

**POSTEMERGENCE NORTRON PLUS GLYPHOSATE TO CONTROL GLYPHOSATE-RESISTANT
WATERHEMP – HOLLOWAY, MN SITE 1**

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Introduction

Glyphosate-resistant waterhemp continues to increase in Minnesota and North Dakota. Previous research demonstrated that Nortron applied postemergence and mixed with glyphosate could control glyphosate-resistant waterhemp. This trial was established to determine what the minimum rate of Nortron could be to achieve effective control.

Materials and Methods

‘Hilleshog 4022’ sugarbeet seed treated with Tachigaren at 45 grams product per 100,000 seeds and Poncho Beta was seeded May 4 at 60,825 seeds/A in six row plots 30 feet in length in a cooperators field having glyphosate-resistant waterhemp. Headline at 12 fl oz/A was applied in-furrow at planting to all plots. Treatments were applied June 2, June 16 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. All treatments included N-Pak AMS (a liquid AMS solution) at 2.5% v/v. Quadris at 15.4 fl oz/A was applied to the entire experiment on June 15. Sugarbeet injury was evaluated June 16, June 30, July 14 and July 20. Common lambsquarters and wild buckwheat control were evaluated June 30, July 14 and July 20. Annual grass control was evaluated July 20. Waterhemp control was evaluated June 16, June 30, July 14, July 20 and August 24. Waterhemp was counted in one meter square at two locations in each plot and averaged together to determine the average waterhemp density per meter squared for each plot July 25. 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 one center row in each plot were harvested September 7.

Table 1. Application information.

Date of Application	June 2	June 16	June 30
Time of Day	11:30 am	11:00 am	12:00 pm
Air Temperature (°F)	80	68	88
Relative Humidity (%)	44	68	60
Soil Temp. (°F at 6")	58	57	72
Wind Velocity (mph)	28	4	9
Cloud Cover (%)	90	60	85
Soil Moisture	good	good	good
Sugarbeet Stage (range/Avg)	V1.0-V4.5/V3.6	V6.0-V12.0/V9.5	V6.0-V12.0/V10.0
Waterhemp (range/Avg) Trt. 1	cot-7 lf/4 lf; 0.125-1.25"/0.5"	cot-17 lf/12 lf; 0.25-12.5"/5.5"	cot-24 lf/16 lf; 0.5-25"/14"
Waterhemp (avg. density) Trt. 1	218/M ²	364/M ²	41/M ²
Waterhemp (range/Avg) Trt. 12	cot-7 lf/4 lf; 0.125-1.25"/0.5"	1-16 lf/8 lf; 0.25-5.25"/2"	cot-14 lf/ 7 lf; 0.125-6"/1.75"
Waterhemp (avg. density) Trt. 12	79/M ²	64/M ²	17/M ²
Common Lambsquarters (range/Avg) Trt. 1	2-11 lf/5 lf; 0.25-2"/0.75"	4-21 lf/14 lf; 0.5-15"/7"	-
Common Lambsquarters (avg. density) Trt. 1	8/M ²	21/M ²	-
Common Lambsquarters (range/Avg) Trt. 12	2-11 lf/5 lf; 0.25-2"/0.75"	6-13 lf/7 lf; 0.75-3"/2"	-
Common Lambsquarters (avg. density) Trt. 12	6/M ²	0.75/M ²	-
Annual Grasses (range/Avg) Trt. 1	2-4 lf/3 lf; 0.33-1.5"/1"	2-6 Till/3.5 Till; 1-8"/5"	-
Annual Grasses (avg. density) Trt. 1	7/M ²	5/M ²	-
Annual Grasses (range/Avg) Trt. 12	2-4 lf/3 lf; 0.33-1.5"/1"	4 lf-3T/1T; 0.75-1.5"/1"	-
Annual Grasses (avg. density) Trt. 12	19/M ²	0.75/M ²	-
Wild Buckwheat (range/Avg) Trt. 1	1-7 lf/4 lf; 0.33-3.5"/1.3"	-	-
Wild Buckwheat (avg. density) Trt. 1	4/M ²	-	-
Wild Buckwheat (range/Avg) Trt. 12	1-7 lf/4 lf; 0.33-3.5"/1.3"	-	-
Wild Buckwheat (avg. density) Trt. 12	5/M ²	-	-

Results

Table 2. Postemergence Nortron plus glyphosate to control glyphosate-resistant waterhemp, Holloway, MN, 2011. (Stachler)

Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	June 16	June 16	July 14	July 14	July 14	July 14
			Sgbt Inju %	Wahe Cntl %	Sgbt Inju %	Wahe Cntl %	Colq Cntl %	Wibw Cntl %
Untreated Check	-	-	0	0	0	0	0	0
Roundup PowerMAX	1.125	June 2						
Roundup PowerMAX	0.75	June 16	2	70	0	60	98	92
Roundup PowerMAX	1.125	June 2						
Roundup PowerMAX	0.75	June 16, 30	1	65	0	74	100	87
Roundup PowerMAX+Nortron	1.125+0.125	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16	3	80	0	73	99	93
Roundup PowerMAX+Nortron	1.125+0.5	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16	5	84	0	78	100	78
Roundup PowerMAX+Nortron	1.125+1	June 2						
Roundup PowerMAX+Nortron	0.75+1	June 16	10	88	2	90	99	93
Roundup PowerMAX+Nortron	1.125+1.5	June 2						
Roundup PowerMAX+Nortron	0.75+1.5	June 16	11	91	5	94	99	89
Roundup PowerMAX+Nortron	1.125+1.875	June 2						
Roundup PowerMAX+Nortron	0.75+1.875	June 16	11	87	3	93	100	88
Roundup PowerMAX+Nortron	1.125+0.25	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16	5	86	1	75	98	85
Roundup PowerMAX+Nortron	1.125+1	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16	6	81	0	76	99	78
Roundup PowerMAX+Nortron	1.125+0.125	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16, 30	3	75	1	64	100	93
Roundup PowerMAX+Nortron	1.125+0.5	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16, 30	4	78	3	85	100	86
LSD (5%)			3.2	7.2	2.3	8.9	2.2	11.7

¹N-Pak AMS (liquid ammonium sulfate from Winfield Solutions) was included in all postemergence treatments at 2.5% v/v.

Table 3. Postemergence Nortron plus glyphosate to control glyphosate-resistant waterhemp, Holloway, MN, 2011. (continued)

Treatment ¹	Rate lb ai/A or lb ae/A	Date of Applic.	July 25	Aug24	Sept. 7	Sept. 7	Sept. 7	Sept. 7
			Wahe Popl plt/M ²	Wahe Cntl %	Root Yield ton/A	Sucr %	Extr Sucr lb/A	Sgt Popl plt/20 ¹
Untreated Check	-	-	290 a	0	0	-	0	-
Roundup PowerMAX	1.125	June 2						
Roundup PowerMAX	0.75	June 16	28 b	42	14.4	14.1	3401	51
Roundup PowerMAX	1.125	June 2						
Roundup PowerMAX	0.75	June 16, 30	6 bc	62	15.2	13.8	3459	52
Roundup PowerMAX+Nortron	1.125+0.125	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16	5 bc	49	13.4	13.3	2886	46
Roundup PowerMAX+Nortron	1.125+0.5	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16	13 bc	51	14.1	13.9	3243	44
Roundup PowerMAX+Nortron	1.125+1	June 2						
Roundup PowerMAX+Nortron	0.75+1	June 16	2 c	70	15.2	13.7	3445	51
Roundup PowerMAX+Nortron	1.125+1.5	June 2						
Roundup PowerMAX+Nortron	0.75+1.5	June 16	1 c	78	15.7	13.5	3430	55
Roundup PowerMAX+Nortron	1.125+1.875	June 2						
Roundup PowerMAX+Nortron	0.75+1.875	June 16	2 c	77	14.8	13.6	3286	50
Roundup PowerMAX+Nortron	1.125+0.25	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16	5 bc	48	12.9	13.7	2881	49
Roundup PowerMAX+Nortron	1.125+1	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16	8 bc	50	13.2	13.6	2921	54
Roundup PowerMAX+Nortron	1.125+0.125	June 2						
Roundup PowerMAX+Nortron	0.75+0.125	June 16, 30	15 bc	51	15.2	13.6	3409	53
Roundup PowerMAX+Nortron	1.125+0.5	June 2						
Roundup PowerMAX+Nortron	0.75+0.5	June 16, 30	6 bc	65	13.1	13.5	2878	52
LSD (5%)			-	11.0	3.3	NS	745	NS

¹N-Pak AMS (liquid ammonium sulfate from Winfield Solutions) was included in all postemergence treatments at 2.5% v/v.

Summary

Nortron applied twice at greater than or equal to 2.0 lb ai/A caused the greatest sugarbeet injury of the season on June 16. Injury declined over time reaching nearly negligible levels for nearly all treatments by July 14. On June 16, Roundup PowerMAX applied at 1.125 lb ae/A caused 75% (data not shown) mortality of ten flagged waterhemp plants/plot and controlled 67% of waterhemp, indicating the presence of glyphosate-resistant waterhemp in this research trial. Waterhemp mortality improved to 92% (data not shown) by August 24, however Roundup PowerMAX applied two or three times only controlled 42 and 62% of waterhemp, respectively. On June 16, Nortron mixed at all rates with Roundup PowerMAX improved waterhemp control compared to Roundup PowerMAX alone. By August 24, only Nortron mixed at a total of 2.0 lb ai/A or greater improved waterhemp control compared to Roundup PowerMAX alone. Sugarbeet root yield and extractable sucrose was similar for all treatments with Nortron at 1.5 lb ai/A plus Roundup PowerMAX producing the greatest root yield. The lack of treatment differences in root yield and extractable sucrose was likely caused by inconsistent control of *Cercospora* and frequency of resistant waterhemp plants in each plot.