

# The Ohio State University

## Zone Defense University Exposure

Trial ID: 22ZONEDEF  
 Protocol ID: 22ZONEDEF Location: Western Branch F-7 West Cooperator Trial ID:  
 Project ID: Project ID 2: Project ID 3: Trial Year: 2022  
 Study Director: Sponsor Contact:  
 Investigator (Creator): Dr. Mark M. Loux

Status: E established  
 ARM Trial Created On: Mar-28-2022  
 Initiation Date: Mar-27-2022

### Trial Location

Address (Location): 7721 South Charleston Pike  
 City: South Charleston Country: USA United States  
 State/Prov.: Ohio  
 Postal Code: 45368

Latitude of LL Corner °: 39.86021 N  
 Longitude of LL Corner °: -83.67095 W  
 Altitude of LL Corner: 1095.00 FT

Conducted Under GLP: No  
 Conducted Under GEP: No  
 None

### Crop Description

Crop 1: C GLXMA Glycine max Soybean BBCH Scale: BSOY  
 Entry Date: May-2-2022 Stage Scale: BBCH  
 Variety: SC7322E  
 Attributes: 2,4-D Choline, Glyphosate, Glufosinate Tol  
 Seed Size: 3140 S/LB  
 Planting Date: Apr-27-2022 Planting Rate: 165000 S/A  
 Depth: 1.5 IN  
 Rows per Plot: 8  
 Row Spacing: 15 IN  
 Planting Method: PLANTD planted  
 Planting Equipment: PP plot planter  
 Seed Bed: MEDIUM medium  
 Soil Temperature: 52 F  
 Emergence Date: May-16-2022 Soil Moisture: NORMAL normal, adequate

### Pest Description

Pest 1 Type: W Code: SETFA Setaria faberi Entry Date: Jul-15-2022  
 Common Name: Giant foxtail Stage Scale: BBCH  
 Pest 2 Type: W Code: ECHCG Echinochloa crus-galli Entry Date: Jul-15-2022  
 Common Name: common barnyardgrass Stage Scale: BBCH  
 Pest 3 Type: W Code: AMBTR Ambrosia trifida Entry Date: Jul-15-2022  
 Common Name: Giant ragweed Stage Scale: BBCH  
 Pest 4 Type: W Code: CHEAL Chenopodium album Entry Date: Jul-15-2022  
 Common Name: common lambsquarters Stage Scale: BBCH  
 Pest 5 Type: W Code: AMARE Amaranthus retroflexus Entry Date: Jul-15-2022  
 Common Name: Redroot pigweed Stage Scale: BBCH  
 Pest 6 Type: W Code: ABUTH Abutilon theophrasti Entry Date: Jul-15-2022  
 Common Name: velvetleaf Stage Scale: BBCH  
 Pest 7 Type: W Code: POLPY Persicaria pensylvanica Entry Date: Jul-15-2022  
 Common Name: annual smartweed Stage Scale: BBCH

### Site and Design

Treated Plot Width: 6.67 FT Site Type: FIELD field  
 Treated Plot Length: 30 FT  
 Treated Plot Area: 200.1 FT<sup>2</sup>  
 Replications: 3 Treatments: 6 Plots: 18 Study Design: RACOB L Randomized Complete Block (RCB)

Previous  
 No. Crop Year  
 1. CORN 2021

### Soil Description

Description Name: F-7 Middle  
 % Sand: 35 % OM: 2.1 Texture: L loam  
 % Silt: 46 Soil Name: Crosby  
 % Clay: 19 Fert. Level: G good  
 pH: 6.4 CEC: 10.3

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### Application Description

A  
 Application Date Apr-28-2022  
 Appl. Start Time 11:00 AM  
 Appl. Stop Time 11:20 AM  
 Application Method SPRAY  
 Application Timing PRE  
 Application Placement BROSOI  
 Applied By Loux  
 Appl. Entry Date May-2-2022  
 Air Temperature Start, Stop 45, 45 F  
 % Relative Humidity Start, Stop 62, 62  
 Wind Velocity+Dir. Start 5 MPH, E  
 Wind Velocity+Dir. Stop 5 MPH, E  
 Wind Velocity+Dir. Max 5 MPH, E  
 Wet Leaves (Y/N) N, no  
 Soil Temperature 51 F  
 Soil Moisture DRY  
 Soil Surface Condition MEDIUM  
 % Cloud Cover 90  
 Next Moisture Occurred On Apr-30-2022  
 Time to Next Moisture 2.0 DAY  
 Moisture 6 Hours after Appl. 0 IN  
 Moisture 1 Week after Appl. 1.1 IN

### Crop Stage At Each Application

A  
 Crop 1 Code, BBCH Scale GLXMA, BSOY  
 Days after Emergence -18

### Pest Stage At Each Application

A  
 Pest 1 Code, Type, Scale SETFA, W, BBCH  
 Density Average 256 PLA/m2  
 Density Minimum, Maximum 175, 296  
 Pest 2 Code, Type, Scale ECHCG, W, BBCH  
 Density Average 56 PLA/M2  
 Density Minimum, Maximum 25, 67  
 Pest 3 Code, Type, Scale AMBTR, W, BBCH  
 Density Average 12 PLA/M2  
 Density Minimum, Maximum 8, 16  
 Pest 4 Code, Type, Scale CHEAL, W, BBCH  
 Density Average 24 PLA/M2  
 Density Minimum, Maximum 13, 29  
 Pest 5 Code, Type, Scale AMARE, W, BBCH  
 Density Average 8 PLA/M2  
 Density Minimum, Maximum 4, 10  
 Pest 6 Code, Type, Scale ABUTH, W, BBCH  
 Density Average 3 PLA/M2  
 Density Minimum, Maximum 0.25, 4  
 Pest 7 Code, Type, Scale POLPY, W, BBCH  
 Density Average 6 PLA/M2  
 Density Minimum, Maximum 0, 15

### Application Equipment

A  
 Appl. Equipment 6' TTI  
 Equipment Type BACCAI  
 Operation Pressure 44 PSI  
 Nozzle Model 1110015  
 Nozzle Type TTI  
 Nozzle Spacing 18 IN  
 Boom Length 6.67 FT  
 Boom Height 20 IN  
 Ground Speed 3 MPH  
 Carrier WATER  
 Water Hardness (ppm CaCO3) 250  
 Application Amount 15 GAL/AC  
 Mix Size 1 L  
 Spray pH 7.8  
 Propellant COMCO2

### Notes

Context	Date	By	Notes
STATUS	Mar-28-2022	Dr. Mark M. Loux	Automatically added by ARM: Trial Status updated to 'S' during trial creation.
STATUS	May-2-2022	Dr. Mark M. Loux	Automatically added by ARM: Trial Status updated to 'E' when Planting Date entered.

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Pest Type	W, Weed	W, Weed	W, Weed	W, Weed	W, Weed			
Pest Code	SETFA	AMBTR	CHEAL	AMARE	ABUTH			
Pest Scientific Name	Setaria faberi	Ambrosia trifida	Chenopodium alb>	Amaranthus retr>	Abutilon theoph>			
Pest Name	Giant foxtail	Giant ragweed	common lambsqua>	Redroot pigweed	velvetleaf			
Crop Type, Code	C, GLXMA							
Crop Name	Soybean							
Rating Date	May-26-2022	May-26-2022	May-26-2022	May-26-2022	May-26-2022			
Part Rated								
Rating Type	PHYLMA	CONTRO	CONTRO	CONTRO	CONTRO			
Rating Unit/Min/Max	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100			
Number of Subsamples	1	1	1	1	1			
Data Entry Date	May-27-2022	May-27-2022	May-27-2022	May-27-2022	May-27-2022			
Days After First/Last Applic.	28, 28	28, 28	28, 28	28, 28	28, 28			
Trt-Eval Interval	28 DA-A	28 DA-A	28 DA-A	28 DA-A	28 DA-A			
Plant-Eval Interval	29 DP-1	29 DP-1	29 DP-1	29 DP-1	29 DP-1			
Days After Emergence	10 DE-1	10 DE-1	10 DE-1	10 DE-1	10 DE-1			
Number of Decimals	0	0	0	0	0			
Trt Treatment	Rate	Appl	1*	2*	3*	4*	5*	6*
No. Name	Rate	Unit Code						
1 utc			0-	0b	0b	0-	0-	0b
2 Zone Defense	0.241 lb ai/a	A	2-	88 a	87 a	100-	100-	100 a
3 Zone Defense	0.193 lb ai/a	A	1-	93 a	93 a	100-	100-	100 a
3 Helmet	1.3 lb ai/a	A						
4 Fierce	0.142 lb ai/a	A	3-	91 a	88 a	100-	100-	100 a
5 Authority Supreme	0.195 lb ai/a	A	0-	88 a	88 a	100-	100-	100 a
6 Zone Elite	1.37 lb ai/a	A	1-	83 a	80 a	100-	100-	93 a
LSD P=.05			2.1	6.6	12.8	.	.	8.6
Standard Deviation			1.2	3.6	7.1	0.0	0.0	4.7
CV			110.3	4.89	9.69	0.0	0.0	5.73
Grand Mean			1.1	73.9	72.8	88.2	83.3	82.2
Levene's F^			0.48	0.26	0.381	.	.	0.533
Levene's Prob(F)			0.784	0.926	0.852	.	.	0.747
Rank X2			.	.	.	.	.	.
P(Rank X2)			.	.	.	.	.	.
Skewness^			0.1354	0.3155	0.3958	.	.	-1.3829*
Kurtosis^			-0.1132	-0.9177	-0.3601	.	.	4.8663*
Replicate F			0.656	10.217	1.201	0.000	0.000	1.000
Replicate Prob(F)			0.5400	0.0038	0.3408	1.0000	1.0000	0.4019
Treatment F			2.598	303.510	77.810	0.000	0.000	220.000
Treatment Prob(F)			0.0933	0.0001	0.0001	1.0000	1.0000	0.0001

Means followed by same letter or symbol do not significantly differ (P=.05, Student-Newman-Keuls).  
 Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.  
 Due to missing data, the effective replicates used for mean comparisons are: col. 1-3,5,6,8-27=3; 4,7=2.8  
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Trt Treatment No. Name	Rate	Appl Unit Code	7*	8*	9*	10*	11*	12*	13*
1 utc			-1 b	14 -	14 -	0 -	0 -	0 -	0 b
2 Zone Defense	0.241 lb ai/a	A	100 a	11 -	12 -	1 -	0 -	0 -	1 b
3 Zone Defense	0.193 lb ai/a	A	95 a	12 -	14 -	0 -	0 -	0 -	2 b
3 Helmet	1.3 lb ai/a	A							
4 Fierce	0.142 lb ai/a	A	100 a	13 -	13 -	1 -	0 -	0 -	3 a
5 Authority Supreme	0.195 lb ai/a	A	100 a	12 -	12 -	1 -	0 -	0 -	0 b
6 Zone Elite	1.37 lb ai/a	A	100 a	12 -	11 -	0 -	0 -	0 -	0 b
LSD P=.05			6.7	3.6	2.0	1.4	.	.	1.3
Standard Deviation			3.7	2.0	1.1	0.8	0.0	0.0	0.7
CV			4.18	16.07	8.77	141.99	0.0	0.0	65.04
Grand Mean			87.4	12.2	12.8	0.6	0.0	0.0	1.1
Levene's F^			0.479	0.73	0.25	0.447	.	.	0.125
Levene's Prob(F)			0.785	0.614	0.932	0.808	.	.	0.984
Rank X2			.	.	.	.	.	.	.
P(Rank X2)			.	.	.	.	.	.	.
Skewness^			-1.2415*	-0.5918	0.7517	0.9003	.	.	-0.1344
Kurtosis^			3.92*	-0.0388	-0.0444	1.2696	.	.	-1.2136
Replicate F			1.125	0.533	1.903	1.429	0.000	0.000	3.298
Replicate Prob(F)			0.3664	0.6025	0.1994	0.2846	1.0000	1.0000	0.0794
Treatment F			260.338	0.749	2.832	1.429	0.000	0.000	7.319
Treatment Prob(F)			0.0001	0.6050	0.0758	0.2946	1.0000	1.0000	0.0040

Means followed by same letter or symbol do not significantly differ (P=.05, Student-Newman-Keuls).  
 Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.  
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Pest Type	W, Weed	W, Weed	W, Weed	W, Weed	W, Weed	W, Weed		
Pest Code	SETFA	AMBTR	CHEAL	AMARE	ABUTH	POLPY		
Pest Scientific Name	Setaria faberi	Ambrosia trifida	Chenopodium alb>	Amaranthus retr>	Abutilon theoph>	Persicaria pens>		
Pest Name	Giant foxtail	Giant ragweed	common lambsqua>	Redroot pigweed	velvetleaf annual	smartweed		
Crop Type, Code								
Crop Name								
Rating Date	Jun-2-2022	Jun-2-2022	Jun-2-2022	Jun-2-2022	Jun-2-2022	Jun-2-2022		
Part Rated								
Rating Type	CONTRO	CONTRO	CONTRO	CONTRO	CONTRO	CONTRO		
Rating Unit/Min/Max	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100		
Number of Subsamples	1	1	1	1	1	1		
Data Entry Date	Jun-13-2022	Jun-13-2022	Jun-13-2022	Jun-13-2022	Jun-13-2022	Jun-13-2022		
Days After First/Last Applic.	35, 35	35, 35	35, 35	35, 35	35, 35	35, 35		
Trt-Eval Interval	35 DA-A	35 DA-A	35 DA-A	35 DA-A	35 DA-A	35 DA-A		
Plant-Eval Interval	36 DP-1	36 DP-1	36 DP-1	36 DP-1	36 DP-1	36 DP-1		
Days After Emergence	17 DE-1	17 DE-1	17 DE-1	17 DE-1	17 DE-1	17 DE-1		
Number of Decimals	0	0	0	0	0	0		
Trt Treatment	Rate	Appl	14*	15*	16*	17*	18*	19*
No. Name	Rate	Unit Code						
1 utc			0b	0b	0b	0-	0b	0-
2 Zone Defense	0.241 lb ai/a	A	72a	77a	100a	100-	98a	100-
3 Zone Defense	0.193 lb ai/a	A	75a	72a	100a	100-	100a	100-
3 Helmet	1.3 lb ai/a	A						
4 Fierce	0.142 lb ai/a	A	75a	77a	100a	100-	100a	100-
5 Authority Supreme	0.195 lb ai/a	A	73a	75a	100a	100-	98a	100-
6 Zone Elite	1.37 lb ai/a	A	72a	70a	97a	100-	95a	100-
LSD P=.05			4.6	9.8	4.4	.	4.6	.
Standard Deviation			2.5	5.4	2.4	0.0	2.5	0.0
CV			4.14	8.76	2.89	0.0	3.08	0.0
Grand Mean			61.1	61.7	82.7	83.3	81.9	83.3
Levene's F^			0.377	0.259	0.576	.	0.768	.
Levene's Prob(F)			0.855	0.927	0.718	.	0.59	.
Rank X2			.	.	.	.	.	.
P(Rank X2)			.	.	.	.	.	.
Skewness^			0.5186	0.1164	-1.3679*	.	-0.2383	.
Kurtosis^			-0.052	-0.8489	4.7238*	.	-0.052	.
Replicate F			14.565	1.000	0.883	0.000	1.522	0.000
Replicate Prob(F)			0.0011	0.4019	0.4433	1.0000	0.2649	1.0000
Treatment F			421.913	94.629	861.913	0.000	758.304	0.000
Treatment Prob(F)			0.0001	0.0001	0.0001	1.0000	0.0001	1.0000

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Pest Type		W, Weed	W, Weed	W, Weed	W, Weed	W, Weed	
Pest Code		SETFA	ECHCG	AMBTR	CHEAL	AMARE	
Pest Scientific Name		Setaria faberi	Echinochloa cru>	Ambrosia trifida	Chenopodium alb>	Amaranthus retr>	
Pest Name		Giant foxtail	common barnyard>	Giant ragweed	common lambsqua>	Redroot pigweed	
Crop Type, Code	C, GLXMA						
Crop Name	Soybean						
Rating Date	Jun-8-2022	Jun-8-2022	Jun-8-2022	Jun-8-2022	Jun-8-2022	Jun-8-2022	
Part Rated							
Rating Type	PHYLMMA	CONTRO	CONTRO	CONTRO	CONTRO	CONTRO	
Rating Unit/Min/Max	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	
Number of Subsamples	1	1	1	1	1	1	
Data Entry Date	Jun-9-2022	Jun-9-2022	Jun-9-2022	Jun-9-2022	Jun-9-2022	Jun-9-2022	
Days After First/Last Applic.	41, 41	41, 41	41, 41	41, 41	41, 41	41, 41	
Trt-Eval Interval	41 DA-A	41 DA-A	41 DA-A	41 DA-A	41 DA-A	41 DA-A	
Plant-Eval Interval	42 DP-1	42 DP-1	42 DP-1	42 DP-1	42 DP-1	42 DP-1	
Days After Emergence	23 DE-1	23 DE-1	23 DE-1	23 DE-1	23 DE-1	23 DE-1	
Number of Decimals	0	0	0	0	0	0	
Trt Treatment	Rate Appl	20*	21*	22*	23*	24*	25*
No. Name	Rate Unit Code						
1 utc		0-	0b	0b	0-	0b	0-
2 Zone Defense	0.241 lb ai/a A	0-	76a	62a	17-	100a	100-
3 Zone Defense	0.193 lb ai/a A	0-	83a	68a	17-	100a	100-
3 Helmet	1.3 lb ai/a A						
4 Fierce	0.142 lb ai/a A	2-	73a	67a	33-	97a	100-
5 Authority Supreme	0.195 lb ai/a A	0-	80a	63a	17-	100a	100-
6 Zone Elite	1.37 lb ai/a A	0-	70a	60a	0-	100a	100-
LSD P=.05		1.1	14.6	12.4	30.7	4.3	.
Standard Deviation		0.6	8.0	6.8	16.9	2.4	0.0
CV		224.5	12.61	12.81	121.67	2.85	0.0
Grand Mean		0.3	63.8	53.3	13.9	82.8	83.3
Levene's F^		1.60	0.398	0.586	0.684	0.533	.
Levene's Prob(F)		0.234	0.841	0.711	0.644	0.747	.
Rank X2		.	.	.	.	.	.
P(Rank X2)		.	.	.	.	.	.
Skewness^		-0.7467	0.7074	0.5751	0.4091	-1.3829*	.
Kurtosis^		4.8663*	0.8227	0.0645	0.2308	4.8663*	.
Replicate F		1.000	16.626	13.929	1.770	1.000	0.000
Replicate Prob(F)		0.4019	0.0007	0.0013	0.2197	0.4019	1.0000
Treatment F		3.571	46.283	44.500	1.654	889.000	0.000
Treatment Prob(F)		0.0411	0.0001	0.0001	0.2329	0.0001	1.0000

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Pest Type		W, Weed	W, Weed
Pest Code		ABUTH	POLPY
Pest Scientific Name		Abutilon theoph>	Persicaria pens>
Pest Name		velvetleaf annual	smartweed
Crop Type, Code			
Crop Name			
Rating Date		Jun-8-2022	Jun-8-2022
Part Rated			
Rating Type		CONTRO	CONTRO
Rating Unit/Min/Max		%, 0, 100	%, 0, 100
Number of Subsamples		1	1
Data Entry Date		Jun-9-2022	Jun-9-2022
Days After First/Last Applic.		41, 41	41, 41
Trt-Eval Interval		41 DA-A	41 DA-A
Plant-Eval Interval		42 DP-1	42 DP-1
Days After Emergence		23 DE-1	23 DE-1
Number of Decimals		0	0
Trt Treatment	Rate	Appl	
No. Name	Unit	Code	
		26*	27*
1 utc		0b	0b
2 Zone Defense	0.241 lb ai/a	A	93 a
3 Zone Defense	0.193 lb ai/a	A	100 a
3 Helmet	1.3 lb ai/a	A	100 a
4 Fierce	0.142 lb ai/a	A	100 a
5 Authority Supreme	0.195 lb ai/a	A	97 a
6 Zone Elite	1.37 lb ai/a	A	90 a
LSD P=.05		12.0	8.6
Standard Deviation		6.6	4.7
CV		8.23	5.73
Grand Mean		80.0	82.2
Levene's F^		0.40	0.533
Levene's Prob(F)		0.84	0.747
Rank X2		.	.
P(Rank X2)		.	.
Skewness^		-0.3428	-1.3829*
Kurtosis^		-0.3514	4.8663*
Replicate F		1.154	1.000
Replicate Prob(F)		0.3541	0.4019
Treatment F		107.385	220.000
Treatment Prob(F)		0.0001	0.0001

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### Pest Type

W, Weed = Weed or volunteer crop

### Pest Code

SETFA, Setaria faberi, Giant foxtail = US  
 AMBTR, Ambrosia trifida, Giant ragweed = US  
 CHEAL, Chenopodium album, common lambsquarters = US  
 AMARE, Amaranthus retroflexus, Redroot pigweed = US  
 ABUTH, Abutilon theophrasti, velvetleaf = US  
 POLPY, Persicaria pensylvanica, annual smartweed = US  
 ECHCG, Echinochloa crus-galli, common barnyardgrass = US

### Crop Type Code

C = EPPO species (Bayer) codes  
 GLXMA, BSOY, Glycine max, Soybean = US

### Part Rated

PLANT = plant  
 C = Crop is Part Rated

### Rating Type

PHYLMA = phytotoxicity - leaf malformation  
 CONTRO = control / burndown or knockdown  
 COUPLA = count - plant / emergence - objective  
 PHYSTU = phytotoxicity - stunting  
 PHYCHL = phytotoxicity - chlorosis  
 PHYNEC = phytotoxicity - necrosis /burn  
 PHYDEF = phyto. deformation (cupping, epinasty, leaf wrap, wrinkling)

### Rating Unit/Min/Max

%, 0, 100 = percent

M, , = meter

### Plant-Eval Interval

29 DP-1 = 1 GLXMA Apr-27-2022  
 36 DP-1 = 1 GLXMA Apr-27-2022  
 42 DP-1 = 1 GLXMA Apr-27-2022