

**PREEMERGENCE AND PREPLANT INCORPORATED HERBICIDES FOR ROUNDUP READY SUGARBEET –
HOLLOWAY, MN – SITE 1**

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Introduction

Glyphosate-resistant waterhemp continues to increase in Minnesota and North Dakota. This trial was established to evaluate various soil-applied herbicides applied preemergence and pre-plant incorporated.

Materials and Methods

‘Betaseed 87RR38’ Roundup Ready sugarbeet was seeded May 4 at 60,825 seeds per acre in six 22” row plots 30 feet in length in a cooperators’ field having glyphosate-resistant waterhemp. Sugarbeet seed was treated with Tachigaren at 45 grams dry product per 100,000 seeds and Poncho Beta. Headline at 12 fl oz/A was applied in-furrow at planting to all plots. Preplant incorporated treatments were applied May 3. A C-shank field cultivator with rolling baskets was set to a depth of 2 to 3” and driven once at approximately 5 mph through the center of all plots to incorporate the applied herbicides. Preemergence treatments were applied May 4. Postemergence treatments were applied June 13 and June 30. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Quadris at 15.4 fl oz/A was applied to the entire experiment June 15. Sugarbeet stand counts were recorded for the middle two rows at a total length of 20 feet on June 1 and 60 feet on August 1. Sugarbeet injury was evaluated May 26, June 13, July 14 and July 20. Waterhemp control was evaluated June 13, June 30, July 14, July 20 and August 24. Lambsquarters, common ragweed, and wild buckwheat were evaluated June 13, June 30, July 14, and July 20. Annual grass (75% white robust foxtail and 25% yellow foxtail) was evaluated June 13. All evaluations are a visual estimate of percent weed control or percent sugarbeet injury in the treated plot compared to the adjacent untreated strips and plots. Proline at 5.7 fl oz/A plus NIS at 0.25 %v/v, Agritin at 8 oz/A plus Manzate at 2 pounds/A, and Headline at 7 fl oz/A were applied on July 19, August 9, and August 26, respectively, over the entire trial area to control Cercospora. Sugarbeet from 20 feet of a center row in each plot was harvested September 7.

Table 1. Application information.

Date of Application	May 3	May 4	June 13	June 30
Time of Day	4:00 pm	2:40 pm	12:30 pm	12:15 pm
Air Temperature (°F)	58	66	69	88
Relative Humidity (%)	22	24	65	60
Soil Temp. (°F at 6”)	48	41	56	72
Wind Velocity (mph)	5.5	21	11	8
Cloud Cover (%)	0	75	75	85
Soil Moisture	good	good	good	good
Sugarbeet Stage (range/Avg)	PPI	PRE	V8.5 – V8.2/V 10.4	V8.0 – V 18/V 14
Waterhemp (range/Avg) Trt. 2	PPI	PRE	cot-14 lf/10 lf; 0.33-6”/3.9”	cot-12lf/5.5 lf; 0.125-12”/2.8”
Waterhemp (avg. density) Trt. 2	PPI	PRE	150/M ²	9.3/M ²
Waterhemp (range/Avg) Trt. 18	PPI	PRE	cot-12 lf/8.75 lf; 0.75-4”/2.5”	cot-14lf/3.5 lf; 0.5-6”/1.6”
Waterhemp (avg. density) Trt. 18	PPI	PRE	32/M ²	3.75/M ²
Com. Lambsquarters (range/Avg) Trt. 2	PPI	PRE	6 lf-16 lf/10 lf; 1-7”/4.6”	-
Com. Lambsquarters (avg. density) Trt. 2	PPI	PRE	8/M ²	0/M ²
Com. Lambsquarters (range/Avg) Trt. 18	PPI	PRE	4 lf-14 lf/10 lf; 0.5-3.5”/2.6”	-
Com. Lambsquarters (avg. density) Trt. 18	PPI	PRE	9/M ²	0/M ²
Annual Grasses (range/Avg) Trt. 2	PPI	PRE	1-3 tillers/1.5 tillers; 3.5-10”/7.75”	-
Annual Grasses (avg. density) Trt. 2	PPI	PRE	15/M ²	0/M ²
Annual Grasses (range/Avg) Trt. 18	PPI	PRE	3 lf-2 tillers/1 tiller; 1-9”/6”	-
Annual Grasses (avg. density) Trt. 18	PPI	PRE	6/M ²	0/M ²

Results

Table 2. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Holloway, MN, 2011. (Stachler)

Trt #	Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	May 26	June 1	July 12
				Sgbt Inju %	Sgbt Popl Plt/20'	Sgbt Popl Plt/60'
1.	Untreated Check	0	---	1	44	125
2.	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	50	134
3.	Ro-Neet 4 EC (PPI)	4	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	12	45	118
4.	Ro-Neet SB (PPI)	4	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	15	44	123
5.	Ro-Neet 4 EC (PRE)	4	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	51	134
6.	Ro-Neet SB (PRE)	4	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	47	136
7.	Ro-Neet 4 EC (PPI)	4	May 3			
	RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	13	48	122
8.	Ro-Neet 4 EC (PRE)	4	May 4			
	RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	51	142
9.	Ro-Neet 4 EC (PPI)	4	May 3			
	RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	21	43	122
10.	Ro-Neet 4 EC (PRE)	4	May 4			
	RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	4	53	142
11.	Ro-Neet 4 EC + Eptam (PPI)	2.5 + 2	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	22	42	126
12.	Ro-Neet 4 EC + Eptam (PRE)	2.5 + 2	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	51	137
13.	Nortron (PPI)	3.75	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	52	137
14.	Nortron (PRE)	3.75	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	48	144
15.	Dual 8 EC (PPI)	1.4	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	6	46	132
16.	Dual 8 EC (PRE)	1.4	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	2	52	139
17.	Warrant (PPI)	1.4	May 3			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	52	145
18.	Warrant (PRE)	1.4	May 4			
	RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13			
	RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	4	50	138
LSD (5%)				5.5	NS	NS

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Table 3. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Holloway, MN, 2011. (Stachler)

Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	Sgbt Inju	Wahe Cntl	June 13			Grass Cntl
					Colq Cntl	Corw Cntl	Wibw Cntl	
				----- % -----				
Untreated Check	0	---	0	0	0	0	0	0
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	0	0	0	0	0	0
Ro-Neet 4 EC (PPI)	4	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	10	78	76	35	35	75
Ro-Neet SB (PPI)	4	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	17	71	69	43	44	78
Ro-Neet 4 EC (PRE)	4	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	41	56	33	28	65
Ro-Neet SB (PRE)	4	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	6	51	61	31	26	56
Ro-Neet 4 EC (PPI)	4	May 3						
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	12	80	74	44	38	83
Ro-Neet 4 EC (PRE)	4	May 4						
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	6	48	50	34	31	63
Ro-Neet 4 EC (PPI)	4	May 3						
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	17	84	68	39	38	83
Ro-Neet 4 EC (PRE)	4	May 4						
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	48	54	38	31	68
Ro-Neet 4 EC + Eptam (PPI)	2.5 + 2	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	24	91	83	46	44	91
Ro-Neet 4 EC + Eptam (PRE)	2.5 + 2	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	9	73	53	35	34	71
Nortron (PPI)	3.75	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	15	83	71	35	46	78
Nortron (PRE)	3.75	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	6	89	74	48	46	80
Dual 8 EC (PPI)	1.4	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	14	76	55	33	32	80
Dual 8 EC (PRE)	1.4	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	7	82	56	29	34	80
Warrant (PPI)	1.4	May 3						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	8	48	34	30	29	43
Warrant (PRE)	1.4	May 4						
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13						
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	4	71	46	33	34	66
LSD (5%)			5.6	13.4	17.8	12.4	10.0	12.9

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Table 4. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Holloway, MN, 2011. (Stachler)

Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	Sgbt Inju	Wahe Cntl	July 20	Corw Cntl	Wibw Cntl
					Colq Cntl		
					----- % -----		
Untreated Check	0	---	0	0	0	0	0
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	57	99	99	95
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	86	99	99	97
Ro-Neet SB (PPI)	4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	72	99	99	95
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	9	63	99	99	95
Ro-Neet SB (PRE)	4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	2	60	99	99	95
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	7	90	99	99	98
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	0	64	99	99	94
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	87	99	99	97
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	65	99	99	97
Ro-Neet 4 EC + Eptam (PPI)	2.5 + 2	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	92	99	99	93
Ro-Neet 4 EC + Eptam (PRE)	2.5 + 2	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	80	99	99	98
Nortron (PPI)	3.75	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	94	99	99	95
Nortron (PRE)	3.75	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	5	96	99	99	98
Dual 8 EC (PPI)	1.4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	87	99	99	97
Dual 8 EC (PRE)	1.4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	91	94	94	90
Warrant (PPI)	1.4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	3	73	99	99	99
Warrant (PRE)	1.4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	1	83	99	99	97
LSD (5%)			NS	18.2	3.2	3.2	5.5

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Table 5. Preemergence and preplant incorporated herbicides for Roundup Ready sugarbeet, Holloway, MN, 2011. (Stachler)

Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	Aug. 24	Sept. 7		Extrac Sucrose lb/A	
			Wahe Cntl %	Sgbt Popl Plts/20'	Root Yield Tons/A		Sucrose %
Untreated Check	0	---	0	29	0.8	-	
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	54	41	12.7	14.0	
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	78	40	13.9	13.2	
Ro-Neet SB (PPI)	4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	66	37	13.2	13.4	
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	59	38	11.5	13.0	
Ro-Neet SB (PRE)	4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	62	41	10.8	13.5	
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	80	41	13.1	13.0	
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+Outlook+AMS	1.125 + 0.984 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	57	47	13.3	13.7	
Ro-Neet 4 EC (PPI)	4	May 3					
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	82	41	14.2	13.4	
Ro-Neet 4 EC (PRE)	4	May 4					
RUPowerMAX+Warrant+AMS	1.125 + 1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	60	48	12.6	13.4	
Ro-Neet 4 EC + Eptam (PPI)	2.5 + 2	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	82	42	12.5	14.0	
Ro-Neet 4 EC + Eptam (PRE)	2.5 + 2	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	72	48	14.9	13.4	
Nortron (PPI)	3.75	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	88	44	16.6	13.7	
Nortron (PRE)	3.75	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	88	49	14.6	13.0	
Dual 8 EC (PPI)	1.4	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	82	45	15.1	13.3	
Dual 8 EC (PRE)	1.4	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	90	45	15.7	13.3	
Warrant (PPI)	1.125	May 3					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	72	52	16.4	13.6	
Warrant (PRE)	1.125	May 4					
RUPowerMAX+AMS	1.125 + 2.5% v/v	June 13					
RUPowerMAX+AMS	0.75 + 2.5% v/v	June 30	83	45	15.1	13.5	
LSD (5%)			17.0	NS	3.70	0.63	NS

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Summary

Ro-Neet and Ro-Neet plus Eptam applied PPI caused the greatest sugarbeet injury on May 26. Ro-Neet, Ro-Neet plus Eptam, Dual Magnum and Nortron applied PPI caused the greatest sugarbeet injury on June 13. Injury declined over time and only the Ro-Neet plus Eptam seemed to reduce sugarbeet root yield due to injury, otherwise Ro-Neet applied PRE reduced sugarbeet yield, due to the poor control of waterhemp.

On August 24, Roundup PowerMAX applied twice controlled only 54% of waterhemp, indicating the presence of glyphosate-resistant biotype(s) in the population.

At the time of the first postemergence application (June 13), Ro-Neet plus Eptam applied PPI and Nortron applied PRE controlled the most waterhemp. Ro-Neet and Ro-Neet plus Eptam must be incorporated to maximize control of all weed species, but especially waterhemp and annual grasses. Two applications of glyphosate following all PRE and PPI herbicide treatments improved weed control compared to the soil-applied herbicide alone, but the glyphosate-resistant waterhemp was not completely controlled by any treatment, leading to future problems.