Soil-Applied Mesotrione in Grain Sorghum

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Introduction

- Herbicide options for grain sorghum are limited because most corn herbicides can not be used for lack of sorghum tolerance; atrazine and *S*-metolachlor are widely used in both crops.
- Mesotrione recently was registered for use in corn. It effectively controls many weed species common in grain sorghum.
- In preliminary studies, grain sorghum was severely injured when mesotrione-containing premixtures were applied postemergence, but injury was much less severe when the herbicides were soil-applied. This indicated mesotrione might have potential for use in grain sorghum.

Objectives

- Evaluate grain sorghum response to herbicide mixtures containing mesotrione applied preplant or preemergence.
- Evaluate weed control compared to *S*-metolachlor&atrazine.

Materials and Methods

- Field experiments were conducted at the Kansas State University Agricultural Research Center near Hays in 2003, 2004 and 2005.
- Soil was a Crete silty clay loam with 1.8 $\pm$ 0.2% organic matter and pH 6.3 $\pm$ 0.2.
- Treatments consisted of a factorial arrangement of six herbicide treatments and three times of applications in a randomized complete block. Treatments were replicated four times.
- Prepackaged mixtures of mesotrione&*S*-metolachlor&atrazine, mesotrione&*S*-metolachlor and *S*-metolachlor&atrazine were each applied at 1X and 2X rates (Table 1) at 20 days preplant (20 DPP), 10 days preplant (10 DPP), and preemergence (PRE).
- DeKalb 'DK36' or DKC36-00 grain sorghum was planted no-till at 42,000 seed/ac in 30-inch row spacing on June 6, 2003; May 28, 2004; and June 7, 2005.
- Crop response (necrosis, stunting, and/or delayed pollen shed) was recorded when observed. Crop stand, mature plant heights and grain yield were measured each year. Visual weed control ratings also were recorded each year.

Table 1. Herbicides, active ingredient concentration, 1X and 2X use rates.

Herbicide premixture	Active ingredient	1X rate	2X rate
	lb/gal	lb/ac	
Mesotrione	0.27	2.57	4.94
S-metolachlor	2.68		
atrazine	1.00		
Meso&meto&atra)			
Mesotrione			
S-metolachlor	0.33	1.84	3.68
(Meso&meto)	3.34		
S-metolachlor			
atrazine	2.40	2.90	5.79
(Meto&atra)	3.10		

Results and Discussion

- In 2003, there was no evidence of chlorosis or necrosis from any preplant treatment. However, at 9 days after planting, outer leaves of emerging sorghum plants in plots receiving the 2X rate of meso&meto&atra or the 1X or 2X rates of meso&meto applied PRE exhibited a narrow necrotic band estimated at 5 to 8% (data not shown). Plants had recovered completely at 16 DAT.
- No herbicide treatment visibly injured grain sorghum in 2004.
- Sorghum growth generally was not affected by herbicide use rate in any year when the herbicides were applied 10 or 20 DPP.
- At 31 days after PRE treatment in 2005, all three herbicides stunted grain sorghum growth (Figure 1). Doubling PRE herbicide use rates increased stunting 2- to 3-times (Figure 3).
- Doubling meso&meto&atra and meso&meto use rates reduced mid-season plant height 5 and 3 inches, respectively, when applied PRE (Figure 2), delayed pollen shed up to 4 days (data not shown), but did not reduce grain yield (Figure 6).

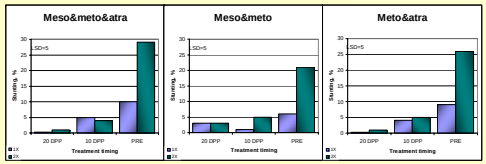

Figure 1. Grain sorghum stunting 34 days after planting in 2005. $LSD_{(0.05)}$ = 5 for comparison across herbicides within application timing.

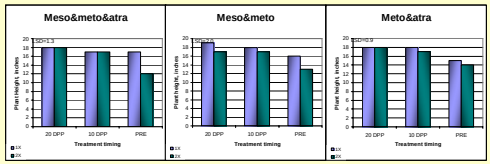

Figure 2. Grain sorghum plant height 38 days after planting in 2005. $LSD_{(0.05)}$ = 1.0 for comparison across herbicides within application timing.

Figure 3. Grain sorghum stunting in mid-season 2005. Treatment in foreground is meso&meto&atra at 2X rate applied PRE.

- Grain sorghum yields varied widely among years. Averaged over herbicide treatment, grain yields were 37, 136 and 104 bu/ac in 2003, 2004 and 2005, respectively (Figures 4, 5 & 6).
- Yield differences between use rates within herbicides did not differ in 2003 or 2004 (Figures 4 & 5), but in 2005 yield for meso&meto&atra was higher for the 2X compared to 1X rate (Figure 6).
- Averaged over herbicides, yields were higher for 10 and 20 DPP than for PRE application timings in 2003 and 2004; not in 2005.

Results and Discussion

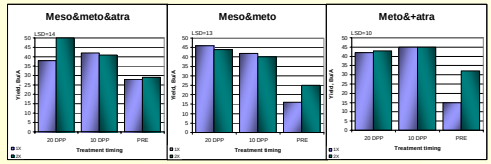

Figure 4. Grain sorghum yields in 2003. Herbicide by application timing interaction was not significant.

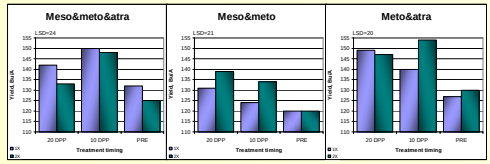

Figure 5. Grain sorghum yields in 2004. Herbicide by application timing interaction was not significant.

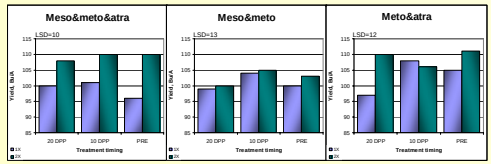

Figure 6. Grain sorghum yields in 2005. Herbicide by application timing interaction was not significant.

- All herbicide treatments provided better broad spectrum weed control when applied 10 or 20 DPP than when applied PRE; there was little or no difference between 10 and 20 DPP.
- 2X rates generally provided higher control of most weed species.
- All herbicides provided excellent pigweed control all years.
- Puncturevine and prairie cupgrass control declined with preplant application interval at 1X herbicide rates in 2005.

Summary and Implications

- In 2 of 3 years, both meso&meto and meso&meto&atra stunted grain sorghum, reduced mature plant height, delayed flowering and reduced grain yields when applied PRE.
- Grain sorghum was seldom injured or yields reduced when meso&meto or meso&meto&atra was applied 10 DPP or 20 DPP.
- Meso&meto and meso&meto&atra controlled pigweed species, puncturevine and annual grass species as well as or better than metolachlor & atrazine, regardless of application timing.
- Both meso&meto and meso&meto&atra appear to have good potential for use in grain sorghum when applied 10 or more days preplant, but PRE application is risky.