

GRAIN SORGHUM RESPONSE TO SOIL APPLIED MESOTRIONE. John C. Frihauf, Phillip W. Stahlman, David L. Regehr, Mark M. Claassen, Larry D. Maddux, Curtis R. Thompson, Alan J. Schelegel, and James M. Lee, Graduate Research Assistant, Professor, Professor, Professor, Professor, Professor, Professor, and Assistant Scientist, respectively, Department of Agronomy, Kansas State University, Manhattan, KS 66506.

Field experiments were conducted at six sites in Kansas during the 2003, 2004, and 2005 grain sorghum growing seasons (12 site-year environments) to evaluate the response of grain sorghum to premixtures of mesotrione & *S*-metolachlor & atrazine, mesotrione & *S*-metolachlor, and *S*-metolachlor & atrazine applied at different rates and timings. These herbicides were applied early preplant (EPP, 16 to 25 days preplant), late preplant (LPP, 7 to 14 days preplant), and preemergence (PRE, 0 to 3 days after planting) at one (1X) and two (2X) times recommended field use rates for corn or sorghum. Analysis of data with sites and years as random effects indicated a significant rate by timing interaction for crop injury averaged across 12 environments. Injury was greatest (8%) at the 2X use rate and PRE application timing, averaged across herbicides. In comparison, injury was $\leq 4\%$ for the 2X use rate and EPP or LPP treatment combinations as well as for the 1X use rate, regardless of application timing. Grain sorghum fully recovered from the injury and yield was not impacted by herbicides, rates, or timings. The data were reanalyzed with sites and years as fixed effects to make comparisons among experiments. Little or no injury was observed for any treatment in 4 of 12 experiments, and little or no injury was observed when herbicides were applied EPP or LPP in most other experiments. Effects of herbicide, rate, and application timing on crop injury and yield were inconsistent. Mesotrione & *S*-metolachlor & atrazine and mesotrione & *S*-metolachlor applied PRE at the 2X use rate caused the greatest injury in three experiments, and PRE application at the 2X use rate averaged over herbicides resulted in the greatest injury in three other experiments. Grain sorghum yield was not reduced by any treatment variable in four experiments. In the remaining experiments, yield was affected by the main effects of timing or rate, or a rate by timing interaction. In two experiments, grain sorghum yield, averaged over herbicides and rates, was 5 or 10% and 4 or 11% lower for PRE compared to EPP or LPP application timings, respectively. Herbicide rate significantly influenced yield in three experiments regardless of herbicide applied or timing. Averaged over herbicides and timings, yields were minimally impacted with reductions of 5 to 6% from 2X rates in two experiments and 5% yield reduction was observed from 1X rates in another experiment. There were differing rate by timing interactions for grain yield in two experiments. Averaged over herbicides, yield reductions in one experiment were greater at 1X compared to 2X use rates when herbicides were applied EPP or LPP, while in the other experiment application at 2X use rates and LPP timing reduced sorghum yield the most. Correlation analysis indicated that early-season crop injury was not a good indicator of grain sorghum yield in most experiments. Injury and yield data generally indicate mesotrione & *S*-metolachlor & atrazine and mesotrione & *S*-metolachlor are just as safe as *S*-metolachlor & atrazine when applied at LPP or EPP timing to grain sorghum.