

## Weed Control and Injury with Non-Labeled Herbicides in Grain Sorghum

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### Summary

Palmer amaranth control at Garden City, KS, was good with Acuron or Lumax EZ. At Lubbock, TX, Palmer amaranth control was excellent with all herbicides except Surestart II and Valor at 1 oz/a. Surestart II and Valor provided only fair control of kochia and Russian thistle late in the season at Garden City. No visible sorghum injury from any herbicide was observed at Garden City, and sorghum yields were not affected. Very dry conditions during the experiment at Garden City likely minimized sorghum injury and limited sorghum yields. At Lubbock, minor sorghum injury was observed early with Acuron and Valor. Later in the season only Surestart II showed sorghum injury at Lubbock that translated into some yield loss. However, all herbicide-treated sorghum at Lubbock yielded 28 to 65 bu/a more grain than nontreated sorghum.

### Introduction

Acuron (*S*-metolachlor + atrazine + mesotrione + bicyclopyrone) and SureStart II (acetochlor + clopyralid + flumetsulam) are not currently labeled for use in grain sorghum, as their potential to injure grain sorghum is unknown. Currently, it is a violation of federal law to use them for weed control in sorghum. However, they show potential for further research. Valor (flumioxazin) is currently labeled for use 30 days before planting grain sorghum provided 1 inch of rain falls prior to planting. It is not known how much injury can occur from Valor when applied 2 weeks prior to planting without rainfall, or the effects of Acuron or Surestart II on grain sorghum. Lumax EZ (*S*-metolachlor + mesotrione + atrazine), Bicep Lite II Magnum (*S*-metolachlor + atrazine), and Degree Xtra (acetochlor + atrazine) have long been used for weed control in sorghum. Therefore, it was the objective of this study to compare Acuron, SureStart II, and Valor to the known standards Lumax EZ, Bicep Lite II Magnum, and Degree Xtra.

### Experimental Procedures

An experiment was conducted at the Kansas State University Southwest Research-Extension Center near Garden City, KS, and at the Texas AgriLife Research Center near Lubbock, TX, to evaluate preplant, non-labeled herbicides for residual weed control and crop tolerance in grain sorghum. Herbicides were applied using a tractor-mounted, compressed-CO<sub>2</sub> sprayer delivering 20 GPA at 30 psi at Garden City and a backpack sprayer delivering 10 GPA at 32 psi at Lubbock. Application, environmental, crop, and weed information is shown in Table 1. Plot size was 10 × 35 feet at Garden City and 10 × 25 feet at Lubbock. Plots were arranged in randomized complete blocks replicated four times at both locations. Soils for the experiments were a Beeler silt loam with pH

7.6 and 2.4% organic matter at Garden City, and an Acuff loam with 0.8% organic matter and pH 7.8 at Lubbock. Weed control was visually rated on August 4 and 18, 2017, at Lubbock and Garden City and these dates were 53 and 67 days after planting (DAP), respectively. Visual sorghum injury was determined on June 13 and July 11, 2017, at Lubbock (14 and 42 DAP), and on June 29 and August 18, 2017 at Garden City (17 and 67 DAP). Sorghum yields were determined on October 19 and November 1, 2017, at Lubbock and Garden City, respectively.

## Results and Discussion

Palmer amaranth control at Garden City was 90% or more with Acuron at 2.0 or 2.5 qt/a and Lumax EZ at 2.7 qt/a (Table 2). At Lubbock, Palmer amaranth control exceeded 96% with all herbicides except Surestart II at 1.5 qt/a and Valor at 1.0 oz/a. Surestart II at 1.5 qt/a and Valor at 1.0 oz/a controlled kochia 75 to 85% at Garden City, and these herbicides along with the 2 oz/a rate of Valor provided 70 to 73% Russian thistle control at Garden City. No visible sorghum injury was observed at Garden City, and sorghum yields did not differ between herbicide-treated and nontreated sorghum (Table 3). Very dry conditions during the experiment at Garden City likely minimized sorghum injury and limited sorghum yields. At Lubbock, minor sorghum injury was observed early with Acuron at either rate or Valor at 2 oz/a. By 42 DAP, only Surestart II showed sorghum injury at Lubbock. The injury with this treatment at Lubbock was also evident in sorghum yields. Sorghum receiving Surestart II yielded 36 bu/a less grain than sorghum treated with Bicep Lite II Magnum, which had the highest yield. However, all herbicide-treated sorghum at Lubbock yielded 28 to 65 bu/a more grain than nontreated sorghum. This research shows that injury from these non-labeled herbicides can vary a great deal from location to location, which suggests that it should also vary from season to season based on rainfall. Therefore, growers should avoid using these unregistered products until permitted by labeling changes.

**Table 1. Application information**

Application timing	Garden City, KS	Lubbock, TX
Application date	May 29, 2017	May 19, 2017
Sorghum planting date	June 12, 2017	May 30, 2017
Air temperature (°F)	53	78
Relative humidity (%)	66	50
Soil temperature (°F)	57	76
Wind speed (mph)	2	8
Wind direction	North	Southwest
Soil moisture	Fair	Good

**Table 2. Weed control with preplant herbicides in grain sorghum**

Treatment	Rate/a	Palmer amaranth		Kochia	Russian thistle
		Garden		Garden City	
		City	Lubbock	67 DAP	67 DAP
		67 DAP <sup>a</sup>	66 DAP	67 DAP	67 DAP
----- % Visual -----					
Untreated	---	---	---	---	---
Acuron	2.0 qt	90	97	99	98
Acuron	2.5 qt	96	97	98	100
Lumax EZ	2.7 qt	90	100	100	93
Surestart II	1.5 qt	78	92	75	73
Valor	1.0 oz	79	59	85	70
Valor	2.0 oz	80	97	90	73
Bicep Lite II Magnum	1.5 qt	80	97	98	94
Degree Xtra	2.25 qt	83	99	94	95
LSD (0.05)		11	7	13	12

<sup>a</sup>DAP is days after planting. Weed control ratings were taken on August 4, 2017 at Lubbock and August 18, 2017 at Garden City.

**Table 3. Sorghum injury and yield with preplant herbicides in grain sorghum**

Treatment	Rate/a	Injury		Yield	
		Lubbock		Garden City	Lubbock
		14 DAP <sup>a</sup>	42 DAP	142 DAP	142 DAP
----- % Visual -----					
----- bu/a -----					
Untreated	---	0	0	14.8	16.3
Acuron	2.0 qt	5	0	23.7	72.0
Acuron	2.5 qt	5	0	23.7	62.2
Lumax EZ	2.7 qt	0	0	21.1	71.5
Surestart II	1.5 qt	0	33	22.3	44.7
Valor	1.0 oz	0	0	17.3	59.0
Valor	2.0 oz	8	0	18.9	80.5
Bicep Lite II Magnum	1.5 qt	0	0	21.1	80.9
Degree Xtra	2.25 qt	0	0	19.9	74.2
LSD (0.05)		2	2	NS	15.6

<sup>a</sup>DAP is days after planting. Sorghum injury was evaluated on June 13, 2017 at Lubbock and July 11, 2017 at Garden City. Yield data were determined on October 19, 2017 and November 1, 2017 at Lubbock and Garden City, respectively.



**Figure 1. Untreated control.**



**Figure 2. Acuron 2.0 qt/a applied 14 days preplant at Garden City, KS, 31 days after planting.**



**Figure 3. Lumax EZ 2.7 qt/a applied 14 days preplant at Garden City, KS, 31 days after planting.**



**Figure 4. SureStart II 1.5 qt/a applied 14 days preplant at Garden City, KS, 31 days after planting.**



**Figure 5. Valor 1.0 oz/a applied 14 days preplant at Garden City, KS, 31 days after planting.**