

## Comparison of Soil Residual Herbicides

Trial Number: UW-2018-WC-2 Lancaster/Preliminary data (August 2018), not for publication

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The authors would like to acknowledge Lancaster ARS staff and Wisconsin Cropping Systems Weed Science (WiscWeeds) Team: Maxwell Oliveira, Victor Ribeiro, Sarah Striegel, Nikola Arsenijevic and Ryan DeWerff.

### Site description

Soil type: Fayette  
Crop: Soybean  
% OM: 2.4  
Variety: Asgrow AG21X8  
pH: 7.3

Date planted: 5/24/2018  
Fertilization: None

Planting depth: 1.5 in  
Row spacing: 30 in  
Plot size: 10 x 25 ft

Planting population: 145,000  
Previous cropping and tillage: Corn; fall chisel- 2 pass spring vertical tillage

Main weeds present: Waterhemp, common lambsquarters

Other pesticides used: None

Experimental design and statistical analysis:  
4 reps, randomized complete block

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### Preliminary Weed Control Ratings from the Lancaster ARS Trial Site

Trt #	Plot	Herbicide and application rate (ac <sup>-1</sup> )	Soybean growth stage (days after treatment)		WATERHEMP		COMMON LAMBSQUARTERS		Price Estimate
			V3 (25 DAT)	R2 (50 DAT)	V3 (25 DAT)	R2 (50 DAT)			
2	102	Pursuit (4 fl oz)	24 (13)	18 (7)	100 (0)	100 (0)			
3	103	Classic (3 oz)	43 (19)	33 (13)	100 (0)	100 (0)			
4	104	FirstRate (0.6 oz)	13 (8)	6 (4)	100 (0)	100 (0)			
5	105	Tricor DF (10.7 oz)	98 (1)	92 (3)	96 (4)	87 (9)			
6	106	Spartan (8 fl oz)	90 (4)	85 (5)	100 (0)	100 (0)			
7	107	Valor SX (3 oz)	100 (0)	96 (3)	94 (3)	87 (5)			
8	108	Sharpen (1 fl oz)	83 (8)	65 (20)	88 (5)	68 (10)			
9	109	Warrant (24 fl oz)	68 (16)	66 (13)	57 (11)	41 (18)			
10	110	Warrant (48 fl oz)	91 (4)	82 (7)	72 (11)	60 (19)			
11	111	Dual II Magnum (13.4 fl oz)	95 (5)	94 (4)	55 (14)	35 (12)			
12	112	Dual II Magnum (26.7 fl oz)	95 (2)	94 (4)	80 (4)	63 (5)			
13	113	Outlook (9 fl oz)	96 (2)	88 (5)	77 (4)	62 (10)			
14	114	Outlook (18 fl oz)	98 (3)	92 (4)	86 (4)	68 (13)			
15	115	Zidua (1.5 oz)	92 (4)	86 (7)	84 (4)	68 (8)			
16	116	Zidua (3 oz)	100 (0)	98 (1)	87 (2)	76 (4)			
17	117	Authority Assist (10 fl oz)	100 (1)	99 (0)	100 (0)	100 (0)			
18	118	Sonic (6.45 oz)	96 (3)	95 (4)	100 (0)	100 (0)			
19	119	Surveil (3.5 oz)	99 (1)	91 (5)	99 (1)	99 (1)			
20	120	Valor XLT (3 oz)	97 (2)	94 (4)	100 (0)	100 (0)			
21	121	Broadaxe XC (25 fl oz)	97 (4)	95 (4)	100 (0)	100 (0)			
22	122	Authority MTZ (12 oz)	85 (9)	75 (15)	100 (0)	100 (0)			
23	123	Authority Supreme (8 fl oz)	97 (4)	92 (5)	100 (0)	100 (0)			
24	124	Verdict (5 fl oz)	97 (3)	91 (5)	87 (6)	82 (5)			
25	125	Prefix (32 fl oz)	100 (0)	99 (1)	90 (2)	80 (6)			
26	126	Fierce (4 oz)	99 (1)	98 (1)	100 (0)	99 (1)			
27	127	Boundary (28.8 fl oz)	100 (0)	73 (22)	92 (3)	83 (4)			
28	128	Canopy DF (2.25 oz)	64 (19)	47 (19)	100 (0)	100 (0)			
29	129	Enlite (2.8 oz)	100 (0)	97 (1)	100 (0)	100 (0)			
30	130	Afforia (2.5 oz)	98 (2)	95 (2)	98 (2)	93 (3)			
31	131	Trivence (6 oz)	96 (2)	91 (4)	100 (0)	99 (1)			
32	132	Zidua PRO (6 fl oz)	99 (1)	93 (6)	99 (1)	99 (2)			
33	133	Fierce XLT (4 oz)	100 (0)	97 (1)	100 (0)	100 (0)			
34	134	Fierce MTZ (3 oz Fierce + 6 oz metribuzin co-pack)	100 (0)	97 (1)	96 (3)	96 (2)			

Trial will be replicated in multiple locations in 2019, and a final data report will be available in the Fall of 2019, complete with statistical analysis. Herbicide rates were based on industry recommended rates; the authors support using maximum labeled rates. Herbicide choices should be based on both herbicide efficacy and price. Length of rotational restrictions should always be considered.

# Lancaster Agricultural Research Station (LARS): Field history and weather

Past Field History by:  
Doug Wiedenbeck and Tim Wood LARS

Waterhemp was first observed in 2008 at the trial site. According to station records, waterhemp was first seen in a grass waterway approaching from a neighboring CRP field. Waterhemp remained mostly unnoticed until soybeans were planted in 2013. At this point, the population had intensified and has since been an issue; research trials have severely limited management options.

## CROP ROTATION AND HERBICIDE USE

Year	Crop	Herbicide Program	Tillage
2013	Soybean	PPI Prowl (1.75 pt/ac) + Pursuit Plus (1.25 qt/ac) POST Managed for research	Field cultivation
2014	Corn	PRE Lumax EZ (3 qt/ac) POST None	Vertical tillage
2015	Corn	Roundup PowerMAX (29 oz/ac)	
2016	Corn	Roundup PowerMAX (29 oz/ac)	
2017	Corn	Lumax EZ (3 qt/ac) POST Roundup PowerMAX (29 oz/ac)	No-till, cover crop research
2018	Soybean	Herbicide evaluation research plots	Fall chisel, 2-pass vertical tillage

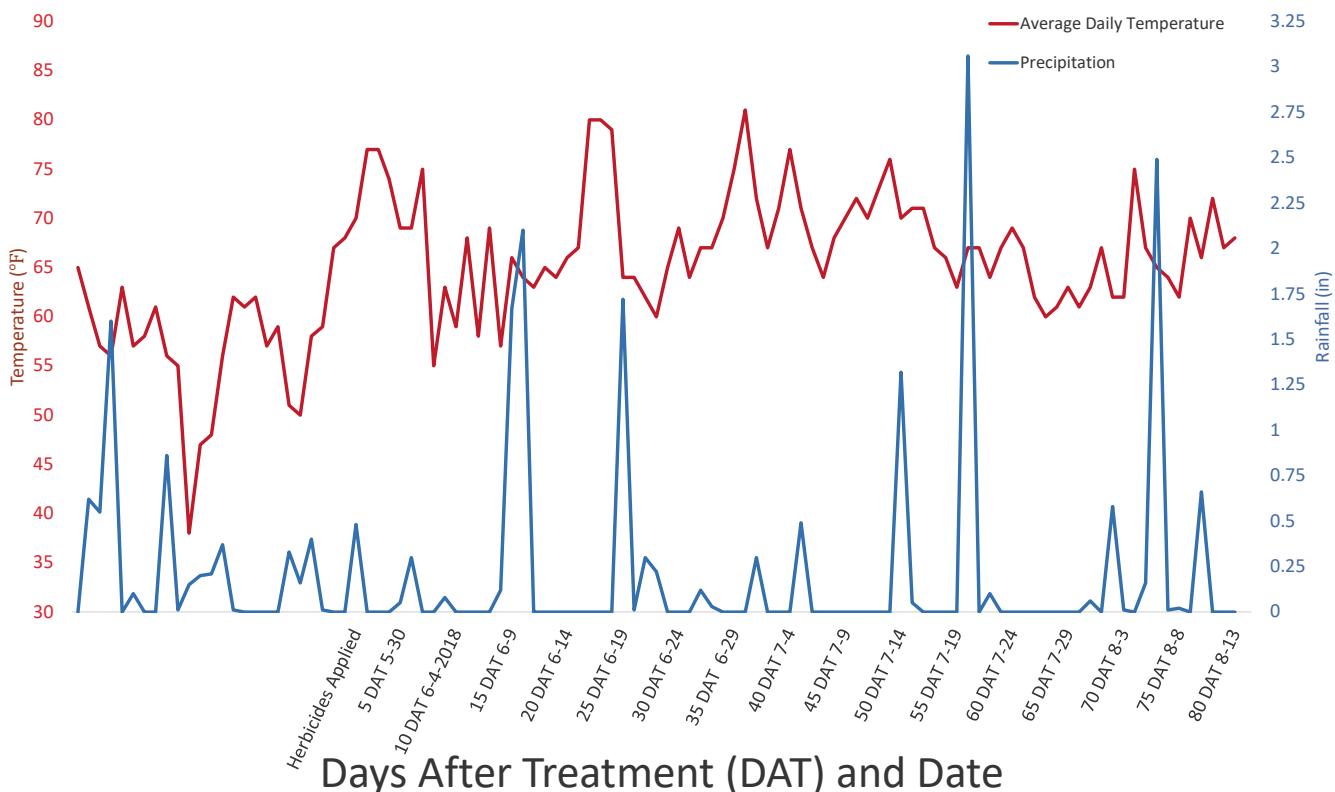
## Weather Summary

Lancaster, WI Collected By: Rita Riely, LARS

### MONTHLY SUMMARIES

Month	Air Temperature (°F)			Rain (in)
	Avg	Avg Low	Avg High	
May	64.7	54.7	74.7	6.41
June	69.6	61.5	77.7	6.35
July	67.5	62.0	81.2	9.31

## Lancaster Agricultural Research Station Weather Data May 1 - August 13, 2018



## Plot image key

Note that some plot photos may be missing a few plants due to planter issues, not herbicide injury.

Look between the rows for weeds



This section contains treatment information

<b>Herbicide</b>	<b>Tricor DF</b>		<b>5</b>
<b>Active Ingredients</b>	<b>metribuzin</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>10.7 oz</b>
<b>Site of Action</b>	<b>Photosystem II Inhibitor</b>		



**Nontreated**



<b>Herbicide</b>	<b>Pursuit</b>		<b>2</b>
<b>Active Ingredient</b>	<b>imazethapyr</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>4 fl oz</b>
<b>Site of Action</b>	<b>ALS Inhibitor</b>		



<b>Herbicide</b>	<b>FirstRate</b>		<b>2</b>
<b>Active Ingredients</b>	<b>cloransulam-methyl</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>0.6 oz</b>
<b>Site of Action</b>	<b>ALS Inhibitor</b>		



<b>Herbicide</b>	<b>Spartan</b>		<b>14</b>
<b>Active Ingredients</b>	sulfentrazone		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	8 fl oz
<b>Site of Action</b>	<b>PPO Inhibitor</b>		



<b>Herbicide</b>	<b>Valor SX</b>		<b>14</b>
<b>Active Ingredients</b>	flumioxazin		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	3 oz
<b>Site of Action</b>	<b>PPO Inhibitor</b>		



<b>Herbicide</b>	<b>Sharpen</b>		<b>14</b>
<b>Active Ingredients</b>	saflufenacil		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	1 fl oz
<b>Site of Action</b>	<b>PPO Inhibitor</b>		



<b>Herbicide</b>	<b>Warrant</b>		<b>15</b>
<b>Active Ingredients</b>	acetochlor		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	24 fl oz
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Warrant</b>		<b>15</b>
<b>Active Ingredients</b>	acetochlor		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	48 fl oz
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Dual II Magnum</b>		<b>15</b>
<b>Active Ingredients</b>	S-metolachlor		
<b>Application Timing/Date</b>	PRE 5/25/18	<b>Application Rate (ac<sup>-1</sup>)</b>	13.4 fl oz
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Dual II Magnum</b>		<b>15</b>
<b>Active Ingredients</b>	<b>S-metolachlor</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>26.7 fl oz</b>
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Outlook</b>		<b>15</b>
<b>Active Ingredients</b>	<b>dimethenamid-P</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>18 fl oz</b>
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Zidua</b>		<b>15</b>
<b>Active Ingredients</b>	<b>pyroxasulfone</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>3 oz</b>
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		

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<b>Herbicide</b>	<b>Outlook</b>		<b>15</b>
<b>Active Ingredients</b>	<b>dimethenamid-P</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>9 fl oz</b>
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Zidua</b>		<b>15</b>
<b>Active Ingredients</b>	<b>pyroxasulfone</b>		
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>1.5 oz</b>
<b>Site of Action</b>	<b>Long-chain Fatty Acid Inhibitor</b>		



<b>Herbicide</b>	<b>Authority Assist</b>		<b>14</b>	<b>2</b>
<b>Active Ingredients</b>	<b>sulfentrazone + imazethapyr</b>			
<b>Application Timing/Date</b>	<b>PRE 5/25/18</b>	<b>Application Rate (ac<sup>-1</sup>)</b>	<b>10 fl oz</b>	
<b>Equivalent Tank Mix (ac<sup>-1</sup>)</b>	<b>8.3 fl oz Spartan + 3.3 fl oz Pursuit</b>			
<b>Site of Action</b>	<b>PPO Inhibitor</b>		<b>ALS Inhibitor</b>	



Treatment  
18

Herbicide	Sonic		14	2
Active Ingredients	sulfentrazone + cloransulam-methyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	6.45 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	8 fl oz Spartan + 0.6 oz FirstRate			
Site of Action	PPO Inhibitor		ALS Inhibitor	



Treatment  
20

Herbicide	Valor XLT		14	2
Active Ingredients	flumioxazin + chlorimuron-ethyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	3 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	1.8 oz Valor SX + 1.24 oz Classic			
Site of Action	PPO Inhibitor		ALS Inhibitor	



Treatment  
22

Herbicide	Authority MTZ		5	14
Active Ingredients	metribuzin + sulfentrazone			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	12 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	4.35 oz Tricor DF + 4.35 fl oz Spartan			
Site of Action	Photosystem II Inhibitor		PPO Inhibitor	

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Treatment  
19

Herbicide	Surveil		14	2
Active Ingredients	flumioxazin + cloransulam-methyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	3.5 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	2.5 oz Valor SX + 0.5 oz FirstRate			
Site of Action	PPO Inhibitor		ALS Inhibitor	



Treatment  
21

Herbicide	Broadaxe XC		15	14
Active Ingredients	S-metolachlor + sulfentrazone			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	25 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	20.6 fl oz Dual II Magnum + 4.4 fl oz Spartan			
Site of Action	Long-chain Fatty Acid Inhibitor		PPO Inhibitor	



Treatment  
23

Herbicide	Authority Supreme		14	15
Active Ingredients	sulfentrazone + pyroxasulfone			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	8 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	4.15 fl oz Spartan + 2.45 oz Zidua			
Site of Action	PPO Inhibitor		Long-chain Fatty Acid Inhibitor	



Herbicide	Verdict		15	14
Active Ingredients	dimethenamid-P + saflufenacil			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	5 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	4.15 fl oz Outlook + 1 fl oz Sharpen			
Site of Action	Long-chain Fatty Acid Inhibitor   PPO Inhibitor			



Herbicide	Fierce		14	15
Active Ingredients	flumioxazin + pyroxasulfone			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	4 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	2.65 oz Valor SX + 2 oz Zidua			
Site of Action	PPO Inhibitor   Long-chain Fatty Acid Inhibitor			



Herbicide	Canopy DF		5	2
Active Ingredients	metribuzin + chlorimuron-ethyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	2.25 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	1.95 oz Tricor DF + 1 oz Classic			
Site of Action	Photosystem II Inhibitor   ALS Inhibitor			

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Herbicide	Prefix		15	14
Active Ingredients	S-metolachlor + fomesafen			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	32 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	18.2 fl oz Dual II Magnum + 16.2 fl oz Flexstar			
Site of Action	Long-chain Fatty Acid Inhibitor   PPO Inhibitor			



Herbicide	Boundary		15	5
Active Ingredients	S-metolachlor + metribuzin			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	28.8 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	19.8 fl oz Dual II Magnum + 6 oz Tricor DF			
Site of Action	Long-chain Fatty Acid Inhibitor   Photosystem II Inhibitor			



Herbicide	Enlite		14	2	2
Active Ingredients	flumioxazin + chlorimuron-ethyl + thifensulfuron-methyl				
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	2.8 oz		
Equivalent Tank Mix (ac <sup>-1</sup> )	2.0 oz Valor SX + 0.32 oz Classic + 0.05 oz Harmony				
Site of Action	PPO Inhibitor   ALS Inhibitor   ALS Inhibitor				



Herbicide	Afforia	14	2	2
Active Ingredients	flumioxazin + thifensulfuron-methyl + tribenuron-methyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	2.5 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	2 oz Valor SX + 0.25 oz Harmony + 0.25 oz Express			
Site of Action	PPO Inhibitor	ALS Inhibitor	ALS Inhibitor	



Herbicide	Zidua PRO	2	14	15
Active Ingredients	imazethypyr + pyroxasulfone + saflufenacil			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	6 fl oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	4 fl oz Pursuit + 2 oz Zidua + 1 oz Sharpen			
Site of Action	ALS Inhibitor	PPO Inhibitor	Long-chain Fatty Acid Inhibitor	



Herbicide	Fierce MTZ	5	14	15
Active Ingredients	metribuzin + flumioxazin + pyroxasulfone			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	3 oz Fierce + 6 fl oz metribuzin	
Equivalent Tank Mix (ac <sup>-1</sup> )	6 fl oz metribuzin+ 2 oz Valor + 1.5 oz Zidua			
Site of Action	Photosystem II Inhibitor	PPO Inhibitor	Long-chain Fatty Acid Inhibitor	

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Herbicide	Trivence	5	14	2
Active Ingredients	metribuzin + flumioxazin + chlorimuron-ethyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	6 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	3.56 oz Tricor DF + 1.5 oz Valor SX + 0.94 oz Classic			
Site of Action	Photosystem II Inhibitor	PPO Inhibitor	ALS Inhibitor	



Herbicide	Fierce XLT	14	15	2
Active Ingredients	flumioxazin + pyroxasulfone + chlorimuron-ethyl			
Application Timing/Date	PRE 5/25/18	Application Rate (ac <sup>-1</sup> )	4 oz	
Equivalent Tank Mix (ac <sup>-1</sup> )	1.9 oz Valor SX + 1.46 oz Zidua + 1 oz Classic			
Site of Action	PPO Inhibitor	Long-chain Fatty Acid Inhibitor	ALS Inhibitor	

Waterhemp plants were submitted to the University of Illinois Plant Clinic for molecular herbicide resistance screening. **The results confirmed glyphosate resistance.** PPO Inhibitor resistance was also screened for and not detected.

**Note:** This publication contains preliminary data from August 2018. Please contact Rodrigo Werle ([rwerle@wisc.edu](mailto:rwerle@wisc.edu)) of the UW-Madison, Department of Agronomy for information on final data.

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