

# Application Factors for Glyphosate and Waterhemp

12-06-05 (05-RL-GPA-MPH)

Southern Illinois University

GPA and MPH Factorial - 1.

Project Code: 05-RL-GPA-MPH Location: Rendlake, IL  
Investigator: Bryan Young

**Investigator:** Bryan Young, Associate Professor, Southern Illinois University

**City State Zip Country:** Ina IL 62846 USA  
**Trial Status:** Final **Updated:** 12-02-05

## Objective:

Determine the influence of application factors (carrier volume and travel speed) on glyphosate efficacy.

Weed Code	Common Name	Scientific Name
1.	AMATA waterhemp, common	Amaranthus rudis Sauer
2.	AMAPA amaranth, Palmer	Amaranthus palmeri S.Wats.

**Crop 1:** GLXMA soybean  
**Planting Method:** Seeded  
**Row Spacing:** 30 IN

**Plot Width, Unit:** 10 FT **Plot Length, Unit:** 50 FT **Reps:** 3  
**Tillage Type:** Reduced-Till **Study Design:** Randomized complete block

## APPLICATION DESCRIPTION

**Application Date:** 06-15-05  
**Time of Day:** 8:00-12:00  
**Application Method:** Spray  
**Application Timing:** 8-12"W  
**Applic. Placement:** BROFOL  
**Air Temp., Unit:** 83 F  
**% Relative Humidity:** 36  
**Wind Velocity, Unit:** 8-10 MPH  
**Dew Presence (Y/N):** N  
**Soil Temp., Unit:** 76 F  
**Soil Moisture:** NORMAL  
**% Cloud Cover:** 10

## CROP STAGE AT EACH APPLICATION

**Crop 1 Code, Stage:** GLXMA V3  
**Height, Unit:** 8 IN

## WEED STAGE AT EACH APPLICATION

**Weed 1 Code:** AMATA  
**Stage (leaves):** 10-12  
**Height (inches):** 8-12  
**Density:** High  
**Weed 2 Code:** AMAPA  
**Stage (leaves):** 12-20  
**Height (inches):** 10-13

## APPLICATION EQUIPMENT

**Appl. Equipment:** CO2 sprayer  
**Operating Pressure:** See note  
**Nozzle Type:** See note  
**Nozzle Size:** See note  
**Boom Length, Unit:** 6.67 FT  
**Spray Volume, Unit:** See note

## NOTES:

Nozzle type and size, and spray volume are listed in treatment list.  
Spray pressure depends on treatment.

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										AMATA	AMATA	AMATA	AMATA	AMATA	AMAPA	AMAPA
										Control	Control	Control	Control	Dry wt.	Control	Control
										Percent	Percent	% INDPLA	% INDPLA	g/INDPLA	Percent	Percent
										06-29-05	07-13-05	06-29-05	07-13-05	07-13-05	06-29-05	07-13-05
										14 DA-A	28 DA-A	14 DA-A	28 DA-A	28 DA-A	14 DA-A	28 DA-A
Trt	Treatment	Form	Form	Rate	Prod	Prod	Grow	Appl								
No.	Name	Conc	Type	Unit	Rate	Unit	Stg	Code								
1	5 MPH								92	87	99	99	0.95	99	99	
1	5 GPA															
1	XR 11001 NOZZLES															
1	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
2	10 MPH								95	91	99	99	1.19	99	99	
2	5 GPA															
2	XR 11002 NOZZLES															
2	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
3	15 MPH								94	92	99	99	0.44	99	98	
3	5 GPA															
3	XR 11003 NOZZLES															
3	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
4	20 MPH								96	94	99	99	1.41	99	97	
4	5 GPA															
4	XR 11004 NOZZLES															
4	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
5	5 MPH								89	85	99	99	1.98	99	97	
5	10 GPA															
5	XR 11002 NOZZLES															
5	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
6	10 MPH								82	79	99	99	0.39	98	98	
6	10 GPA															
6	XR 11004 NOZZLES															
6	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
7	15 MPH								82	70	95	89	0.56	99	99	
7	10 GPA															
7	XR 11006 NOZZLES															
7	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
8	20 MPH								77	70	99	99	0.35	99	97	
8	10 GPA															
8	XR 11008 NOZZLES															
8	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
9	5 MPH								95	87	97	99	0.85	99	96	
9	15 GPA															
9	XR 11003 NOZZLES															
9	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
10	10 MPH								75	71	99	99	0.71	96	93	
10	15 GPA															
10	XR 11006 NOZZLES															
10	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
11	15 MPH								70	69	99	99	0.73	98	94	
11	15 GPA															
11	XR 11008 NOZZLES															
11	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
12	20 MPH								69	63	97	99	0.52	96	92	
12	15 GPA															
12	XR 11010 NOZZLES															
12	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
13	5 MPH								77	79	99	99	0.75	99	98	
13	20 GPA															
13	XR 11004 NOZZLES															
13	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
14	10 MPH								75	64	99	99	0.62	98	91	
14	20 GPA															
14	XR 11008 NOZZLES															
14	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								
15	15 MPH								68	58	93	92	0.66	98	93	
15	20 GPA															
15	XR 11010 NOZZLES															
15	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W A								

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Prod Rate	Prod Unit	Grow Stg	Appl Code	AMATA Control Percent 06-29-05 14 DA-A	AMATA Control Percent 07-13-05 28 DA-A	AMATA Control % INDPLA 06-29-05 14 DA-A	AMATA Control % INDPLA 07-13-05 28 DA-A	AMATA Dry wt. g/INDPLA 07-13-05 28 DA-A	AMAPA Control Percent 06-29-05 14 DA-A	AMAPA Control Percent 07-13-05 28 DA-A
16	20 MPH 20 GPA XR 11015 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	73	65	82	79	0.52	97	88
17	NONTREATED									0	0	0	0	1.91	0	0
18	10 MPH 5 GPA AI 110015 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	89	86	99	99	0.88	99	98
19	15 MPH 5 GPA AI 11002 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	95	94	99	99	0.67	99	99
20	20 MPH 5 GPA AI 110025 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	96	94	99	99	1.36	99	99
21	5 MPH 10 GPA AI 110015 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	97	95	99	99	0.69	99	99
22	10 MPH 10 GPA AI 110025 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	94	91	99	99	0.64	99	98
23	15 MPH 10 GPA AI 11004 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	92	92	99	99	1.03	99	99
24	20 MPH 10 GPA AI 11005 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	90	89	99	99	0.69	99	99
25	5 MPH 15 GPA AI 11002 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	78	73	99	99	0.39	98	95
26	10 MPH 15 GPA AI 11004 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	78	75	99	99	0.61	98	96
27	15 MPH 15 GPA AI 11006 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	76	76	91	89	0.71	99	97
28	20 MPH 15 GPA AI 11008 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	73	66	99	99	0.45	98	91
29	5 MPH 20 GPA AI 110025 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	92	88	99	99	0.44	99	99
30	10 MPH 20 GPA AI 11005 NOZZLES ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"	A	73	66	99	99	0.31	98	92

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Weed Code		AMATA	AMATA	AMATA	AMATA	AMATA	AMAPA	AMAPA	
Crop Code									
Rating Data Type		Control	Control	Control	Control	Dry wt.	Control	Control	
Rating Unit		Percent	Percent	% INDPLA	% INDPLA	g/INDPLA	Percent	Percent	
Rating Date		06-29-05	07-13-05	06-29-05	07-13-05	07-13-05	06-29-05	07-13-05	
Trt-Eval Interval		14 DA-A	28 DA-A	14 DA-A	28 DA-A	28 DA-A	14 DA-A	28 DA-A	
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Unit	Prod Rate	Prod Unit	Grow Stg	Appl Code
31	15 MPH								
31	20 GPA								
31	AI 11008 NOZZLES								
31	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A
LSD (P=.05)									
				7.7		10.6		10.2	
								12.5	
								0.851	
								2.2	
								5.2	
	Replicate F	23.038		5.752		2.277		1.737	1.363
	Replicate Prob(F)	0.0001		0.0052		0.1114		0.1847	0.2636
	Treatment F	43.097		23.653		24.725		16.549	1.869
	Treatment Prob(F)	0.0001		0.0001		0.0001		0.0001	0.0001

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Prod Rate	Prod Unit	Grow Stg	Appl Code	AMAPA	AMAPA	AMAPA	Coverage	Drops	Coverage	Drops
										Control % INDPLA 06-29-05 14 DA-A	Control % INDPLA 07-13-05 28 DA-A	Dry wt. g/INDPLA 07-13-05 28 DA-A	TOPCAN Percent 06-15-05 0 DA-A	TOPCAN /sq cm 06-15-05 0 DA-A	MIDCAN Percent 06-15-05 0 DA-A	MIDCAN /sq cm 06-15-05 0 DA-A
1	5 MPH 1 5 GPA 1 XR 11001 NOZZLES 1 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.83	0	6	0	10
2	10 MPH 2 5 GPA 2 XR 11002 NOZZLES 2 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.46	7	67	1	13
3	15 MPH 3 5 GPA 3 XR 11003 NOZZLES 3 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.48	13	43	2	15
4	20 MPH 4 5 GPA 4 XR 11004 NOZZLES 4 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.16	4	26	0	6
5	5 MPH 5 10 GPA 5 XR 11002 NOZZLES 5 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.54	12	80	0	10
6	10 MPH 6 10 GPA 6 XR 11004 NOZZLES 6 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.48	21	62	3	19
7	15 MPH 7 10 GPA 7 XR 11006 NOZZLES 7 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.93	21	56	2	15
8	20 MPH 8 10 GPA 8 XR 11008 NOZZLES 8 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.55	11	38	4	15
9	5 MPH 9 15 GPA 9 XR 11003 NOZZLES 9 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.32	43	83	9	45
10	10 MPH 10 15 GPA 10 XR 11006 NOZZLES 10 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.02	10	48	3	23
11	15 MPH 11 15 GPA 11 XR 11008 NOZZLES 11 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.09	13	29	5	21
12	20 MPH 12 15 GPA 12 XR 11010 NOZZLES 12 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.88	19	30	1	12
13	5 MPH 13 20 GPA 13 XR 11004 NOZZLES 13 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.70	26	47	6	32
14	10 MPH 14 20 GPA 14 XR 11008 NOZZLES 14 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.84	38	42	5	28
15	15 MPH 15 20 GPA 15 XR 11010 NOZZLES 15 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.81	31	51	4	24

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Prod Rate	Prod Unit	Grow Stg	Appl Code	AMAPA	AMAPA	AMAPA	Coverage	Drops	Coverage	Drops
										Control % INDPLA 06-29-05 14 DA-A	Control % INDPLA 07-13-05 28 DA-A	Dry wt. g/INDPLA 07-13-05 28 DA-A	TOPCAN Percent 06-15-05 0 DA-A	TOPCAN /sq cm 06-15-05 0 DA-A	MIDCAN Percent 06-15-05 0 DA-A	MIDCAN /sq cm 06-15-05 0 DA-A
16	20 MPH 16 20 GPA 16 XR 11015 NOZZLES 16 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.28	22	38	6	27
17	NONTREATED									0	0	4.29	0	0	0	0
18	10 MPH 18 5 GPA 18 AI 110015 NOZZLES 18 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.34	6	18	2	6
19	15 MPH 19 5 GPA 19 AI 11002 NOZZLES 19 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.13	1	9	1	9
20	20 MPH 20 5 GPA 20 AI 110025 NOZZLES 20 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.98	3	17	1	10
21	5 MPH 21 10 GPA 21 AI 110015 NOZZLES 21 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.05	13	23	7	18
22	10 MPH 22 10 GPA 22 AI 110025 NOZZLES 22 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	2.52	28	42	6	15
23	15 MPH 23 10 GPA 23 AI 11004 NOZZLES 23 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.82	18	40	5	24
24	20 MPH 24 10 GPA 24 AI 11005 NOZZLES 24 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.57	31	34	2	15
25	5 MPH 25 15 GPA 25 AI 11002 NOZZLES 25 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.94	25	34	3	19
26	10 MPH 26 15 GPA 26 AI 11004 NOZZLES 26 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.73	34	35	3	15
27	15 MPH 27 15 GPA 27 AI 11006 NOZZLES 27 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	1.39	35	33	7	19
28	20 MPH 28 15 GPA 28 AI 11008 NOZZLES 28 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.86	38	48	3	18
29	5 MPH 29 20 GPA 29 AI 110025 NOZZLES 29 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.35	42	45	8	20
30	10 MPH 30 20 GPA 30 AI 11005 NOZZLES 30 ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A	99	99	0.46	27	34	8	15

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										AMAPA		AMAPA		AMAPA		Coverage		Drops		Coverage		Drops	
										Control		Control		Dry wt.		TOPCAN		TOPCAN		MIDCAN		MIDCAN	
										% INDPLA		% INDPLA		g/INDPLA		Percent		/sq cm		Percent		/sq cm	
										06-29-05		07-13-05		07-13-05		06-15-05		06-15-05		06-15-05		06-15-05	
										14 DA-A		28 DA-A		28 DA-A		0 DA-A		0 DA-A		0 DA-A		0 DA-A	
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Unit	Prod Rate	Prod Unit	Grow Stg	Appl Code														
31	15 MPH									99	99	0.70	38	31	8	15							
31	20 GPA																						
31	AI 11008 NOZZLES																						
31	ROUNDUP W-MAX	4.5	SL	0.188	lb ae/a	5.35	fl oz/a	8-12"W	A														
LSD (P=.05)										0.2	0.2	1.622	14.5	28.1	6.2	18.1							
Replicate F										1.000	1.000	0.937	32.198	6.981	30.693	24.783							
Replicate Prob(F)										0.3739	0.3739	0.3976	0.0001	0.0019	0.0001	0.0001							
Treatment F										88190.212	88190.212	1.687	6.779	3.675	1.544	1.794							
Treatment Prob(F)										0.0001	0.0001	0.0429	0.0001	0.0001	0.0763	0.0274							

Trial Comments

1. Protocol: SIU / ISPOB.
2. Ratings: CI and WC 14 and 28 DAT.
3. DA-A = Days after 8-12"W application. 0 DA-A = At 8-12" application.
4. % INDPLA = Percent for individual plants. Dry wt. = Oven dry weight. g/INDPLA = grams per individual plant.  
 Coverage and Drops = Evaluation of the spray pattern as measured by oil-sensitive spray cards.  
 /sq cm = Per square centimeter. TOPCAN and MIDCAN = Top and middle of the crop canopy, respectively.