

Assessing the Need for Supplemental Control of Bollworms in Bt and Non-Bt cottons

Severino Signa

Introduction

During the summer of 2014, I helped with a study to research the economic difference between conventional cotton and two Bt cottons, as well as the benefit of using chemicals in the Diamide class to control bollworms. This study is important because farmers have become accustomed to spraying Bt cottons for bollworms as a preventative measure, sometimes even before thresholds are met. The objectives of this study were: 1) to determine whether there is an economic benefit to growing Bt cottons and 2) to determine how often supplemental control of bollworms is needed in Bt cottons.

Materials and Methods

At the beginning of summer, we ran bollworm and tobacco budworm traps and checked plots at each of our seven off-site test locations. Specifically, we checked cotton plots weekly for thrips, aphids, spider mites, and plant bugs, and ran pheromone traps that had an attracting effect on bollworm and budworm moths. We checked these traps once a week and changed the pheromones every two weeks. About two weeks later, when plants averaged about seven to ten nodes, and had seven to ten squares, we began recording square retention for each plot. Square set is determined by taking the top ten squares of the plant and counting, with a clicker, for missing squares. We repeat this step on five plants to get a total of fifty squares, and take the number of missing squares and multiply it by two to get an average for 100 squares. Then, that number is subtracted by a hundred, which gives us the percentage of squares set on plants for a given plot. A high percentage of square set is good because it indicates that the plants were not losing fruit due to insects or environmental conditions. If the percent square set is low, plots were treated promptly with an insecticide that was toxic to plant bugs but not to bollworm larvae. Each of our research plots had two replications of three different varieties of cotton, a conventional and two Bt cotton varieties. Each of the three varieties was subdivided into five individual treatment plots. Each plot was roughly one hundred feet long, 12 rows wide, and was randomly assigned one of the following treatments: sprayed control, unsprayed control, Prevathon threshold treatment, Belt threshold treatment, and a Besiege threshold treatment.



Discussion

Conventional cotton doesn't have any built-in protection from bollworm larvae, and the variety we're using in our test plots is Delta Pine 174. Bt, *Bacillus Thuringiensis*, cotton produces a bacteria, which in turn produces a protein in the plant that is toxic to certain insects, especially larvae. When the insects start to eat on the plant, the Bt toxin stimulates a pH change inside the insect's stomach and eventually kills it. The two Bt varieties that we used in our test plots were PhytoGen 495 Widestrike 3 and Delta Pine 1321 Bollgard II. The 495 Widestrike 3 contains the crystalline proteins Cry1Ac + Cry 1F + Vip3A, which kills mostly all larvae, but is considered very good on tobacco budworm and fall armyworm larvae. It was a new variety for 2014 that features a superior yield potential and broad adaptation for preventing insect resistance. The 1321 Bollgard II also contains the crystalline protein Cry1Ac, but uses Cry2ab instead of Cry 1F and Vip3A. Both of the Bt cotton varieties are considered proactive insect resistance management strategies due to the multiple proteins and different modes of control for lepidopteran larvae. Both Bt varieties have good built-in protection from lepidopteran larvae. The two Bt varieties also reduce variability in planning and budgeting for insect control costs and increase operational efficiency for the farmer.

References

- Gore, J., B.R. Leonard, and J.J. Adamczyk. 2001. Bollworm (Lepidoptera: Noctuidae) survival on 'Bollgard' and "Bollgard II" cotton flower bud and flower components. *Journal of Economic Entomology* 94(6): 1445-1451.
- Gore, J., J.J. Adamczyk, A. Catchot, and R. Jackson. 2008. Yield response of dual-toxin Bt cotton to *Helicoverpa zea* infestations. *Journal of Economic Entomology* 101(5): 1594-1599.