

DOES GLYPHOSATE APPLIED TOPICALLY TO ROUNDUP READY COTTON AFTER THE FIVE-LEAF STAGE AFFECT FIBER QUALITY?

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Introduction

Over 90% of the cotton planted in Georgia is Roundup Ready. Glyphosate should be applied topically to Roundup Ready cotton from emergence through the 4-leaf stage. Afterwards, precise directed applications are recommended. Unfortunately, an estimated 30 to 50% of Georgia cotton acres were treated with glyphosate topically or sloppily directed after the fifth leaf stage of cotton development between 2001 and 2003. These applications can cause fruit abortion, delayed maturity, and yield loss but impacts on fiber quality are not determined or scientifically documented. With Georgia grower's struggling with fiber quality issues, the need for data regarding Roundup Ready cotton fiber response to "late" topical or sloppy directed applications of glyphosate may be critical.

Thus, the objective of this trial was to measure the response of the Roundup Ready cotton fiber quality to glyphosate applied topically between the 8- and 10-leaf stage of development as well as to sloppily directed glyphosate applications applied at layby.

Materials and Methods

'DP 555 B/RR' cotton was planted at the Rural Development Center Pivot (RDC) and at the Ponder farm in both 2002 and 2003. Each trial was planted in late April or early May in fields infested with little to no weed pressure. Each trial was maintained weed free allowing potential treatment differences to not be impacted by weed control. The experimental design was a randomized complete block with treatments replicated four times. Plots were four or six rows by 50 to 100 feet in length. All inputs for cotton production, including irrigation, followed those recommended by the University of Georgia Extension Service, with the exception of herbicide treatments. Treatments are listed in Table 1 and included Roundup UltraMax (26 fl oz) in 2002 or Roundup WeatherMax (22 fl oz) in 2003 applied overtop of cotton at the 4 leaf stage followed by Roundup directed at layby, Roundup overtop of 4- and 9-leaf cotton followed by Roundup sloppily directed at layby, or Roundup overtop of 1-, 4-, and 9-leaf cotton followed by Roundup sloppily directed at layby. A conventional herbicide program including Prowl (1 qt/A) plus Cotoran (1 qt/A) plus Staple (0.8 oz/A) applied preemergence, Staple (1.2 oz/A) plus a nonionic surfactant overtop mid postemergence, and Direx (1 qt/A) plus MSMA (2 lb ai/A) directed at layby was included as a comparison to the glyphosate treatments.

Table 1. Broadcast herbicide systems implemented in DP 555 B/RR*.

At-Plant	EPOST-topical (1-leaf cotton)	MPOST-topical (4- to 5-leaf cotton)	LPOST-topical (8- to 10-leaf cotton)	Layby (directed)
Prowl + Cotoran + Staple	none	Staple	none	Direx + MSMA
Prowl	none	glyphosate	none	glyphosate
Prowl	none	glyphosate	glyphosate	glyphosate
none	glyphosate	glyphosate	glyphosate	glyphosate

Results and Discussion

Seed Cotton Yield. Cotton yield response to herbicide systems was similar at the RDC and at the Ponder farm in 2003 (Table 2). Only at the Ponder farm in 2002 did the aggressive glyphosate systems reduce yield compared to the conventional herbicide system. These results appear to be very comparative to other work as applying glyphosate late or sloppily reduces cotton yield only 15 to 25% of the time. Compared to the conventional system, a 7% loss in yield was noted when glyphosate was applied topically to 1-, 4-, and 8-leaf cotton followed by a sloppily directed application at layby.

Table 2. Roundup seed cotton response to glyphosate herbicide systems.^a

Herbicide treatments	Seed yield (lb/A)			
	RDC 2002	Ponder 2002	RDC 2003	Ponder 2003
Conventional system (no RU*)	4660 a	4470 a	3060 a	3250 a
RU topical at 4-leaf and precision directed at layby	4650 a	4480 a	2922 a	3200 a
RU topical at 4- and 8-leaf and sloppily directed at layby	4689 a	4293 ab	2713 a	3345 a
RU topical at 1-, 4-, and 8-leaf and sloppily directed at layby	4700 a	4165 b	2871 a	3240 a

^aMeans followed by the same letter within a column are not different at P = 0.05.

*RU = Roundup UltraMax in 2002 or Roundup WeatherMax in 2003

Plant Mapping Results. No impact on fruit set or maturity was noted at the Ponder farm or at the RDC pivot in 2003 (Table 3). However at the RDC pivot in 2002, there was clearly a visual delay in cotton maturity as a response to treatments. The aggressive glyphosate systems in which glyphosate was applied overtop of 8-leaf cotton produced less total fruit on positions one and two of the fruiting branches. However, cotton in these aggressive glyphosate systems did produce more fruit at positions three and out as well as on vegetative branches (data not shown). Even though, the aggressive glyphosate programs

had a visual and measurable impact on maturity and fruit set, these applications did not affect cotton seed yield (Table 2). Interestingly, there was no difference in the number of fruit set on the first five fruiting branches (positions 1 and 2) (Table 4). We will closely analyze the mapping data to determine exactly where fruit was lost when cotton was treated with the aggressive glyphosate programs at the RDC pivot in 2002.

Table 3. Total number of bolls set on positions one or two on all fruiting branches.^a

Herbicide treatments	RDC 2002		Ponder 2002		RDC 2003		Ponder 2003	
	Pos. 1	Pos. 2	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2
Conventional system (no RU*)	9.7 a	3.7 a	8.7 a	3.9 a	8.1 a	3.8 a	7.8 a	3.1 a
RU topical at 4-leaf and precision directed at layby	10.0 a	3.3 ab	7.4 a	3.4 a	8.8 a	4.2 a	8.3 a	3.7 a
RU topical at 4- and 8-lf and sloppily directed at layby	8.2 b	2.0 c	7.8 a	3.5 a	7.5 a	3.5 a	8.7 a	3.7 a
RU topical at 1-, 4-, and 8-lf and sloppily directed at layby	8.2 b	2.3 c	8.4 a	3.4 a	7.8 a	3.6 a	7.6 a	2.4 a

^aMeans followed by the same letter within a column are not different at P = 0.05. Mapped 10 plants per plot.

*RU = Roundup UltraMax in 2002 or Roundup WeatherMax in 2003

Table 4. Number of bolls set on positions one or two on the first five fruiting branches.^a

Herbicide treatments	RDC 2002		Ponder 2002		RDC 2003		Ponder 2003	
	Pos. 1	Pos. 2	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2
Conventional system (no RU*)	3.7 a	1.3 a	3.1 a	1.9 a	5.7 a	2.8 a	5.6 a	2.6 a
RU topical at 4-leaf and precision directed at layby	3.4 a	1.4 a	2.9 a	1.8 a	6.2 a	3.3 a	6.2 a	3.1 a
RU topical at 4- and 8-lf and sloppily directed at layby	4.1 a	1.6 a	3.7 a	1.9 a	5.7 a	3.2 a	6.0 a	2.8 a
RU topical at 1-, 4-, and 8-lf and sloppily directed at layby	3.8 a	1.6 a	4.2 a	2.4 a	6.1 a	3.1 a	5.9 a	1.9 a

^aMeans followed by the same letter within a column are not different at P = 0.05. Mapped 10 plants per plot.

*RU = Roundup UltraMax in 2002 or Roundup WeatherMax in 2003

Fiber Quality Results. After harvesting at least 35 pounds of cotton lint from each plot, cotton was sent to Mississippi for ginning and fiber quality (HVI and AFIS) measurements. Results from 2003 have not been returned as of this time, thus conclusions can not be drawn. Results from 2002 did not suggest herbicide systems had any effect on gin turnout or any of the HVI or AFIS fiber measurements.