VARIATION IN YIELD BY NODE AND POSITION WITH INJURY FROM HELIOTHINE PESTS IN SELECTED CULTIVARS IN NEW MEXICO

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Abstract

As part of a regional collaborative project with Cotton Incorporated and Texas A & M University, seven varieties of Bt +/- cotton were planted in a field trial in Artesia, NM in 2018 and 2019. Damage to squares and bolls in 2018 was reported in 2019. Yields were picked from two 50ft center rows. Plants were also removed for yield partitioning comparisons by position and node. Plants from ten foot of row were removed from each plot. Bolls were hand picked and sorted by node and position. Number of locks/boll was recorded and seed cotton weighed for each boll. Mean lint and seed weights were calculated after ginning seed cotton for each node and position. with weights recorded for seed cotton, lint and number of locks. Very low bollworm pressure in 2019 resulted in no differences in the field. Under heavy bollworm pressure in 2018, yield losses for non Bt cotton were highest in nodes 9 and 10 which produced 246 lb/A on first position bolls 27% less lint than DP 1845 B3XF.

Introduction

High input costs for insect control including technology fees and insecticide applications make it difficult for growers to produce profitable cotton in much of the cotton belt including New Mexico and Texas. Cotton bollworm, *Helicoverpa zea* (Boddie), is the most important insect pest of cotton in New Mexico. It is found in every cotton field in New Mexico and is one of the reasons Bt cotton is prevalent in New Mexico. Recently, there have been increasing concerns about bollworm resistance to dual and triple gene Bt cotton varieties (Kerns et. al. 2018 and Taillon et. al. 2018). The objective of this study was to evaluate efficacy of dual and triple gene Bt cottons to determine if the use of these cotton varieties is currently cost effective in New Mexico.

Material and Methods

Seven varieties of cotton with 0-3 Bt genes were planted in 4 row, 50 ft plots in Artesia, NM in 2018 and 2019. The Bt cotton technologies evaluated included: PHY 333 WFE (WideStrike®), DP 1522 B2XF (Bollgard II®), ST 5122GLT (TwinLink™), ST 5471GLTP (TwinLink Plus™), DP 1845 B3XF (Bollgard® 3), PHY 330 W3FE (WideStrike 3®). FM 2322GL, a non-Bt variety was included as a check. Squares and bolls were sampled for damage from the middle two rows weekly. The center two rows were mechanically picked and weighed. Ten feet of plants of one outer row were cut in 2018 and brought to the lab to record lint weight by position and node. Each boll was removed and sorted by node and position. Seed cotton weight and lock number was recorded for each boll. Seed cotton was ginned by boll position and node to determine total lint weight by position and node for each variety.

Results

Highest yields were produced by 1st position bolls (Figure 1). Highest yields were produced by nodes 7-14 in position 1 with little difference in yield among nodes in positions 2 and 3. Thus, in evaluating damage from insects our analysis was restricted to first position bolls.

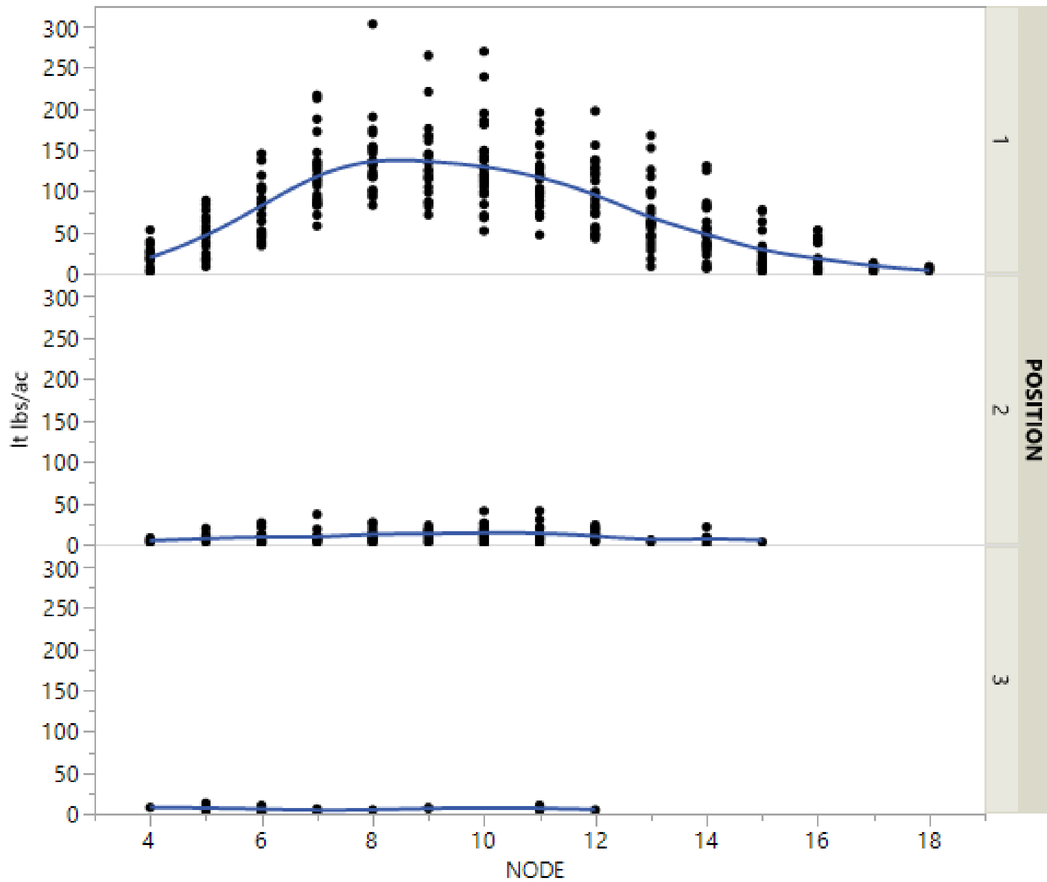


Figure 1. Mean yield (lb/A) by node and position for 7 varieties of cotton exposed to injury by Heliothine insect pests in 2018.

Losses from bollworm damage in non Bt cotton were most severe in nodes 9-10. For example, DP 1845 B3XF produced 174 and 165 lb/A compared to 132 and 114 lb/A in FM 2322GL on nodes 9 and 10 first position bolls respectively (Figure 2). The non Bt cotton had 93 lb/A or 27% less lint on just those 2 nodes compared to DP 1845 B3XF. In 2018 losses from heliothine pests were the highest in 20 years at this location. In 2018 non Bt cotton had 3 times as many damaged squares compared to the DP 1845 Bollgard 3 cotton with 9.2% vs 2.8% damaged squares. This damage was in July when squares on the 9^{th} and 10^{th} nodes were susceptible to feeding damage. (Pierce et al. 2013).

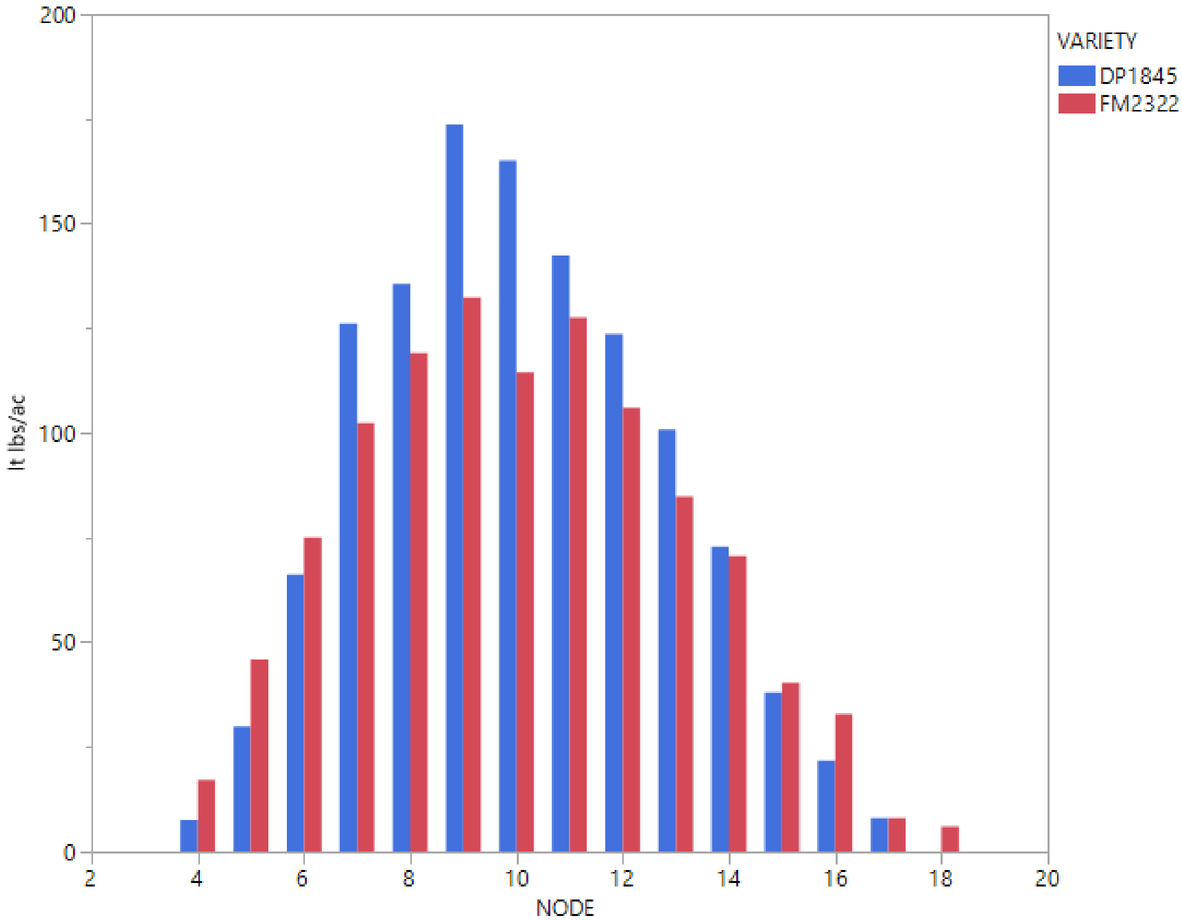
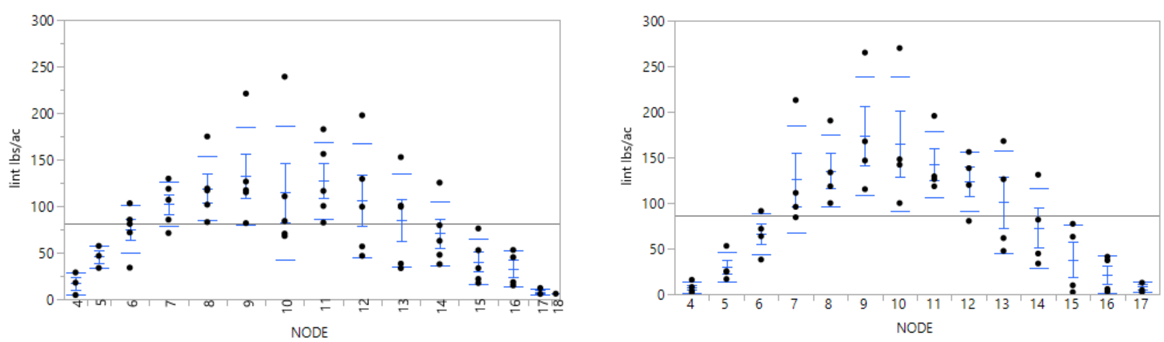


Figure 2. Mean yield (lb/A) of first position bolls by node for 2 selected varieties of Bt and non Bt cotton from 2018 field trial.

Insect populations are often not uniformly distributed. One plot produced yields on nodes 9 and 10 similar to DP 1845 B3XE, while all other plots had mean yield losses of 50-51% compared to the highest yielding control plot and 55-59% less than the highest yielding DP 1845B3XE plot. (Figure 3)



FM2322GL DP1845 B3XF

Figure 3. Mean yield (lb/A) of first position bolls by node for a non Bt cotton and a Bollgard 3 variety.

Mean yields recorded from machine picking (Pierce et al. 2019) were 1412 lb/A in the non Bt FM 2322 GL and 1630 lb/A in DP 1845 B3XE plots. The difference was not statistically significant. However, the severe losses in two of the highest producing nodes illustrate the risk of heliothine damage. Nodes 9-10 produced 339 lb//A in the first position bolls, 21% of total yield for that cultivar. Actual yield losses were less than 21%. Losses were severe but compensation may have lessened the impact of yield loss of selected nodes both by retaining squares that would otherwise be shed and reallocation of resources resulting in larger yield per lock in subsequent bolls (Pierce et al. 2008)

Acknowledgements

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