MANAGEMENT SYSTEMS FOR GLYPHOSATE-RESISTANT PALMER AMARANTH

Jared Ross Whitaker
A. C. York
North Carolina State University
Raleigh, NC
A. S. Culpepper
University of Georgia
Tifton, GA

Abstract

Glyphosate-resistant Palmer amaranth has been confirmed in 11 counties in North Carolina and 13 counties in Georgia. Research in both states has clearly shown that preemergence (PRE) control is essential in the management of this pest. Adequate control cannot be achieved with postemergence and lay-by herbicides only. The objective of our research was to determine the most effective PRE herbicides for Palmer amaranth.

The first experiment was conducted in conventionally tilled cotton at Mount Olive, NC in 2007. Treatments consisted of several herbicides applied PRE alone and in combination. Herbicides applied individually included Cotoran 2 pt/A, Direx 1.6 pt/A, Prowl H_2O 2.1 pt/A, Reflex at 1 and 1.5 pt/A, and Staple LX 1.8 fl oz/A. Combinations included the following: Reflex 1 pt/A plus Direx, Cotoran, or Staple; Direx plus Prowl or Reflex 1 pt/A; and Staple plus Direx or Reflex 1 pt/A. A treatment with no PRE herbicide also was included. All treatments included Sequence 2.5 pt/A and Touchdown Total 34 fl oz/A at the 2- and 6-leaf cotton stages, respectively, followed by a directed lay-by application of Suprend 1.25 lb/A plus MSMA 2.4 pt/A. This location has an extremely heavy infestation of Palmer amaranth, with about one-third of the population being glyphosate-resistant.

Staple, Staple plus Reflex, and Staple plus Direx injured cotton 19 to 24% 15 days after planting. Reflex plus Cotoran and Reflex 1.5 pt injured cotton 11 and 6%, respectively, while all other treatments injured cotton 5% or less. Except for Cotoran, all PRE herbicides increased Palmer amaranth control 60 days after lay-by. Palmer amaranth was controlled only 44% in systems without a PRE herbicide. Staple, Reflex, and combinations of Reflex plus Staple, Direx plus Staple, Direx plus Reflex, and Reflex plus Prowl were most effective. Direx plus Staple, Reflex plus Staple, Staple, Reflex plus Prowl, Reflex plus Direx, Reflex 1.5 pt, Direx, Reflex plus Cotoran, Reflex 1 pt, Direx plus Prowl, and Prowl increased control 51, 51, 46, 44, 41, 40, 34, 32, 27, 26, and 24 percentage points, respectively. Greatest control, 95%, was obtained in systems with Direx plus Staple or Reflex plus Staple.

All PRE herbicides increased cotton yield 57 to 109% although no statistical differences were noted among the PRE herbicides. Numerically, greatest yields were obtained with Reflex, Reflex plus Staple, Reflex plus Prowl, and Direx plus Staple.

A second experiment with cotton planted no-till into a desiccated wheat cover crop was also conducted in 2007 at Mount Olive, NC. Treatments consisted of a factorial arrangement of preplant burndown, PRE, and early postemergence (EPOST) herbicides. Preplant options, applied 26 days before planting, were Roundup plus 2,4-D 0.5 pt/A and Roundup plus 2,4-D plus Valor SX 2 oz/A. PRE options were Roundup and Roundup plus Reflex 1 pt/A. EPOST options, applied to two-leaf cotton, were Roundup, Roundup plus Dual Magnum 1 pt/A, and Roundup plus Staple LX at 2.5 oz/A. All treatments included Roundup applied overtop to six-leaf cotton and Direx 2 pt/A plus MSMA 2 pt/A directed at lay-by. Roundup Weathermax at 22 fl oz/A was used in all applications.

Palmer amaranth 14 days after planting and prior to EPOST application was controlled 81, 93, and 97% in systems with Valor preplant, Reflex PRE, and Valor preplant plus Reflex PRE, respectively. At 30 days after lay-by, a small but significant effect of preplant herbicides was noted. Averaged over PRE and EPOST herbicides, Palmer amaranth was controlled 93 and 96% in systems without and with Valor preplant, respectively. Averaged over preplant treatments, Palmer amaranth in the absence of Reflex PRE was controlled 85, 92, and 96% in systems with Roundup, Roundup plus Dual, and Roundup plus Staple EPOST, respectively. With Reflex PRE, Palmer amaranth was controlled 95, 99, and 99% in systems with Roundup, Roundup plus Dual, and Roundup plus Staple EPOST, respectively.

Only the main effects of preplant, PRE, and EPOST herbicides were significant for yield. Averaged over other factors, Valor preplant and Reflex PRE increased seed cotton yield 15 and 9%, respectively. Staple and Dual EPOST increased yield 16 and 7%, respectively.

Similar to other research in North Carolina and Georgia, these experiments demonstrate the importance of PRE herbicides in the management of glyphosate-resistant Palmer amaranth. Good control can be obtained in systems with a good residual herbicide preplant or PRE followed by residual herbicides postemergence and lay-by. Reflex, Staple, Reflex plus Staple, Reflex plus Direx, and Staple plus Direx were the most efficacious PRE herbicides. Timely rainfall was received for PRE herbicide activation in these experiments, and the aforementioned PRE herbicides were somewhat more effective than Valor preplant. Valor preplant would have more opportunity for activation and may perform more consistently than PRE herbicides.