COTTON VARIETY PERFORMANCE AND WEED CONTROL IN ROUNDUP READY FLEX COTTON

Project 05-608TX
2006 Final Report to Cotton Incorporated
January 15, 2007

Wayne Keeling and Randy Boman,

Texas Agricultural Experiment Station, Lubbock, TX
Texas Cooperative Extension and Lubbock, TX

Roundup Ready cotton varieties are widely planted on the Texas High and Rolling Plains. In-season glyphosate applications have controlled a wide range of annual and perennial weeds; however, wet and windy conditions combined with large acreages to spray present challenges for making needed postemergence-topical (POST) applications prior to the 4- to 5-leaf stage. Any POST applications past this stage can lead to delayed maturity and yield loss. Some weeds such as morningglory and Russian thistle are more difficult to control with the current glyphosate rates. Cotton varieties are currently being developed incorporating a new gene for extended glyphosate tolerance in cotton. These varieties, marketed as Roundup Ready Flex cotton, will allow postemergence-topical (POST) applications of glyphosate beyond the 4- to 5-leaf stage and at higher rates than the current Roundup Ready varieties will tolerate. With the scheduled launch of Roundup Ready Flex cotton in 2006, additional information is needed as to the agronomic performance of these varieties, as well as the optimum rates and timings for economical and effective weed control.

Roundup Ready Flex variety performance

A large scale Roundup Ready Flex variety comparison was conducted at the AG-CARES farm near Lamesa, TX in 2006. Thirteen Roundup Ready Flex and Roundup Ready Flex/BollGard II varieties were planted on May 4. Plots were four rows x length of pivot pie (340-810 ft) with three replications. Roundup WeatherMax was applied POST as needed during the growing season to control weeds. Approximately 13" of irrigation water was applied per acre. Plots were mechanically harvested on October 27 and grab samples were collected and ginned for % lint turnout and fiber quality analysis. Lint yields ranged from 1048-1249 lbs/A, with highest yield produced with ST 4554B2RF, DP 143B2RF, FiberMax 9058F, and BCG 3255B2RF. (Table 1). Loan values ranged from 50.58 to 56.48 ¢/lb. Gross revenues per acre (yield x loan value) ranged from $544 to $672/A.

Table 1. Lint yield, turnout, loan value, and gross value/A from Roundup Ready Flex varieties at AG-CARES, Lamesa, TX 2005.

Variety	Yield	Turnout	Lint value	Gross Revenue
	lb/acre	%	¢/lb	$/acre
Stoneville ST 4554B2RF	1249 a	35.3 b	50.58 d	634 a-c
Deltapine DP 143B2RF	1213 ab	34.8 b-e	54.50 bc	661 ab
FiberMax 9058B2RF	1190 a-c	35.9 a	56.48 a	672 a
Beltwide Cotton Genetics 3255B2RF	1136 a-d	33.1 fg	53.65 c	609 a-d
FiberMax 9068F	1115 b-d	35.1 a-c	57.03 a	636 a-c
All Tex Summit B2RF	1103 b-d	34.1 c-d	51.70 d	571 c-d
All Tex Apex B2RF	1093 cd	33.8 e-g	55.95 ab	611 a-d
FiberMax 9063B2RF	1091 cd	34.0 d-f	55.00 bc	600 b-e
Stoneville ST 4700B2RF	1076 cd	32.9 g	54.27 c	584 c-d
Deltapine DP 147F	1071 cd	35.0 a-d	54.57 bc	585 c-d
Phytogen 485WF	1066 d	32.8 g	50358 d	539 c
Deltapine DP 117B2RF	1061 d	34.3 b-d	51.22 d	544 de
Beltwide Cotton Genetics 4630B2RF	1048 d	34.0 d-f	54.91 bc	575 d-e

Roundup Ready Flex weed control

Common annual weeds in Texas High Plains cotton include Palmer amaranth (*Amaranthus palmeri*) and ivyleaf morningglory (*Ipomoea hederacea*). Palmer amaranth is a widely distributed weed in cotton and can significantly reduce yield if uncontrolled. Ivyleaf morningglory is not a widespread problem across the Texas High Plains but an increasing number of fields are infested each year. The control of these weeds has been inconsistent in Roundup Ready cotton due to application timing, weed size, semi-arid conditions, and repeated weed flushes during the growing season.

Studies were conducted in 2005 and 2006 at the Texas Agricultural Experiment Station near Lubbock to 1) evaluate Roundup timings in combination with preplant incorporated (PPI) and postemergence (POST) residual herbicides for improved Palmer amaranth control 2) evaluate Roundup rates in combination with preemergence (PRE) and POST residual herbicides for improved ivyleaf morningglory control and 3) determine effects of weed competition with delayed Roundup WeatherMax treatments on cotton yield. Palmer amaranth management treatments consisted of no PPI or trifluralin PPI followed by Roundup POST with or without Staple or Dual Magnum. POST residual herbicides were tank-mixed with Roundup and applied only with the first POST application. The second POST application of Roundup was made "as needed". Treatments for ivyleaf morningglory management included combinations of Caparol PRE, Roundup at two rates (0.75 and 1.12 lbs ae/A), and Staple EPOST. All ivyleaf morningglory treatments were compared with or without Caparol PRE at 1.2 lbs ai/A or Staple EPOST at 0.032 lbs ai/A. All applications were made with a carrier volume of 10 GPA. ST 4554 B2RF cotton was planted in early to mid-May and mechanically harvested in mid-October. Visual weed control was evaluated prior to and 14 days after each Roundup application. Treatment means were separated using Fisher's protected LSD at the 5% level of probability.

Season-long Palmer amaranth control was not improved when trifluralin PPI was followed by Roundup with Staple or Dual Magnum compared to Roundup alone. However, when trifluralin was not applied, the addition of Staple or Dual Magnum improved Palmer amaranth control 8 to 10% (Figure 1). Delaying the initial POST application from EPOST to MPOST did not reduce weed control or cotton yield (Figures 2, 3, 4). Although residual herbicides were not always necessary to control Palmer amaranth season-long, residual herbicides are important from a resistance management standpoint.

Ivyleaf morningglory control was more effective when Roundup at 1.12 lbs ae/A was used compared to Roundup at 0.75 lbs ae/A. Caparol PRE or Staple POST did not improve ivyleaf morningglory control when applied with either rate of Roundup. Improved weed control when Roundup was applied at 1.12 lbs ae/A resulted in greater cotton lint yield in 2005. However, in 2006, no differences in cotton yield were observed between treatments although there was a trend of increased yield with increased weed control.

Figure 1. End of Season Palmer amaranth control with initial early POST Roundup applications in 2005 and 2006.

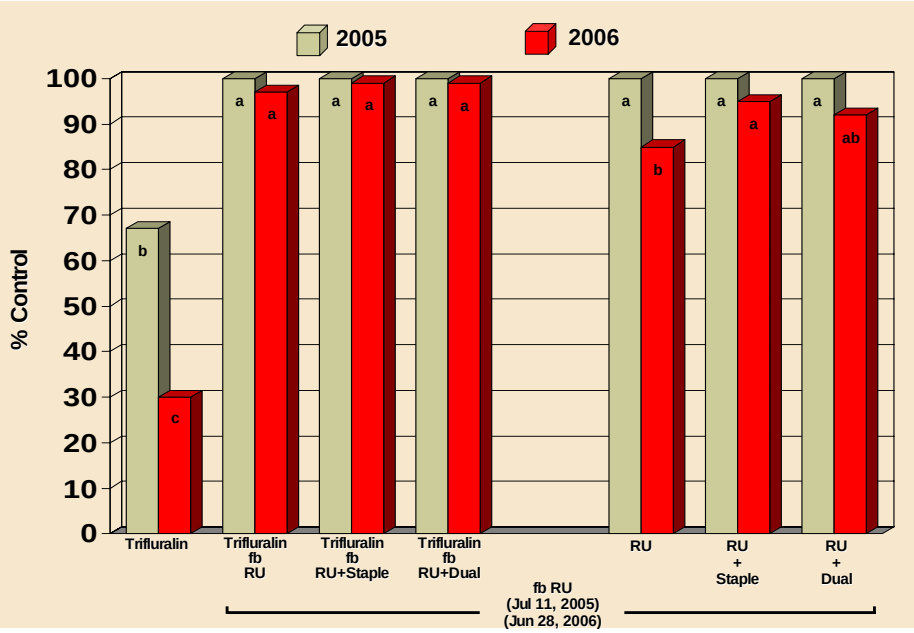


Figure 2. End of Season Palmer amaranth control with initial mid POST Roundup applications in 2005 and 2006.

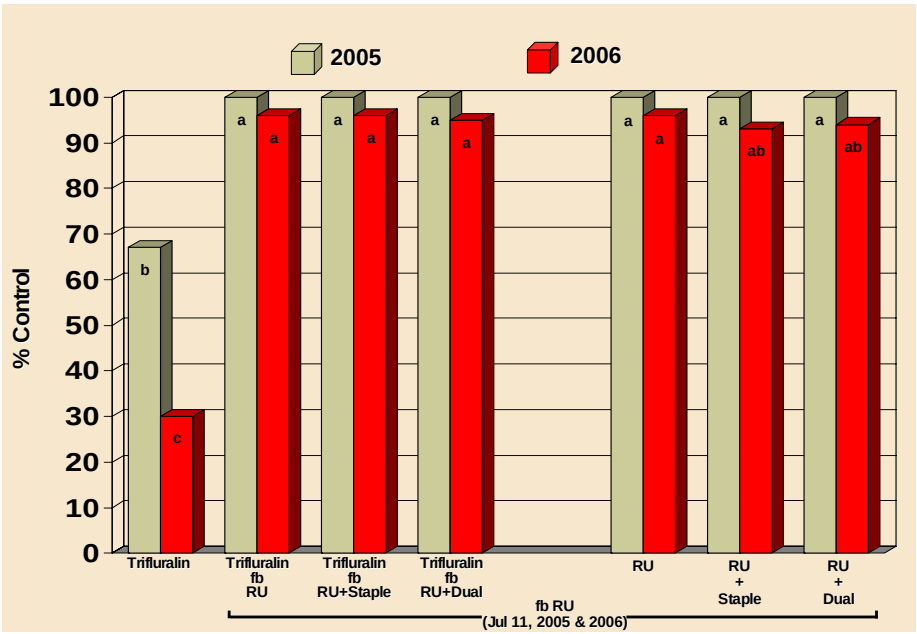


Figure 3. Effects of initial early POST Roundup applications of cotton lint yield.

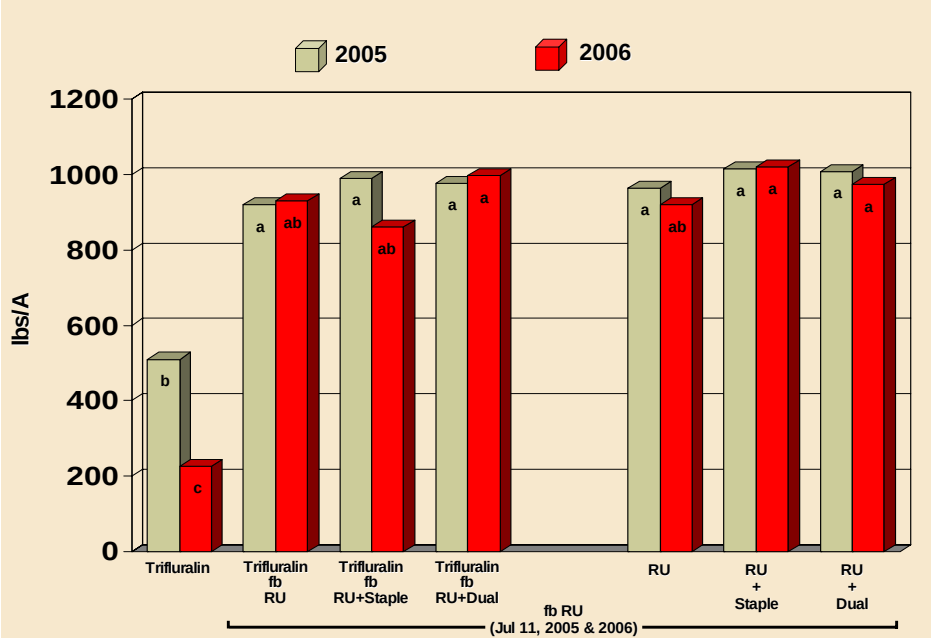
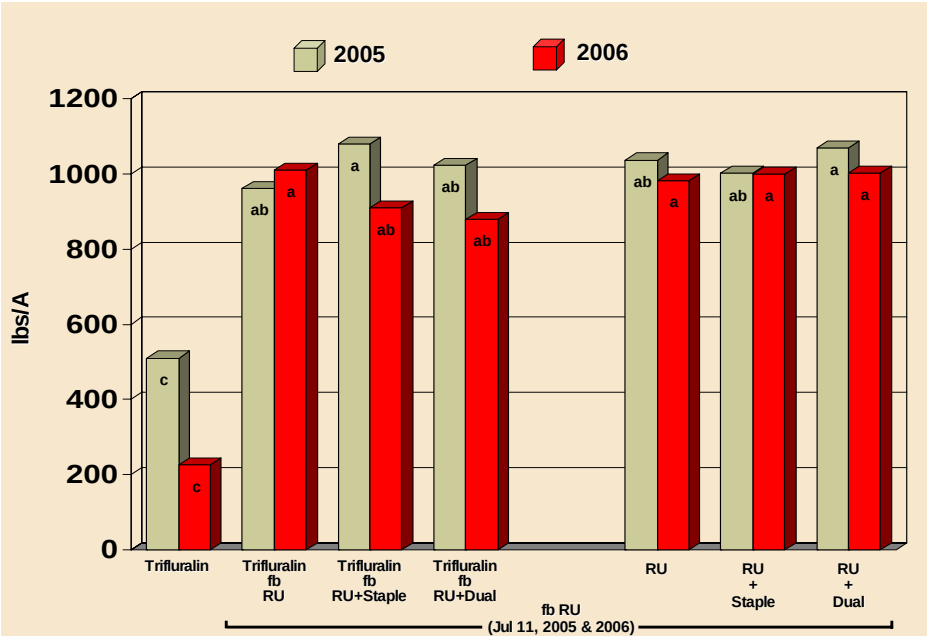


Figure 4. Effects of initial mid POST Roundup applications of cotton lint yield.



Weed competition and cotton yield

The expanded application window for POST treatments in Round Ready Flex cotton creates the potential for waiting too long to treat early-season weed flushes. This study was designed to determine effects on cotton yield with delayed initial Roundup WeatherMax treatments. Treatments compared included Roundup WeatherMax POST to 2" tall weeds to treatments delayed 7, 14, 21, and 28 days. Subsequent Roundup POST treatments were applied as needed after the different initial treatments to control weeds for the rest of the season. Each treatment was applied to plots receiving a Prowl PPI treatment compared to no PPI. With or without a PPI treatment, no yield loss was observed by delaying the first Roundup treatment up to 21 days (Figure 5). With heavier weed pressure or more difficult-to-control weeds such as morningglory, these delayed treatments may result in yield loss. Recommendations to growers will still be to treat weeds early when they are small and actively growing, but there may be situations where lack of early-season rainfall limits weed growth and delayed treatments will not affect weed control or yield.

Figure 5. Effects of delayed Roundup WeatherMax POST treatments on cotton yield, 2005 and 2006.