

PINK BOLLWORM MORTALITY DYNAMICS IN TWINLINK™ COTTON**Peter C. Ellsworth****Shujuan Li****Bruce Tabashnik****University of Arizona & Arizona Pest Management Center****Tucson, AZ****Jonathan Holloway****Robert Humphries****Bayer CropScience****Lubbock, TX****Abstract**

Transgenic cotton producing toxins from *Bacillus thuringiensis* (*Bt*) have been successfully used to control various insect pests over the last 15 years. Bayer CropScience's TwinLink™, a pyramided cotton technology that expresses two insecticidal proteins, Cry1Ab and Cry2Ae, derived from *Bt*, was developed through conventional breeding of two events, T304-40 and GHB119, and designed to control lepidopteran pests of cotton. Arizona is currently using *Bt* cotton varieties as part of a multi-pronged pink bollworm (*Pectinophora gossypiella* Saunders) eradication program. These studies were designed to examine the efficacy of the TwinLink trait and its constituent parts in providing control of pink bollworm. They also support regulatory and future resistance management strategies that depend on establishment of "high-dose" control of target pests. We used approaches related to US Environmental Protection Agency Methods 3 and 4 to examine pink bollworm mortality dynamics in cotton expressing the Bayer CropScience insecticidal proteins. Plants from near isogenic lines of cotton (TwinLink, Cry1Ab-producing, Cry2Ae-producing, and check lines) were grown in the field and bioassays designed around bolls of uniform age in four years of study. Over 3,900 bolls and 61,000 pink bollworm larvae were assayed over the course of 11 artificial field infestations. In addition, lab-maintained Cry1Ac-resistant pink bollworms (AZP-R) were lab bioassayed on field-grown bolls. "Survivors" were defined as live pink bollworm third instar or larger in size or development. Both transgenic events demonstrated very high efficacy in controlling pink bollworm, most often as 1st instar larvae. The Cry1Ab (99.87%) and TwinLink (99.98%) cotton lines were ostensibly superior to Cry2Ae (99.37%) in controlling this pest. The efficacy of the Cry1Ab and TwinLink lines appears sufficiently high, well in excess of 99.5%, to be considered high-dose for this target. The Cry2Ae lines in this study also demonstrated arguably high-dose efficacy for pink bollworm, though slightly less than for the Cry1Ab or TwinLink lines. The Cry1Ac-resistant pink bollworms were able to survive on the Cry1Ab-based line, confirming cross-resistance identified in prior studies of AZP-R and diet-incorporated Cry1Ac or Cry1Ab. TwinLink (100%) cotton and Cry2Ae-based (99.95%) lines provided great efficacy on Cry1Ac-resistant pink bollworm in cotton, suggesting that TwinLink cotton, will be very useful in resistant management. Additional details of this study can be found at, <http://cals.arizona.edu/crops/presentations/11BeltwideTwinlinkvF3lo.pdf>.