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BOLLGARD II™ EFFICACY ON FALL ARMYWORM IN A SCREENED ENCLOSURE BIOASSAY

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Abstract

Previous field trial results have indicated that Bollgard II exhibits a high level of control of fall armyworms (*Spodoptera frugiperda*). However, populations in these trials have been relatively low and damage ratings have often been confused with multiple pests (bollworms and tobacco budworms) occurring at the same time as the fall armyworm. Consequently, it has been difficult to assess the performance of Bollgard II strictly for fall armyworm control under heavy fall armyworm pressure situations. A field cage study including non-Bollgard, Bollgard® and Bollgard II cotton plants was infested with high populations of fall armyworms throughout the fruiting period. Results indicated that Bollgard gave a measurable level of fruit protection from fall armyworm and that Bollgard II exhibited excellent fruit protection under these heavy infestation conditions.

Introduction

Trials conducted to determine the efficacy of Bollgard II on different pest species have indicated activity on fall armyworm. Although data have indicated that Bollgard II will have good activity on *S. frugiperda,* successfully predicting and placing trials in areas where extreme fall armyworm pressure will occur has proven to be difficult. In order to guarantee pressure, a controlled environment was created using a screened enclosure. Under the enclosure, extreme pressures could be created with the use of pupal infestations while eliminating the presence of both beneficials and non-target pests.

Materials and Methods

Single 30' rows of DP 5415, DP 33 BG, and DP 33BG II cotton were planted on May 15, 2002 at the Monsanto Agronomy Research Station near Loxley, AL. Once the cotton reached the first true leaf stage, a screened enclosure was constructed over entire test area. The 15' X 30'enclosure was constructed out square aluminum tubing with 18 X 14 strands per square inch fiberglass screen. The 18 X 14 screen is small enough to block most beneficial insects from entering the system while allowing more than 80% of the UV light to penetrate. In order to control beneficial insects, the enclosed test area and perimeter received one application of Capture 2EC (0.04 LB AI/Acre, bifenthrin; FMC) immediately after enclosure construction. Once cotton reached early bloom stage, approximately 1000 pupae were released into the caged area per week for seven weeks during the fruiting period. Pupae were provided by Dekalb fall armyworm lab colony in Dekalb, Illinois. This lab colony is generated each year from wild male pupae provided by USDA in Starkville, MS combined with laboratory-generated females. Infestations started on July 9, 2002 and continued for seven consecutive weeks. After pupae emerged, adults deposited eggs throughout the test area. With an assumed 50/50 male to female ratio, an estimated 50% survival rate on both adult and larvae emergence, and each female laying approximately 1000 eggs, each plant under the enclosure was exposed to approximately 300 viable neonate larvae per week. Plant monitoring to determine larval feeding damage and fruit retention was conducted on a weekly basis and continued through cotton maturity. At cotton maturity a final plant map was conducted in each cotton type to determine relative levels of plant protection from fall armyworm damage.

Results

The screened enclosure provided an environment that eliminated both beneficial and non-target pest insects while providing predictable heavy fall armyworm pressure. Bollgard II exhibited significantly greater average 1st and 2nd position percent fruit retention than either the Bollgard or the conventional variety. Bollgard exhibited significantly higher retention than the conventional variety (Figure 1). Feeding damage (including bract etching) was considerably higher in DP 5415 and Bollgard than Bollgard II. Bollgard II received 10% or less feeding damage throughout the season for the 1st and 2nd position fruit while DP 5415 and Bollgard showed greater than 65% feeding (Figure 2). Similar to the percent feeding damage, percent fruit loss to fall armyworm was greater for DP 5415 and Bollgard than that of Bollgard II. The difference between feeding damage and actual fruit loss shows that although a detectable amount of feeding occurred, not all feeding resulted in sufficient damage to cause fruit loss (Figure 3).

Summary

In the controlled environment provided by the screened enclosure, DP 33BG II provided fall armyworm control superior to DP 33 BG and DP 5415. In addition, DP 33 BG provided suppression superior to DP 5415. Under these extreme infestation conditions Bollgard II provided excellent control. Based on the results of this field cage experiment it is expected that Bollgard II should be an effective tool in combating extreme fall armyworm infestations under normal field conditions.

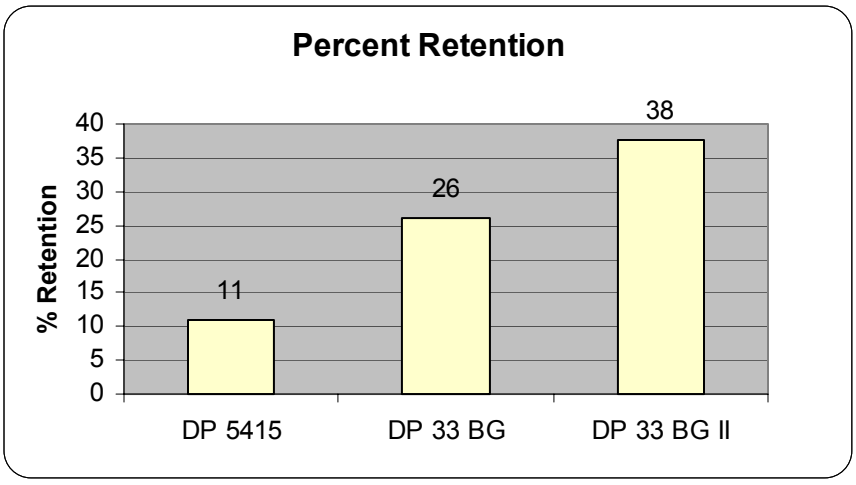

Figure 1.

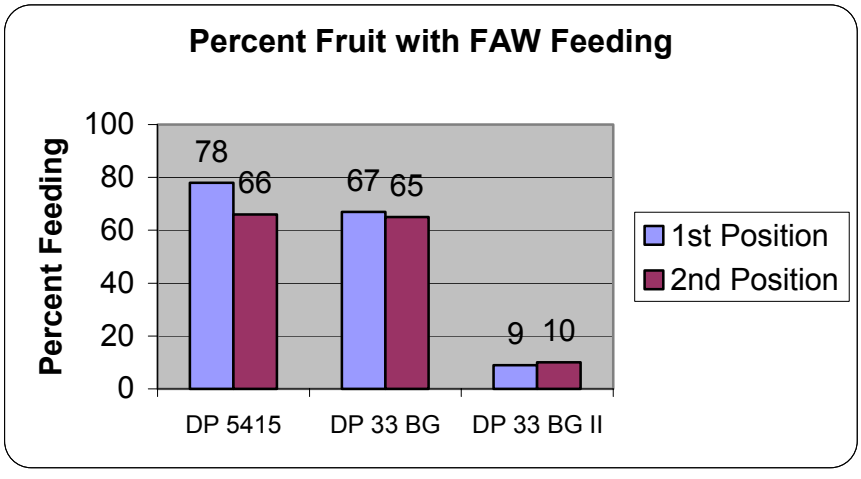

Figure 2.

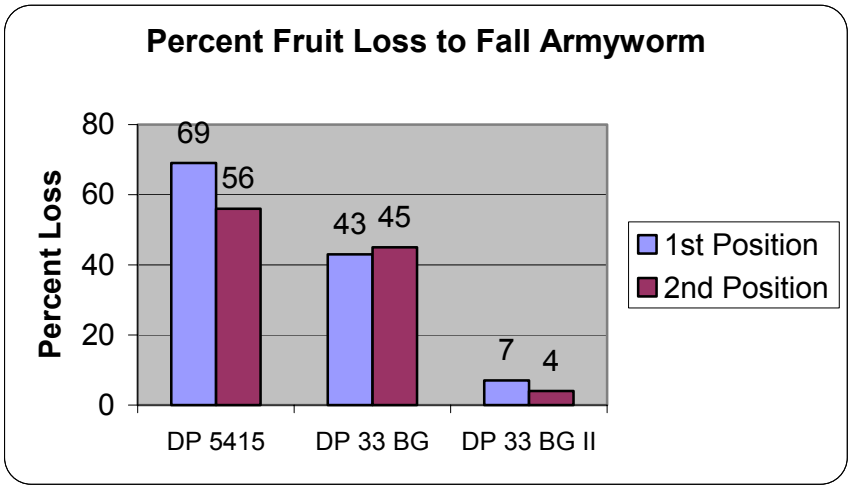

Figure 3.