LIBERTY LINK® COTTON: TOLERANCE AND WEED MANAGEMENT SYSTEMS

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 and J. R. Gannaway
Texas Agricultural Experiment Station
Lubbock, TX
M. J. Oliver and J. E. Quisenberrry
USDA-ARS
Lubbock, TX

Abstract

Due to the recent progress made in biotechnology, new herbicide resistant cultivars are now available to help control weeds in cotton. In 1995, joints projects by the USDA-ARS, Texas Agricultural Experiment Station, Texas Agricultural Extension Service, and Texas Tech University in Lubbock were developed to provide Texas producers with improved germplasm for herbicide, insect, and disease resistance, environmental stress tolerance, and value-added traits for fiber and seed. A Liberty Link® cotton line was produced by using a DNA fragment containing the coding sequence of the *bar* gene from Streptomyces hygroscopicus, which is responsible for coding the *pat* enzyme. The chimeric bar gene was introduced into Coker 312 using Agrobacterium infection. Infected plants were screened for tolerance, which is achieved by metabolism. In 1997 and 1998, field experiments with the new Liberty Link® cotton line were conducted at the Texas Agricultural Experiment Station near Lubbock. Cotton growth and development was evaluated following Liberty™ applications at various growth stages, at different rates, and with sequential applications. Weed management systems with Liberty Linkâ cotton also were evaluated.

Liberty™ was first applied at 0.54 pounds ai/A to Liberty Link® cotton at the cotyledonary, 2-3 leaf, 4-5 leaf, first square, first bloom, peak bloom, cutout, or 50% open boll stages of growth. In a second test, LibertyÔ was applied to 2-3 leaf cotton at 0.36, 0.72, 1.44, and 2.88 pounds ai/A. In a third test, Liberty™ was applied to cotton in the 0-1, 3-4, 9-10, and 14-15 leaf stages in single and repeated applications. The treatments were applied using a tractor-mounted compressed air sprayer or CO_2 backpack sprayer that delivered 10 GPA. In 1997 test plots were 2 rows by 25' in length due to availability of seed, while in 1998 test plots were 4 rows by 40'. During both years, plots 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. At harvest plants were mapped and lint yield and fiber quality determined.

No visual crop injury was observed as a result of Liberty™ applications in either year. No differences were found in plant height, nodes per plant, or number of first position bolls following Liberty™ applications in either year. Herbicide applications did not adversely affect cotton yield in any of the tests. In all of the tests no differences were found in micronaire, length, strength, leaf grade and color grade.

During 1998, other tests evaluated the control of annual and perennial weeds in Liberty Link® cotton. Treflan was applied alone at 0.75 lbs ai/A preplant incorporated or used in combination with Caparol at 1.0 lbs ai/A applied preemergence and/or Liberty™ at 0.36 lbs ai/A applied postemergence. Liberty™ was also applied alone. After each application, pigweed and devil's-claw control was evaluated. Liberty™ controlled pigweed and devil's-claw if the weeds were small and actively growing. If no residual herbicide was applied, repeated applications of Liberty™ were necessary. The most effective control of both pigweed and devil's-claw was achieved using Treflan, Caparol, and Liberty™ combinations.

These results indicated that the transformation events in Coker 312 were successful and the gene for Liberty™ tolerance was expressed. Future studies are needed to better understand the how to utilize Liberty™ as part of the overall weed management program. Although the present seed lines are useful for initial field experiments, regionally adapted stripper cultivars that have Liberty™ tolerance will improve the effectiveness of the Liberty Link® cotton system on the Texas Southern High Plains.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:747-747 (1999)
National Cotton Council, Memphis TN