

CONTROLLING GLYPHOSATE-RESISTANT PALMER AMARANTH WITH DEEP TILLAGE

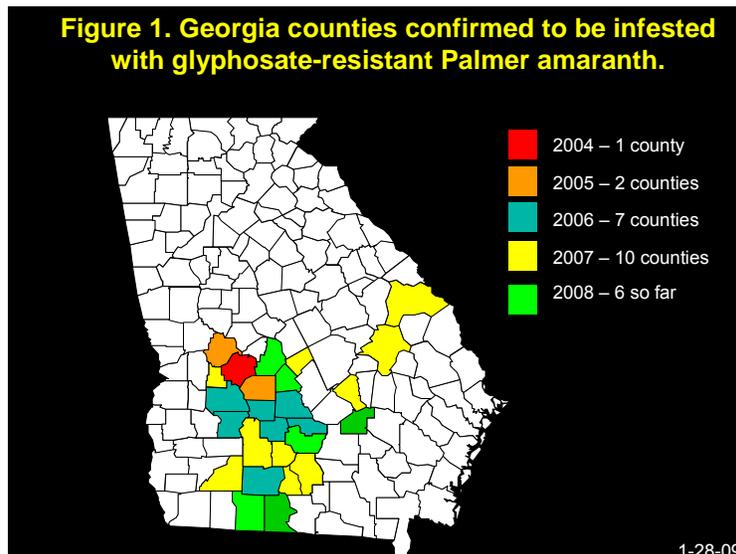
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Introduction

Cotton is the most vulnerable agronomic crop to competition from glyphosate-resistant Palmer amaranth infestations and managing glyphosate-resistant Palmer amaranth in glyphosate-resistant cotton has proven to be nearly impossible, especially when relying exclusively on herbicides. Glyphosate-resistant Palmer amaranth currently infests over 300,000 acres of land across 26 Georgia counties (Figure 1). Once Palmer amaranth resistant to glyphosate escapes the at-plant herbicides, it can only be controlled during early season cotton development with topical applications of pyriithiobac (Staple LX). Palmer amaranth resistant to pyriithiobac is common throughout the cotton belt and Palmer amaranth populations with resistance to glyphosate and pyriithiobac have been confirmed in Georgia. Palmer amaranth with resistance to both glyphosate and ALS-inhibiting herbicides can not be managed or even suppressed with any topical herbicide application in glyphosate-resistant or non-transgenic cotton.



A grower's ability to manage glyphosate-resistant Palmer amaranth in Roundup Ready cotton is heavily dependent on residual herbicides. With greater than 50% of the cotton acreage in Georgia produced without irrigation, timely rainfalls often do not activate these residual herbicides in a timely manner. An experiment was conducted to determine the impact of deep turning or preplant incorporating (PPI) a yellow herbicide on the control of this resistant pest.

Materials and Methods

A research study was conducted in dryland cotton during 2008 in Macon County, GA on a loamy sand soil with 2% organic matter having a pH of 5.9. The randomized split-plot design experiment was conducted in a field with a heavy population of glyphosate-resistant Palmer amaranth. Treatments included two tillage options (deep turning land 10 inch deep or not turning land) and four herbicide systems (Table 1).

Soil Inversion	Herbicide Options*			
	At-Plant	Early POST (5-leaf cotton)	Mid POST (8-leaf cotton)	Layby (13 lf cotton)
Yes	--	--	--	--
No	--	--	--	--
Yes	--	glyphosate	glyphosate	glyphosate
No	--	glyphosate	glyphosate	glyphosate
Yes	Prowl + Reflex PRE [^]	glyphosate + Dual	--	Direx + MSMA
No	Prowl + Reflex PRE	glyphosate + Dual	--	Direx + MSMA
Yes	Treflan PPI + Reflex PRE	glyphosate + Dual	--	Direx + MSMA
No	Treflan PPI + Reflex PRE	glyphosate + Dual	--	Direx + MSMA

*Herbicide use rates: Direx at 2 pt/A; Glyphosate = Roundup WeatherMax at 22 oz/A; MSMA at 2 lb ai/A; Prowl H₂O at 2.1 pt/A; Reflex at 1 pt/A; Treflan at 1 pt/A; and Dual Magnum at 1 pt/A.
[^]Abbreviations: PRE = preemergence; PPI = preplant incorporated with tillage.

Plot size was 4 rows by 30 feet and cotton was harvested with a single row cotton harvester. The first rainfall occurred 5 d after planting DP 555 BR cotton and applying at-plant herbicides.

Results and Discussion

At 1 month after planting, Palmer amaranth plant emergence was reduced 60% by deep turning the land when residual herbicides were not applied. Although populations were reduced throughout the season by deep turning the land, no visual control was noted at harvest when residual herbicides were not applied because of the robust size of plants that did emerge. Applications of glyphosate did not impact Palmer amaranth control regardless of tillage option. Deep turning the land in the Prowl PRE system improved Palmer amaranth control 15% and cotton yield by 19% when compared to the same herbicide program without deep turning the land. Deep turning the land did not significantly impact control or yield with the Treflan PPI system. When comparing the

Prowl PRE and Treflan PPI systems without deep turning the land, Palmer amaranth control was 11% greater and yield was 26% greater with the Treflan PPI system when compared to the Prowl PRE system. No differences were noted between the Prowl PRE and Treflan PPI systems when the land was deep turned.