

**CROP TOLERANCE AND WEED  
MANAGEMENT IN LIBERTY(GLUFOSINATE)-  
TOLERANT COTTON**

**L. K. Blair**

**Texas Tech University**

**Texas Agricultural Experiment Station**

**Lubbock, TX**

**P. A. Dotray**

**Texas Tech University**

**Texas Agricultural Experiment Station**

**Texas Agricultural Extension Service**

**Lubbock, TX**

**J. W. Keeling, J. R. Gannaway and L. L. Lyon**

**Texas Agricultural Experiment Station**

**Lubbock, TX**

**J. E. Quisenberry**

**USDA-ARS**

**Hilo, HI**

**Mel J. Oliver**

**USDA-ARS**

**Lubbock, TX**

**Abstract**

Liberty tolerance in cotton has recently been achieved by the insertion and expression of the bialaphos resistance (BAR) gene that codes for the phosphinothricin-N-acetyl-transferase (*pat*) enzyme, which was isolated from *Streptomyces hygroscopicus*. In 1997 and 1998, field experiments were conducted at the Texas Agricultural Experiment Station near Lubbock to examine field tolerance of Liberty-tolerant cotton. In these experiments, cotton growth and development was evaluated following Liberty applications at various growth stages, at different rates, and with sequential applications. Regardless of cotton growth stage at application, number of applications or Liberty application rate, no visual injury nor adverse effects on cotton development, yield or fiber quality were observed in either year.

Sequential applications of Liberty were applied to Liberty-tolerant cotton again in 1999. Liberty at 0.54 lb ai/A was applied to the cotton in the 0-1, 3-4, 9-10, and 14-15 leaf stages in all possible combinations of repeated treatments. The treatments were applied using a tractor-mounted compressed air sprayer or CO<sub>2</sub> backpack sprayer calibrated to deliver 10 GPA. Plots, 4 rows by 40 feet, were maintained weed-free throughout the growing season. Visual injury was evaluated 7, 14, and 21 days after treatment. Plant heights were evaluated 21 and 56 days after treatment. Plants were mapped at harvest and lint yield and fiber quality were determined.

No visual injury was observed as a result of sequential Liberty applications. Yield, micronaire, length, and strength

were not affected by the herbicide applications. There were no differences in plant height, nodes per plant, or number of first position bolls following Liberty applications. These results were similar to those obtained in 1997 and 1998 and confirm complete tolerance.

In 1998 and 1999, annual weed control in Liberty-tolerant cotton was evaluated. Plots were 4 rows by 30 feet in both years. Treflan was applied alone at 0.75 lbs ai/A preplant incorporated or followed by (fb) Caparol at 1.0 lbs ai/A applied preemergence. Liberty at 0.36 lbs ai/A was applied postemergence topical alone or in combination with the soil applied treatments. Liberty was applied on an as-needed basis. All herbicide treatments were used with and without cultivation. Cotton, Palmer amaranth (*Amaranthus palmeri*), and devil's-claw (*Proboscidea louisianica*) height and Palmer amaranth and devil's-claw densities in nontreated control plots were taken at the time of Liberty applications. After each herbicide application, Palmer amaranth and devil's-claw control was evaluated.

In 1998, >95% late-season (10 weeks after planting) Palmer amaranth control was provided by Treflan fb Liberty and by Treflan fb Caparol fb Liberty. The use of cultivation with Treflan fb Liberty or Treflan fb Caparol fb Liberty improved late-season devil's-claw control.

The most effective late-season (11 weeks after planting) Palmer amaranth control in 1999 was achieved by Treflan fb Caparol fb Liberty, Caparol fb Liberty, and Treflan fb Liberty. Throughout the 1999 growing season, the use of cultivation with Liberty alone or Liberty used in conjunction with Treflan, Caparol, or a combination of Treflan and Caparol controlled devil's-claw.

In 1998, the use of Treflan fb Liberty or Treflan fb Caparol fb Liberty yielded the same when cultivation was not used; however, when cultivation was employed, Treflan fb Caparol fb Liberty yielded more than Treflan fb Liberty. Similar to 1999, Treflan fb Caparol fb Liberty and Treflan fb Liberty provided the greatest cotton yields also in 1999.

These results indicated that the transformation events for Liberty-tolerance in Coker 312 were successful and the gene expressing Liberty-tolerance was expressed throughout the growing season. Liberty following Treflan, Caparol, or both Treflan fb Caparol improved late-season Palmer amaranth and devil's-claw control. The most effective Palmer amaranth and devil's-claw control was achieved by Treflan fb Liberty or Treflan fb Caparol fb Liberty with cultivation. Effective weed control resulted in the highest cotton lint yields. However, future studies are needed to better understand how to utilize Liberty as part of the overall weed management program.