TWINLINK™ PERFORMANCE ACROSS THE COTTON BELT

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Abstract

TwinLink™ insect resistance technology contains two *cry* genes, expressing Cry1Ab and Cry2Ae proteins targeting cotton lepidopteran pests. TwinLink technology, which contains two *bar* gene copies as molecular markers for the two Cry protein genes, stacked with GlyTol technology, offers tolerance to glufosinate ammonium and glyphosate herbicides, as well as dual-*Bt* insect protection. Trials conducted from 2007 to 2009 showed no significant effects on agronomic performance from technology introgression and a large window of lepidopteran control compared to their non-*Bt* counterpart (data not presented). Trials in 2010 were conducted to further characterize lepidopteran control, confirm agronomic performance, compare varietal background performance, and determine protein expression profiles.

Efficacy trials were performed at 15 locations in 2010 across the US Cotton Belt. The primary pest was *Helicoverpa zea (H. zea)* in all areas. These trials contained three entries, BCSX 1518 GlyTol only, BCSX 1518 GlyTol x TwinLink (GT x TL), and Coker GlyTol x TwinLink (GT x TL). The test design was a randomized split block, with the block treatment of lepidopteran sprayed (fully protected with insecticide sprays) versus un-sprayed (no protection other than the Cry proteins in TwinLink). No effects were observed in lint yield where target pest population was low, comparing the sprayed to the unsprayed lines. At the Leland, MS location, peak boll damage was 31% and 1% for the unsprayed BCSX 1518 conventional and GT x TL, respectively. At the Jamesville, NC location, peak boll damage was 63% and 0% for the unsprayed BCSX 1518 conventional and GT x TL, respectively. Similar reductions in boll damage from TwinLink were observed at other moderate damage locations. Lint yields were not significantly increased at locations with low to moderate populations in the sprayed versus unsprayed treatments indicating supplemental control may not be needed for the TwinLink technology. Although in most cases there was no statistical difference in yields between the sprayed and unsprayed TwinLink lines, some yield differences were observed at the locations with select lines where pest pressure was severe between the sprayed and unsprayed. At these locations with 100% boll damage in unsprayed, conventional plots, peak boll damage of 28% and 22% were observed with BCSX 1518 GT x TL and Coker GT x TL, respectively. These levels of damage were similar to those observed in the current commercial technology in other trials where it was being tested in the same general area. These data indicate supplemental lepidopteran control may be needed for the TwinLink technology under certain conditions, including extreme lepidopteran pressure.

TwinLink performance was also tested in five elite germplasm lines in Memphis, TN and Jamesville, NC. Moderate damage to the non-*Bt* lines due to *H. zea* was observed at both locations; 57% and 36% peak boll damage in TN and NC, respectively. The average boll damage in TwinLink lines across varietal backgrounds was 2% and never exceeded 6%. Cry1Ab and Cry2Ae protein concentration was determined by protein extraction from terminal leaf tissue and quantitative, colorimetric ELISA procedure. Five locations and multiple genetic backgrounds were sampled for six consecutive weeks during the flowering and boll set period. Similar to other Cry1 proteins, data indicate a slight decline of TwinLink Cry1Ab protein as the cotton plant matures. However, the Cry2Ae protein in TwinLink either maintained, or numerically increased, expression through maturity.