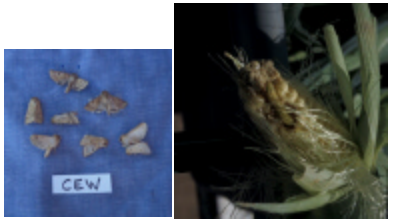
Developing a Monitoring Program for Helicoverpa zea in California Sweet Corn

Janet Caprile, Farm Advisor, University of California Cooperative Extension, Contra Costa County, 75 Santa Barbara Rd., 2nd Floor, Pleasant Hill, CA 94523, jlcaprile@ucdavis.edu
Emma Connery, Research Associate, University of California Cooperative Extension, Entomology Department, One Shields Ave, Davis, CA 95616, DFConnery@aol.com
Dr. Larry Godfrey, Specialist, University of California Cooperative Extension, Entomology Department, One Shields Ave, Davis, CA 95616, ldgodfrey@ucdavis.edu

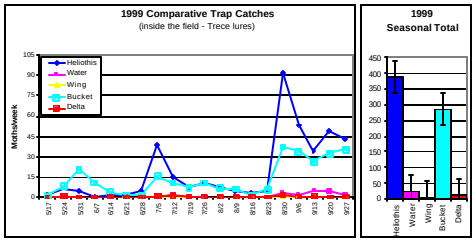


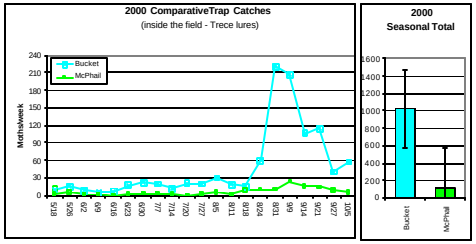
INTRODUCTION:

Helicoverpa zea is a pest of sweet corn (corn earworm), tomatoes (tomato fruit worm), and cotton (cotton bollworm). The monitoring systems that have been developed for tomatoes and cotton are not sensitive enough to detect damaging levels in sweet corn. This research was initiated to develop a more sensitive monitoring program appropriate for sweet corn. Six trap designs, four pheromone lures and five trap placements were evaluated for their influence on trap performance in detecting corn earworm (CEW) in 1999, 2000, and 2001. Additional work was conducted in 2000 and 2001 to establish action thresholds to prevent crop damage. The project was funded by the University of California, Center for Pest Management Research and Education (CPMRE).

TRAP DESIGN

Methods: Five trap designs were compared in 1999 and a sixth was evaluated in 2000. All traps were baited with a Trece red rubber septa pheromone lure and placed in random order within the first few rows and along the upwind side of commercial corn fields. Traps were placed 150-200 feet apart in the row on adjustable poles and hung so that the lure was in the upper canopy. They were checked weekly or semi-weekly and rotated within the field on a weekly basis. Lures were changed monthly as recommended by the manufacturer. Trapping was continuous from May to October with each set of traps moved to a new site as fields were harvested. Nineteen fields were trapped in 1999 and 20 fields were trapped in 2000.





Results: The heliothus and bucket traps caught significantly more moths than any of the other traps. Both of these traps showed similar flight initiation, peak and duration patterns. The heliothus trap was most sensitive, however, it was impractical for commercial monitoring due to size, cost, visibility, and the inconvenient collection reservoir. The bucket trap was inexpensive, reusable, inconspicuous, easy to read and a much more practical field tool. It was readily adopted by local Pest Control Advisors. All the other trap designs caught too few moths to accurately identify flight patterns. The low trap catch in the wing trap was surprising as it has been the standard monitoring trap used in California.

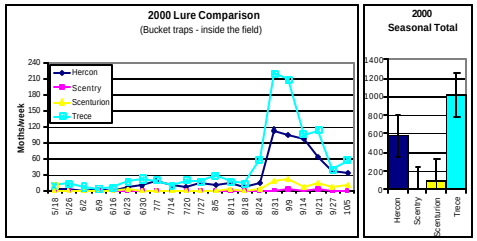

Heliothus trap

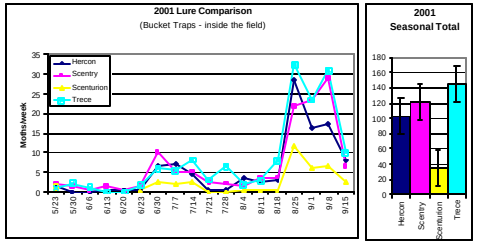

Bucket trap


Wing trap

LURE TYPE

Methods: Four different commercially available pheromone lures were compared in 2000 and 2001. Bucket traps, each baited with one of the 4 lures, were placed 150-200 feet apart in random order within the first few rows of commercial corn fields. Traps were checked, emptied, and rotated weekly and adjusted so that the lure hung in the mid to upper canopy as the corn grew. Lures were changed monthly (Trece, Scentry and Scenturion) or semi-monthly (Hercon) as recommended by the manufacturer. Trapping was continuous from mid May through September with each of the four sets of traps moved to a new site as fields were harvested.





Results: In 2000, the Trece lure caught significantly more CEW than all other lures and the Hercon lure caught significantly more than the Scentry and Scenturion. All the lures tracked the flight patterns similarly; however, the Trece lure caught more CEW during most flights than the others providing a better indication of moth activity. In 2001, the Trece lure again caught significantly more moths than the Hercon lure. The Scentry lure had been reformulated for the 2001 season improving performance which was not significantly different than either the Trece or Hercon lures.

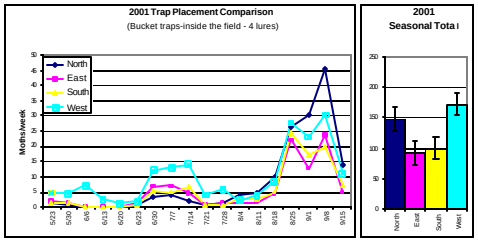
Water trap

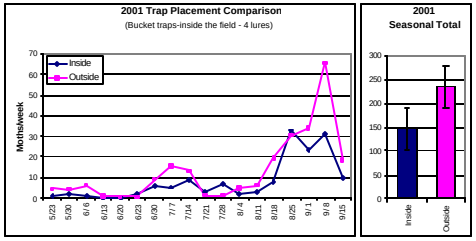

Delta trap

McPhail trap

TRAP PLACEMENT

Methods: In 2001, a set of 5 bucket traps were placed on the north, east, south , and west sides of commercial fields in order to evaluate the influence of wind direction on trap efficiency. Four of the 5 traps were placed inside the field within the first few rows of corn and each was baited with a Trece, Hercon, Scenturion, or Scentry lure. The traps in each set were rotated on a weekly basis and lures changed on a monthly or semi monthly basis as recommended by the manufacturer. The 5th trap was baited with a Trece lure and placed 10-20 feet outside the field and midway along that side to evaluate the influence, of this more convenient placement.

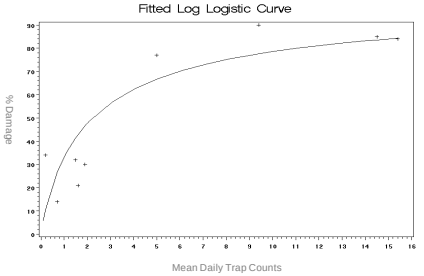




Results: The traps on the west and north (upwind) sides of the fields caught significantly more moths than those on the south and east sides. The Trece baited traps placed just outside the field caught significantly more moths than the Trece baited traps inside the field.

TREATMENT THRESHOLDS

Methods: In 2001, two research plots were established at UC Davis to correlate the amount of damage in unsprayed fields to trap captures in those fields. Nine plantings of Prime Plus sweet corn were made from mid March through June. Bucket traps with Trece lures were placed just inside each field on the upwind side and monitored twice a week. Lures were changed monthly. One hundred ears were collected from each harvest and evaluated for damage. The cumulative trap counts during the susceptible period (from 4 days prior to 5% silk to 4 days before harvest) were correlated with total damage at harvest.



Results: Damage ranged from 14% to 90% in the unsprayed fields with the damage increasing rapidly as trap counts increased. Regression analysis showed a significant curvilinear relationship between damage and trap counts with an an r^2 value of 0.699. This relationship also established an extremely low treatment threshold. As the economic threshold for CEW damage for fresh market corn is essentially 0, a trap threshold of 1 moth per week during any susceptible period should initiate treatment.

CONCLUSIONS

Over the course of 3 years, the authors developed a practical, effective monitoring program for corn earworm (CEW). A bucket trap baited with a Trece lure and set 10-20 feet outside of the upwind edge of the field has proven to maximize trap efficiency. Even with improved trap efficiency, the treatment threshold for this sensitive crop is quite low; control treatments should begin after a catch of just 1 moth per week to avoid economic damage.