

Southern Illinois University

Adjuvant Evaluation for Glyphosate and PPO Herbicides on Glyphosate-Resistant Waterhemp.

Trial ID: 13-DSO-PPOadj Location: De Soto, IL Trial Year: 2013
Investigator: Bryan Young

Trial Status: F one-year/final Initiation Date: 5-24-13 Completion Date: 7-18-13	Trial Location City: De Soto Country: USA State/Prov.: Illinois IL Postal Code: 62924
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Objectives:
Evaluate the efficacy of adjuvants for combinations of glyphosate and PPO-inhibiting herbicides on glyphosate-resistant waterhemp.

Study Director: Bryan Young Organization: Southern Illinois University Address: 1205 Lincoln Drive - AG 176 - MC 4415 City+State/Prov: Carbondale IL Postal Code: 62901 Country: USA	Title: Professor Phone No.: 618-453-7679 Mobile No.: 618-713-6471 E-mail: bgyoung@siu.edu
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Crop 1: GLXMA Glycine max Soybean Variety: AG3832 BBCH Scale: BSOY Description: RR2Y Planting Rate, Unit: 145000 S/A Planting Date: 5-24-13 Depth, Unit: 1.75 IN Planting Method: SEEDED Row Spacing, Unit: 30 IN
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Pest 1 Type: W Code: AMATA <i>Amaranthus rudis</i> Sauer Common Name: waterhemp, common Description: glyphosate-resistant waterhemp

Treated Plot Width: 6.67 FT Total Plot Width: 10 FT Treated Plot Length: 30 FT Total Plot Length: 30 FT Replications: 3 Untreated Arrangement: INCLUDED single control randomized in each block	Site and Design Site Type: FIELD Experimental Unit: 1 PLOT Tillage Type: NOTILL no-till Study Design: RACOB L Randomized Complete Block (RCB)
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No.	Previous Crop	Year
1.	ZEAMD	2012

<table border="1"> <thead> <tr> <th>No.</th> <th>Maintenance Product Name</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>N 0 LB/A, P2O5 0 LB/A, K2O 0 LB/A</td> </tr> </tbody> </table>	No.	Maintenance Product Name	1.	N 0 LB/A, P2O5 0 LB/A, K2O 0 LB/A
No.	Maintenance Product Name			
1.	N 0 LB/A, P2O5 0 LB/A, K2O 0 LB/A			

% Sand: 15.4 % OM: 2.15 Texture: SIL silt loam % Silt: 64.7 pH: 6.9 Soil Name: Okaw % Clay: 19.9 CEC: 12.4
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Element	Quantity	Unit
P1	94	lb/A
K	468	lb/A

Overall Moisture Conditions: NORMAL Closest Weather Station: SOUTHERN IL AIRPORT (93810)	Moisture and Weather Conditions Distance, Unit: 1.5 MI
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No.	Date	Amount	Unit	Type	Type Description	Interval	Unit	Min Temp	Max Temp	Temp Unit
1.	5-3-13	1.33	IN	RAIN	rain	3	DAY			
2.	5-5-13	0.75	IN	RAIN	rain	2	DAY			
3.	5-6-13					7	DAY	41	80	F
4.	5-10-13	0.17	IN	RAIN	rain	3	DAY			
5.	5-13-13					7	DAY	37	87	F
6.	5-16-13	0.23	IN	RAIN	rain	2	DAY			
7.	5-20-13					7	DAY	43	85	F
8.	5-21-13	0.91	IN	RAIN	rain	1	DAY			
9.	5-27-13					7	DAY	59	86	F
10.	5-31-13	0.7	IN	RAIN	rain	3	DAY			
11.	6-1-13	1.67	IN	RAIN	rain	2	DAY			
12.	6-3-13					7	DAY	50	82	F
13.	6-10-13	0.13	IN	RAIN	rain	5	DAY			
14.	6-10-13					7	DAY	57	93	F
15.	6-17-13	0.36	IN	RAIN	rain	2	DAY			
16.	6-17-13					7	DAY	61	92	F
17.	6-22-13	0.34	IN	RAIN	rain	2	DAY			
18.	6-24-13					7	DAY	64	93	F
19.	6-26-13	1.25	IN	RAIN	rain	2	DAY			
20.	6-30-13	0.3	IN	RAIN	rain	2	DAY			
21.	7-1-13					7	DAY	57	88	F
22.	7-2-13	1.16	IN	RAIN	rain	2	DAY			
23.	7-8-13					7	DAY	59	92	F
24.	7-14-13	0.05	IN	RAIN	rain	5	DAY			
25.	7-15-13					7	DAY	68	93	F
26.	7-20-13	1.24	IN	RAIN	rain	2	DAY			

Application Description

	A
Application Date:	6-20-13
Appl. Start Time:	9:30
Appl. Stop Time:	10:00
Application Method:	Spray
Application Timing:	6"W
Application Placement:	BROFOL
Applied By:	RJW
Air Temperature, Unit:	86 F
% Relative Humidity:	51
Wind Velocity, Unit:	1 MPH
Wind Direction:	N
Dew Presence (Y/N):	N
Soil Temperature, Unit:	80 F
Soil Moisture:	BELNOR
% Cloud Cover:	25
Next Moisture Occurred On:	6-22-13
Time to Next Moisture, Unit:	2 DAY

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	GLXMA
Stage Scale Used:	DESC
Stage Majority, Percent:	V3
Stage Minimum, Percent:	V2
Stage Maximum, Percent:	V3
Height, Unit:	8 IN
Height Minimum, Maximum:	6 8

Adjuvant Evaluation for Glyphosate and PPO Herbicides on Glyphosate-Resistant Waterhemp.

Trial ID: 13-DSO-PPOadj Location: De Soto, IL Trial Year: 2013
Investigator: Bryan Young**Pest Stage At Each Application**

	A
Pest 1 Code, Type, Scale:	AMATA W
Stage Majority, Percent:	16
Stage Minimum, Percent:	4
Stage Maximum, Percent:	20
Height, Unit:	6 IN
Height Minimum, Maximum:	1 8
Density, Unit:	20 FT2

Application Equipment

	A
Appl. Equipment:	CO2 sprayer
Equipment Type:	BACSPR
Operation Pressure, Unit:	30 PSI
Nozzle Type:	XR
Nozzle Size:	8002
Boom Length, Unit:	6.67 FT
Spray Volume, Unit:	15 GPA

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Pest Code Crop Code Rating Date Rating Type Rating Unit Rating Timing Trt-Eval Interval								GLXMA 6-23-13 Injury Percent	GLXMA 6-27-13 Injury Percent	GLXMA 7-4-13 Injury Percent	GLXMA 7-18-13 Injury Percent	
								3 DA-A	7 DA-A	14 DA-A	28 DA-A	
Trt No.	Treatment Name	Form Conc	Form Type	Rate Unit	Other Rate	Other Rate Unit	Growth Stage	Appl Code				
1	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC	5 SL 2 EC		0.56 lb ae/a 0.25 lb ai/a	14.3 fl oz/a 1 pt/a	6"W 6"W	A A		6 g	5 f	4 f	0 a
2	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC N-PAK AMS	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W	A A A		9 fg	9 e	6 ef	0 a
3	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC CLASS ACT NG	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W	A A A		20 c	17 c	8 cde	0 a
4	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC PRIME OIL COC N-PAK AMS	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		23 abc	19 abc	9 bcd	0 a
5	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC CLASS ACT NG	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		24 ab	21 ab	14 a	0 a
6	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC AG 8034	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v	6"W 6"W 6"W 6"W	A A A A		23 abc	19 abc	9 bcd	0 a
7	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC AG 8034 INTERLOCK	5 SL 2 EC 100 SL 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v 4 fl oz/a	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v 4 fl oz/a	6"W 6"W 6"W 6"W 6"W	A A A A A		25 ab	21 ab	11 bc	0 a
8	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC MSO (MSO ULTRA) N-PAK AMS	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		25 ab	19 bc	9 bcd	0 a
9	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC DESTINY HC CLASS ACT NG	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		20 c	21 ab	10 bcd	0 a
10	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC DESTINY HC AG 8034	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v	6"W 6"W 6"W 6"W	A A A A		25 a	22 a	11 ab	0 a
11	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC AG 11011	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v	6"W 6"W 6"W	A A A		22 bc	19 bc	12 ab	0 a
12	NONTREATED								0 h	0 g	0 g	0 a
13	FLEXSTAR GT 3.5 DRX 101	2.82 SL 100 SL		0.93 lb ae/a 0.83 % v/v	2.65 pt/a 1 pt/a	6"W 6"W	A A		12 ef	11 de	7 de	0 a
14	FLEXSTAR GT 3.5 DRX 102	2.82 SL 100 SL		0.93 lb ae/a 0.417 % v/v	2.65 pt/a 0.5 pt/a	6"W 6"W	A A		13 de	11 de	7 de	0 a

Means followed by same letter do not significantly differ (P=.05, LSD)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

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Pest Code								GLXMA	GLXMA	GLXMA	GLXMA
Crop Code								6-23-13	6-27-13	7-4-13	7-18-13
Rating Date								Injury	Injury	Injury	Injury
Rating Type								Percent	Percent	Percent	Percent
Rating Unit											
Rating Timing											
Trt-Eval Interval								3 DA-A	7 DA-A	14 DA-A	28 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate Rate	Unit Unit	Other Rate	Other Rate	Growth Unit Stage	Appl Code		
15	FLEXSTAR GT 3.5 MSO (MSO ULTRA)	2.82 SL	0.93 SL	lb ae/a	1 % v/v	2.65 pt/a	1 % v/v	6"W 6"W	A A	16 d	13 d
										7 de	0 a
LSD (P=.05)								3.5	2.9	3.3	0.0
Standard Deviation								2.1	1.7	2.0	0.0
CV								11.85	11.59	23.99	0.0
Replicate F								1.104	0.547	0.157	0.000
Replicate Prob(F)								0.3457	0.5848	0.8552	1.0000
Treatment F								43.616	43.831	8.907	0.000
Treatment Prob(F)								0.0001	0.0001	0.0001	1.0000

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Pest Code Crop Code Rating Date Rating Type Rating Unit Rating Timing Trt-Eval Interval							AMATA-HR 6-23-13 Control Percent 3 DA-A	AMATA-HR 6-27-13 Control Percent 7 DA-A	AMATA-HR 7-4-13 Control Percent 14 DA-A	AMATA-HR 7-18-13 Control Percent 28 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate Rate Unit	Other Rate	Other Rate Unit	Growth Stage	Appl Code		
1	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC	5 SL 2 EC		0.56 lb ae/a 0.25 lb ai/a	14.3 fl oz/a 1 pt/a	6"W 6"W	A A		70 b	75 b
2	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC N-PAK AMS	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W	A A A		78 b	82 b
3	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC CLASS ACT NG	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W	A A A		93 a	95 a
4	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC PRIME OIL COC N-PAK AMS	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		90 a	92 a
5	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC CLASS ACT NG	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		95 a	95 a
6	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC AG 8034	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v	6"W 6"W 6"W 6"W	A A A A		97 a	96 a
7	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC SUPERB HC AG 8034 INTERLOCK	5 SL 2 EC 100 SL 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v 4 fl oz/a	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v 4 fl oz/a	6"W 6"W 6"W 6"W 6"W	A A A A A		96 a	96 a
8	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC MSO (MSO ULTRA) N-PAK AMS	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		96 a	94 a
9	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC DESTINY HC CLASS ACT NG	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2.5 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2.5 % v/v	6"W 6"W 6"W 6"W	A A A A		93 a	93 a
10	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC DESTINY HC AG 8034	5 SL 2 EC 100 SL 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 pt/a 2 % v/v	14.3 fl oz/a 1 pt/a 1 pt/a 2 % v/v	6"W 6"W 6"W 6"W	A A A A		92 a	93 a
11	TOUCHDOWN HI-TECH AVALANCHE ULTRA 2 EC AG 11011	5 SL 2 EC 100 SL		0.56 lb ae/a 0.25 lb ai/a 1 % v/v	14.3 fl oz/a 1 pt/a 1 % v/v	6"W 6"W 6"W	A A A		94 a	94 a
12	NONTREATED								0 c	0 c
13	FLEXSTAR GT 3.5 DRX 101	2.82 SL 100 SL		0.93 lb ae/a 0.83 % v/v	2.65 pt/a 1 pt/a	6"W 6"W	A A		88 a	91 a
14	FLEXSTAR GT 3.5 DRX 102	2.82 SL 100 SL		0.93 lb ae/a 0.417 % v/v	2.65 pt/a 0.5 pt/a	6"W 6"W	A A		94 a	95 a

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Pest Code								AMATA-HR	AMATA-HR	AMATA-HR	AMATA-HR
Crop Code								6-23-13	6-27-13	7-4-13	7-18-13
Rating Date								Control	Control	Control	Control
Rating Type								Percent	Percent	Percent	Percent
Rating Unit											
Rating Timing											
Trt-Eval Interval								3 DA-A	7 DA-A	14 DA-A	28 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate Rate	Unit Unit	Other Rate	Other Rate	Growth Unit	Appl Code		
15	FLEXSTAR GT 3.5 MSO (MSO ULTRA)	2.82 SL	100 SL	0.93 lb ae/a	1 % v/v	2.65 pt/a	1 % v/v	6"W 6"W	A A	96 a	96 a
										94 a	85 a
LSD (P=.05)								10.6	8.4	8.5	16.4
Standard Deviation								6.4	5.0	5.1	9.8
CV								7.51	5.88	5.96	14.56
Replicate F								1.412	1.484	1.124	3.076
Replicate Prob(F)								0.2604	0.2440	0.3391	0.0620
Treatment F								44.794	70.418	69.502	12.893
Treatment Prob(F)								0.0001	0.0001	0.0001	0.0001

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Trial Comments

1. Protocol: Winfield Solutions (study 8), and Drexel (HSMOC13).
2. Ratings: CI/WC at 3, 7, 14, and 28 DA-A.
3. No yield requested.
4. AMATA-HR = Herbicide-resistant waterhemp (glyphosate).
5. Blanket burndown of glyphosate (1.5 lbae/A) plus Salvo (12 floz/A) was applied to all plots on 4-2-13.
Blanket prior to planting of Gramoxone (2.5 pt/A) was applied to all plots on 5-24-13.
Blanket application of Arrow (8 floz/A) plus COC (1%) was applied to all plots on 6-11-13.
Blanket application of Warrior (1.92 oz/A) was applied to all plots on 6-19-13.
6. Not harvested.