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BEET ARMYWORM POPULATION ABUNDANCE IN COTTON AS AFFECTED BY PIGWEED

Stanley C. Carroll, Megha N. Parajulee, Ram B. Shrestha, and Mark D. Arnold
Texas Agricultural Experiment Station
Lubbock, TX

Abstract

Texas High Plains cotton losses due to beet armyworms have increased greatly over the last ten years. This study is being conducted to determine the influence of cotton planting date window (timely vs. late) and level of pigweed infestation (pigweed-infested vs. non-infested) on beet armyworm population abundance in Texas High Plains cotton. Planting window and level of pigweed infestation both contributed to differences in seasonal beet armyworm activity. Significantly higher numbers of beet armyworm larvae were observed in the timely (10 May) planted cotton than in the late (14 June) planted cotton, with seasonal averages of 2579 and 1676 larvae per acre in the May and June planted cotton, respectively. Pigweed-infested cotton was observed to have a seasonal average of 3240 larvae per acre compared with a significantly lower count of 1015 larvae per acre in the clean-tilled non-infested cotton. Preliminary results suggest that cotton fields infested with a preferred wild host, such as pigweed, could have an increased risk for beet armyworm colonization.

Introduction

Historically, the beet armyworm has been considered an occasional pest in Texas High Plains cotton, usually associated with hot and dry weather conditions. Because of increasing levels of infestation and damage the beet armyworm is now considered a secondary pest. In the Texas High Plains region, cotton losses attributed to beet armyworms have consistently increased over the last ten years with 5 bales, 15,000 bales, 38,500 bales, and 581,000 bales lost to beet armyworms in 1992, 1995, 1998, and 2000, respectively (Williams 2002).

In addition to climatic factors and natural enemy levels, the presence of noncotton weed hosts, particularly pigweed (*Amaranthus* spp.), is believed to influence beet armyworm seasonal activity and abundance. Our field observations and reports by scientists from other regions of the U. S. cottonbelt suggest that beet armyworms prefer pigweed over cotton for initial colonization. However, there is no information on the effect of pigweed on beet armyworm abundance and activity in cotton that is in close proximity to a pigweed source.

The objective of this study was to determine the influence of level of pigweed infestation and cultural practices such as planting date on beet armyworm population abundance in Texas High Plains cotton. Results of the study will aid in developing cultural control strategies for beet armyworms in cotton.

Materials and Methods

The study was conducted at the Texas A&M University Agricultural Research and Extension Center farm located northeast of Lubbock, Texas. The experiment consisted of two main effects, each with two levels and four replications, arranged as a 2x2 factorial in a randomized complete block design (RCBD). The two factors were planting date window (timely vs. late) and level of pigweed infestation (pigweed-infested vs. non-infested). The timely planted plots were planted within the Texas High Plains optimum planting window on 10 May, 2002 while the late planted plots were planted on 14 June, which represents the crop insurance replanting cut-off date for the High Plains region.

Pigweed infestation level treatments included 20-row clean cultivation (non-infested) cotton plots and 20-row plots with the middle four rows containing pigweed plants (i.e., 8 rows of cotton on each side of the 4-row pigweed-infested cotton area). The ends of the pigweed-infested rows were clean-tilled to allow for a weed-free buffer between non-infested plots and the closest pigweed plants. In the pigweed-infested plots, the 4-row by 75 ft area to which pigweed plants were confined occupied slightly less than 10% of the total plot area.

Experimental plots were 20 rows (40-inch) by 150 ft in length. Paymaster 2379RR was selected as the cultivar used in the study. The cotton received furrow irrigation with one pre-plant and three in-season irrigation applications.

Seasonal activity of beet armyworm larvae in cotton was monitored during the growing season using a modified dropcloth method. Only cotton plants were sampled for larvae and all rows sampled in the pigweed-infested plots were at a minimum of 3.3 ft away from the nearest pigweed plants. On each sample date, a total of 46-row ft per plot was sampled to determine larval density. Dropcloth counts were converted to numbers per acre for data analysis. Data were analyzed using analysis of variance (SAS Institute 2000), with planting date, pigweed infestation level, and planting date x pigweed infestation level interaction as sources of variation. The protected least significant difference test (LSD) was used to test the differences in mean abundance among treatments. Mean comparisons were evaluated at α=0.05.

Green bucket traps containing beet armyworm specific pheromone caps (Trece, Inc., Salinas, CA) were used to monitor adult beet armyworm populations around the study site. An effort was made to correlate pheromone trap catches and larval densities throughout the testing period.

Weekly sampling for beneficial arthropods also was conducted in each experimental plot. Data analyses related to beneficial arthropods are in progress and will therefore not be reported at this time.

Results and Discussion

Numerous beet armyworm moths were present throughout the test period, however the moth activity trend did not follow the larval population activity observed in the experimental cotton plots (Table 1). Beet armyworm larval activity began in late July, peaked in mid-August, and declined after mid-August without chemical intervention, while moth response to pheromone traps indicated increasing adult populations for the entire test period.

Beet armyworm larval activities were higher in the timely planted cotton from early to mid-August, but activity increased in the late-planted cotton during late August, possibly indicating the effect of crop phenology on beet armyworm activity (Table 2). The proximity of pigweed to the cotton significantly affected beet armyworm larval activity in cotton. Table 3 shows that beet armyworm larval counts from cotton in close association to a pigweed source were higher (significantly higher on 4 of 6 sample dates) than those from cotton plots not infested with pigweed.

Numerically higher beet armyworm larval counts were observed in the cotton in pigweed-infested plots regardless of planting date (Tables 4 and 5). In the timely planted cotton plots the differences were significantly higher on three (August 4, 11, and 16) of six sampling dates. Although the majority of the differences were not significant, it should be noted that without exception the observed larval counts were always numerically higher in the pigweed infested plots. We speculate that the influence of pigweed would have been more pronounced had our test plots been larger and better separated. A larger plot size would likely result in less “bleeding over” of egg-laying moths attracted by pigweed into the non-infested cotton areas. In the current study, some of the outside rows of the non-infested plots were within 26 ft (8 rows x 3.33 ft/row) of pigweed plants growing in the infested plots.

Both factors tested contributed to differences in seasonal beet armyworm activity. Overall, significantly higher numbers of beet armyworm larvae were observed in the timely planted cotton than in the late planted cotton. The timely planted cotton had a seasonal average of 2579 larvae per acre while the later planted cotton averaged 1676 per acre. Cotton plots infested with pigweed averaged 3240 larvae per acre compared with only 1015 larvae per acre in the clean-tilled, non-infested cotton plots. Preliminary results suggest that cotton fields infested with a preferred wild host, such as pigweed, could be at higher risk for beet armyworm colonization. The results and discussion presented in this article are preliminary based upon one year’s data. This study will be repeated in 2003 to further evaluate the behavior of beet armyworms as affected by pigweed.

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Table 1. Seasonal abundance of beet armyworm moths captured in pheromone traps and estimated population density of beet armyworm larvae in experimental cotton plots. Lubbock, TX. 2002.

Trap sampling date	Moths captured / day	Larval sampling date	Larvae / acre
23 Jul	24.1	28 Jul	1116
2 Aug	27.1	4 Aug	1642
7 Aug	29.3	11 Aug	2708
14 Aug	30.5	16 Aug	5672
22 Aug	43.1	23 Aug	1518
29 Aug	101.1	28 Aug	107

Table 2. Average number of beet armyworm larvae per acre detected in timely (10 May) and late (14 June) planted cotton plots. Lubbock, TX. 2002.

	28 Jul	4 Aug	11 Aug	16 Aug	23 Aug	28 Aug
Timely planted	788 a	1758 a	4244 a	7440 a	1154 b	89 a
Late planted	1444 a	1527 a	1172 b	3906 a	1882 a	124 a

Means within columns followed by different letters are statistically different (P<0.05).

Table 3. Average number of beet armyworm larvae per acre detected in pigweed-infested and non-infested cotton plots.Lubbock, TX. 2002.

	28 Jul	4 Aug	11 Aug	16 Aug	23 Aug	28 Aug
Pigweed-infested	1773 a	2770 a	4190 a	8079 a	2450 a	178 a
Non-infested	460 a	515 b	1225 b	3267 b	586 b	36 a

Means within columns followed by different letters are statistically different (P<0.05).

Table 4. Average number of beet armyworm larvae per acre detected in pigweed-infested and non-infested cotton plots planted on 10 May which is within the optimum (or timely) planting window for the Texas High Plains region. Lubbock, TX. 2002.

	28 Jul	4 Aug	11 Aug	16 Aug	23 Aug	28 Aug
Pigweed-infested	1444 a	3445 a	6463 a	11257 a	2095 a	178 a
Non-infested	131 a	71 b	2024 b	3622 b	213 a	0 a

Means within columns followed by different letters are statistically different (P<0.05).

Table 5. Average number of beet armyworm larvae per acre detected in pigweed-infested and non-infested cotton plots planted on 14 June which is considered a late planting for the Texas southern High Plains region. Lubbock, TX. 2002.

	28 Jul	4 Aug	11 Aug	16 Aug	23 Aug	28 Aug
Pigweed-infested	2101 a	2095 a	1917 a	4901 a	2806 a	178 a
Non-infested	788 a	959 a	426 a	2912 a	959 a	71 a

Means within columns followed by different letters are statistically different (P<0.05).