

**Beyond® Xtra Efficacy Against Problematic Desert Weeds**

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Author Note

Project was completed with the support of BASF CO.

Yuma, Arizona, August 2023.

### Abstract

There is always a need for additional tools for weed control in the state of Arizona. The objective of this evaluation was to assess the efficacy of Beyond<sup>®</sup> Xtra herbicide (imazamox) for some of the most problematic weeds present in alfalfa in our State. Postemergence (POST) applications were done of Pursuit<sup>®</sup> (imazetapyr), Beyond<sup>®</sup> Xtra, Sharpen<sup>®</sup> (saflufenacil), and Suppress<sup>®</sup> (caprylic acid). Beyond<sup>®</sup> Xtra performed better than Pursuit<sup>®</sup> for the control of Pigweed. For Spiderling the population was not very consistent, but we obtained one reading. In relation to Malva the evaluations show Pursuit<sup>®</sup> and Beyond<sup>®</sup> Xtra performed well for this species. The rates used were 6fl oz, 6fl oz, 2fl oz respectively, and 4.5% with Biolink<sup>®</sup> 2fl oz/100gal. All treatments included AMS 1qt and MSO 1% V/V except for the Suppress<sup>®</sup>. Application was performed 4 days after cutting. The species present in the alfalfa were Pig weed (*Amaranthus palmeri*), Malva (*malva parviflora*), Red Spiderling (*Boerhavia coccinea*). Some data was collected for these weeds.

### Beyond® Xtra Efficacy Against Problematic Desert Weeds

The crop used for this evaluation was Alfalfa because there is another formulation of Imazamox (Raptor®) that is currently in use, as well as the presence of a weed that is considered as the “King of Weeds” because of the rapid growth, prolific seed production and competitiveness against the crop. Another objective of the project was to compare the efficacy against imazetapyr (Pursuit®), a compound of the same mode of action.

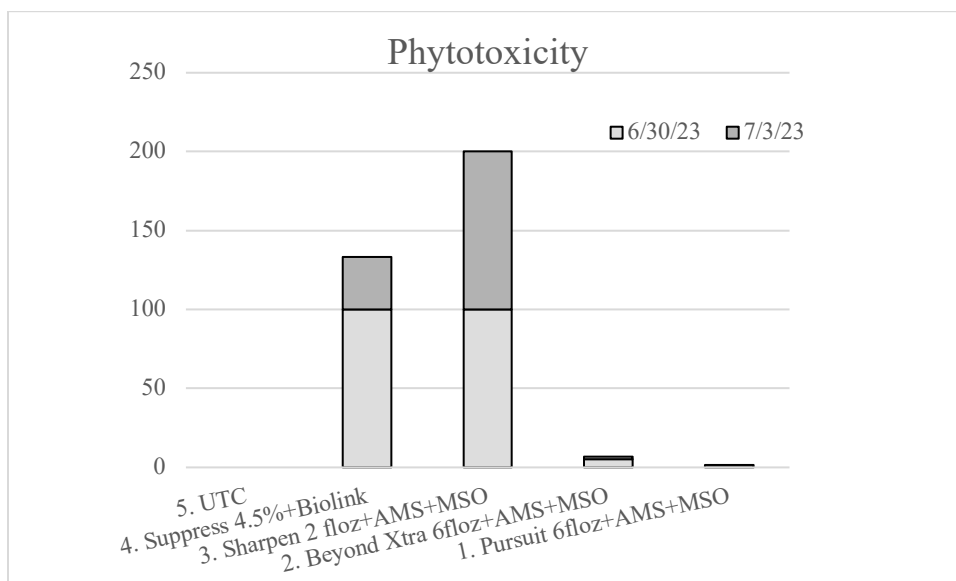
### Materials and Methods

Field study was done in a commercially grown alfalfa field at the mesa in Yuma, AZ. The field was planted in fall of 2021.

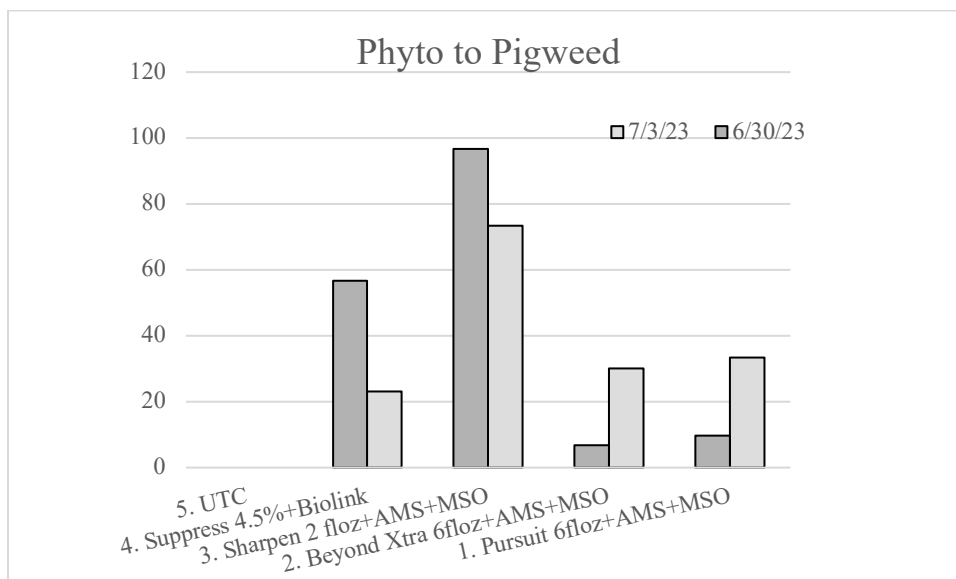
Postemergence (POST) application was done of Pursuit® (Imazetapyr), Beyond® Xtra, Sharpen® (Saflufenacil), and Suppress® (Caprylic acid). The rates used were 6fl oz, 6fl oz, 2fl oz respectively, and 4.5% with Biolink® 2fl oz/100gal. All treatments included AMS 1qt and MSO 1% V/V except for the Suppress®. Application was performed 4 days after cutting. The species present in the alfalfa were Pig weed (*Amaranthus palmeri*), Malva (*malva parviflora*), Red Spiderling (*Boerhavia coccinea*). Some data was collected for these weeds.

POST herbicide treatments were replicated three times in a randomized complete block design. Each plot measuring 14 feet wide by 30 feet in length. All treatments were applied with a hand-held boom having four flat fan 8002 nozzles spaced at 20- inches apart delivering 20 GPA of water pressurized with a CO<sub>2</sub>, backpack sprayer at 40 psi. Stage of the weeds at application time were 3-4 inches tall. The application date of the Beyond® Xtra trial was June 27, 2023, Evaluations were done on June 30<sup>th</sup>, July 3<sup>rd</sup>, 12<sup>th</sup>, and 31<sup>st</sup>. Ratings were subjected to statistical analysis and means were separated by Duncan's Multiple Range Test.

## Results and Discussion

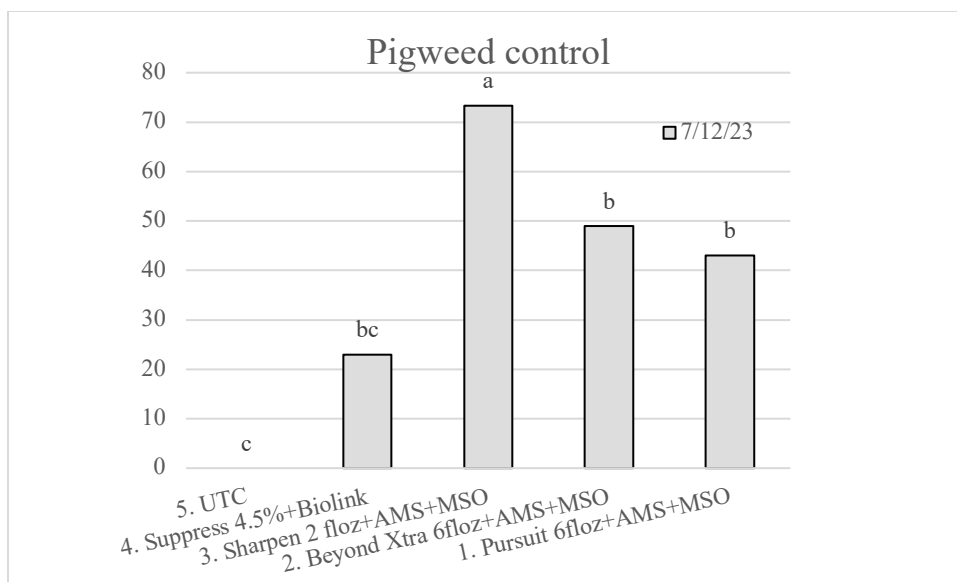


The chart above shows Sppress and Sharpen presented the highest level of phytotoxicity at the 3DAT (days after treated) and 7DAT evaluations to the crop. Pursuit and Beyond Xtra showed a small amount of phyto to the alfalfa. In Figure 6 of this report can be seen that by July 12, 2023, except for Sharpen most of the plots recovered from temporary injury.

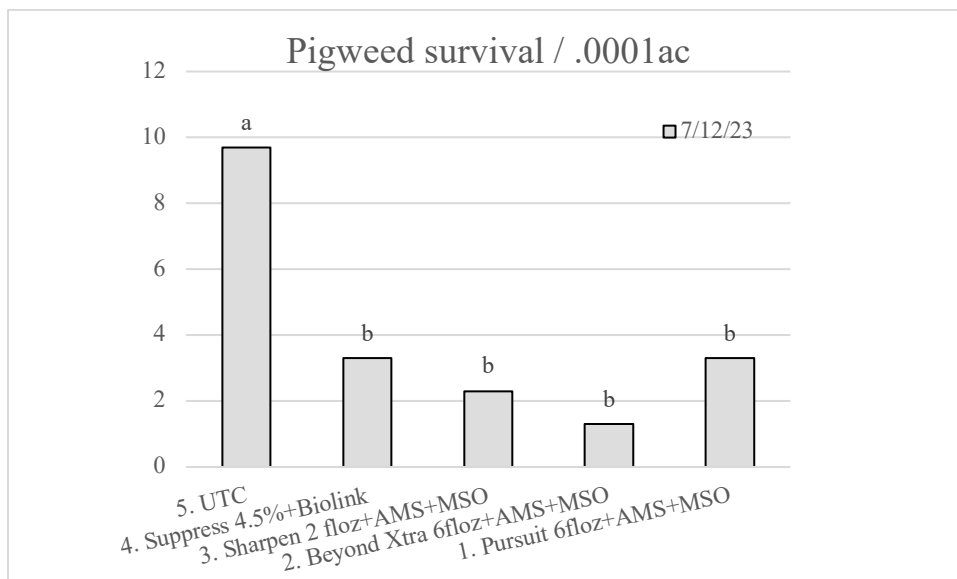


The initial phytotoxicity to Palmer amaranth in the 3DAT by Sharpen and Suppress started declining by the 6DAT, but the activity of Beyond Xtra and Pursuit on the weeds increased.

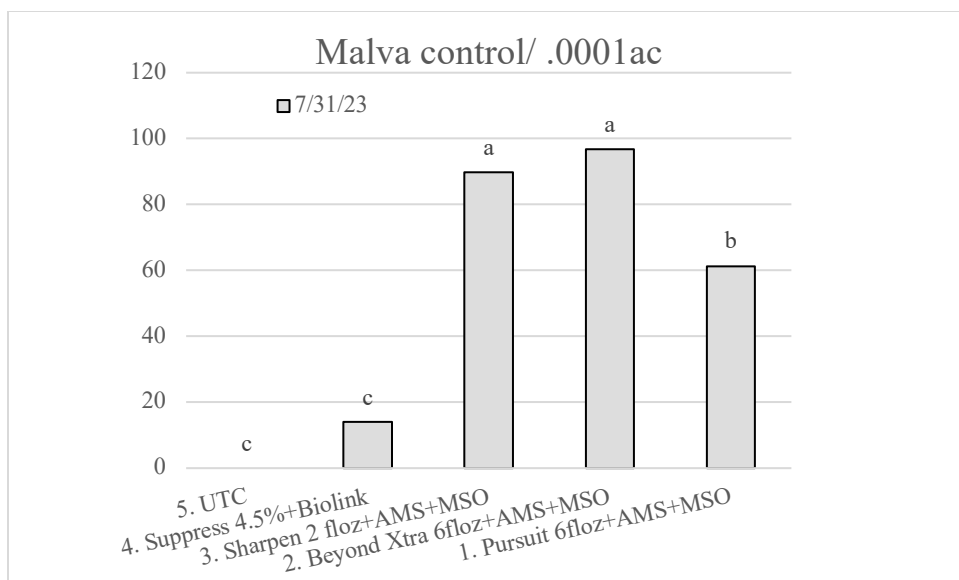




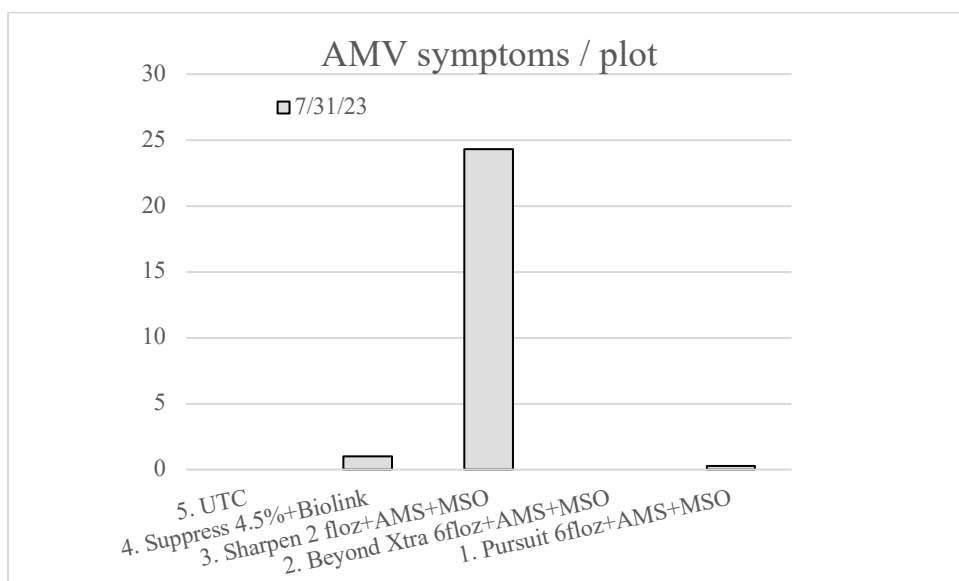
The Phyto or injury shown by Pigweed before did not exactly equate to the “Weed Control” as can be seen in the chart above. Suppress showed aggressive initially to the weeds and the alfalfa but both recovered from the injury. The weed control from Beyond and Pursuit at a 15DAT evaluation slowly increased.



The chart above portrays the survival of Palmer amaranth weeds per .0001 ac area. Here we can see Beyond and Pursuit performing similarly and in the same statistical group as Sharpen and Suppress. Beyond presented the lowest number of pigweed survival.



With respect to Malva, the best treatments of this evaluation were Beyond and Sharpen. Beyond outperformed Pursuit, which outperformed Suppress.



It was noticed that the Sharpen plots presented a higher amount of Alfalfa Mosaic Virus symptoms when compared to the other treatments. We sent images to our plant pathologist and diagnostician at the Yuma Ag Center, and they mentioned the possibility that the stress produced by saflufenacil could have caused those symptoms in this field. An image of the symptoms is included at the end of this report.

Sep-8-2023 (2023 Beyond Xtra Evaluation)

ARM2023.0 Assessment Data Summary Page 1 of 7

**Gylling Data Management, Inc.****Beyon Xtra Efficacy Against Problematic Desert Weeds**

Trial ID: 2023 Beyond Xtra Evaluation  
 Protocol ID: Location: Trial Year: 2023  
 Project ID: 2023 Beyond Xtra Evaluation Project ID 2: Project ID 3:  
 Study Director: Sponsor Contact:  
 Investigator:

Pest Type		W, Weed				W, Weed	W, Weed	W, Weed
Pest Name		Pigweed				Pigweed	Pigweed	Malva
Crop Name		Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Rating Date		Jun-30-2023	Jun-30-2023	Jun-30-2023	Jul-3-2023	Jul-3-2023	Jul-12-2023	Jul-12-2023
SE Description			PRESENCE	LEVEL	general%	with symptoms	control	control
Part Rated		PLADAM, -				PLADAM, -		
Rating Type		DAMAGE	PHYGEN	PHYGEN	PHYGEN	DAMAGE	CONTRO	CONTRO
Rating Unit/Min/Max		%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100	%, 0, 100
Number of Subsamples		1	1	1	1	1	1	1
Data Entry Date		Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023
Trt Treatment	Rate							
No. Name	Rate Unit Plot	1	2	3	4	5	6	7
1 Pursuit	6 fl oz/a 101	4.0	0.0	0.0	0.0	30.0	47.0	90.0
	202	20.0	0.0	0.0	0.0	40.0	29.0	41.0
	302	5.0	0.0	0.0	5.0	30.0	53.0	53.0
	Mean =	9.7	0.0	0.0	1.7	33.3	43.0	61.3
2 Beyond	6 fl oz/a 102	6.0	10.0	5.0	0.0	30.0	40.0	100.0
	201	10.0	5.0	5.0	0.0	40.0	32.0	100.0
	304	4.0	0.0	0.0	5.0	20.0	75.0	90.0
	Mean =	6.7	5.0	3.3	1.7	30.0	49.0	96.7
3 Sharpen	2 fl oz/a 103	100.0	100.0	100.0	100.0	100.0	60.0	100.0
	205	90.0	100.0	90.0	100.0	30.0	60.0	69.0
	305	100.0	100.0	100.0	100.0	90.0	100.0	100.0
	Mean =	96.7	100.0	96.7	100.0	73.3	73.3	89.7
4 Suppress	4.5 % v/v 104	50.0	100.0	30.0	50.0	60.0	27.0	11.0
	204	60.0	100.0	20.0	30.0	20.0	22.0	11.0
	303	60.0	100.0	50.0	20.0	30.0	20.0	20.0
	Mean =	56.7	100.0	33.3	33.3	36.7	23.0	14.0
5 Untreated Check	105	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	203	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	301	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean =	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sep-8-2023 (2023 Beyond Xtra Evaluation)

ARM 2023.0 Assessment Data Summary Page 2 of 7

**Gylling Data Management, Inc.****Beyond Xtra Efficacy Against Problematic Desert Weeds**

Trial ID: 2023 Beyond Xtra Evaluation  
 Protocol ID: Location: Trial Year: 2023  
 Project ID: 2023 Beyond Xtra Evaluation Project ID 2: Project ID 3:  
 Study Director: Sponsor Contact:  
 Investigator:

Pest Type	W. Weed	W. Weed	D. Disease
Pest Name	Pigweed	Spiderling	Alfalfa Mosaic >
Crop Name	Alfalfa	Alfalfa	Alfalfa
Rating Date	Jul-31-2023	Jul-31-2023	Jul-31-2023
SE Description	per 1/10000ac	per 1/10000ac	per plot
Part Rated			
Rating Type	SURVIV	SURVIV	plant count
Rating Unit/Min/Max	%, 0, 100	%, 0, 100	
Number of Subsamples	1	1	1
Data Entry Date	Sep-8-2023	Sep-8-2023	Sep-8-2023
Trt Treatment	Rate		
No. Name	Rate Unit Plot		
		8	9
1 Pursuit	6 fl oz/a 101	5.0	2.0
	202	4.0	3.0
	302	1.0	1.0
	Mean =	3.3	2.0
2 Beyond	6 fl oz/a 102	1.0	2.0
	201	3.0	2.0
	304	0.0	0.0
	Mean =	1.3	1.3
3 Sharpen	2 fl oz/a 103	3.0	2.0
	205	0.0	1.0
	305	4.0	3.0
	Mean =	2.3	2.0
4 Suppress	4.5 % v/v 104	4.0	2.0
	204	3.0	3.0
	303	3.0	1.0
	Mean =	3.3	2.0
5 Untreated Check	105	8.0	4.0
	203	10.0	3.0
	301	11.0	4.0
	Mean =	9.7	3.7
			0.0

Sep-8-2023 (2023 Beyond Xtra Evaluation)

ARM 2023.0 AOV Means Table Page 4 of 7

**Gylling Data Management, Inc.****Beyon Xtra Efficacy Against Problematic Desert Weeds**

Trial ID: 2023 Beyond Xtra Evaluation  
 Protocol ID: Location: Trial Year: 2023  
 Project ID: 2023 Beyond Xtra Evaluation Project ID 2: Project ID 3:  
 Study Director: Sponsor Contact:  
 Investigator:

Pest Type	W, Weed				W, Weed	W, Weed	W, Weed	W, Weed	
Pest Name	Pigweed				Pigweed	Pigweed	Malva	Pigweed	
Crop Name	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	
Rating Date	Jun-30-2023	Jun-30-2023	Jun-30-2023	Jul-3-2023	Jul-3-2023	Jul-12-2023	Jul-12-2023	Jul-31-2023	
SE Description		PRESENCE	LEVEL	general%	with symptoms	control	control	per 1/10000ac	
Part Rated	PLADAM, -				PLADAM, -				
Rating Type	DAMAGE	PHYGEN	PHYGEN	PHYGEN	DAMAGE	CONTRO	CONTRO	SURVIV	
Rating Unit/Min/Max	% 0, 100	% 0, 100	% 0, 100	% 0, 100	% 0, 100	% 0, 100	% 0, 100	% 0, 100	
Number of Subsamples	1	1	1	1	1	1	1	1	
Data Entry Date	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	
Trt Treatment	Rate	1*	2*	3*	4*	5*	6*	7*	8*
No. Name	Rate Unit								
1 Pursuit	6 fl oz/a	9.7 c	0.0 b	0.0 c	1.7 c	33.3 ab	43.0 b	61.3 b	3.3 b
2 Beyond	6 fl oz/a	6.7 c	5.0 b	3.3 c	1.7 c	30.0 ab	49.0 b	96.7 a	1.3 b
3 Sharpen	2 fl oz/a	96.7 a	100.0 a	96.7 a	100.0 a	73.3 a	73.3 a	89.7 a	2.3 b
4 Suppress	4.5 % v/v	56.7 b	100.0 a	33.3 b	33.3 b	36.7 ab	23.0 bc	14.0 c	3.3 b
5 Untreated Check		0.0 c	0.0 b	0.0 c	0.0 c	0.0 b	0.0 c	0.0 c	9.7 a
LSD P=.05		10.99	4.21	13.75	14.07	37.58	23.88	25.13	3.45
Standard Deviation		5.84	2.24	7.30	7.47	19.96	12.68	13.35	1.83
CV		17.2	5.45	27.39	27.34	57.57	33.67	25.51	45.87
Levene's F <sup>A</sup>		0.366	1.80	0.825	1.524	0.209	0.10	0.167	0.429
Levene's Prob(F)		0.828	0.205	0.538	0.268	0.928	0.98	0.95	0.785
Shapiro-Wilk <sup>A</sup>		0.9816	0.878*	0.9574	0.9197	0.9011	0.9447	0.9379	0.9336
P(Shapiro-Wilk) <sup>A</sup>		0.9795	0.0443*	0.6469	0.1904	0.099	0.445	0.3563	0.3086
Skewness <sup>A</sup>		-0.1293	0.0	0.6368	0.4665	-0.551	0.0759	0.4642	-0.3748
P(Skewness) <sup>A</sup>		0.842	1.0	0.3342	0.4758	0.4014	0.9067	0.478	0.5655
Kurtosis <sup>A</sup>		-0.0733	3.2308*	1.4455	2.8091*	0.2596	-1.2954	-0.6557	-0.9617
P(Kurtosis) <sup>A</sup>		0.9533	0.0199*	0.2596	0.0385*	0.8359	0.3102	0.6024	0.4474
Replicate F		0.589	1.000	1.156	0.478	1.021	3.619	1.797	0.059
Replicate Prob(F)		0.5772	0.4096	0.3622	0.6369	0.4028	0.0760	0.2266	0.9427
Treatment F		152.703	1743.000	97.188	99.149	5.130	14.284	32.193	9.554
Treatment Prob(F)		0.0001	0.0001	0.0001	0.0001	0.0240	0.0010	0.0001	0.0039

Sep-8-2023 (2023 Beyond Xtra Evaluation)

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**Gylling Data Management, Inc.****Beyon Xtra Efficacy Against Problematic Desert Weeds**

Trial ID: 2023 Beyond Xtra Evaluation  
 Protocol ID: Location: Trial Year: 2023  
 Project ID: 2023 Beyond Xtra Evaluation Project ID 2: Project ID 3:  
 Study Director: Sponsor Contact:  
 Investigator:

Pest Type	W, Weed	D, Disease
Pest Name	Spiderling	Alfalfa Mosaic >
Crop Name	Alfalfa	Alfalfa
Rating Date	Jul-31-2023	Jul-31-2023
SE Description	per 1/10000ac	per plot
Part Rated		
Rating Type	SURVIV	pant count
Rating Unit/Min/Max	%, 0, 100	
Number of Subsamples	1	1
Data Entry Date	Sep-8-2023	Sep-8-2023
Trt Treatment	Rate	
No. Name	Rate Unit	
1 Pursuit	6 fl oz/a	2.0 - 0.3 b
2 Beyond	6 fl oz/a	1.3 - 0.0 b
3 Sharpen	2 fl oz/a	2.0 - 24.3 a
4 Suppress	4.5 % v/v	2.0 - 1.0 b
5 Untreated Check		3.7 - 0.0 b
LSD P=.05	1.90	7.06
Standard Deviation	1.01	3.75
CV	45.83	73.02
Levene's F <sup>a</sup>	0.219	0.682
Levene's Prob(F)	0.922	0.62
Shapiro-Wilk <sup>a</sup>	0.961	0.8911
P(Shapiro-Wilk) <sup>a</sup>	0.7099	0.0696
Skewness <sup>a</sup>	0.134	-1.0603
P(Skewness) <sup>a</sup>	0.8363	0.118
Kurtosis <sup>a</sup>	-0.9347	2.9794*
P(Kurtosis) <sup>a</sup>	0.46	0.0296*
Replicate F	0.590	0.816
Replicate Prob(F)	0.5767	0.4758
Treatment F	2.230	24.633
Treatment Prob(F)	0.1554	0.0001

Pest Type W, Weed = Weed or volunteer crop D, Disease = Disease, such as a fungus, bacteria, or virus Part Rated PLADAM = plant - damaged Rating Type DAMAGE = damage PHYGEN = phytotoxicity - general / injury CONTRO = control / burndown or knockdown SURVIV = survival Rating Unit/Min/Max %, 0, 100 = percent							
Pest Type	W Weed				W Weed	W Weed	W Weed
Pest Name	Pigweed				Pigweed	Pigweed	Malva
Crop Name	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Rating Date	Jun-30-2023	Jun-30-2023	Jun-30-2023	Jul-3-2023	Jul-3-2023	Jul-12-2023	Jul-12-2023
SE Description		PRESENCE	LEVEL	general%	with symptoms	control	control
Part Rated	PLADAM				PLADAM		
Rating Type	DAMAGE	PHYGEN	PHYGEN	PHYGEN	DAMAGE	CONTRO	CONTRO
Rating Unit/Min/Max	% 0 100	% 0 100	% 0 100	% 0 100	% 0 100	% 0 100	% 0 100
Number of Subsamples	1	1	1	1	1	1	1
Data Entry Date	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023	Sep-8-2023
Plot	1	2	3	4	5	6	7
101	4	0	0	0	30	47	90
102	6	10	5	0	30	40	100
103	100	100	100	100	100	60	100
104	50	100	30	50	60	27	11
105	0	0	0	0	0	0	0
205	90	100	90	100	30	60	69
204	60	100	20	30	20	22	11
203	0	0	0	0	0	0	0
202	20	0	0	0	40	29	41
201	10	5	5	0	40	32	100
301	0	0	0	0	0	0	0
302	5	0	0	5	30	53	53
303	60	100	50	20	30	20	20
304	4	0	0	5	20	75	90
305	100	100	100	100	90	100	100



Pest Type	W Weed	W Weed	D Disease
Pest Name	Pigweed	Spiderling	Alfalfa Mosaic Virus
Crop Name	Alfalfa	Alfalfa	Alfalfa
Rating Date	Jul-31-2023	Jul-31-2023	Jul-31-2023
SE Description	per 1/10000ac	per 1/10000ac	per plot
Part Rated			
Rating Type	SURVIV	SURVIV	pant count
Rating Unit/Min/Max	% 0 100	% 0 100	
Number of Subsamples	1	1	1
Data Entry Date	Sep-8-2023	Sep-8-2023	Sep-8-2023
Plot	8	9	10
101	5	2	0
102	1	2	0
103	3	2	15
104	4	2	2
105	8	4	0
205	0	1	30
204	3	3	1
203	10	3	0
202	4	3	0
201	3	2	0
301	11	4	0
302	1	1	1
303	3	1	0
304	0	0	0
305	4	3	28



BASF BEYOND EXTRA HERBICIDE EVALUATION 2023  
 UNIVERSITY OF ARIZONA, YUMA AGRICULTURAL CENTER  
 APPLICATION OF TEST SUBSTANCE: JUNE 27, 2023  
 EVALUATIONS: 6/30, 7/6, 7/12, AND 7/31.

	6/30/23	6/30/23	6/30/23	7/3/23	7/12/23	7/12/23	7/31/23	7/31/23	7/31/23	7/31/23	7/31/23
	% Pigweed			% Pigweed	% Control	% Control	# Live	# Live	# Live	# Live	# Alfalfa
Trt	Showing Symptoms	% Phyto to alfalfa	% Level Phyto to alfalfa	Showing Symptoms	Pigweed	Malva	Pigweeds/.001A	Spiderlings/.0001A	Spiderlings/.0001A	Plants with symptoms	AMV symptoms
101	4	0	0	30	47	90	5	2	2	0	0
102	6	10	5	30	40	100	1	2	2	0	0
103	100	100	100	100	60	100	3	2	2	15	15
104	50	100	30	60	27	11	4	2	2	2	2
105	0	0	0	0	0	0	8	4	4	0	0
201	10	5	5	40	32	100	3	2	2	0	0
202	20	0	0	40	29	41	4	3	3	0	0
203	0	0	0	0	0	0	10	3	3	0	0
204	60	100	20	20	22	11	3	3	3	1	1
205	90	100	90	30	60	69	0	1	1	30	30
301	0	0	0	0	0	0	11	4	4	0	0
302	5	0	0	30	53	53	1	1	1	1	1
303	60	100	50	30	20	20	3	1	1	0	0
304	4	0	0	20	75	90	0	0	0	0	0
305	100	100	100	90	100	100	4	3	3	28	28

PW=Pigweed control

**Figures**

*Figure 1. June 27, 2023. Application was performed on this date.*





*Figure 2-3. June 27 phyto shown by Suppress 30 min after application.*





*Figure 4. This is the view 1day after application. Phytotoxicity shown by the Sharpen and Suppress plots.*



Image 5. All treatments 3DAT (days after treated)





*Figure 6. All treatments 15 DAT July 12, 2023.*





***Figure 7. Untreated plot July 12, 2023. Note pigweed plants uncontrolled and Alfalfa Mosaic Virus Symptoms observed.***