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# TEMPORAL OCCURRENCE OF BOLLWORM ADULTS IN PHEROMONE BAITED TRAPS ACROSS LOUISIANA

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## Abstract

Bollworm adult populations were monitored with pheromone baited wire-cone traps throughout the 2002 growing season (June to September) at four locations in Louisiana. These locations were near Rayville (Richland parish), Cheneyville (Rapides parish), Ferriday (Concordia parish), and Newellton (Tensas parish) Louisiana. Traps were monitored weekly and trap captures were recorded and compared across sites and to historical data. Results from all locations, with the exception of Ferriday, had bollworm population trends similar to previous results. The total seasonal bollworm captures at each site during 2002 were 4706 (Rayville), 6172 (Cheneyville), 7413 (Ferriday), and 11624 (Newellton).

## Introduction

Bollworm, *Helicoverpa zea* (Boddie), and tobacco budworm, *Heliothis virescens* (F.), have been significant pests of cotton, *Gossypium hirsutum* (L.), for many years. During 2001, the bollworm and tobacco budworm complex ranked as the most costly cotton pests infesting over 9.4 million acres in the U.S. resulting in a 1.3% yield loss (Williams 2002). In Louisiana during 2002, the heliothine complex infested ca. 755044 acres of cotton causing a loss of 26699 bales, requiring an average of two insecticide applications (Williams 2002). Until recently, the tobacco budworm was the most important species of this complex. However, the tobacco budworm is effectively managed with Bollgard cultivars. The widespread adoption of Bollgard has allowed the bollworm to account for as much as 72% of the species composition (Williams 2002). The bollworm's polyphagous habit makes it a persistent pest on many crops throughout most of the production season. On cultivated field crops in Louisiana, larvae occur initially on field corn and subsequent generations occur on less preferred hosts (cotton, grain sorghum, and soybean) as field corn matures. This species is present during the reproductive stage of other important row crops such as field corn, grain sorghum, and soybeans, and can occur on as many as 100 hosts (King and Coleman 1989). In Louisiana bollworm populations peak in mid-to-late summer in cotton (Lincoln et al. 1967) and develop multiple generations (four to five) in a single year (Oliver and Chapin 1981).

Pheromone baited wire-cone traps have been an effective means to sample heliothine adult populations (Hartstack et al. 1980, Hayes and Coleman 1989). Although traps should not be used to trigger insecticide applications, these tools can forecast the temporal occurrence of oviposition (Hartstack et al 1979). The Texas pheromone trap (TP) is one such trap that is commonly used in Louisiana and across the South to monitor bollworm and tobacco budworm adult populations (Hartstack et al 1979, Leonard et al. 1989, Chapin et al. 1997, Micinski 2001).

Bollgard cotton cultivars have been widely accepted by producers since their commercial release, in spite of the lack of satisfactory bollworm control. Recently, producers have become interested in reducing the non-Bollgard cotton refuge acreage required by the Environmental Protection Agency (EPA) as part of an Insect Resistance Management (IRM) strategy. A proposed alternative plan is to supplement or replace non-Bollgard cotton with other heliothine crop host plants. Attempting to delay or prevent heliothine resistance to Bollgard through the use of non-cotton refuges will require more knowledge on the distribution and abundance of bollworm on alternate host crops as well as on Bollgard and non-Bollgard cotton. The objective of this study was to examine the production and synchrony of *H. zea* adult populations in Bollgard cotton fields with adjacent alternate crop hosts throughout the production season, and relate moth trap capture data to historical data for Louisiana.

## Materials and Methods

Pheromone baited wire-cone traps were used to monitor the temporal occurrence of bollworm adults across Louisiana during June through September 2002. The trap design is similar to that previously described by Hartstack et al. (1979). The pheromone is impregnated into a small piece of plastic and is suspended near the bottom of the inverted cone (Hendricks et al. 1987). Traps were positioned at interfaces of Bollgard cotton and four alternate host crops (non-Bollgard cotton, field corn, grain sorghum, soybean) at the following four locations in Louisiana: near Rayville (Richland parish), Cheneyville (Rapides parish), Ferriday (Concordia parish), and Newellton (Tensas parish). Crop interfaces were located within ca. a 1-2 mile radius of each respective location.

During June, two pheromone baited wire-cone traps were placed at the interface of Bollgard cotton and other crops at each location, crop interface treatments included 1) grain sorghum:Bollgard cotton, 2) field corn:Bollgard cotton, 3) soybeans:Bollgard cotton, 4) non-Bollgard cotton:Bollgard cotton, and 5) Bollgard cotton:Bollgard cotton. Traps were monitored weekly by recording the number of moths present in each trap at each interface, until cotton matured to the node above cracked boll (NACB) 5 stage in the representative Bollgard cotton field or until the alternate host crop (corn, grain sorghum, or soybean) was harvested.

## Results

Few bollworm adults are collected in traps in spring and early summer. Historical trap data for the years 1998, 2000, and 2002 suggest bollworm moth captures generally reach peak levels during late July to early August (Fig. 1). As the season progresses, populations gradually build to peak numbers, and decline throughout the remainder of the season. The total seasonal bollworm captures at each site during 2002 were 9467 (Rayville), 12703 (Cheneyville), 13753 (Ferriday), and 23245 (Newellton) (Fig. 2).

### Rayville

The greatest number of adults were collected at the grain sorghum:Bollgard cotton interface during the sampling period, (2849) 30%, while the fewest were collected at the Bollgard cotton:Bollgard cotton interface (202). The peak capture of bollworm adults (797) occurred during the fifth week of July (Fig. 3,4).

### Cheneyville

Approximately 31% (4189) of the total moths for the sampling period were captured at the Bollgard cotton:Bollgard cotton interface, while the fewest moths collected were at the soybean:Bollgard cotton interface (1293). Peak bollworm adult captures (1114 moths) occurred during the fourth week of July (Fig. 3,4).

### Ferriday

The majority of the bollworm adults for the sampling period, >30% (5207), were captured at the non-Bollgard cotton:Bollgard cotton interface, with the fewest being captured at the corn:Bollgard cotton interface (2616). Peak captures of adults production (1261) was observed during the first week of June (Fig. 3,4).

### Newellton

The greatest number of adults captured during the sampling period, (7132 or 31%), were captured at the Bollgard cotton:Bollgard cotton interface, while the fewest (3335) were captured at the grain sorghum:Bollgard cotton interface. The peak bollworm capture was reached during the third week of July (2328) (Fig. 3,4).

## Summary

Across locations over the entire sampling period, the most adults were collected at the non-Bollgard cotton:Bollgard cotton and the grain sorghum:Bollgard cotton interfaces with totals of 12588 and 12229, respectively (Fig. 5). Data collected during 2002 indicated trends similar to previous observations. All sites, with the exception of Ferriday, experienced a peak capture of bollworm adults from the third to fifth weeks of July. However, at Ferriday, bollworm captures reached their highest peak in early July, two weeks earlier than that observed for historical data. The unusual pattern in Ferriday could have resulted from field corn and grain sorghum fields maturing rapidly and becoming unsuitable host crops in early summer. If other local hosts at this same time were not attractive, the adults could have emigrated from the area searching for a suitable host. The weather patterns for that particular area could have also affected the movement of the local moth population. Also, in light of heavy bollworm larval infestations in all crops throughout Louisiana, numerous insecticide applications were made for bollworm control. These factors could have influenced the trap captures.

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## References

Chapin, J.B., D.R. Ganaway, B.R. Leonard, S. Micinski, E. Burris, and J.B. Graves. 1997. Species composition of Heliothinae captured in cone traps baited with synthetic bollworm or tobacco budworm pheromones. Southwestern Entomol. 22: 223-231.

Hartstack, A.W., D.E. Hendricks, J.D. Lopez, E.A. Stadelbacher, J.R. Phillips and J.A. Witz. 1979. Adult sampling, pp. 105-131. *In* Economic Thresholds and Sampling of Heliothis Species on Cotton, Corn, Soybeans and Other Host Plants. South. Coop. Series Bull. 231.

Hartstack, A.W., Jr., J.D. Lopez, J.A. Klum, J.A. Witz, T.N. Shaver and J.R. Plimmer. 1980. New trap designs and pheromone bait formulations for Heliothis, pp. 132-136. *In* Proc. 1980 Beltwide Cotton Conf. National Cotton Council, Memphis, TN.

Hayes, J.L. and R.J. Coleman. 1989. Relating Heliothis spp. pheromone trap captures to egg counts in cotton: II Second year data from the Mississippi Delta, pp. 313-317. *In* Proc. 1989 Beltwide Cotton Conf. National Cotton Council, Memphis, TN.

Hendricks, D.E., T.N. Shaver, and J.L. Goodenough. 1987. Development of bioassay of molded polyvinyl chloride substrates for dispensing tobacco budworm (Lepidoptera: Noctuidae) sex pheromone bait formulations. Environ. Entomol. 16:605-613.

King, E.G. and R.J. Coleman. 1989. Potential for biological control of Heliothis species. Ann. Rev. Entomol. 34: 53-76.

Leonard, B.R., J.B. Graves, S. Micinski, E. Burris, K. Ratchford, J. Baldwin, A.M. Pavloff and A.M. Hammond. 1989. Seasonal captures of bollworm and tobacco budworm (Lepidoptera: Noctuidae) males in pheromone baited traps in Louisiana. J. Entomol. Sci. 24: 107-116.

Lincoln, C., J.R. Phillips, W.H. Whitcomb, G.C. Dowell, W.P. Bayer, K.O. Bell, Jr., E.J. Matthews, J.B. Graves, L.D. Newsome, D.F. Clower, J.R. Bradley, Jr. and J.L. Bagent. 1967. The bollworm-tobacco budworm problem in Arkansas and Louisiana. Ark. Agric. Expt. Sta. Bull. 720. 66 pp.

Micinski, S. 2001. Relationship between bollworm (Lepidoptera: Noctuidae) pheromone trap catches and yield differences in sprayed and nonsprayed Bt cotton. Southwestern Entomol. 26: 137-142.

Oliver, A.D. and J.B. Chapin. 1981. Biology and illustrated guide for the identification of twenty economically important Noctuid pests. Louisiana Agric. Expt. Sta. Tech. Bull. 733. 26 pp.

Williams, M.R. 2002. Cotton insect losses-2001. Proceedings Beltwide Cotton Conf. National Cotton Council, Memphis, TN.

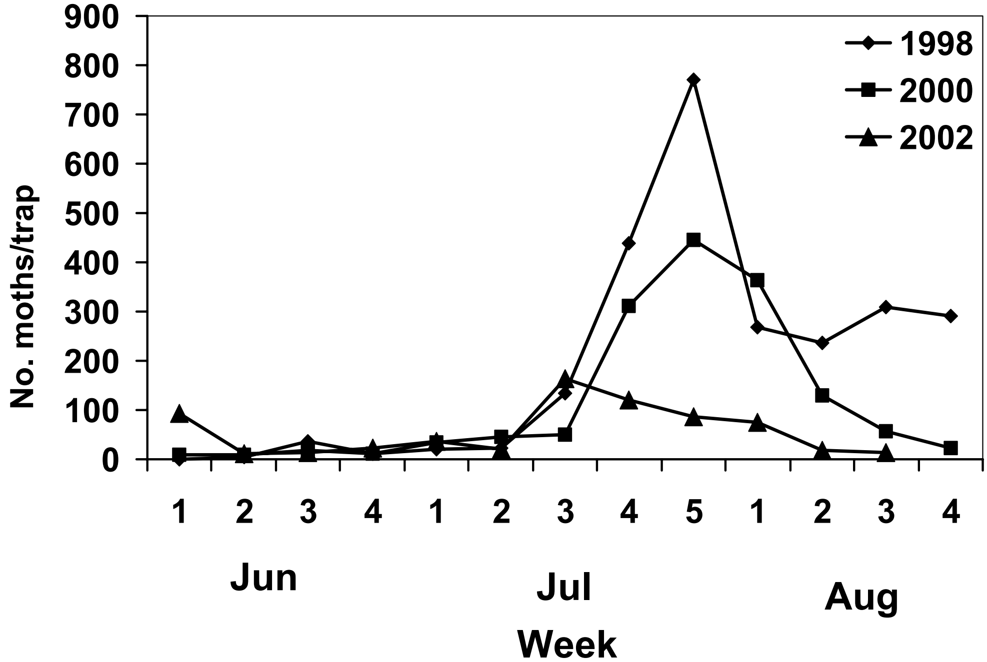


Figure 1. Bollworm trap captures for Winnsboro, La during 1998, 2000, and 2002.

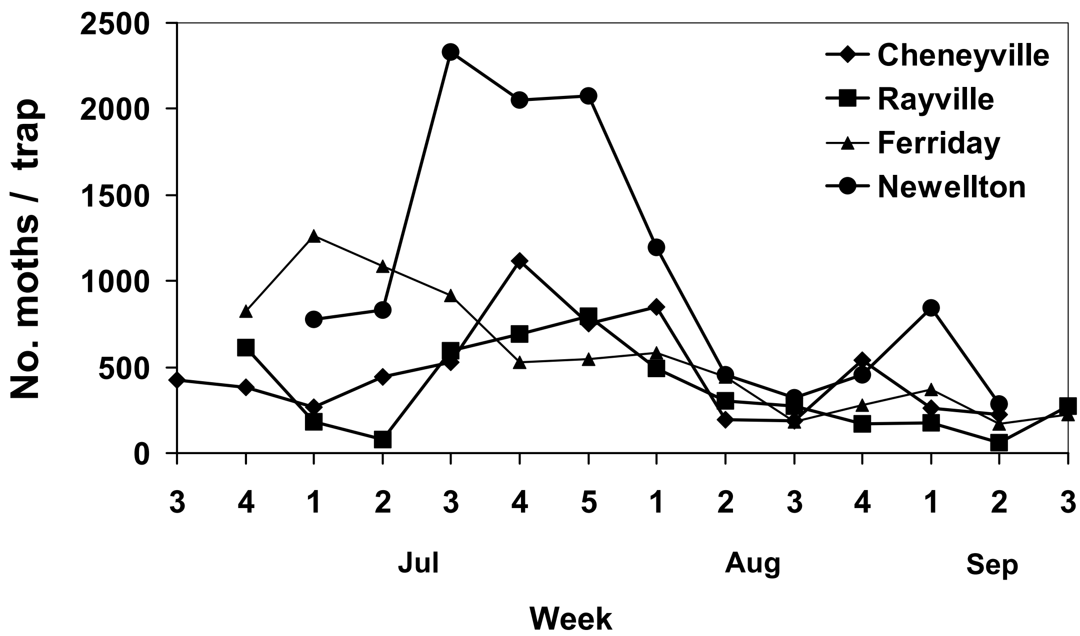


Figure 2. Weekly no. bollworm adults captured for each sample location over time.

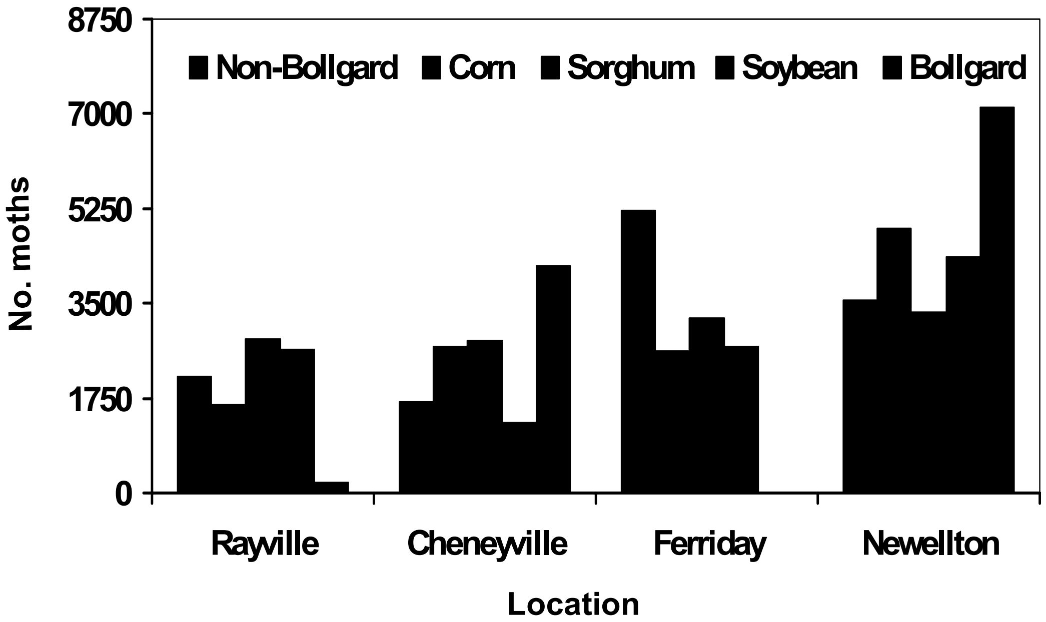


Figure 3. Bollworm adult trap captures for each interface at each location.

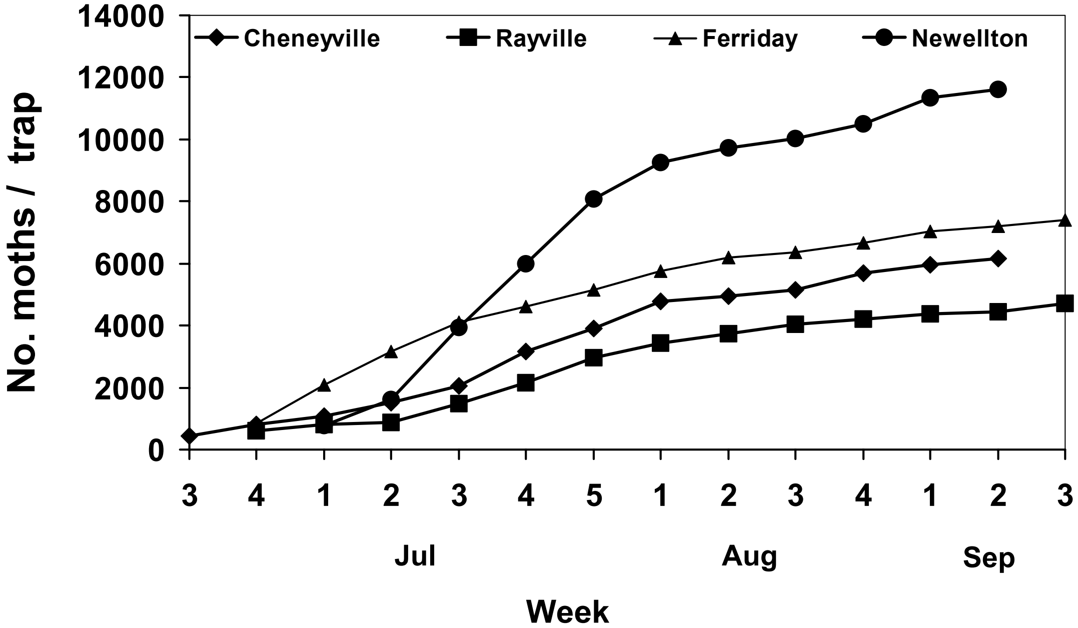

Figure 4. Weekly no. bollworm adults captured for each sample location over time.