Late Season Pink Bollworm Pressure in the Top Crop of Bt and Non-Bt Cotton .

Tim C. Knowles, Tim J. Dennehy, and Albert Rovey

Abstract

Green bolls (100/field) were sampled from the uppermost internodes within adjacent fields of Bt (Deltapine 33B) and non-Bt (Hyperformer HS 44) cotton experiencing severe pink bollworm pressure late in the growing season. Average top crop lint yield reductions ranging from 30 to 70% were observed in the uppermost bolls of the non-Bt cotton variety. Average top crop lint yield reductions ranging from 0 to 40% were observed in the uppermost bolls of the transgenic Bt cotton variety.

Introduction

Transgenic Bt cotton expresses an insecticidal protein from *Bacillus thuringiensis* which is active against lepidopteran pests including pink bollworm larvae. However, there is concern over the risk of reduced expression of the protein late in the growing season in senescent cotton. Furthermore, late season insect populations can explode and even Bt cotton could be at risk of losses to worm pests at this time. Therefore, University of Arizona guidelines for Bt cotton production suggest that irrigation termination, chemical termination, harvest and plowdown should be timed to maximize the first fruit cycle set and minimize late season exposure to pink bollworm and other pests.

Materials and Methods

A field experiment was conducted during 1997 in Parker Valley (located in southwestern La Paz County) to determine the effects of severe late season pink bollworm pressure on loss of top crop yield potential of Bt (Deltapine 33B) and non-Bt (Hyperformer HS 44) cotton varieties. On October 17, 100 susceptible green bolls were sampled from the uppermost internodes within adjacent Bt and non-Bt fields. Both of these cotton fields experienced severe late season pink bollworm pressure in 1996 and again in 1997.

Bolls were cracked and examined to determine the number of warts and mines per boll, the total number of live and dead pink bollworm larvae within each boll and the larval instar of live larvae, percent of the boll damaged or stained by pink bollworm feeding activity, and the total number of exit holes per boll. Top crop lint yield reduction was determined based on a visual judgement of percent damaged or missing lint in each boll sampled from the upper portion of the cotton plant. Data were subjected to standard regression analysis (CoStat).

Results and Discussion

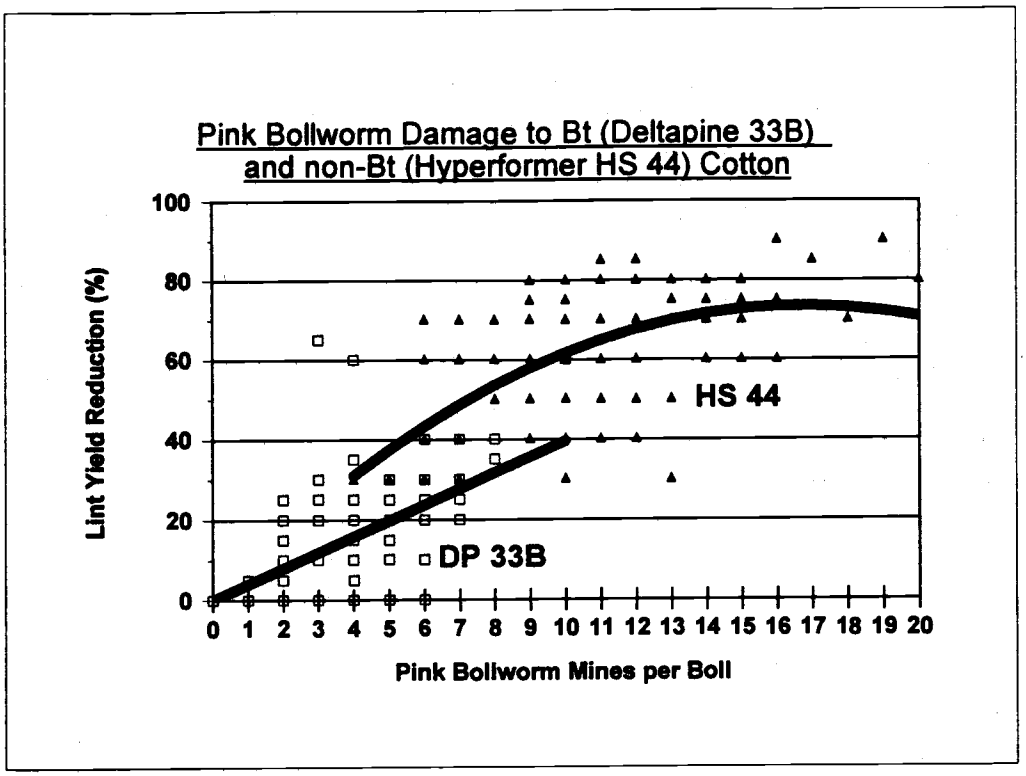
Top crop lint yield of the non-Bt cotton variety (Hyperformer HS 44) was dramatically reduced due to severe pink bollworm feeding (Figure 1). The total number of pink bollworm mines per boll per boll was highly correlated with the reduction in top crop lint yield ($R^2 = 0.951$). If it is assumed that each mine resulted from one egg laid by a female moth, then each boll in the non-Bt plot had from 4 to 20 pink bollworm larvae. Average lint yield reductions ranging from 30 to 70% were observed within uppermost bolls at the mid-October sampling date. The total number of pink bollworm exit holes per boll ranged from 2 to 10 (data not shown), while the total number of larvae per boll ranged from 4 to 20.

Top crop lint yield of the transgenic Bt cotton variety (Deltapine 33B) was only slightly reduced by pink bollworm feeding (Figure 1). If assumed that the total number of mines per boll was equal to the total number of live and dead first and second instar pink bollworm larvae per boll, both were correlated with top crop lint yield reduction ($R^2 = 0.653$). Average lint yield reductions ranging from 0 to 40% were observed within uppermost bolls by mid-October. Only one pink bollworm exit hole from one boll was observed for the 100 boll sample (data not shown), while the total number of larvae per boll ranged from 0 to 10. The lint yield reduction observed within the uppermost bolls of this Bt cotton variety was due to feeding damage by first or second instar pink bollworm larvae. No live third or fourth instar pink bollworm larvae were found in bolls sampled from the Bt field.

Acknowledgment

The valuable cooperation, land, and resources provided by Albert Rovey of Rolanco Farms is highly appreciated.

Figure 1. Top crop lint yield reduction due to severe late season pink bollworm infestations of Bt (Deltapine 33B) and non-Bt (Hyperformer HS 44) cotton varieties.


Pink Bollworm Damage to Bt (Deltapine 33B) and non-Bt (Hyperformer HS 44) Cotton
Lint Yield Reduction (%)
100
80
60
40
20
0
HS 44
DP 33B
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Pink Bollworm Mines per Boll