8 / 10.5 / 14.4 fl oz/a	C/E/F		3	38	0	56	97	73	74	70	168	32.3	14.1	7610
	Nortron	4 fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F													
	N Pak AMS	2.5 % v/v	CEF													
	Destiny HC	1.5 pt/a	CEF													
9	Nortron	3.5 pt/a	B		5	48	0	64	99	74	75	70	151	31.9	13.7	7351
	Betamix	7.8 / 10.5 / 14.4 fl oz/a	C/E/F													
	Nortron	4 fl oz/a	CEF													
	RU PowerMax	28 / 28 / 22 fl oz/a	C/E/F													
	N Pak AMS	2.5 % v/v	CEF													
	Destiny HC	1.5 pt/a	CEF													

Table 2. Management of Kochia in Roundup Ready® Sugarbeet – Barney, ND – 2013 (Carlson)

				June 7		July 8			Jul 23	Aug 6	Sep 4	September 17			
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	sgbt inj	kocz cntl	sgbt inj	kocz cntl	colq cntl	kocz cntl	kocz cntl	kocz cntl	sgbt stand	sgbt yield	sgbt sucr	sgbt ext sucr
									%				#/100'	ton/a	%	lb/a
10	Nortron	7	pt/a	B	3	79	0	80	99	84	86	83	174	37.3	13.9	8794
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F												
	Nortron	4	fl oz/a	CEF												
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F												
	N Pak AMS	2.5	% v/v	CEF												
	Destiny HC	1.5	pt/a	CEF												
11	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F	1	15	0	68	98	85	86	86	173	38.7	13.8	9097
	Nortron	4	fl oz/a	CEF												
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F												
	N Pak AMS	2.5	% v/v	CEF												
12	Nortron	3.5	pt/a	B	2	64	0	74	98	86	88	87	154	38.4	13.5	8691
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F												
	Nortron	4	fl oz/a	CEF												
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F												
	N Pak AMS	2.5	% v/v	CEF												
13	Nortron	7	pt/a	B	6	69	0	72	98	86	87	88	148	36.6	14.0	8791
	Betamix	16.4 / 21.7 / 32.9	fl oz/a	C/E/F												
	Nortron	4	fl oz/a	CEF												
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F												
	N Pak AMS	2.5	% v/v	CEF												
14	Nortron	7.5	pt/a	A	15	55	0	61	98	74	72	63	166	30.9	13.6	6894
	Betamix	7.8 / 10.5 / 14.4	fl oz/a	C/E/F												
	Nortron	4	fl oz/a	CEF												
	RU PowerMax	28 / 28 / 22	fl oz/a	C/E/F												
	N Pak AMS	2.5	% v/v	CEF												
	Destiny HC	1.5	pt/a	CEF												
	LSD 5%				**3.7**	**20.6**	**NS**	**12.1**	**2.7**	**9.3**	**9.8**	**10.2**	**33.7**	**5.8**	**1.0**	**1341**
	CV %				**76**	**38**	**0**	**14**	**2**	**9**	**9**	**10**	**16**	**13**	**5**	**13**

EFFECT OF SOIL-HERBICIDES ON OAT COVER CROP AND WATERHEMP IN ROUNDUP READY® SUGARBEET AT HERMAN, MN IN 2013

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The objective of this study was to evaluate soil-herbicides on cover crop establishment, waterhemp control, and sugarbeet yield and quality.

MATERIALS AND METHODS

Urea fertilizer was applied at 143 lbs/A and incorporated with a Kongskilde 's-tine' field cultivator equipped with rolling baskets on May 10, 2013. 'Souris' oat was broadcast with a 3-point mounted rotary spreader perpendicular to sugarbeet rows and incorporated with the Kongskilde field cultivator on May 13. 'Crystal 875RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre also on May 13. Sugarbeet was treated with Tachigaren and Poncho Beta at 45 grams and 5.07 fl oz of product, respectively, per 100,000 seeds. Counter 15G insecticide at 6 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 13, June 6 & 27, and July 10. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A, Inspire XT + Topsin at 7 + 10 fl oz/A, and Headline at 9 fl oz/A broadcast July 18, August 13 and 19, respectively. Sugarbeet was harvested September 18 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Oat stand was counted and height was measured in the center two rows of plots on June 5. Sugarbeet injury was evaluated on June 27. Waterhemp control was evaluated on June 27, July 23, August 6, and September 5. All evaluations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Sugarbeet stand was counted on September 18.Experimental design was randomized complete block with 4 replications. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	D	D
Date	May 13	June 6	June 27	July 10
Time of Day	5:00 P	12:30 P	11:45 A	11:35 A
Air Temperature (F)	91	61	81	73
Relative Humidity (%)	25	58	45	48
Wind Velocity (mph)	10	6	10	4
Wind Direction	WSW	NE	NW	NW
Soil Temp. (F at 6")	58	55	76	72
Soil Moisture	Fair	Good	Good	Good
Cloud Cover	50	100	5	5
Sugarbeet stage (avg)	PRE	cot-2 lf	12 lf	16 lf
Oat	-	2 lf – 1 tiller	-	-
Waterhemp (untreated avg)	-	cot – 1 lf	5 lf	22 inch

SUMMARY

Preemergence (PRE) applications of Dual Magnum (s-metolachlor; 7.62 lbai/gal) at 1 pt/A and Ethofumesate 4SC (ethofumesate; 4 lbai/gal) at 3 and 7 pt/A followed by three applications of Roundup PowerMax (glyphosate; 4.5 lbae/gal) significantly improved waterhemp control compared to three applications of PowerMax. Three applications of PowerMax gave 83% waterhemp control at the September 5 evaluation when averaged across all oat seeding rates; this suggests the presence of glyphosate-resistant waterhemp at this location. Waterhemp control on September 5 from PowerMax was greater under the 3 bushel/Acre oat seeding rate than when no oat cover crop was sown. This suggests the oat cover crop either reduced waterhemp emergence or increased the sensitivity of waterhemp to glyphosate.

Oat response to the soil herbicides varied by herbicide. There was no difference in oat stand from PRE Dual Magnum compared to the no soil herbicide treatment for either oat seeding rate. Oat height was reduced but the reduction was minimal. This indicates great cover crop safety and the best option, of those tested, for applying a soil herbicide to sugarbeet in the presence of oat cover crop. Preemergence Ethofumesate significantly reduced oat stand and oat height at both rates tested and at both oat seeding rates. Ethofumesate at 3 pt/A reduced the 1 bu/A oat stand by about 20% and the 3 bu/A oat stand by about 40%. This reduction, however, appeared minimal enough to allow a satisfactory amount of cover crop to remain and protect sugarbeet seedlings. The 7pt/A rate of Ethofumesate was reduced oat stand and height at both rates to a point that the cover crop no longer provided any benefit to the sugarbeet crop.

Sugarbeet injury was observed June 27 from PRE Dual Magnum that was greater than the no soil herbicide treatments for each oat seeding rate. Injury severity tended to increase as oat seeding rate increased. The injury level may have been magnified due to the competition of the cover crop on the sugarbeet. Either way, no significant difference in sugarbeet yield or quality was observed among treatments at harvest.

Table 2. Effect of Soil-Herbicides on Oat Cover Crop and Waterhemp in Roundup Ready® Sugarbeet – Herman, MN – 2013 (Carlson)

Trt No	Treatment Name	Rate Rate	Rate Unit	Appl Code	June 5 oat count	June 5 oat ht	June 27 sgbt inj	June 27 wahe cntl	Jul 23 wahe cntl	Aug 6 wahe cntl	Sept 5 wahe cntl	September 18 sgbt stnd	September 18 sgbt yield	September 18 sgbt sucr	September 18 sgbt ext suc
					#/¼ m^2	in	----------%----------					#/100'	ton/a	%	lb/a
	Oat	**0 bu/a**													
1	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D	0	0	0	64	88	88	80	218	28.9	16.8	8976
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
2	Dual Magnum	1	pt/a	A	0	0	3	96	99	99	98	216	29.6	17.1	9436
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
3	Ethofumesate	3	pt/a	A	0	0	0	96	100	100	98	214	28.6	16.6	8885
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
4	Ethofumesate	7	pt/a	A	0	0	0	100	100	100	100	207	29.5	16.8	9145
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
	Oat	**1 bu/a**													
5	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D	28	3.5	1	70	88	90	83	220	26.8	17.0	8502
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
6	Dual Magnum	1	pt/a	A	31	3.3	5	98	100	100	100	209	28.7	16.6	8805
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
7	Ethofumesate	3	pt/a	A	22	2.1	0	94	100	100	99	221	29.8	16.6	9216
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
8	Ethofumesate	7	pt/a	A	12	1.2	0	99	99	99	100	217	29.7	16.3	9004
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
	Oat	**3 bu/a**													
9	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D	81	3.8	2	76	94	92	87	212	28.6	16.5	8839
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
10	Dual Magnum	1	pt/a	A	81	3.4	9	98	99	99	99	201	30.6	17.0	9676
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
11	Ethofumesate	3	pt/a	A	48	2.1	0	96	99	100	99	212	28.9	16.7	8963
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
12	Ethofumesate	7	pt/a	A	23	1.5	2	100	100	100	100	216	29.7	16.7	9195
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D											
	N Pak AMS	2.5	% v/v	BCD											
	NIS	0.25	% v/v	BCD											
	LSD 5%				**12.3**	**0.24**	**2.7**	**9.4**	**3.9**	**4.5**	**5.6**	**NS**	**NS**	**NS**	**NS**
	CV%				**31**	**9**	**107**	**7**	**3**	**3**	**4**	**6**	**8**	**2**	**8**

EFFECT OF SOIL-HERBICIDES ON OAT COVER CROP AND ROUNDUP READY® SUGARBEET AT PROSPER, ND IN 2013

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The objective of this study was to evaluate soil-herbicides on cover crop establishment and sugarbeet yield and quality.

MATERIALS AND METHODS

'Souris' oat was broadcast with a 3-point mounted rotary spreader perpendicular to sugarbeet rows and incorporated with a 'c-tine' field cultivator equipped with a spring-tooth harrow on May 24. 'SES 36917RR' sugarbeet was seeded 1.25 inches deep in 22 inch rows at 60,825 seeds per acre also on May 24. Sugarbeet was treated with Tachigaren at 45 grams per 100,000 seeds and NipsIT Suite. Counter 20G insecticide at 8.9 pounds product per acre was applied in a 5-inch band and drag chain incorporated at planting. Herbicide treatments were applied May 24, June 19, and July 3 & 16. All treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO_2 at 40 psi to the center four rows of six row plots 30 feet in length. Quadris was broadcast at 16 fl oz/A June 13 to prevent Rhizoctonia root rot. Cercospora leaf spot was controlled with Proline at 5.7 fl oz/A and Headline EC at 9 fl oz/A broadcast July 29 and August 19, respectively. Sugarbeet was harvested September 25 from the center two rows of each plot and weighed. Twenty to thirty pounds of sugarbeet was collected from each plot and analyzed for quality at American Crystal Sugar Quality Lab, East Grand Forks, MN.

Oat stand was counted, height measured, and visual injury evaluated on June 19. Sugarbeet injury was evaluated on June 19 and July 30. Redroot pigweed control was evaluated on June 19. All evaluations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Sugarbeet stand was counted on September 25. Experimental design was randomized complete block with 4 replications. Data were analyzed with the ANOVA procedure of Agriculture Research Manager, version 8.5.0 software package.

Table 1. Application Information

Application code	A	B	C	D
Date	May 24	June 19	July 3	July 16
Time of Day	4:00 P	1:00 P	9:45 A	10:00 A
Air Temperature (F)	60	83	79	86
Relative Humidity (%)	53	50	50	70
Wind Velocity (mph)	16	4	2	8
Wind Direction	SW	SE	S	S
Soil Temp. (F at 6")	52	82	75	72
Soil Moisture	Good	Good	Dry	Good
Cloud Cover	100	60	5	65
Sugarbeet stage (avg)	PRE	2-3 lf	8 lf	12 lf
Oat	-	3 lf – 1 tiller	-	-
Redroot pigweed (untreated avg)	-	cot	7 inch	22 inch

SUMMARY

Redroot pigweed control varied by treatment but generally increased as the rate of preemergence (PRE) herbicide increased. Preemerge Dual Magnum (s-metolachlor; 7.62 lbai/gal) at 1 and 1.5 pt/a gave 98% or better pigweed control across all oat seeding rates on June 19. Dual Magnum at 0.5 pt/a gave more variable pigweed control ranging from 86 to 100% depending on oat seeding rate. Preemerge Ethofumesate 4SC (ethofumesate; 4 lbai/gal) showed more variable pigweed control from 3 and 5 pt/a compared to 7 pt/a. Ethofumesate at 7 pt/a PRE gave 98% or better pigweed control across all oat seeding rates on June 19. Roundup PowerMax (glyphosate; 4.5 lbae/gal) effectively controlled all weeds at this location.

Oat response to the soil herbicides varied by herbicide. There was no difference in visual oat injury from PRE Dual Magnum at 1 pt/a or less compared to the no soil herbicide treatment for either oat seeding rate. Dual Magnum at 1.5 pt/a showed only 8% cover crop injury at 3 bu/a oat and 5% at 1 bu/a oats. Oat stand was reduced about 25% by PRE Dual Magnum at all rates tested in the 3 bu/a oat rate, but no difference was detected at the 1 bu/a oat rate. Oat height was not affected by Dual Magnum at any herbicide or oat seeding rate. This indicates great cover crop safety from PRE Dual Magnum. Preemergence

Ethofumesate significantly reduced oat stand and oat height at all rates tested and at both oat seeding rates. Ethofumesate at 3 pt/A reduced the 1 bu/A oat stand by about 35% and the 3 bu/A oat stand by about 50%. This reduction, however, appeared minimal enough to allow a satisfactory amount of cover crop to remain and protect sugarbeet seedlings. Visual estimates of oat injury from Ethofumesate at 5 and 7 pt/a ranged from 76 to 91%. The 5 and 7 pt/A rates of Ethofumesate also reduced oat stand and height to a point that the cover crop no longer provided any benefit to the sugarbeet crop.

Sugarbeet injury was observed June 19 from PRE Dual Magnum at 1.5 pt/a at the 1 and 0 bu/a oat seeding rates as well as at the 1.0 pt/a rate under no oat cover crop. This early season injury was not enough to cause any significant difference in sugarbeet yield or quality among treatments at harvest.

Table 2. Effect of Soil-Herbicides on Oat Cover Crop and Waterhemp in Roundup Ready® Sugarbeet – Prosper, ND – 2013 (Carlson)

					June 19				July 30		September 25			
Trt No	Treatment Name	Rate	Rate Unit	Appl Code	oat count	oat ht	oat inj	rrpw cntl	sgbt inj	sgbt inj	sgbt stand	sgbt yield	sgbt sucr	sgbt ext suc
					#/¼ m^2	in	----------	----------	%	----------	#/100'	ton/a	%	lb/a
	Oat	**0 bu/a**												
1	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D	0	0.0	0	0	1	0	210	30.4	15.5	8775
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
2	Dual Magnum	0.5	pt/a	A	0	0.0	0	86	0	1	212	30.0	16.0	8951
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
3	Dual Magnum	1	pt/a	A	0	0.0	0	98	5	1	193	29.0	15.5	8350
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
4	Dual Magnum	1.5	pt/a	A	0	0.0	0	100	11	0	193	29.3	15.8	8625
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
5	Nortron	3	pt/a	A	0	0.0	0	68	1	1	210	29.8	15.9	8816
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
6	Nortron	5	pt/a	A	0	0.0	0	96	3	0	215	29.1	16.0	8694
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
7	Nortron	7	pt/a	A	0	0.0	0	99	4	0	206	28.9	15.7	8468
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
	Oat	**1 bu/a**												
8	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D	20	4.5	0	0	0	0	207	29.9	15.5	8601
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
9	Dual Magnum	0.5	pt/a	A	19	5.4	0	82	1	0	199	30.0	14.5	7956
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										
10	Dual Magnum	1	pt/a	A	18	4.5	3	100	3	0	200	29.5	15.5	8464
	RU PowerMax	32 / 24 / 22	fl oz/a	B/C/D										
	N Pak AMS	2.5	% v/v	BCD										
	NIS	0.25	% v/v	BCD										

Table 2. Effect of Soil-Herbicides on Oat Cover Crop and Waterhemp in Roundup Ready® Sugarbeet – Prosper, ND – 2013 (Carlson)

Trt No	Treatment Name	Rate Rate Unit	Appl Code	June 19 oat count	June 19 oat ht	June 19 oat inj	June 19 rrpw cntl	July 30 sgbt inj	July 30 sgbt inj	September 25 sgbt stand	September 25 sgbt yield	September 25 sgbt sucr	September 25 sgbt ext suc
				#/¼ m^2	in	----------%----------				#/100'	ton/a	%	lb/a
11	Dual Magnum	1.5 pt/a	A	20	4.4	5	100	8	1	198	29.0	15.4	8203
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
12	Nortron	3 pt/a	A	13	4.0	40	84	1	0	215	29.4	15.2	8311
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
13	Nortron	5 pt/a	A	4	3.4	87	88	0	0	208	29.0	15.4	8299
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
14	Nortron	7 pt/a	A	7	3.3	91	100	1	0	205	29.5	15.7	8611
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
	Oat	**3 bu/a**											
15	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D	58	5.1	0	0	0	0	209	26.9	14.9	7295
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
16	Dual Magnum	0.5 pt/a	A	42	5.8	0	100	1	0	212	28.4	15.3	7971
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
17	Dual Magnum	1 pt/a	A	41	5.0	1	100	0	0	212	28.8	15.0	7915
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
18	Dual Magnum	1.5 pt/a	A	45	4.8	8	100	4	0	187	28.9	15.8	8460
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
19	Nortron	3 pt/a	A	28	3.5	44	70	0	0	210	29.3	15.2	8237
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
20	Nortron	5 pt/a	A	22	3.8	76	99	0	0	210	29.1	15.3	8152
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
21	Nortron	7 pt/a	A	13	4.0	88	98	1	0	204	28.4	15.4	8049
	RU PowerMax	32 / 24 / 22 fl oz/a	B/C/D										
	N Pak AMS	2.5 % v/v	BCD										
	NIS	0.25 % v/v	BCD										
	LSD 5%			**6.3**	**0.750**	**5.9**	**15.4**	**4.1**	**NS**	**15.6**	**NS**	**NS**	**NS**
	CV %			**27**	**18**	**20**	**14**	**138**	**462**	**5**	**6**	**4**	**7**