

TEXAS A&M AGRI LIFE EXTENSION

Texas A&M AgriLife 2020-2021 Bushland Grain and Forage Sorghum Herbicide Trials



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Introduction

Over-the-top herbicide technologies will provide sorghum producers more weed control options. New herbicide tolerant sorghum hybrids and herbicides prevent weeds from using valuable crop water and nutrients that are necessary to optimize yields and maintain profit margins. Although three herbicides are available to sorghum producers on the Texas High Plains, not all technologies were readily available for the 2020 and 2021 Texas A&M AgriLife herbicide trials.

The three technologies are from Corteva, Alta Seed, and Sorghum Partners. Each of these companies have developed sorghum varieties that are resistant to over-the-top herbicide applications for broadleaf and grassy weed control. The herbicide Zest WDG from Corteva/Pioneer was approved by EPA in 2016 for use in sorghum with the Inzen[®] trait. Inzen sorghum is non-transgenic, ALS-tolerant, for post-emergent grass control in sorghum. Inzen sorghum is not commercially available. Although Inzen hybrids and the Zest herbicide were not evaluated in the 2020 or 2021 herbicide trials, experimental hybrids and Inzen were evaluated in 2015 and 2018 Texas A&M AgriLife trials. Igrowth grain sorghum was commercially launched in 2021 and is a non-transgenic imidazoline tolerant grain and forage sorghum from Alta Seeds. The igrowth[®] program allows for the post-emergent imidazoline herbicide (Imiflex) to be used to control broadleaf and grassy weeds in pre- or post-emergent sorghum. These three new herbicide technologies are not labeled for Johnsongrass (*Sorghum halepense*) or Shattercane (*Sorghum bicolor*) control in sorghum. Sorghum Partners developed an herbicide resistant sorghum that is tolerant to Quizalofop and branded as Double Team[™] sorghum. This sorghum is non-transgenic and resistant to Acetyl CoA Carboxylase (ACCase) inhibiting herbicides. Double Team Sorghum will be commercially available for the 2022 growing season.

Resistant and herbicide tolerant weed species have become a problem in the Texas High Plains. Hard to control weeds require critical evaluation of herbicide programs that include preplant burndown, use of residual herbicides, and the timing of in-season applications as well as using labeled application volumes. Commercially available herbicides are evaluated in the Texas A&M AgriLife herbicide trials at Bushland in order to evaluate herbicide efficacy under regional conditions. This publication includes herbicide tank-mixes evaluated in grain and forage sorghum trials at the Texas A&M AgriLife James Bush Research Farm and the USDA-ARS Conservation and Research Production Laboratory at Bushland, Texas. Herbicides used in these trials are marketed for Texas High Plains production and approved for use in the respective crops in Texas by the United States Environmental Protection Agency.

Section 1. 2020-2021 Grain and Forage Sorghum Herbicide Trials

Industry partners for the 2020 and 2021 sorghum herbicide trials included Bayer, Corteva, and UPL (Tables 1-7). Treatments were replicated in the Bayer and Corteva trials using a commercially available grain sorghum hybrid Dekalb DKS37-07. The UPL trials evaluated a new pre- and post-emergent herbicide in an igrowth[®] grain sorghum ADVXG390IG (an imidazoline tolerant grain sorghum hybrid) from Alta Seeds that was not commercially available in 2020 but was launched commercially in 2021. In the 2021 UPL trials, igrowth grain sorghum hybrid ADVG2193IG and forage sorghum ADV2450IG were used for the efficacy trials.

The igrowth[®] program allows for post-emergent imidazoline herbicide (Imiflex) to be used to control broadleaf and grassy weeds in imidazoline tolerant sorghum. The Imiflex herbicide can be used pre or post sorghum emergence and has good residual control of weeds. Imiflex can be applied at a rate of 9 oz/acre as a pre-emergent or 6 oz/acre as a post-emergent, but not both. There is an 18-month sorghum plant-back restriction when using igrowth grain or forage sorghums.

Herbicide efficacy plots were fertilized, irrigated at a deficit rate, and conventionally tilled. All plots were swept and bedded to ensure a clean field prior to planting. All herbicide applications were sprayed with an application volume of 15 gallons/acre with a Lee Agra Spider broadcast sprayer using flat-fan nozzles at 40 PSI on 15-inch spacings. All treatments were assessed against an untreated check, to evaluate herbicide efficacy and crop phytotoxicity. Reported weed control is an average of ratings for all plots within a treatment at a specified number of days post herbicide application. Sorghum hybrids were planted on June 5, 2020, and June 9, 2021. There were 6 irrigation events for the 2020 season totaling 11.9 inches of applied water with 3.9 inches of rainfall from June 6 to August 19 when the trial was terminated. There were 3 irrigation events for the 2021 season totaling 8 inches of applied water with 10 inches of rainfall from June 9 to August 18 when the trial was terminated. In 2020 preemergent applications were applied on June 10 and post-emergent applications, at the 2-4 inch weed stage, were applied on July 1, 2020. Three treatments in the igrowth grain sorghum (2020) had a 19-day preplant herbicide (S-metolachlor + Mesotrione) applied on May 21, 2020. In 2021 pre-emergent applications were applied on June 10 and post-emergent applications, at the 2-4 inch weed stage, were applied on July 1, 2021. In addition to the grain sorghums used in the 2021 trials, an Alta Seeds igrowth imidazoline tolerant forage sorghum was also evaluated. Different tank mixes and herbicide application timings were evaluated across all trials. Plots were rated every 7-10 days during the growing season. Yield is not a component for these trials and is not reported. There was no observable phytotoxicity after 30 days in any trial, when herbicides were applied at the recommended rates, and most trials had no observable phytotoxicity from herbicide applications.

Weed Species Targeted

Weeds targeted in the Bushland herbicide trials include redroot pigweed (*Amaranthus retroflexus*), Palmer Amaranth (*Amaranthus palmeri*), tumble pigweed (*Amaranthus albus*), kochia (*Kochia scoparia*), Russian thistle (*Salsola iberica*), barnyardgrass (*Echinochloa crus-galli*), windmill grass (*Chloris verticillata*), and witchgrass (*Panicum capillare*). Weed populations vary between years. Primary weeds targeted in the 2020-2021 herbicide plots established in May, and June, were the *Amaranthus* species, *Kochia*, and grass weeds across all plots.

Acknowledgements

We gratefully acknowledge the assistance of students Shelby Lain, and Garyn Bigham with herbicide applications and plot maintenance.

Table 1. igrowth 2020 Bushland Sorghum Herbicide Trial

Primary Company Protocol - igrowth - Sorghum ADVXG390IG planted on 6-5-20				% Control 62 days after Pre 21 days after Post				% Control 77 days after Pre 36 days after Post				% Control 90 days after Pre 49 days after Post				
Treatment	Rate	Herbicide app timing	% Crop Injury				% Crop Injury				% Crop Injury					
			Kochia	Palmer	Grass Weeds	Kochia	Palmer	Grass Weeds	Kochia	Palmer	Grass Weeds					
1	Untreated Check	NA	NA													
2	ImiFlex	9 fl oz/a	Pre @planting	10	98	99	97									
	Atrazine	1 qt/a														
	2,4-D	8 fl oz/a		Post 2-4" weeds sorg at 4-5 leaf					0	87	85	97	0	87	85	97
3	ImiFlex	9 fl oz/a	Pre @planting	10	100	98	99									
	Mocassin II Plus	1 pt/a														
	Atrazine	1 qt/a	Post 2-4" weeds sorg at 4-5 leaf					0	99	92	99	0	99	90	99	
	COC	1% v/v														
4	ImiFlex	9 fl oz/a	Pre @planting	10	98	81	94									
	Atrazine	1 qt/a		Post 2-4" weeds sorg at 4-5 leaf					0	90	66	93	0	90	61	93
	COC	1% v/v														
5	Mocassin II Plus	1 pt/a	Pre @planting	10	100	98	100									
	Atrazine	1 qt/a														
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	99	97	100	0	99	94	100	
	COC	1% v/v														
6	Mocassin II Plus	1 pt/a	Pre @planting	10	95	93	95									
	Atrazine	1 qt/a														
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	95	88	93	0	95	80	92	
	2,4-D	8 fl oz/a														
7	Coyote	2 qt/a	15 days pre-plant	10	99	99	100									
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	99	95	100	0	99	95	100	
	COC	1% v/v														
8	Coyote	2 qt/a	15 days pre-plant	10	100	100	100									
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	100	100	0	100	100	100	
	Atrazine	1 qt/a														
	COC	1% v/v														
9	Coyote	2 qt/a	15 days pre-plant	10	100	100	99									
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	100	100	0	100	99	100	
	2,4-D	8 fl oz/a														
10	Mocassin II Plus	1 pt/a	Pre @planting	10	100	98	98									
	Atrazine	1 qt/a														
	2,4-D	8 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	95	96	0	100	95	96	
11	Bicep Lite 2 Mag.	1.5 qt/a	Pre @planting	10	100	100	100									
	Huskie	13 fl oz/a														
	NIS	0.25% v/v		Post 2-4" weeds sorg at 4-5 leaf					0	100	100	100	0	100	100	100
	AMS	4.75 lb/a														

Table 2 (cont). igrowth 2021 Bushland Sorghum Herbicide Trial

Primary Company Protocol - igrowth - Sorghum ADVG2193IG planted on 6-9-21				% Control 20 days after Pre 0 days after Post				% Control 41 days after Pre 20 days after Post				% Control 61 days after Pre 40 days after Post			
Treatment	Rate	Herbicide app timing	% Control				% Control				% Control				
			% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds	
8	Moccasin II Plus	1.3 pt/a	15 days pre-plant	0	100	98	100								
	Motif	6 fl oz/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorghum at V4												
	COC	1 % v/v													
	UAN	2.5 % v/v													
9	Moccasin II Plus	1.3 pt/a	15 days pre-plant	0	100	94	100								
	Sharpen	1 fl oz/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf												
	Atrazine	1 qt/a													
	COC	1 % v/v													
UAN	2.5 % v/v														
10	Moccasin II Plus	1.3 pt/a	Pre @planting	0	100	96	100								
	Motif	6 fl oz/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf												
	Atrazine	1 qt/a													
	COC	1 % v/v													
UAN	2.5 % v/v														
11	Moccasin II Plus	1.3 pt/a	Pre @planting	0	100	97	100								
	Atrazine	1 qt/a													
	Huskie	14 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf												
AMS	1 lb/a														
12	Moccasin II Plus	1.3 pt/a	Pre @planting	0	100	97	100								
	Atrazine	1 qt/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds sorg at 4-5 leaf												
	Huskie	14 fl oz/a													
AMS	1 lb/a														

Table 3. igrowth 2021 Bushland Forage Sorghum Herbicide Trial

Primary Company Protocol - igrowth - Forage Sorghum ADV2450IG planted on 6-9-21				% Control 20 days after Pre 0 days after Post				% Control 41 days after Pre 20 days after Post				% Control 61 days after Pre 40 days after Post			
Treatment		Rate	Herbicide app timing	% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds
1	Untreated Check	NA	NA												
2	ImiFlex	9 fl oz/a	Pre @planting	0	100	99	100					0	100	100	100
	Atrazine	1 qt/a													
	Huskie	14 fl oz/a	AMS	1 lb/a	Post 2-4" weeds forage at 4-5 leaf										
3	ImiFlex	9 fl oz/a	Pre @planting	0	100	96	100					0	100	75	100
	Moccasin II Plus	1.3 pt/a													
	Atrazine	1 qt/a	Post 2-4" weeds forage at 4-5 leaf									0	100	48	100
	COC	1 % v/v													
	UAN	2.5 % v/v													
4	ImiFlex	9 fl oz/a	Pre @planting	0	100	98	100					0	100	100	100
	Moccasin II Plus	1.3 pt/a													
	Atrazine	1 qt/a	Post 2-4" weeds forage at 4-5 leaf									0	100	100	100
	Huskie	14 fl oz/a													
	AMS	1 lb/a													
5	Moccasin II Plus	1.3 pt/a	Pre @planting	0	100	98	100					0	100	100	100
	Atrazine	1 qt/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds forage at 4-5 leaf									0	99	100	100
	2,4-D	0.5 pt/a													
NIS	0.25 % v/v														
6	Moccasin II Plus	1.3 pt/a	Pre @planting	0	100	98	100					0	100	99	100
	Atrazine	1 qt/a													
	ImiFlex	6 fl oz/a	Post 2-4" weeds forage at 4-5 leaf									0	100	99	100
	Atrazine	1 qt/a													
	COC	1 % v/v													
UAN	2.5 % v/v														

Table 6. Corteva 2021 Bushland Sorghum Herbicide Trial

Primary Company Protocol -Corteva-Sorghum DKS37-07 planted on 6-9-21				% Control 20 Days after Pre 0 Days after Post				% Control 53 Days after Pre 32 Days after Post				% Control 61 Days after Pre 40 Days after Post				
Treatment		Rate	Herbicide app timing	% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds	% Crop Injury	Kochia	Palmer	Grass Weeds	
1	Check	NA	NA													
2	Cinch ATZ	3.2 pt/a	Pre @planting	0	100	98	100									
	Roundup															
	Powermax	1 qt/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	88	99	0	100	88	99	
	Starane NXT	1.3 pt/a														
Atrazine	1 Lb/a															
3	FulTimeNXT	2 qt/a	Pre @planting	0	100	98	100									
	Roundup															
	Powermax	1 qt/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	97	99	0	100	95	99	
	FulTimeNXT	2 qt/a														
	Starane Ultra	6.4 Fl oz/a														
4	FulTime NXT	3.2 pt/a	Pre @planting	0	100	98	100									
	Roundup															
	Powermax	1 qt/a	Post 2-4" weeds sorg at 4-5 leaf					0	100	67	99	0	100	63	99	
	Starane Ultra	6.4 Fl oz/a														
5	Dual 2 Mag	1.33 pt/a	Pre @planting	0	100	98	100		0	100	68	99	0	100	65	99
	Atrazine	1 qt/a														
6	Dual 2 Mag	1.3 pt/a	Post 2-4" weeds sorg at 4-5 leaf	0	100	83	100		0	100	0	100	0	100	0	100
	Atrazine	1 qt/a														

Section 2. Weather Data

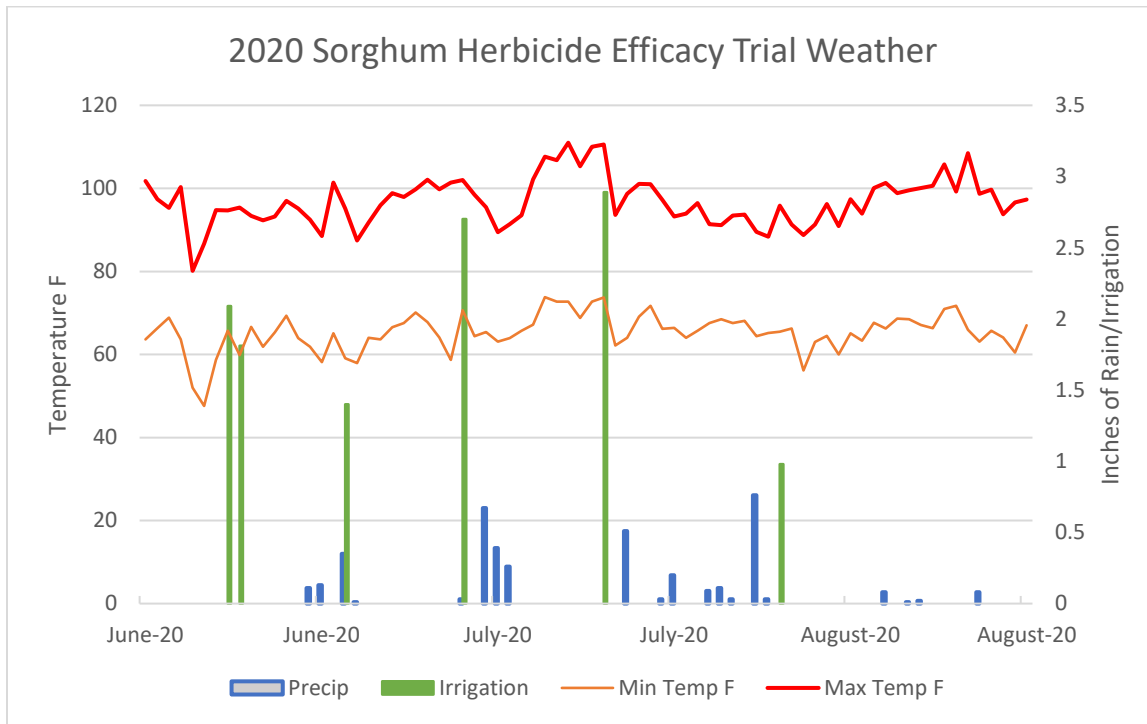


Figure 1. 2020 Sorghum Herbicide Efficacy Trial Weather

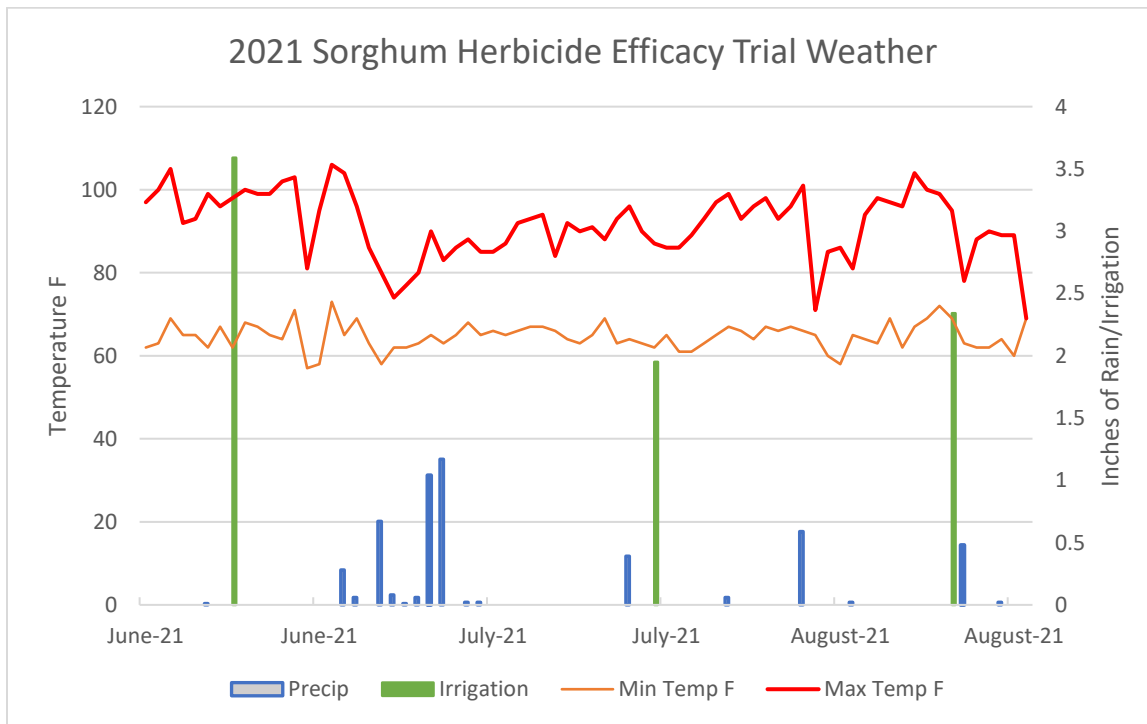


Figure 2. 2021 Sorghum Herbicide Efficacy Trial Weather