

DOES GLYPHOSATE PLUS STAPLE OR ENVOKE APPLIED TOPICALLY TO ROUNDUP READY COTTON IMPACT FRUIT SET OR SEED YIELD?

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Introduction

In Georgia, Roundup Ready cotton is now the standard technology planted on at least 92% of the acreage. Traditional cotton residual herbicide programs have been largely replaced with weed management systems often consisting of only the herbicide glyphosate (Roundup, others). Although glyphosate effectively controls many of the common weeds in Georgia, several weed species, including morningglories, have become more troublesome in part due to the elimination of traditional residual herbicides.

With morningglory being the most common and one of the most troublesome weeds facing Georgia producers, the addition of Staple herbicide with early topical glyphosate applications has become a common practice. Nearly half of Georgia's 1.3 million acres were treated with glyphosate plus Staple in 2003 and 2004. Staple plus glyphosate effectively controls morningglory but growers have voiced concerns regarding crop tolerance and potential yield losses from crop injury when applying this mixture to their cotton. Therefore, a study was implemented to evaluate the impact of glyphosate plus Staple mixtures applied topically to cotton in the 1- to 5-leaf stage when grown in a weed free environment.

Envoke, also a very effective *Ipomoea* morningglory herbicide, has recently been commercialized. Envoke can be applied otop of cotton, including transgenic or conventional, after the fifth leaf stage of cotton development. The addition of this herbicide in a Roundup Ready system will improve morningglory control. Research has indicated that applications of Envoke can be deleterious if made prior to fifth leaf stage cotton. However, little Georgia research has been conducted evaluating cotton response to Envoke when applied topically following label recommendations.

Thus, the objectives of this research was to evaluate the impact of Staple plus glyphosate or Envoke applied topically on development, maturity, and yield of Roundup Ready cotton.

Materials and Methods

'DP 555 B/RR' cotton was planted on April 22, 2004 at the Ponder Farm Research Station located near TyTy Georgia. Cotton was grown in a weed free environment without irrigation after the cotton emerged. Rainfall was plentiful during 2004 and drought stress was not observed for more than two days on this cotton throughout the season. The experimental design was a randomized complete block with treatments arranged factorially with six replications. The factorial design and six replications were

utilized to maximize statistical separation of treatments. Treatments included two at-plant and five topical herbicide options as shown in Table 1. Plots were four rows by 25 feet in length and all inputs for cotton production followed those recommended by the University of Georgia Cooperative Extension Service, with the exception of herbicide treatments and irrigation. Visual estimates of crop tolerance were estimated throughout the season. Additionally, cotton heights were measured on two separate dates and eight plants per plot were mapped prior to harvest. The middle two rows of each plot were harvested with a spindle picker modified for plot work.

Table 1. Factorial arrangement of herbicide treatments including 2 at-plant and 5 topical options.*

At-plant options	Topical options		
	1-leaf cotton	4-leaf cotton	7-leaf cotton
Prowl + Cotoran	RU	RU	
Prowl + Cotoran + Staple	RU + Staple (0.4 oz/A)	RU + Staple (0.4 oz/A)	
	RU	RU + Staple (0.6 oz/A)	
	RU	RU + Staple (0.9 oz/A)	
	RU	RU	Envoke

*Prowl, Cotoran, and Staple PRE were applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively. RU = Roundup WeatherMax applied at 22 oz/A. A nonionic surfactant was included with Envoke (0.1 oz/A). The entire trial received a Caparol plus MSMA directed application on June 11 when cotton was 22 inches tall.

Results and Discussion

Visual Cotton Injury. Applying Prowl plus Cotoran behind the press wheel did not injure cotton at 26 days after planting (Table 2). However, applying Staple preemergence (PRE) with Prowl plus Cotoran stunted cotton 7%. Several rain events occurred immediately after planting and increased cotton injury from soil-applied herbicides. By 48 days after planting, cotton stunting from the Staple PRE was not visually detectable. Cotton responded similarly to postemergence (POST) treatments with injury ranging from 4 to 10%, when pooled over PRE treatments (Table 3). By 48 days after planting cotton injury was not detectable.

Table 2. Visual estimates of cotton injury from soil-applied herbicides. TyTy, Georgia.*

Herbicide Options**	Percent Cotton Stunting		
	26 days after planting	36 days after planting	48 days after planting
Prowl + Cotoran	0 b	3 b	0 a
Prowl + Cotoran + Staple	7 a	12 a	1 a

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the POST herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively.

Table 3. Visual estimates of cotton injury from POST herbicides. TyTy, Georgia.*

Cotton Growth Stage at Time of Topical Applications**			Percent Cotton Injury	
1-leaf	4- to 5-leaf	7-leaf	3 days after 7-leaf application	15 days after 7-leaf application
RU	RU		6 a	0 a
RU + Staple (0.4 oz/A)	RU + Staple (0.4 oz/A)		10 a	1 a
RU	RU + Staple (0.6 oz/A)		10 a	0 a
RU	RU + Staple (0.9 oz/A)		6 a	1 a
RU	RU	Envoke	4 a	0 a

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the at-plant herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively. RU = Roundup WeatherMax applied at 22 oz/A. A nonionic surfactant was included with Envoke (0.1 oz/A) only.

Cotton Height. Mixing Staple with Prowl plus Cotoran and applying behind the press wheel reduced plant heights 15 and 6% at 43 and 55 days after planting, respectively, when pooled over POST treatments (Table 4). Again, plant stunting from herbicides was likely in response to the heavy rain that occurred shortly after planting. POST herbicide treatments did not impact plant height at 42 days after planting. However by 55 days after planting, shorter cotton plants or trends for shorter cotton plants were noted in systems treated with the Roundup plus Staple mixtures and with Envoke (Table 5).

Table 4. Cotton height response to soil-applied herbicides. TyTy, Georgia.*

Herbicide Options**	Height (cm)	
	43 days after planting	55 days after planting
Prowl + Cotoran	31.9 a	72.2 a
Prowl + Cotoran + Staple	27.0 b	68.3 b

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the POST herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively.

Table 5. Cotton heights as impacted by topical herbicide applications. TyTy, GA.*

Stage of Cotton Growth at Time of Topical Applications**			Cotton Heights (cm)	
1-leaf	4- to 5-leaf	7-leaf	9 days after 7 leaf application; 16 days after 4 leaf application; 27 days after 1 leaf application	23 days after 7 leaf application; 30 days after 4 leaf application; 41 days after 1 leaf application
RU	RU		30.9 a	72.8 a
RU + Staple (0.4 oz/A)	RU + Staple (0.4 oz/A)		28.0 a	68.1 b
RU	RU + Staple (0.6 oz/A)		28.5 a	69.2 b
RU	RU + Staple (0.9 oz/A)		30.2 a	70.7 ab
RU	RU	Envoke	29.9 a	69.4 b

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the at-plant herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively. RU = Roundup WeatherMax applied at 22 oz/A. A nonionic surfactant was included with Envoke (0.1 oz/A) only.

Plant Mapping Results. Eight plants per plot were mapped to evaluate the impact that Staple plus Roundup or Envoke had on cotton maturity and boll set throughout the cotton profile (data not shown). Treatments did not impact the number of total nodes produced as well as bolls set on fruiting nodes 5-9, 10-14, 15-20, 20-24, and 5-24.

Seed Cotton Yield. Cotton yield was statistically similar among all herbicide systems (Tables 6 and 7). Yields were not impacted by the early season injury from Staple applied PRE (Table 6). Additionally, while POST herbicide height reductions were noted for Envoke and Staple, no yield differences were detected.

Table 6. Seed cotton yield response to soil-applied herbicides. TyTy, Georgia.*

Herbicide Options**	Seed Yield (Lb/A)
Prowl + Cotoran	3882 a
Prowl + Cotoran + Staple	3836 a

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the POST herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively.

Table 7. Seed cotton yield response to POST herbicides. TyTy, GA.*

Stage of Cotton Growth at Time of Topical Application**			Seed Yield (Lb/A)
1-leaf	4- to 5-leaf	7-leaf	
RU	RU		3954 a
RU + Staple (0.4 oz/A)	RU + Staple (0.4 oz/A)		3824 a
RU	RU + Staple (0.6 oz/A)		3934 a
RU	RU + Staple (0.9 oz/A)		3817 a
RU	RU	Envoke	3767 a

*Means followed by the same letter within a column are not significantly different (P=0.05). Data pooled over the at-plant herbicide options.

**Prowl, Cotoran, and Staple PRE applied at 2 pt, 1.5 pt, and 0.8 oz/A, respectively. RU = Roundup WeatherMax applied at 22 oz/A. A nonionic surfactant was included with Envoke (0.1 oz/A) only.

Conclusions

These data indicate that PRE applied Staple with Prowl and Cotoran can cause cotton injury if significant rain occurs shortly after planting and application. However, this injury was transient and not observable by mid-season, did not affect node or boll development, nor cotton seed yield. Similarly, application of Staple with glyphosate POST or Envoke POST did cause height reduction but this did not adversely affect cotton seed yield. Therefore, the weed control benefit from having Staple or Envoke in a Roundup Ready weed management program is far greater than the potential for yield loss from crop injury.