EVALUATION OF CORN EARWORM, *HELICOVERPA ZEA*, MOTH TRAPPING TRENDS IN ARKANSAS

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Abstract

Corn earworm*, Helicoverpa zea,* is a major pest of corn, cotton (cotton bollworm), grain sorghum (sorghum headworm), and soybean (soybean podworm). In Arkansas there is a major effort to monitor for this pest in all counties with row crops. Each year traps are strategically placed in crop producing counties to monitor for this pest. In Lonoke and Drew County, the Extension Entomology program collects trap data to monitor *corn earworm* moth flights. Moths caught in traps are also used for insecticide resistance monitoring. Trapping is initiated in late-April and monitored through mid-September. A modified Hartstack trap is placed in areas that are near corn, soybeans, and cotton. Weekly trap counts are reported through multiple outlets to alert growers and consultants to developing populations which can help them make informed decisions on scouting and treating their crops. In 2020, the moth flight was below average. Data from previous years was used to map trends that could be seen for the current year. This year we did a study on two different traps, basket and light traps. Of the traps tested this year the Hartstack trap was more efficient than the basket trap and the light trap.

Introduction

Corn earworm is a pest with a wide host range affecting many agricultural commodities across Arkansas. Infestations average ~4% yield loss in corn, cotton, and soybean. Monitoring corn earworm flights are a crucial component to Arkansas IPM programs, allowing producers and consultants to track distribution of corn earworm across the state. Corn earworm flights are monitored through pheromone trapping systems. Location and pheromone selection, along with proper trap maintenance are imperative to accurately depict corn earworm migration. Additionally, moths collected from these traps allow researchers to test for resistant populations in Arkansas. Resistance to pyrethroid insecticides has been observed across the Mid-south, and there is a potential for resistance to other insecticide classes. Proper monitoring of corn earworm is a major part of the Arkansas IPM programs foundation, helping growers and consultants make sustainable and economically feasible decisions about corn earworm management.

Materials and Methods

Trapping Study

A survey was conducted using a modified Hartstack trap across Lonoke and Drew Counties at 15 and 11 locations, respectively. Traps were strategically placed along edges of corn, cotton, and soybean production fields, and away from factors that may obstruct trap efficiency such as, manmade structures, and tree lines. A male attracting pheromone called Zea Lure (Hercon, Emigsville, PA) was securely placed inside the trap, and was replaced weekly. Zea Lure is replaced to ensure that they pheromone remains fragrant for the male moths. The area surrounding the traps were mechanically and chemically managed to reduce plant vegetation and ensure quality airflow. Traps were monitored every four days, and moths were properly identified and collected. Two other trap designs were tested to compare to the Hartstack traps in this study to observe if a more cost-effective method would result in similar results. One was a bucket trap, which is a modified Lindgren funnel trap. Pheromone is placed in a container at the top of the trap. Moths are attracted to the pheromone, land in the interior funnel, and they fall into the collection bucket. Basket

traps were also tested in this study. Pheromone is placed into a container at the highest point of the trap and attracted species will fly into the trap and be forced to go into a net below the pheromone. Finally, solar powered light traps were also tested, which used a combination of light and pheromone. Pheromone strips were placed in a compartment on the edge of the trap and at dusk attracted insects flying toward the black light or pheromone. A connection with the grid was made which electrocutes the moth and they fall into a connection net.

Resistance Monitoring

An additional study to monitor the resistance of corn earworm to pyrethroid insecticides was conducted from moths caught in the Hartstack traps. Cypermethrin treated vials were sent to the Lonoke County Entomology lab by the Mississippi State University Entomology Lab for this experiment. One hundred vials were used weekly from May to August for this study. Sixty vials were treated with a pyrethroid, and forty were used as untreated checks for comparison. Moths were placed in a designated vial for 24 hours. Following the allotted exposure time, each vial was analyzed for corn earworm mortality, and ratings were recorded.

Results

Trapping Study

Over the past ten growing seasons in Lonoke County the highest peak in mean trap catches falls between the last week in June and the first week in July (Figure 1). Observations in 2020 showed mean trap catches were similar to the 2017 growing season, with similar peaks in collection less than one week apart (Figure 2). In Drew county, a trend was observed when comparing the 2018 and 2020 growing seasons. Although the number of moths collected during the 2018 growing season compared to 2020, similar peaks in trap catches were observed (Figure 3). Preliminary data suggest that the Hartstack trap is the optimal method for collecting moths. Approximately 99% of adults trapped during this growing season were obtained using the Hartstack method. Mean trap catches of other methods tested were lower when compared to the Hartstack method.

Resistance Monitoring

These data suggest corn earworm populations have substantially built resistance to cypermethrin over the past two decades. Originally, data collected in 1998 reported a 6% survival rate of male corn earworm moths, in 2016 survival rates had increased 6x reporting a 36% survival rate. (Figure 4). These data suggest corn earworm has progressively become more resistant to pyrethroids such as cypermethrin.

Summary

Studies show that the most accurate and productive trap that is currently available is the modified Hartstack trap. Despite bucket, basket, and solar light traps being less costly and require less maintenance they did not consistently catch moths when compared to the Hartstack trap. The bucket traps would support the moth numbers until the moth flight numbers began to rise, but lost efficacy during larger flights. Moth numbers in the basket and the solar light traps did not correlate to actual moth populations during any time during the study. The Hartstack trap is expensive and inconvenient but will continue to be the recommended tool to monitor moth flights in Arkansas due to its accuracy. The resistance study showed that the corn earworm has become resistant to pyrethroids, and other modes of action are required to control infestations. Many growers are using diamides insecticides to control corn earworm and studies are being conducted to evaluate additional insecticide options. These data suggest that the current monitoring method, the Hartstack trap, will provide the greatest accuracy to detect corn earworm flights. Studies are now being conducted to test corn earworm resistance to the diamide insecticide class. This data will aid producers in management decisions for control of corn earworm.

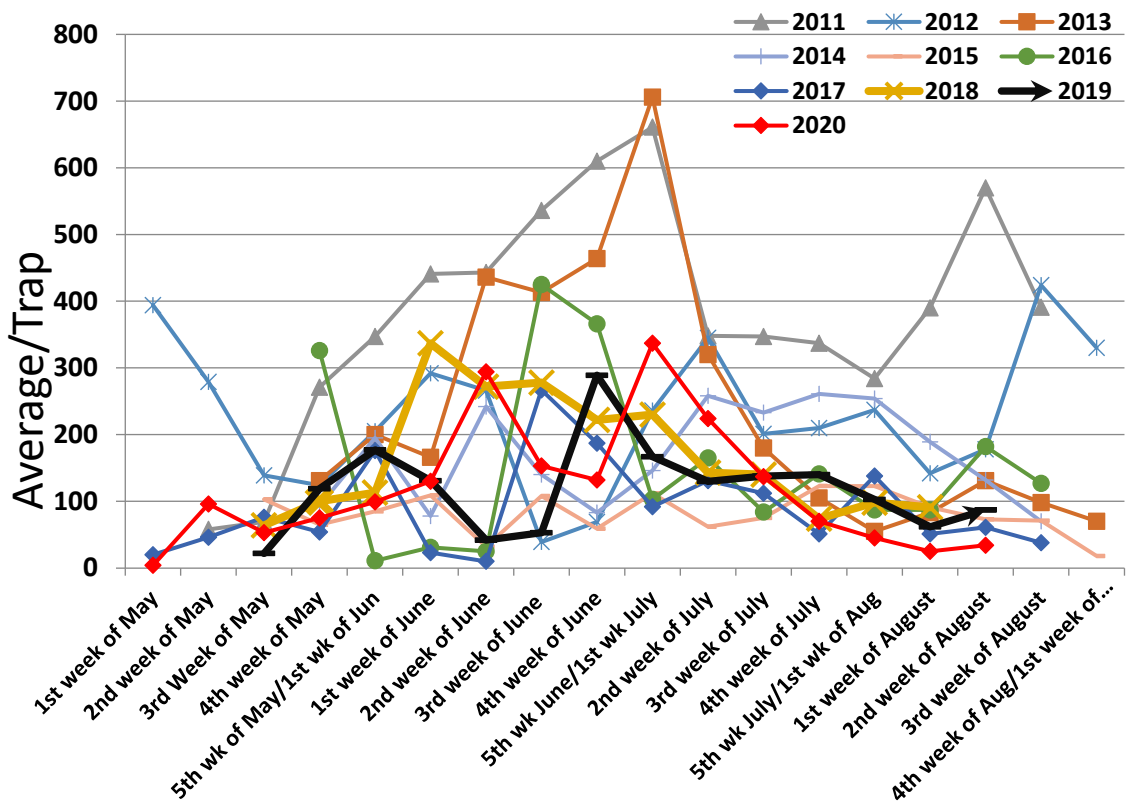

Figure 1. Modified Hartstack moth trap averages for *H. zea* from 2011 to 2020

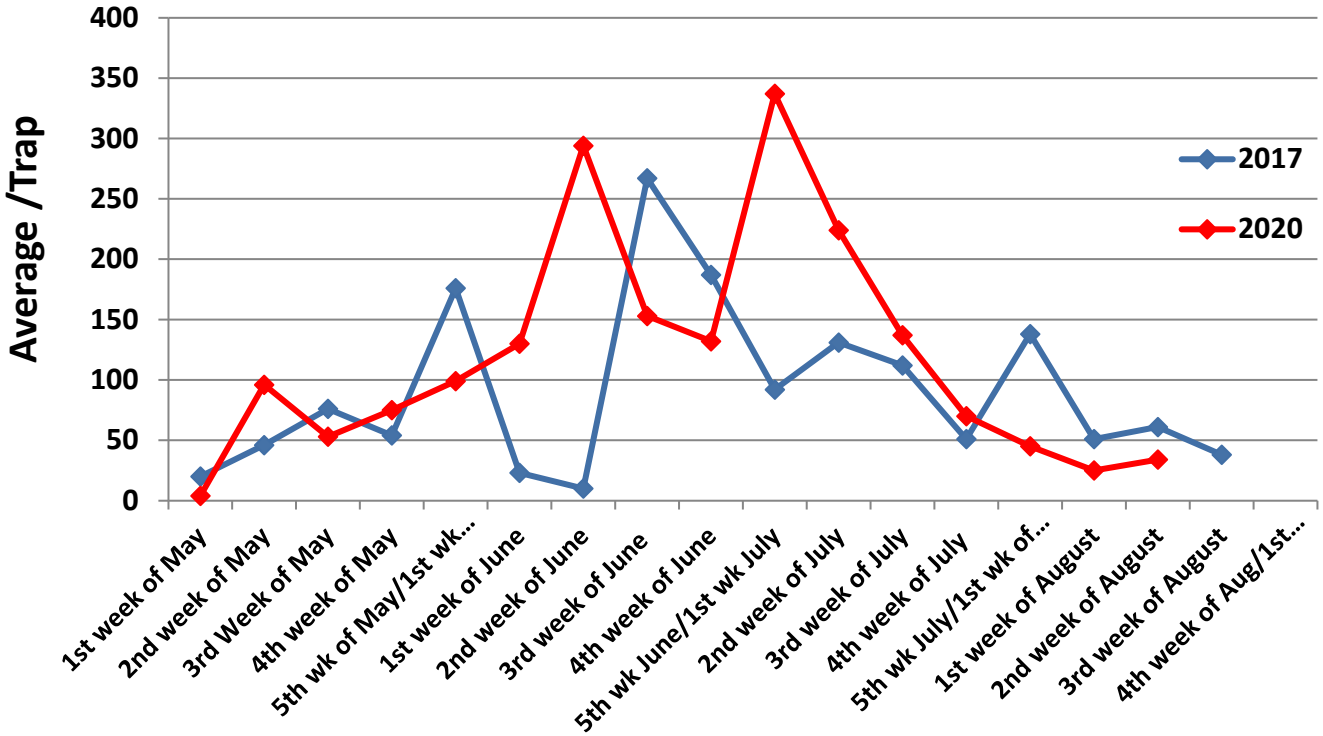

Figure 2. Modified Hartstack moth trap averages for *H. zea* in Lonoke County in 2017 and 2020

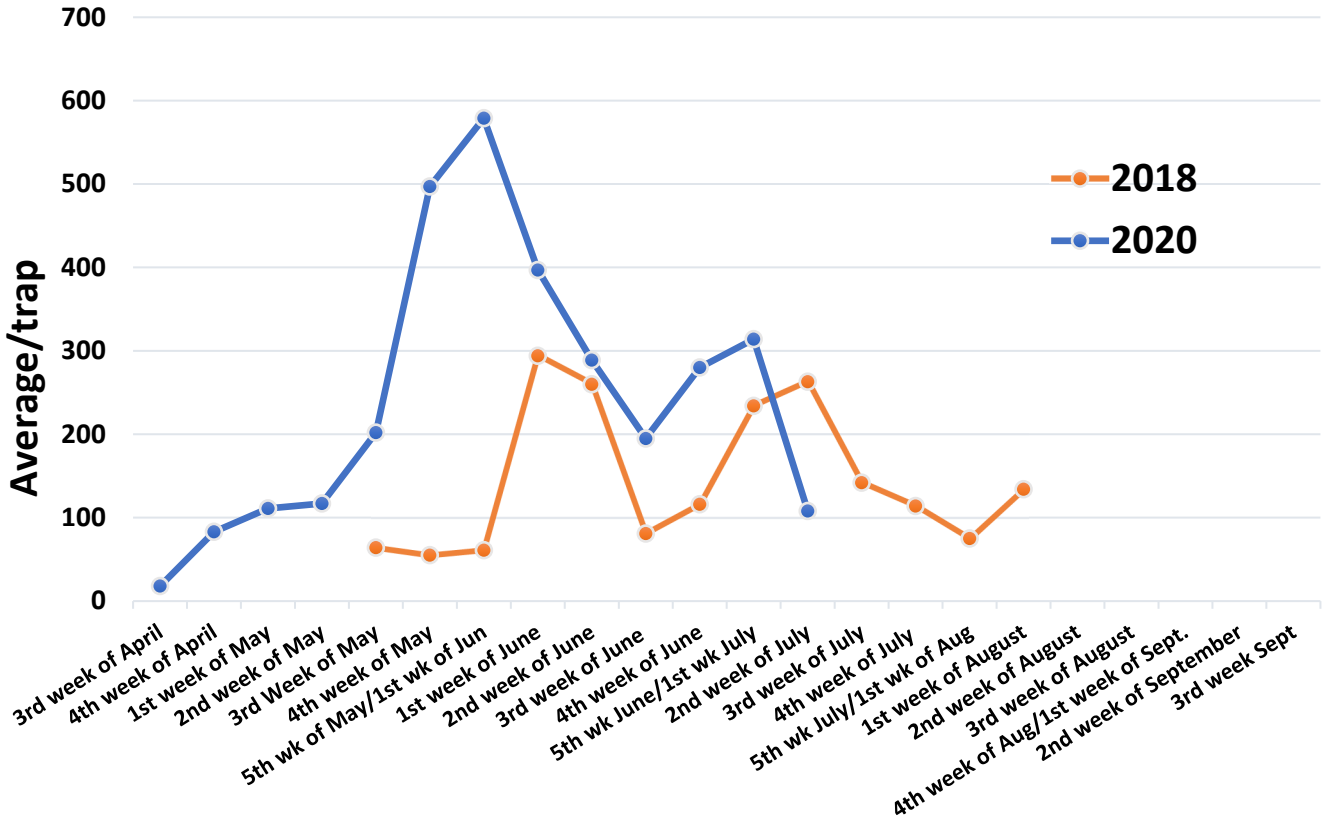

Figure 3. Modified Hartstack moth trap averages for *H. zea* in Drew county in 2018 and 2020

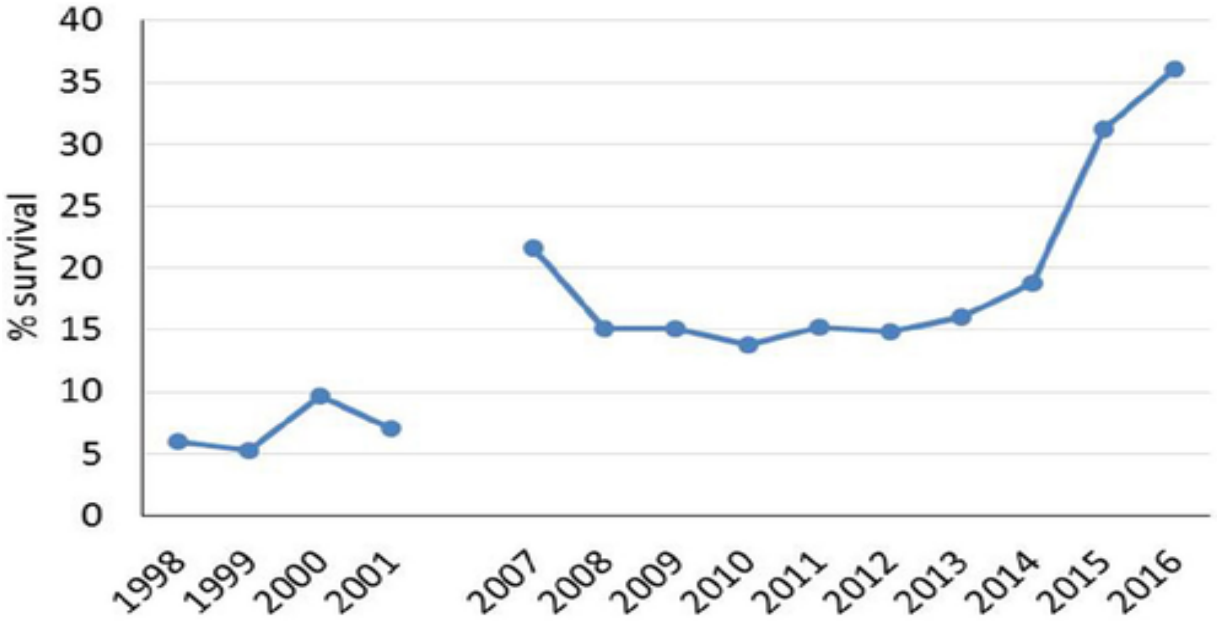

Figure 4. Male moth resistance to cypermethrin as it progresses from 1998 to 2016.