

Evaluation of Sharpen Herbicide in Grain Sorghum

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Introduction

Several selective herbicides may be used preplant-incorporated (PPI) or preemergence (PRE) in sorghum but concerns about plant-back intervals, weed control spectrum, and crop safety limit their use in sorghum. Sharpen (saflufenacil) is a new herbicide from BASF for PRE burndown and selective broadleaf weed control in several agronomic crops including corn, soybean, cotton and grain sorghum. Sharpen provides rapid foliar burndown of weeds as well as soil residual activity. It can be used with other burndown and residual herbicides but allows for rotational crop flexibility. Studies were conducted in 2008, 2009 and 2010 to evaluate Sharpen in sorghum.

Objectives

- 1) Evaluate Sharpen as a burndown treatment for annual and perennial weeds in grain sorghum.
- 2) Examine Sharpen as a PRE for treatment in grain sorghum.
- 3) Determine grain sorghum tolerance to Sharpen was applied PRE in sorghum and in combination with Outlook (Verdict).

Methods and Materials

Herbicide treatments evaluated for kochia and Russian thistle burndown included Sharpen at 0.8 oz/A and 3.2 oz/A, Verdict at 18.4 oz/A and glyphosate at 22 oz/A. Field studies also compared Sharpen to dicamba, 2,4-D, and glyphosate to control woollyleaf bursage, Texas blueweed, and field bindweed. Herbicide treatments consisted of Sharpen at 0.8, 1.2, 3.2, and 6.0 oz/A; dicamba at 8.0 oz/A; 2,4-D at 32 oz/A; and Roundup at 32 oz/A. Palmer amaranth control using Sharpen was evaluated 14 days before planting (DBP) and PRE. 14 DBP herbicide treatments included Sharpen at 0.8, and 3.2 oz/A, Verdict at 18.4 oz/A and glyphosate at 22.0 oz/A. PRE treatments included Sharpen at 2.4 and 3.2 oz/A, Verdict at 15.5 and 18.4 oz/A, Sharpen + atrazine at 3.2 + 16.0 oz/A, and G-Max Lite at 40.0 oz/A.

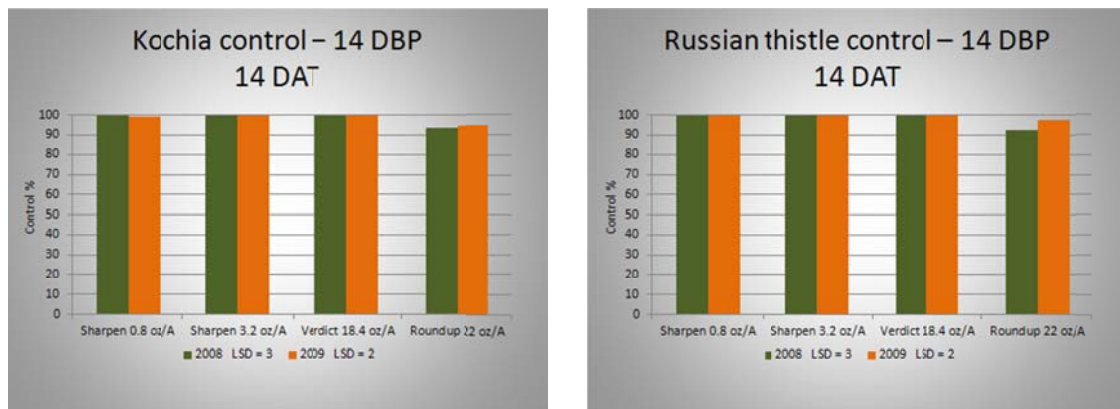
Field experiments were conducted to evaluate sorghum tolerance to Sharpen on three different soil types at Lubbock, Halfway, and Lamesa, TX. In each study, Pioneer 85G01 and Dekalb 44-20

were planted. All herbicide treatments were applied PRE at planting and were kept weed-free by cultivation and hand-hoeing. Rates at each location were based on soil texture. Herbicide treatments at Lubbock included Sharpen at 1.6 and 3.6 oz/A; Verdict at 9.2 and 18.4 oz/A, and Outlook at 14.8 and 30.0 oz/A. Herbicide treatments at Halfway included Sharpen at 2.0, and 4.0, Verdict at 10.3 and 20.5 oz/A, and Outlook at 17.1 and 34.0 oz/A. Herbicide treatments at Lamesa included Sharpen at 1.2 and 2.4 oz/A, Verdict at 6.0 and 12.0 oz/A, and Outlook at 9.7 and 19.2 oz/A.

Results

Kochia and Russian thistle control

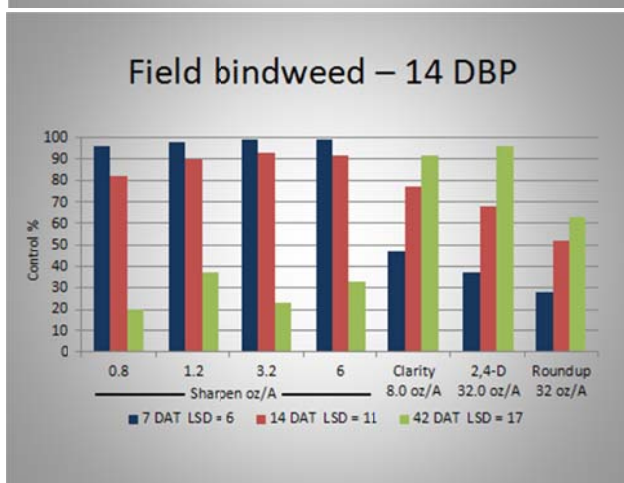
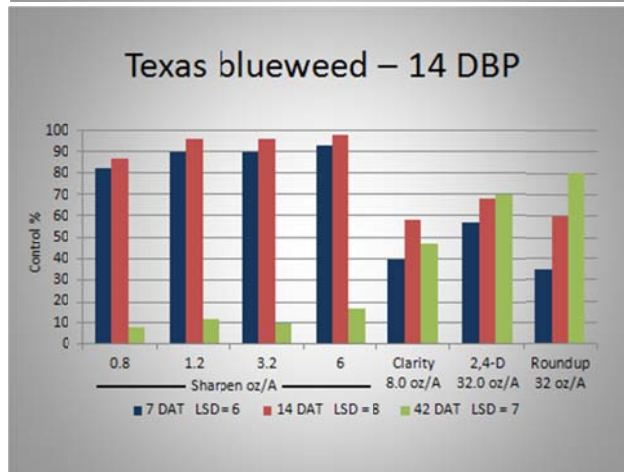
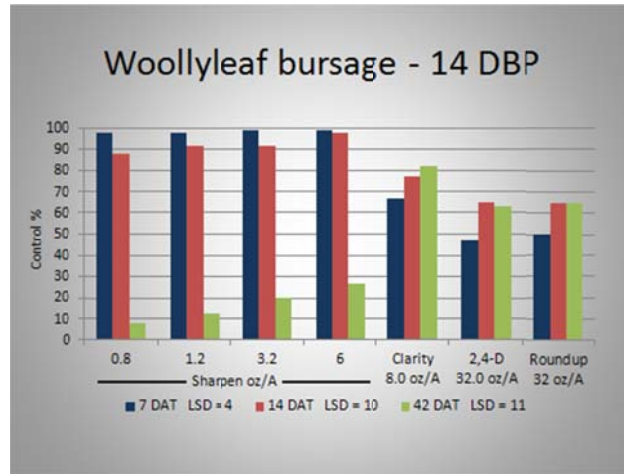
At 14 days after treatment (DAT), both Sharpen treatments controlled kochia $\geq 99\%$, while the glyphosate-only treatment controlled kochia 96%. A rate response was not observed between Sharpen at 0.8 and 3.2 oz/A. Sharpen controlled Russian thistle 100% at both rates while glyphosate controlled Russian thistle 95 to 97%.



Perennial weed control

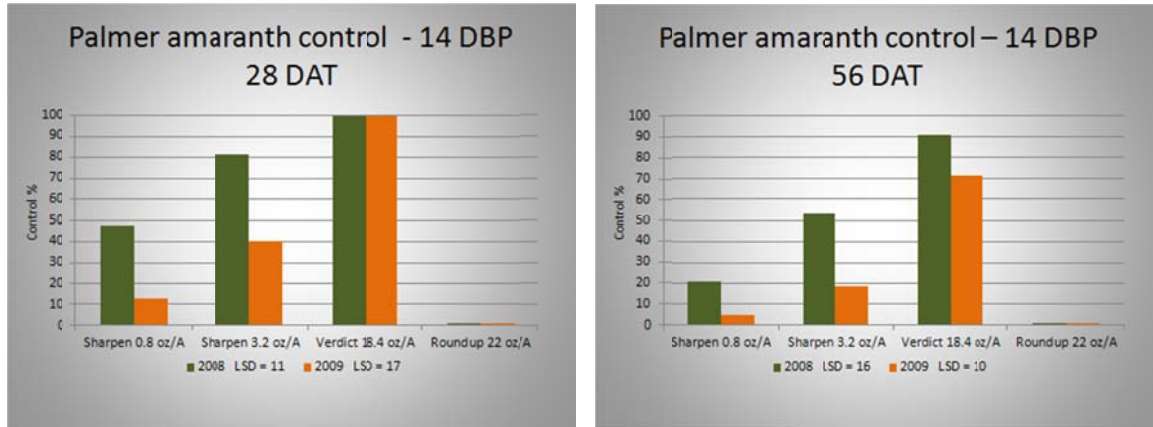
In 2009, woollyleaf bursage control ranged from 47 to 99% 7 DAT. All Sharpen treatments controlled this weed at least 98%, which were more effective than dicamba, 2,4-D, or glyphosate. 14 DAT, woollyleaf bursage control from 87-99% was maintained. At 42 DAT, control with Sharpen declined to <25% while Clarity and 2,4-D controlled woollyleaf bursage 60-82%. At 7 DAT, Texas blueweed was controlled 90 to 93% with Sharpen which was more effective than all other treatments. At 14 DAT, Sharpen controlled this weed at least 96%. At 42 DAT, Texas blueweed control with Sharpen was <20%, while glyphosate controlled this weed 80%. Sharpen controlled field bindweed 96 to 99% 7 DAT, which was more effective than dicamba, 2,4-D, or glyphosate. At 14 DAT, Sharpen controlled this weed at least 90%. At 42

DAT, dicamba and 2,4-D controlled field bindweed 92 to 96%, which was more effective than glyphosate and Sharpen. These results indicate that Sharpen can provide rapid burndown control of these perennial weeds but little to no long-term control is achieved.

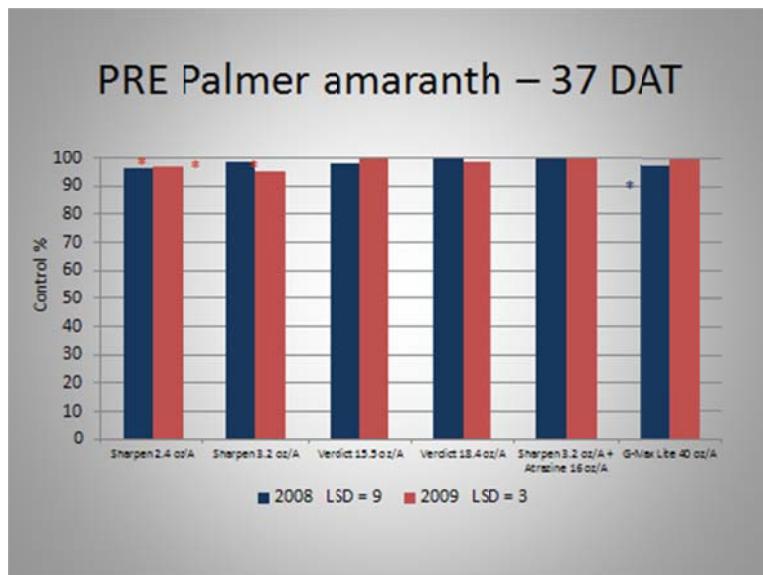


Palmer amaranth control

Residual Palmer amaranth control from treatments applied 14 DBP in 2008 ranged from 48 to 100% 28 DAT. Increasing Sharpen rates increased residual Palmer amaranth control. Verdict provided more effective control than Sharpen. All Sharpen containing treatments provided greater control than glyphosate alone in 2008. In 2009, residual Palmer amaranth control ranged from 13 to 100% 28 DAT. Similar to 2008, Verdict controlled Palmer amaranth better than Sharpen or glyphosate alone at 28 and 56 DAT.



Palmer amaranth control after PRE applications of Sharpen ranged from 96 to 100% 37 DAT in 2008. Palmer amaranth control was similar across treatments. In 2009, all herbicide treatments controlled Palmer amaranth greater than 95% 37 DAT. Sharpen applied alone was less effective at controlling Palmer amaranth when compared to Sharpen + atrazine, Outlook, and G-Max Lite. No differences were observed between treatments and when compared to the nontreated control (data not shown).



Crop tolerance

No treatment affected yields at Lubbock or Halfway in 2008 (Table 1). At Lamesa in 2008, above label rates of both Sharpen and Verdict decreased yields of 'Pioneer 85G01' compared to the nontreated control. 'Dekalb 44-20' was not affected by above label rates of Sharpen or Verdict indicating variable tolerance to Sharpen between different sorghum hybrids. In 2008 at Lamesa, a significant rainfall event occurred within 10 days after treatment, possibly causing more injury with above label rates of Sharpen. In 2009, no treatment affected yields at Lubbock. However, above label rates of Sharpen decreased yields of both 'Pioneer 85G01' and 'Dekalb 44-20' at Halfway and Lamesa that year. Significant rainfall in 2009 at Halfway and Lamesa 10 days after treatment also seemed to cause injury with above label rates of Sharpen just as occurred in 2008 at Lamesa.

These results suggest that when applied at labeled rates, Sharpen or Verdict can be applied PRE in sorghum without injuring sorghum or affecting yields. Injury from above labeled rates has been observed, especially when heavy rainfall occurs within 10 days after application. Sharpen or Verdict (which is not currently registered in sorghum) can be valuable new tools for preplant burndown and early-season weed management in grain sorghum.

Table 1. Grain sorghum yield as affected by PRE herbicide treatments.

Herbicide	Rate (oz/A)	2008						2009							
		Lubbock		Halfway		Lamesa		Lubbock		Halfway		Lamesa			
		PN	DK	PN	DK	PN	DK	PN	DK	PN	DK	PN	DK		
	Lubbock	Halfway	Lamesa	lbs/A											
Nontreated	--	--	--	6490	5975	5002	4934	5302	5555	3027	3794	5611	6379	4223	5589
Sharpen	1.6	2.0	1.2	6355	6198	4569	4863	4715	6473	2058	4709	4732	7147	3602	5402
Sharpen	3.6	4.0	2.4	6047	5916	4188	5579	3307	6966	2341	3014	817	2927	1407	4036
Verdict	9.2	10.3	6	6778	6050	6003	5864	4704	6991	2893	3323	6392	7074	4554	5030
Verdict	18.4	20.5	12	6954	6505	5025	5772	2727	5262	3067	2826	4989	5867	4906	5154
Outlook	14.8	17.1	9.7	7307	6573	5942	5574	5783	6145	3902	3270	7172	6538	2981	5134
Outlook	30.0	34.0	19.2	6935	6266	5692	5058	5411	4985	3013	3525	6257	5379	2794	4968
LSD 0.05				NS	NS	NS	NS	1383	NS	NS	NS	1359	1148	1372	1446

Abbreviations: DK, Dekalb 44-20; LSD, least significant difference; NS, not significant; PN, Pioneer 85G01.

Yields with boxes are significantly different than the untreated control.

Recommended Sharpen rates

Soil type	Rate (lb/A)	Product (oz/A)
Course soil	0.03	1.3
Medium soil	0.04	1.8
Fine soil	0.05	2.0

- Sharpen at 0.8 oz/A controlled kochia and Russian thistle greater than 99%
- Sharpen and Verdict provided greater than 95% Palmer amaranth
- Sharpen provided rapid burndown and control for 2 weeks after treatment on perennial weeds – limited control at 4 weeks
- Above label rates of Sharpen and Verdict increased sorghum injury at all 3 locations
- Above label rates of Sharpen injured sorghum more than Verdict at comparable rates
- Pioneer 85G01 was less tolerant than Dekalb 44-20
- At all locations Sharpen and Verdict at 1X rates did not affect yield in any trials

Conclusions

- Sharpen will be a valuable tool in sorghum weed control
- Has potential to control many problematic weeds in grain sorghum
- Good crop safety when using labeled rates