VIPCOT™ PERFORMANCE IN THE SOUTHEAST AND TEXAS UPPER GULF COAST: 2006 - 2007

Brad W. Minton
Henry S. Mclean
Victor Mascarenhas
Syngenta Crop Protection
Greensboro, NC
David V. Negrotto
David P. Dickerson
Syngenta Biotechnology, Inc.
Research Triangle Park, NC

Abstract

Syngenta is currently developing VipCot™, a transgenic insect-resistant cotton that expresses dual insect toxins (Vip3A and Cry1Ab). Trials were conducted throughout the cotton belt to test the efficacy of VipCot™ against tobacco budworm, *Heliothis virescens* (Fabricius), and cotton bollworm, *Helicoverpa zea* (Boddie). The efficacy of VipCot™ was compared to that of the conventional variety, Coker 312. VipCot™ provided excellent control of both tobacco budworm and cotton bollworm, suffering little or no square, flower or boll damage. Results from 2006 and 2007 field trials conducted in the South East (NC, SC, GA) and Upper Gulf Coast Region of Texas will be presented.

Introduction

Currently all available transgenic insect-resistant cotton varieties rely on Cry proteins from *Bacillus thuringiensis* (Bt). Bollgard II® expresses both Cry1Ac and Cry2Ab, whereas Widestrike® expresses Cry1Ac and Cry1F. Thus there is a real need for greater insecticidal protein diversity in the cottonseed marketplace. To meet this need, Syngenta has been developing cotton varieties that express the novel insecticidal protein Vip3A (Estruch et al., 1996). VipCot cotton will comprise Vip3A stacked with the Cry protein Cry1Ab. Vip3A is unrelated to the Cry proteins and targets a distinct binding site in the insect's midgut (Lee et al., 2003; Chen and Lee, 2005). Substantial evidence is available supporting a lack of cross-resistance between Vip3A and Cry proteins (Marcus et al., 2005; Jackson et al., 2006; McCaffery et al., 2006; Fang et al., 2007 Jackson et al., 2007). The combination of Vip3A and Cry1Ab is expected to provide both exceptional lepidopteran insect control spectrum as well as excellent insect resistance management (IRM) attributes.

VipCot field trials testing the agronomic performance and insect efficacy were performed in 2006 (Martin et al., 2007) and 2007. The field trial program included 35 locations in 2006 and 20 locations in 2007. These trials were run by Syngenta, D&PL & University Cooperators. Efficacy trials were artificially infested with *H. virescens* and *H. zea* where there was a lack on natural lepidopteran insect pressure. Agronomic performance trials were treated as conventional cotton to prevent insect damage and measure plant performance. Larger plot trials (1 – 2 acres) relied on natural infestations (Coker 312 & VipCot only).

Materials and Methods

Several lines were evaluated in the 2006 and 2007 field trial programs. All lines were in the Coker 312 background. This report focuses on four of these lines: Coker 312 (non-transgenic), COT67B (Cry1Ab component), COT102 (Vip3A component) and the pyramided combination of COT102 and COT67B (VipCot).

Trials were planted across the US Cotton Belt to evaluate performance in a variety of environmental/growing conditions. This report focuses on the Southeastern US and Upper Gulf Coast of Texas. Results from the Mid-South are presented separately.

Table 1. Trial Locations for 2006 and 2007 Insect Efficacy Trials – SE and TX

Beasley, TX	2006
Beasley, TX	2007
Chula, GA	2007
Seven Springs, NC	2006
Seven Springs, NC	2007
Jamesville, NC	2006
Jamesville, NC	2007
Blackville, SC	2007

Natural infestations of *H. virescens / H. zea*: All entries were assessed at ~ 7 day intervals during the entire period when there was significant insect pressure on the trial. At each evaluation, 100 randomly selected squares and bolls were assessed per plot. Each structure was rated for feeding damage. A damage rating was based on fruiting body penetration, rather than on superficial feeding damage. The data provided were the number of damaged structures per 100 structures.

Artificial infestation of *H. virescens / H. zea*: Artificial infestations were only carried out if less than 10% square damage due to the relevant species was observed in Coker 312 by ~ 3 weeks after pinhead square. Ratings were carried out 3 and 7 days after the artificial infestation. At each evaluation, 100 randomly selected squares and bolls were assessed per plot. Each structure was rated for feeding damage. A damage rating was based on fruiting body penetration, rather than on superficial feeding damage. The data provided were the number of damaged structures per 100 structures.

Results

Agronomic results obtained in trials from 2006 were reported (Mahaffey 2007). Analyses of the 2007 Agronomic trials are not complete.

In the tobacco budworm (TBW) plots (Figure 1), Coker 312 showed a high level of square damage. Overall, VipCot showed less square damage than both parent lines, COT102 (Vip3A) and COT67B (Cry1Ab). The missing locations either had no natural TBW pressure, the artificial infestations did not succeed or the data were not available.

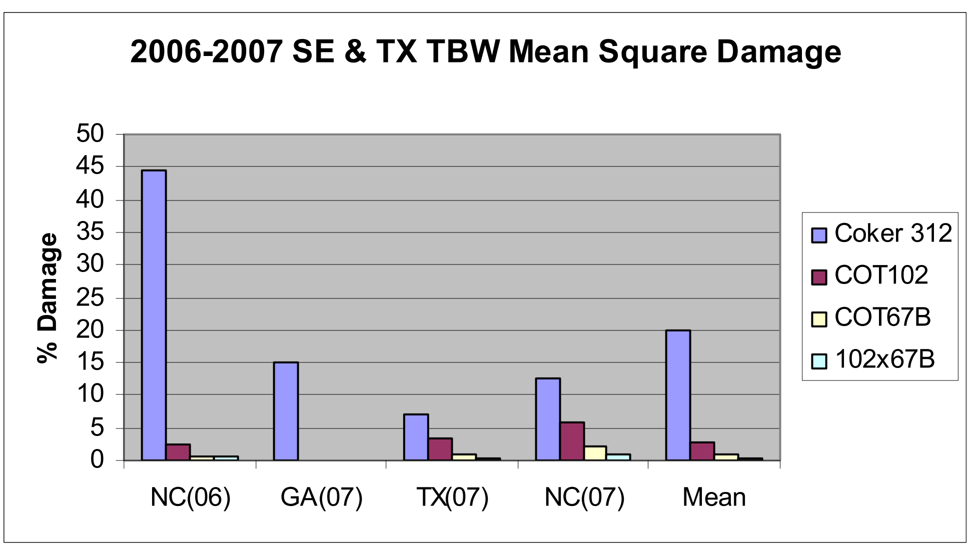

Figure 1.

In the cotton bollworm (CBW) plots (Figure 2), Coker 312 showed a high level of square damage. Overall, VipCot showed less square damage than both parent lines, COT102 (Vip3A) and COT67B (Cry1Ab). The missing locations either had no natural CBW pressure, the artificial infestations did not succeed or the data were not available.

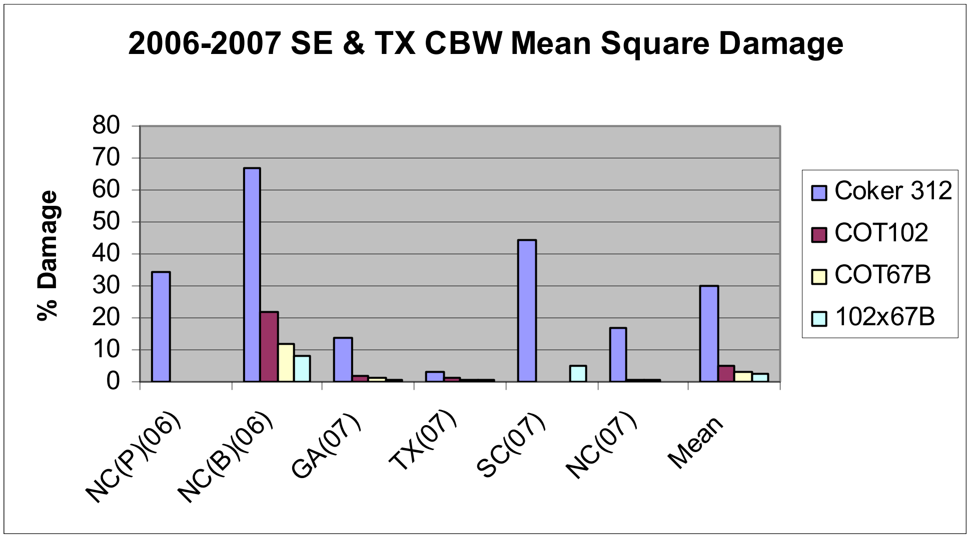

Figure 2.

In the cotton bollworm (TBW) plots (Figure 3), Coker 312 showed a high level of boll damage. Overall, VipCot showed less square damage than both parent lines, COT102 (Vip3A) and COT67B (Cry1Ab). The missing locations either had no natural TBW pressure, the artificial infestations did not succeed or the data were not available.

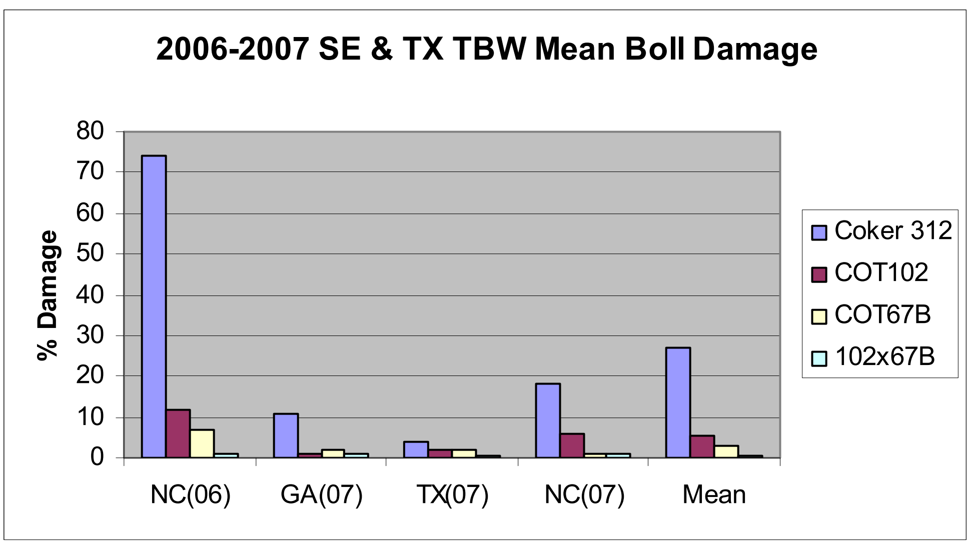

Figure 3.

In the cotton bollworm (CBW) plots (Figure 4), Coker 312 showed a high level of boll damage. Overall, VipCot showed less boll damage than both parent lines, COT102 (Vip3A) and COT67B (Cry1Ab). The missing locations either had no natural CBW pressure, the artificial infestations did not succeed or the data were not available.

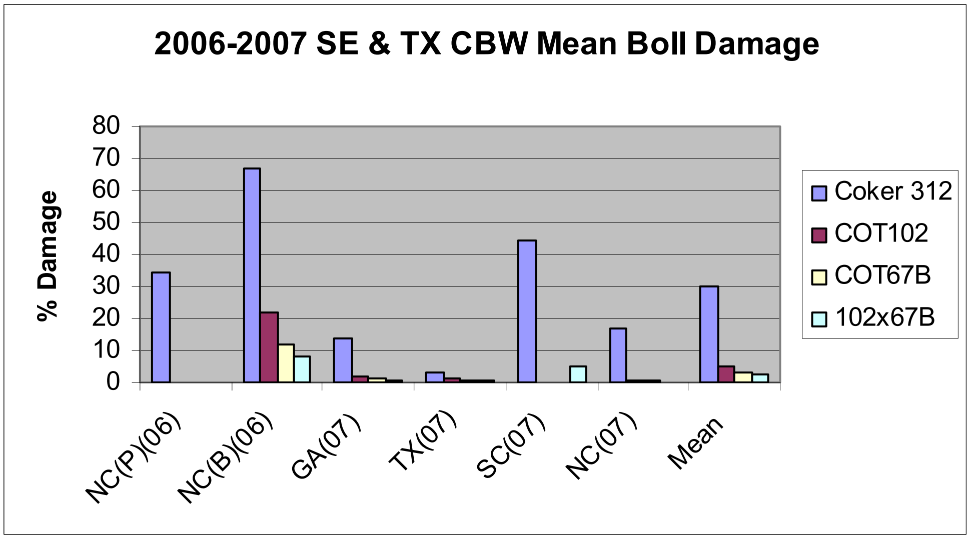

Figure 4.

Conclusions

VipCot provided excellent control of both TBW (*H. virescens*) and CBW (*H. zea*), resulting in little or no square or boll damage. Additionally, VipCot provided levels of control better than either of the parental lines included in these trials. These data confirm VipCot cotton has excellent activity against these key heliothine pests in the USA.

The risk of cross-resistance developing between Vip3A and Cry toxins is extremely low. Vip3A represents an excellent partner for Cry toxins in stacked cotton product offerings due to having exceptional efficacy, no adverse agronomic effects, and excellent insect resistance management properties

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