

**SUSCEPTIBILITY OF BOLLWORM (*HELICOVERPA ZEA*) ADULTS
FROM ACROSS THE MID-ATLANTIC STATES TO PYRETHROID INSECTICIDES**

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Abstract

Bollworm (*Helioverpa zea*) moths were collected from twenty six sites throughout five mid-atlantic states including Virginia, Maryland, Delaware, Pennsylvania and New Jersey and evaluated for resistance to the pyrethroid insecticide, cypermethrin. One third of the sites evaluated had moths that survived the 10 µg cypermethrin/vial rate. Two thirds of the sites evaluated had moths that survived the and 5 µg cypermethrin/vial rate.

Introduction

Between 1998-2002, Cotton Incorporated and the Insecticide Resistance Action Committee (IRAC-US) sponsored a monitoring program to assess the extent of pyrethroid resistance in bollworm populations throughout the mid-south/southeastern U.S. In 2003, an opportunity to extend this monitoring effort into the mid-Atlantic States was provided through a collaborative research project sponsored by the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service. Although the major emphasis of this project is to contribute research and marketing information towards sustaining diversified vegetable farms in the northeast by advancing IPM for sweet corn cropping systems, one objective is to assess pyrethroid resistance of immigrating bollworm (alias: Corn earworm, *Helicoverpa zea*) populations. Most (82%) of sweet corn is treated with insecticides to control three major lepidopterous pests (i.e., European corn borer, corn earworm and fall armyworm). The corn earworm (bollworm) is unique among these 3 pests because of the heavy reliance on pyrethroids for control. The 2002 commercial production recommendations used in VA, MD, DE, PA and NJ include 6 insecticide formulations: 5 of these 6 are pyrethroids. Numerous studies have reported pyrethroid resistant bollworm populations in the southern U.S. The 1998-2002, Cotton Incorporated Project generated data suggesting that bollworm populations throughout the mid-south/southern U.S. have become more resistant to the effects of pyrethroid insecticides. Furthermore, resistance in some of the more northerly locations may be due to immigration from more southern locations. It was hypothesized that emigrants from those populations affect bollworm control in sweet corn in the northeast. Bollworm populations throughout VA, DE, PA, MD, and NJ were evaluated for resistance to pyrethroid insecticides.

Materials and Methods

An adult vial test (AVT) was used to monitor the susceptibilities of bollworm moths to cypermethrin. Male moths were collected and tested in five states (including Virginia, Delaware, Maryland, Pennsylvania and New Jersey). Wire cone traps, baited with *Helicoverpa zea* pheromone lures, were used to capture the moths. In general, the sampling season extended from June through September. Traps were placed in open areas, upwind of a likely source of moths, near the edges of corn or soybean fields and monitored on a regular basis. The insides of clean, borosilicate glass scintillation vials (20 ml) were coated with a residue of technical grade cypermethrin (94.4% pure, FMC Corp., Princeton, NJ). The insecticide concentrations used in this study were 5 µg cypermethrin/vial and 10 µg cypermethrin/vial. Control vials were treated with acetone alone. One moth was placed in each vial and the vials were capped loosely. The vials containing the moths were held at room temperature (ca. 24°C) and mortality counts were recorded 24 h after the test was initiated. The data reported are “raw data” and have not been corrected for control mortality.

Results

To date, more than 8100 moths have been evaluated for resistance to cyermethrin (a pyrethroid insecticide) in five mid-atlantic states (i.e., Virginia, Maryland, Delaware, Pennsylvania, and New Jersey) (Figures 1-6). Eight of the 26 locations tested had survival at the 10 µg cypermethrin/ vial rate. However, the percentages of bollworm adults that survived the 10 µg rate were low (between 0.77% and 8.1%). Although the highest percent survival recorded for the 10 µg rate was 8.1% (Maryland), percent survival at the 10 µg rate was more consistently recorded throughout Virginia (5 of 8 sites) and Delaware, the most southern states surveyed. Survival at the 10 µg rate was not recorded in the more northern sites located in Pennsylvania and New Jersey. Fifteen of the 26 locations tested had survival at the 5 µg rate. The highest survival rate recorded for the 5 µg rate was 32.8% (Maryland). Also, it was noted that % survival was greater in June/July than in August/September. These data suggested that low percentages of resistant individuals may exist within these populations and that efforts to monitor pyrethroid resistance in these populations should be continued.

Summary

- Pyrethroids are critical tools in the sweet corn IPM arsenal;
- This is the first year of a three year project. This research is providing the agricultural community with valuable baseline data that may be used for future research efforts;
- Continued monitoring and the development and implementation of effective resistance management plans should be a priority;
- As for immigration....Stay tuned.

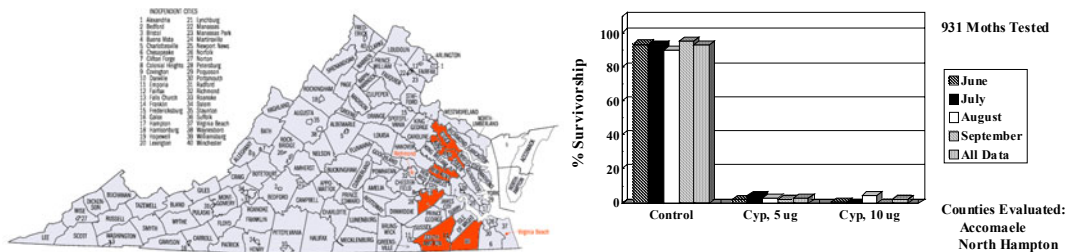


Figure 1. Bollworm Susceptibility to Cypermethrin in Virginia.

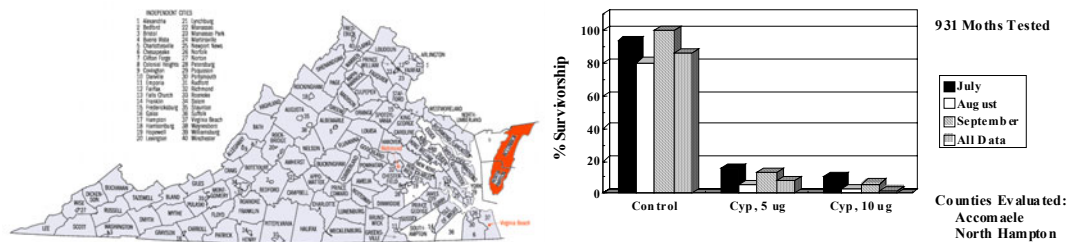


Figure 2. Bollworm Susceptibility to Cypermethrin in Virginia.

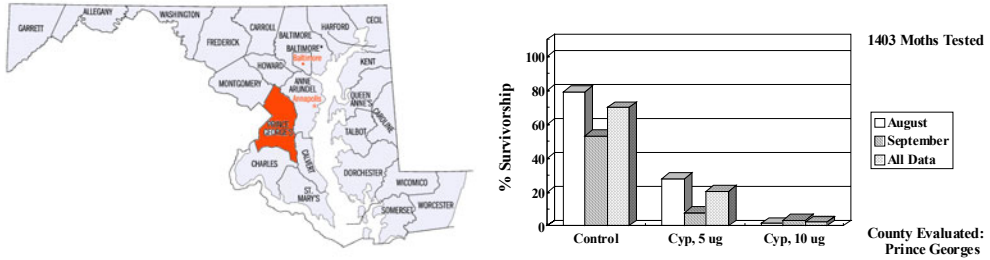


Figure 3. Bollworm Susceptibility to Cypermethrin in Maryland.

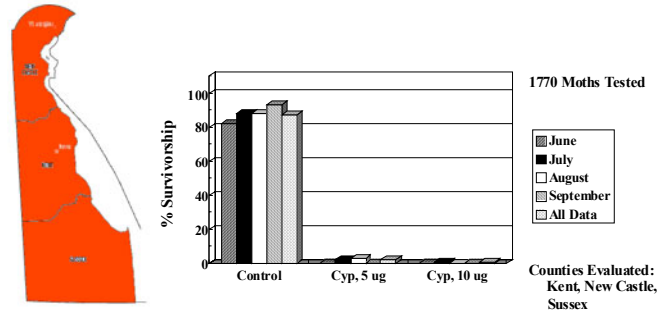


Figure 4. Bollworm Susceptibility to Cypermethrin in Delaware.

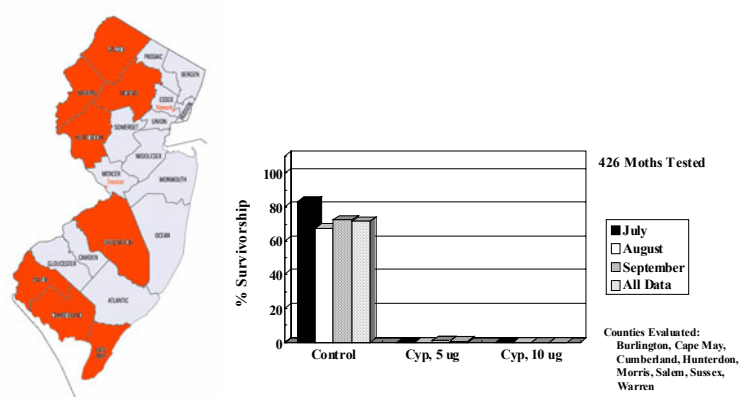


Figure 5. Bollworm Susceptibility to Cypermethrin in New Jersey.

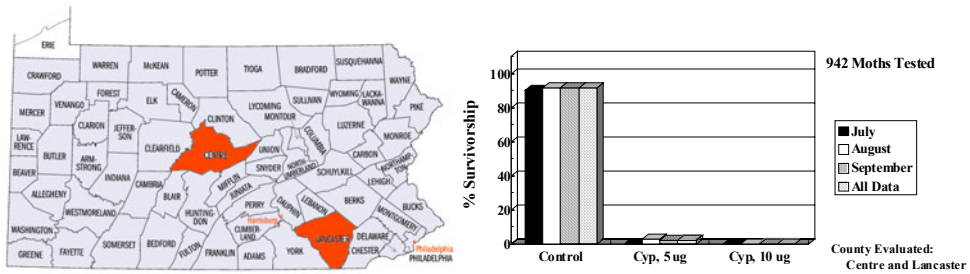


Figure 6. Bollworm Susceptibility to Cypermethrin in Pennsylvania.