EVALUATION OF BACILLUS THURINGIENSIS TECHNOLOGY IN COTTON VARIETIES GROWN IN THE UPPER COASTAL BEND OF TEXAS

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OBJECTIVE

Applied research issues that need to be addressed and have been identified by producers as well as by crop consultants in the growing region include: (1) evaluating Bt cotton cultivars and subsequent Heliothine populations; (2) determining the economic viability of these cultivars relative to conventional (non-Bt) cotton.

Abstract

A study was conducted during the 2012 crop season to evaluate the *Bacillus thuringiensis* (Bt) genetically modified cotton in selected varieties grown in the Upper Coastal Bend of Texas and record its effect on subsequent Heliothine populations. DeltaPine1048B2RF™, FiberMax9058F™, FiberMax1749B2F™, and PhytoGen499WRF™ were selected for this study. The plant stand data a 12 DAP was not statistically different between varieties how ever it was at 30 DAP. Significant differences were observed in the total number of damaged squares at 64 DAP only. There were no significant differences for the amount *of Helicoverpa zea* eggs, larvae, and beneficial insects during the entire study. Only two bollworm larvae were seen in the variety FiberMax9058F, both were small and seen on separate days. However, it should be noted that the participating grower did overspray these plots in between the 64 and 71 DAP data collection with a synthetic pyrethroid, which may have had a mitigating effect on subsequent *Helicoverpa zea* populations, egg lays, and beneficials.

INTRODUCTION

Bacillus thuringiensis (B.t.) is a naturally occurring soil bacterium whose spores contain a crystalline (Cry) protein that is toxic to several insect orders. This toxin is used as a transgenic gene in cotton to protect the crop from insect larvae of the Lepidoptera class. One of the main focus of this crystalline protein is the larva of *Helicoverpa zea.* This microbial protein has been used for more than three decades (Adamczyk et. al 2001). The use of Bt varieties have dramatically reduced pesticide use in commercial cotton production. Monsanto released the first transgenic crystalline protein Cry1A (Adamczyk et. al 2001). This protein was limited to affecting only three larval species in the Lepidoptera class (Heckel et. al 2007). Since then, additional Cry proteins have been incorporated to target additional Lepidopteran species. Due to recent field observations and ensuing Heliothine population, this project seeks to evaluate one of the costly technologies that the majority of cotton producers utilize during the growing season. Specifically a through examination of Heliothines, as to their population dynamics, complexity and possible resistance to the existing Bt genes in genetically modified cotton has not been fully evaluated in the Upper Gulf Coast of Texas.

Acknowledgements

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MATERIALS AND METHODS

This test was conducted on farmland owned by Paul Hunt in Matagorda County, Texas. The field was located about five miles west of Palacious, Texas Planting was on April 14, 2012. . For the purpose of this project, five cotton varieties were selected, DeltaPine1048B2RF™, FiberMax9058F™, FiberMax1740B2F™, and PhytoGen499WRF™; both FiberMax1740B2F™ and DeltaPine1948B2RF™ contained the Bt proteins Cry1Ac and Cry2Ab, where as the PhytoGen499WRF™ contains the proteins Cry1Ac and Cry1F, and FiberMax9058F™ with no *B. thuringiensis* protection. These varieties were planted on four consecutive rows per replication on forty-inch centers, and were replicated four times in a randomized complete block design. Prior to planting glyphosate was broadcasted at a rate of 1.75 pts./acre and 475 pounds of 21-7-2-3 fertilizer was applied. At planting Dual® was applied by banding at a rate of .62 pts./acre. Data was collected from plants in ten row feet for plant stand at 12 and 30 DAP (days after planting). The data used to evaluate the Bt transgenic technology was collected at 64, 71, and 78 DAP, which included the number of eggs for twenty-five plants, number of worms for twenty-five plants, number of damaged squares for twenty-five pulled squares, and the number of beneficial insect for twenty-five plants. All was data was collected from the middle two rows of each plot.

Table 1. Plant Stand Means

Treatments	12 DAP	30 DAP
FiberMax9058F	28.5	28.8 a
FiberMax1740B2F	27.8	26.3 a
DeltaPine1048B2RF	24.5	15.3 b
PhytoGen499WRF	23.5	20.0 b

Figure 1. Number of Bollworm Eggs

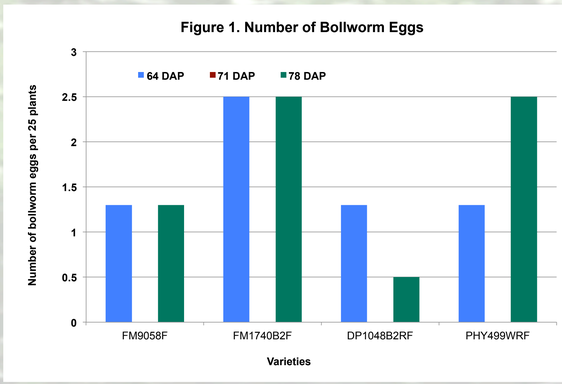


Figure 2. Number of Damaged Squares

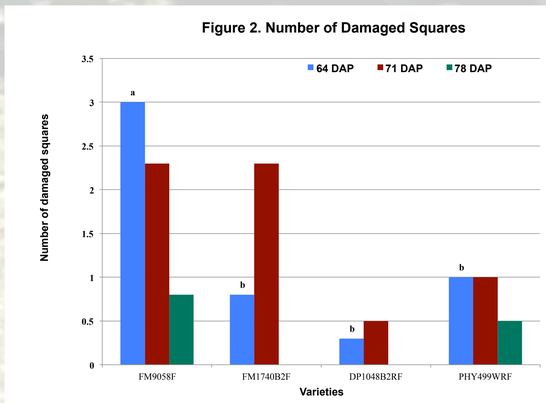
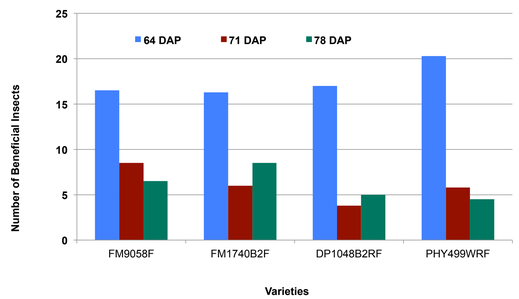


Figure 3. Number of Beneficial Insects



RESULTS & DISCUSSION

Agronomically, plant stand data showed statistical differences at 30 DAP (P=.002) but not at 12 DAP (P=0.46). As shown in Table 1 the variety FiberMax9058F™ had the highest average of plants in 10-row ft. at 12 DAP with an average of 28.5 plants, while PhytoGen499WRF™ had the lowest stand count average with 23.5 plants. At 30 DAP the variety FiberMax9058F™ had the highest average with 28.75 plants while DeltaPine 1048B2RF had the lowest stand count with 15.25 plants. This may have been a result of the dry weather pattern that settled over the area about one week after planting.

The number of Helothine eggs did not show any statistical differences at 64 DAP (P=0.45), 71 DAP (P=0.45), and at 78 DAP (P=0.17) as seen in Figure 1. During this study only two worms were observed throughout this entire test therefore no statistical differences were observed. However, in Figure 2, there were significant differences observed between varieties in the number of damaged squares at 64 DAP (P=0.05). There were no statistical differences seen between varieties for the amount of beneficial insects at 64, 71, and 78 DAP, however statistical trends were noted at both 71 and 78 DAP (Figure3).

It should be noted that the participating grower did overspray these plots in between the 64 and 71 DAP data collection with a synthetic pyrethroid, which may have had a mitigating effect on subsequent *Helicoverpa zea* populations, egg lays, and beneficials.

References

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