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Integrating Half Rates of Dicamba and Atrazine with Increasing Sorghum Density and Nitrogen Rate for Palmer Amaranth Control

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Integrating Half Rates of Dicamba and Atrazine with Increasing Sorghum Density and Nitrogen Rate for Palmer Amaranth Control

Abstract

Sorghum is an important crop in Kansas. However, in-season weed control options for sorghum are limited. This limitation is exacerbated by Palmer amaranth season-long interference and resistance to multiple herbicide modes of action.

This 2-year study investigated the ability of a contrasting combination of cultural and chemical practices to control Palmer amaranth while maintaining or improving sorghum grain yield. Particular research emphasis was to evaluate the effect(s) of integrating half rates of dicamba and atrazine applied as PRE with increasing sorghum density and nitrogen rate on Palmer amaranth control and grain yield in an irrigated environment.

Keywords

Dicamba, Atrazine, sorghum, Palmer amaranth, nitrogen rates

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Integrating Half Rates of Dicamba and Atrazine with Increasing Sorghum Density and Nitrogen Rate for Palmer Amaranth Control

I.B. Cuvaca, A.J. Foster, and R.S. Currie

Summary

In-season weed control options for grain sorghum (*Sorghum bicolor*) are limited. Palmer amaranth (*Amaranthus palmeri*) can significantly reduce sorghum yield. Integrating half rates of dicamba and atrazine with increasing sorghum density and nitrogen rate could speed up canopy closure and therefore suppress Palmer amaranth (PA). A study was conducted at the Southwest Research-Extension Center near Garden City, KS from 2016 to 2017 to determine if PA could be suppressed with half-rates of dicamba and atrazine applied as preemergent (PRE) with increasing sorghum density (60,000, 90,000, and 120,000 seeds/a), and nitrogen rate (0, 100, and 200 lb/a). Sorghum grain yield was reduced by about 40% with the integration of increased sorghum density and nitrogen rate with half rates of dicamba and atrazine. Therefore, integrating half-rates of dicamba and atrazine applied as PRE with increasing sorghum density and nitrogen rate may not be an effective strategy for Palmer amaranth control.

Introduction

Sorghum is an important crop in Kansas. However, in-season weed control options for sorghum are limited. Season-long interference by Palmer amaranth exacerbates the limitation, due to PA's resistance to multiple herbicides that have different modes of action.

This 2-year study investigated the ability of a contrasting combination of cultural and chemical practices to control Palmer amaranth while maintaining or improving sorghum grain yield. Particular research emphasis was to evaluate the effect(s) of integrating half-rates of dicamba and atrazine applied as PRE with increasing sorghum density and nitrogen rate on PA control and grain yield in an irrigated environment.

Procedures

Experimental Site

Field experiments were conducted at the Southwest Research-Extension Center, near Garden City, KS, in 2016 and 2017. The soil at the site was predominantly Richfield silt loam (fine, montmorillonitic, mesic Aridic Argiustoll).

Experimental Design

Three planting densities (60,000, 90,000, and 120,000 seeds/a), three nitrogen rates (0, 100, and 200 lb/a), and two in-season weed control levels (weedy vs. weed free) were evaluated for their ability to control Palmer amaranth while maintaining grain yield of sorghum using a completely randomized block design with split-split plot arrangement and four replicates. Planting density, nitrogen rate, and in-season weed control were treated as the main plot, sub-plot, and sub-sub plot factors, respectively.

Plot Establishment and Management

Experimental plots were established using a John Deere planter in a field with a natural infestation of Palmer amaranth. Each sub-sub plot was planted to 4 rows of sorghum at 22.5 ft (2016) or 35 ft (2017) long. The field was disked and field cultivated to assure a weed-free seedbed at planting. Sorghum, “DK 3707,” was planted on June 20, 2016, and May 24, 2017, in rows 30 in. apart, and 0.5 lb/a dicamba tank-mixed with 2 lb/a atrazine + .25% v/v Induce (surfactant) was sprayed across all plots at the spike stage or after sorghum had sprouted, but prior to sorghum emergence to avoid potential injury from the herbicide. No other weed species but Palmer amaranth was allowed to grow within the plots to avoid unwanted sources of variation. Further, hand-pulling and hoeing were done as necessary in plots assigned for in-season weed control. Irrigation was supplied to meet 120% of crop evapotranspiration. Sorghum was harvested at physiological maturity and yields were adjusted to 13% grain moisture.

Data Collection

Yield and other parameters including sorghum height and headcount, and Palmer amaranth number, height, and biomass were estimated from the two central rows. Only grain yield will be presented in this report.

Data Analysis

Data were analyzed using SAS version 9.3 (SAS Institute Inc., Cary, NC).

Results

Nitrogen rate and seeding rate did not affect sorghum yield independently or in combination. Controlling Palmer amaranth in plots increased sorghum yield by 50 bu/a (56%) in 2017 and 35 bu/a (32%) in 2016 (Figure 1).

Conclusion

In both years of the study, Palmer amaranth reduced sorghum yield by an average of about 40%. Clearly, integration of greater sorghum density (>60,000 seeds/a) in conjunction with increased N rate and half rates of dicamba and atrazine is not an effective strategy to control Palmer amaranth.

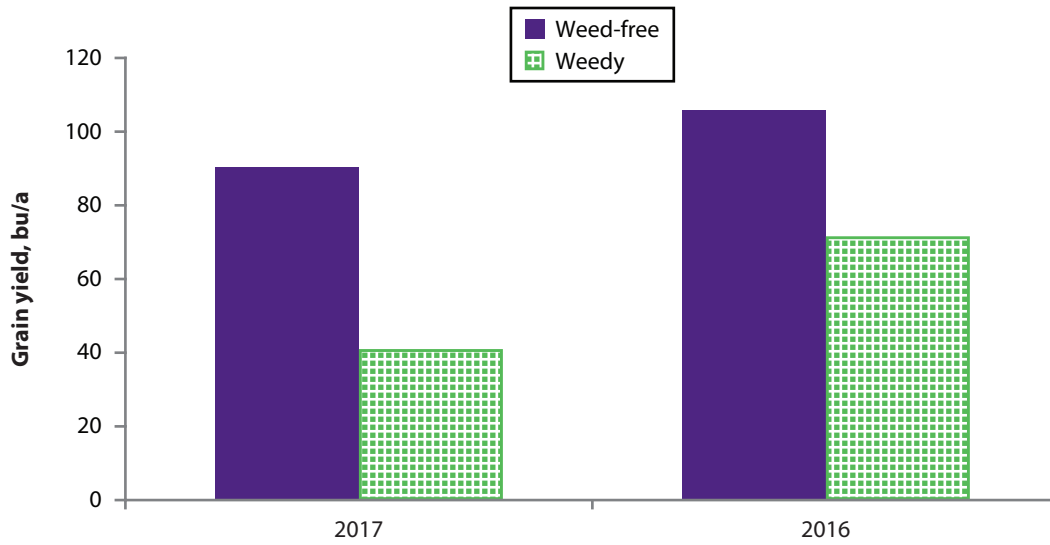


Figure 1. Sorghum grain yield as influenced by in-season weed control.