

NRCS Conservation Innovation Grant

Project Title: Demonstrating Use of High-Residue, Cover-Crop Conservation-Tillage Systems to Control Glyphosate-Resistant Palmer Amaranth.

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Much effort has been spent to identify methods to control glyphosate resistant (GR) pigweed populations and to curtail its spread. While a number of alternative weed management practices have been proposed to aid in managing resistant weed species, it has become apparent that a multi-level approach is critical to attain satisfactory pigweed control. High-residue cover crops used in conjunction with chemical weed control can provide an additional level of pigweed suppression in cotton production systems. To that end, field sites were established in Alabama, Georgia, South Carolina, and Tennessee to demonstrate to producers effective methods for integrating high-residue cover crops into cotton production systems, both with and without tillage, to manage GR Palmer amaranth. This regional project evaluated the weed control efficacy, yield, and economics of these systems compared to current farming practices of reduced tillage without cover crops.

On-farm field demonstration sites were established beginning in 2009 with areas of known resistant pigweed populations throughout the four participating states. Three tillage systems were compared at each location including: a no-till, high-residue rye cover with in-row sub-soiling, a high-residue rye cover followed by inversion tillage, and a farmer standard which consisted of winter fallow, no-till. Additionally, herbicide tolerant cotton was planted depending on producer practices at a particular site. Varieties included Roundup Ready[®], Liberty Link[®], WideStrike[®], and/or Roundup Ready Flex[®] technology selections. Plot size varied according to field layout; however, each treatment covered an area of approximately 1.3 ha. Individual site details for each year are provided in the following table.

Location, soil type, and cotton variety for individual sites during the project.

Year	Location	Soil type	Cotton variety
2009-2010	Calhoun Co., SC	Sandy loam	DP 0949 B2RF
	Lee Co., SC	Sandy loam	FM 1735 LLB2
	Macon Co., GA*	Loamy sand	PHY 375 WRF
	Tipton Co., TN		

2010-2011	Barbour Co., AL	Sandy loam	
	Calhoun Co., SC	Sandy loam	PHY 565 WRF
	Lee County, SC	Sandy loam	DP 1050 B2RF
	Screven Co., GA*		PHY 565 WRF
	Seminole Co., GA*		FM 1845 LL B2
	Tipton Co., TN		
	Worth Co., GA*		PHY 565 WRF
2011-2012	Barbour Co., AL	Sandy loam	PHY 499 WRF

*Sites were demonstration purposes only; no experimental analyses were conducted with data from these locations.

Rye planting occurred in early fall to achieve high biomass levels unless delayed due to inclement weather. Tillage operations were performed prior to cover crop planting. Spring rye cover crop termination was realized using herbicides (per location production practice) and conditioned with a mechanical roller. Prior to termination, rye biomass samples were collected from each treatment. Cotton planting coincided with producer operations and generally occurred from the end of April until the first of June.

While the final results are currently being analyzed, interpreted and written for journal submission, it was apparent from the Amaranth populations recorded in Georgia with likely the highest resistant Palmer populations that deep tillage in the fall followed by rye cover reduced the populations the greatest the following year. Other research conducted by Patterson, Monks, and Price at Auburn University and the USDA-ARS has demonstrated that deep tillage allows for burial of surface located weed seeds, thus reducing populations the following growing season. However, because of the long-term benefits of reduced tillage and encouragement for producers to utilize conservation systems, deep tillage is no small issue. Thus, this demonstration project and additional research has shown that utilizing high residue cover crops in combination with overlapping soil residual and effective alternative postemergence herbicides usually can provide adequate Palmer amaranth control while protecting soil quality. The use of tillage continues to be in great debate; however, this research project was conducted over several locations across the southeastern U.S. to provide a more solid foundation on which to base recommendations. This information has been presented at numerous production meetings, regional meetings, and the Beltwide Cotton Conference. A manuscript is currently underway to describe all the facets of the project and its findings. We especially appreciate the support that we have received from USDA-NRCS and Alabama Cotton Producers through Cotton Incorporated.

A field day was held at the site to highlight the CI project and discuss herbicide resistance management. Approximately 110 participants on three different field stops of the Alabama, Florida, and Georgia Soil and Water Conservation Society annual meeting viewed the project (Figures 1 and 2).



Figure 1 Picture of person speaking in front of farm machinery.



Figure 2. Picture of participants listening to a presentation at one of the field stops.