

# MULTIPLE RESISTANCE TO GLYPHOSATE AND ALS-INHIBITING HERBICIDES IN PALMER AMARANTH IN GEORGIA

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## Introduction

In 2004, a glyphosate-resistant (GLY-R) biotype of Palmer amaranth was discovered at a field site in Macon County where glyphosate-tolerant cotton had been produced in a monoculture for at least seven years. In 2006, the grower reported that he was unable to effectively control the same population of Palmer amaranth using the labeled rate of pyriithobac. The objective of this study was to determine the level of resistance to glyphosate and pyriithobac in a known GLY-R Palmer amaranth population.

## Materials and Methods

Field studies were conducted in 2007 and 2008 to evaluate the response of the putative GLY/ALS-R biotype to glyphosate and pyriithobac applied singly and tank mixed. Seventeen herbicide treatments were included in the study: glyphosate applied at 22 (labeled field rate), 48, 88 and 176 oz/A; pyriithobac applied at 2.5 (labeled field rate), 5, 10 and 15 oz/A; and glyphosate+ pyriithobac at 22+2.5, 44+5, 88+10 and 176+15 oz/A, as well as a non-treated check. The herbicide treatments were arranged in a randomized complete block design with four replicates. Visual control ratings for each plot (represented as percentage of the non-treated check, where 0 equals no weed control and 100 equals complete weed control) were taken at 1, 5 and 8 weeks after treatment (WAT). Data were analyzed using the PROC MIXED procedure in SAS. Contrast statements were used to make comparisons of Palmer amaranth control between rates within herbicide categories.

## Results and Discussion

Results demonstrated that the GLY/ALS-R biotype was ineffectively controlled (5-28 % control, 1 to 8 WAT) by both glyphosate and pyriithobac at labeled use rates (22 and 2.5 oz/A, respectively) (Table 1). Palmer amaranth control increased with increased herbicide rate. Glyphosate applied at 44, 88 and 176 oz/A provided between 34 and 89% control 1 WAT. At 5 and 8 WAT, Palmer amaranth control from glyphosate applied at 2-, 4- and 6-times the labeled rate ranged from 5 to 80% and from 5 to 76%, respectively. Pyriithobac applied at 5, 10 and 15 oz/A provided 39, 39 and 47% control of Palmer amaranth, respectively, at 1 WAT. Control of Palmer amaranth at 5 and 8 WAT ranged from 17 to 65% for the same rates. When glyphosate and pyriithobac were applied as a tank mixture at rates ranging from 22+2.5 to 176+15 oz/A, Palmer amaranth was controlled 41 to 92% 1 WAT. At 5 and 8 WAT, control ratings ranged from 16 to 90%. Glyphosate and pyriithobac applied at up to 6-times the labeled rates, alone and in combination, failed to provide commercially acceptable control of this

population indicating that it possesses resistance to both chemicals. This is the first confirmed report of multiple resistances to glyphosate and pyriithiobac in Palmer amaranth in the SE US.

Table 1. Visual control of GLY/ALS-R Palmer amaranth in the field by glyphosate and pyriithiobac, applied singly and tank-mixed, 1, 5 and 8 WAT.

Herbicide rate oz/A	Visual control <sup>a</sup>					
	1 WAT		5 WAT		8 WAT	
glyphosate						
22	5		5		5	
44	34	*	23	*	19	*
88	68	*	47	*	49	*
176	89	*	80	*	76	*
pyriithiobac						
2.5	28		25		12	
5	39	*	32		17	
10	39	*	51	*	28	*
15	47	*	65	*	48	*
glyphosate + pyriithiobac						
22 + 2.5	41		31		16	
44 + 5	57	*	55	*	48	*
88 + 10	76	*	76	*	71	*
176 + 15	92	*	89	*	90	*

<sup>a</sup> Control values followed by a star within each herbicide are significantly different from the level of control achieved using the field rate (glyphosate = 22 oz/A, pyriithiobac = 2.5 oz/A) as determined using contrast statements.