AN ASSESSMENT OF COTTON TOLERANCE TO PYROXASULFONE, ACETOCHLOR, AND *S*-METOLACHLOR

P.M. Eure
A.S. Culpepper
R.M. Merchant
The University of Georgia
Tifton, GA 31793

Abstract

Residual herbicides applied throughout the season are critical for the control of glyphosate-resistant Palmer amaranth in Georgia cotton. Concern of over dependence of PPO inhibitors such as, fomesafen and flumioxazin, has led to the need to more effectively rotate herbicide chemistry. Pyroxasulfone, acetochlor, and *S*-metolachlor are very long chain fatty acid inhibitors that are highly effective residual herbicides for control of Palmer amaranth as well as other annual grasses and broadleaf weeds. At present, acetochlor and *S*-metolachlor are only labeled for topical application to Georgia cotton while pyroxasulfone is not labeled for any use in cotton. Therefore, experiments were conducted in Georgia to evaluate cotton tolerance to PREPLANT, PRE and POST tolerance to pyroxasulfone, acetochlor, and *S*-metolochlor.

Cotton Tolerance to Pyroxasulfone, Acetochlor, and S-metolachlor

Three field studies were conducted during 2011 and 2012 at the UGA Ponder Research Farm and an on-farm site near Ty Ty, Georgia on a loamy sand soil. The design was a randomized complete block design with 4 replications. ‘PHY 375 WRF’ cotton was planted on May 18, 2011 at the on-farm site and ‘PHY 499 WRF’ was planted on June 1, 2011 and April 10, 2012 at the Ponder Farm. Each study included, pyroxasulfone 85WG applied PRE (immediately following planting) or POST (2-3 leaf) in cotton at 60, 75, 120 and 180 g ai/ha. A system with pyroxasulfone PRE (60 g ai/ha) followed by pyroxasulfone POST (60 g ai/ha) was also included. Acetochlor 3ME at 1,250 g ai/ha and *S*-metolachlor 7.62EC at 1,070 g ai/ha were applied PRE or POST for comparison. Also included for comparison was a glyphosate only system. All POST applications of residuals included glyphosate 4.5L at 990 g ae/ha. Irrigation was applied immediately following PRE herbicide applications and again prior to emergence. Plots were maintained weed-free using glyphosate and hand-weeding. Cotton injury was recorded weekly through boll set and plant densities were recorded after cotton emergence. At harvest, seed cotton yield data was collected. All data were subjected to ANOVA and means separated using Fisher’s Protected LSD Test ($p \leq 0.05$).

Parameters were not influenced by the interaction of location and treatment; therefore data are pooled over locations. Pyroxasulfone PRE injured cotton 38 to 61% at 10 to 14 days after treatment (DAT) while injury by PRE applied acetochlor 3ME (5%) and *S*-metolachlor (21%) was lower. PRE applied pyroxasulfone and *S*-metolachlor reduced cotton density by 35 to 76% and 16%, respectively, compared to no PRE system. Acetochlor 3ME PRE did not influence plant density. Topical applications of pyroxasulfone injured cotton 30 to 40% at 10 DAT with sequential applications of pyroxasulfone causing the greatest injury (55%). Injury from POST applied acetochlor 3ME and *S*-metolachlor was 9 and 15%, respectively. At boll set, cotton injury from PRE or POST applications of pyroxasulfone ranged from 16 to 46%, *S*-metolachlor 9 to 13%, and acetochlor 3ME 4 to 6%. Seed cotton yields were reduced 24 to 69% when pyroxasulfone was applied PRE. Pyroxasulfone at 60 g ai/ha POST did not impact yield but 75, 120, or 180 g ai/ha resulted in a 19 to 25% reduction in yields; the sequential pyroxasulfone system reduced yield 35%. *S*-metolachlor applied PRE reduced yield 8% while acetochlor PRE did not influence yield. Topical applications of *S*-metolchalor or acetochlor 3ME did not impact yields.

Cotton Tolerance to Acetochlor

A field study was conducted at the UGA Ponder Research Farm on a loamy sand soil. ‘PHY 449 WRF’ cotton was planted on April 10, 2012. The study was a randomized complete block design with four replications. Treatments included PREPLANT or PRE application of acetochlor 3ME (1.250 g ai/ha), acetochlor 3ME (1,250 g ai/ha) plus fomesafen (280 g ai/ha), acetochlor 7EC (1,250 g ai/ha), and *S*-metolachlor 7.62 (1,070 g ai/ha). Also included was acetochlor 3ME (1,250 g ai/ha) PRE followed by acetochlor 3ME (1,250 g ai/ha) EPOST to 2- to 3-leaf cotton or POST to 4-to 5-leaf cotton. Glyphosate 4.5L at 990 g ae/ha was included with EPOST and POST applications. A glyphosate only system was included for comparison and the study was maintained weed free. Cotton stand was not reduced with acetochlor 3ME applied PREPLANT or PRE, however acetochlor 7EC reduced stand 32 to 54% when

applied PREPLANT or PRE. Acetochlor 3ME plus fomesafen applied PREPLANT or PRE did not reduce cotton stand. *S*-metolachlor applied PREPLANT reduced cotton stand 20 while PRE applications did not reduce cotton stand. Acetochlor 3ME PRE and EPOST or POST caused at most 15% leaf speckling 7 DAT. Injury was not detectable from any application of acetochlor 3 ME 14 d after any application and yields from these systems were similar to the weed-free control. Cotton injury at bollset from PREPLANT or PRE applications of acetochlor 7EC ranged from 54 to 74% with a 20 to 22% yield loss. *S*-metolachlor PREPLANT or PRE injured cotton 34 to 54% at boll set and yield was reduced 15% but only with the PREPLANT application. These studies indicate that pyroxasulfone applied PRE or POST under environmental conditions found in Georgia will cause undesirable stand loss, cotton injury, and yield loss. *S*-metolachlor applied PREPLANT or PRE can reduce plant density and cause yield loss, however, it remains an effective POST residual tool in Georgia cotton production. Cotton tolerance to acetochlor 3ME applied PREPLANT or PRE is excellent and this herbicide will give growers an additional PRE herbicide mode of action for the control Palmer amaranth.