MOVEMENT OF BOLL WEEVILS IN THREE AREAS OF TEXAS

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Abstract

Boll weevil movement, as measured by pheromone trap captures of adults, was compared in three areas of Texas including north central area (Knox county), the southeast area (Houston county), and southwest central area (Uvalde county). The studies were conducted from 1995 to 1997. The results of these comparisons demonstrated that the captures of first boll weevils in the spring occurs in January to March in Uvalde county and March to April in Houston and Knox counties. A greater percentage of the overwintered boll weevils emerge before first 1/3 grown square in Knox county compared with Uvalde and Houston counties. These tests found little difference between the date of the last capture of boll weevils in the fall in the three areas and that there was at least an equal chance of capturing a boll weevil five miles from cotton as next to cotton. More boll weevils were captured per trap in the spring in the Knox county area than in the other two areas; however, there appeared to be little or no difference in boll weevil trap catches in the fall. There was a more clearly defined spring peak trap capture of boll weevils in the Knox county area than the other two test areas.

Introduction

The movement of boll weevils prior to, during, and after a cotton production season has long been of interest to entomologists studying this pest. This information is critical to managing boll weevil population either on a field-to-field basis or an areawide basis. The movement of boll weevils in specific areas of Texas has been documented by numerous researchers. Wade and Rummel (1978) and White and Rummel (1978) conducted numerous studies on boll weevil movement and colonization of cotton on the High and Rolling Plains of Texas; Jones and Sterling (1979) and Beerwinkle et al. (1996) conducted similar studies in the Brazos Valley (South Central Texas) area; while Wright and Chandler (1990) and Guerra (1986) have reported on boll weevil movement in the Rio Grande Valley of Texas.

Coppedge et al. (1996) investigated boll weevil movement as measured by pheromone-baited traps in four areas of Texas, one area in Mexico (near Tampico), and one area near Stoneville, Mississippi. These investigators found that more boll weevils were captured at sites away from, rather than near, cotton fields. Boll weevil trap captures declined as the season progressed; however, the decline was more rapid near cotton. Coppedge et al. (1996) also presented evidence that suggested that a portion of the F_1 boll weevil population leave cotton and moves to remote areas, although the cotton is near the peak fruiting period. Jones and Coppedge (1996), Jones et al. (1997) have investigated pollen feeding by overwintering boll weevils in several areas of Texas. The results of these studies have clearly shown that boll weevils feed on the pollen from non-malvaceous taxa prior to the availability of suitable cotton. The diversity of the pollen detected in boll weevils captured in pheromone traps indicated that there is possibly extensive movement of boll weevils in the spring from one pollen source to another in order to survive until fruiting cotton is available.

The research reported in this report was conducted to compare several parameters of boll weevil activity in three areas of Texas: north central Texas (Knox county), southeast Texas (Houston county) and southwest central Texas (Uvalde county, Wintergarden area). The results of these comparisons should be quite useful in the planning of areawide boll weevil management programs such as the ongoing boll weevil eradication program.

Methods and Procedures

The following sites were selected for these studies: Uvalde county, TX, Knox county, TX and Crockett county , TX. At each location a core area of one or more cotton fields was selected and traps were placed along turn rows or down fence lines near the cotton fields at each location. The number of traps deployed per core area varied to some extent according to the size of the core field(s). The core fields were the same each year. The least number of traps used was three and the maximum number was seven. Next, pheromone-baited traps were deployed along directional lines at one-mile intervals from the core area up to five miles in 1995. In 1996 and 1997, additional traps were added at ten miles from the core field. The distances given were from the core field and non-test cotton fields and may have been closer than the given distances; however, the five and ten mile traps were actually 5 and 10 miles from any known cotton. In the first year, trapping was initiated six weeks prior to cotton square. The tests were initiated in the spring of 1995 and completed either in the fall of 1996 (Houston county) or the fall of 1997 (Uvalde and Knox counties).

The traps were installed on slotted ¾" PVC pipe at a height of 36-42" above the ground and Hercon Luretape Grandlure - 10® were used as an attractant source. Traps were inspected twice weekly (generally 3-4 day intervals) and the lure tapes were replaced every two weeks. Boll weevil trap captures were recorded at each inspection and then forwarded to College Station, where it was compiled and analyzed. Captured weevils were frozen, or placed in Kahle's solution for preservation until they could be examined in the laboratory to verify their identification.

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Weather records were obtained for each of the locations. Initially (1995), 50-100 cotton plants were selected weekly at random and examined in the core field(s). These inspections were conducted to monitor the phenological development of cotton in the test fields. In 1996 and 1997 records were maintained only as the time of first square, bloom, green boll and open boll. With the exception of the data from traps at different distances from the core field, the data presented in this report is the combined results from the trap catches around the core field and the trap catches from the remote areas.

Results and Discussion

The three counties in which the study areas were located are indicated in Figure 1. Based on personal observations in the past, we felt the Uvalde county area would be a good representative of the more sub-tropical areas of Texas, the Houston county area would represent wet temperate areas while Knox county would represent the colder and drier temperate areas of Texas. The Uvalde county area is part of what is known as the Texas Wintergarden area, and producers in that area grow crops year round. It was surprising to find that the Houston county area, which is basically a summer crop area, has more frost-free days than Uvalde county (Table 1). The higher rainfall and the proximity to the Gulf of Mexico appears to have a moderating influence on temperature in Houston county. Uvalde county has a smaller temperature variance based on mean than Houston county.

The average first catch of boll weevils in the spring varied from one area to the other and from one year to the other (Table 2). In Uvalde county the first boll weevil was caught on January 7 (Julian date 07) in 1996 and March 3 in 1997. Of the three locations, Knox county was the most consistent as the first boll weevil was captured April 10 (Julian Date 100) in 1996 and March 25 (Julian Date 84) in 1997 (Table 2).

The percent of the total overwintered boll weevils captured before the first 1/3 grown square was 40-70% in Uvalde and Houston counties with a mean slightly less than 50% (Table 3). This percentage was considerably higher in Knox county which ranged from 78-88%.

These data should be interpreted with some caution. The high value for Uvalde county in 1995 (70.4%) could well have been biased by the late deployment (April 17, 1995) of the traps that year. Also, many Knox county producers plant cotton on a delayed schedule as part of a management program for the boll weevil. This would certainly increase the percentage of boll weevils that are available for capture before the first 1/3 grown square. Finally, producers in the Uvalde county began the fall diapause part of an eradication program in the fall of 1995 and the producers in Knox county began a similar program in 1996. These treatments (aerial application of 12 oz of cythion) may have had some impact on the availability of overwintered boll weevils.

The last fall catch of boll weevils in the test areas was surprisingly consistent from one area to the other and from one year to the next (Table 4). The last catches ranged from December 15 (Julian date 349) in Uvalde county in 1996 to December 31 (Julian date 365) in Houston county in 1996. The mean last catch between the three areas was only five days difference. This information also may be somewhat misleading for Uvalde since the fall period was ended (for these calculations and in this county) on January 1. In at least one year boll weevils were captured during all months of the year, including January.

Consistent with data previously published by Coppedge et al. (1996), more boll weevils were captured in remote areas than near cotton fields (Table 5). The data from the 2-3 year study clearly suggest that there is at least an equal chance of capturing boll weevils 5-10 miles away from cotton as near cotton. This information should be useful in trap placement for areawide boll weevil management programs.

During the 2-3 year test period more boll weevils were captured per trap in the spring in Knox county than in either Uvalde or Houston counties; while the lowest numbers were in Uvalde county (Table 6). In the fall, the average number of boll weevils captured per trap was about the same in the three study areas ranging from 3.5 boll weevils per trap in Uvalde county to 2.6 boll weevils per trap in Houston county (Table 6).

Again, the data from Uvalde county may be somewhat misleading since the traps were deployed in late April 1995 in that county, thus possibly missing some of the early responding weevils. Also, the fall diapause boll weevil application in 1995 in that county and the spring overwintered boll weevil pesticide application in the spring of 1996 may have reduced the trap catches in that county.

The average catch of boll weevils per trap per week for the 2-3 year testing period are given in Table 7. There is no clear spring peak for Uvalde and Houston counties but the spring peak occurring in June in Knox county was quite distinct, averaging over 40 boll weevils per trap per week (Table 7). One of the most consistent occurrences during these studies was a very high catch of boll weevils for a one to two week period in June usually around two weeks prior to first grown square. The boll weevils captured during this short period usually represented over 50% of the overwintered boll weevils captured. The numbers of boll weevils captured in the late summer and early fall peaked in September in Uvalde and Houston counties and in October in Knox county.

The lack of a clear spring peak catch of boll weevils in Uvalde and Houston counties is inconsistent with most

available data on boll weevil trapping. The reason for this inconsistency is not clear. Possibly if the data were calculated and presented as average per week on a per week basis rather than a monthly basis, the results would be more comparable to other studies.

Additionally, in the study area of this test, there were approximately four traps in remote areas for every one trap near the core cotton field. Coppedge et al. (1996) found that boll weevils respond differently over time to pheromone bait traps depending on the placement of traps. This may also help explain the apparent lack of a clear "summer lull" in the test areas described by numerous authors.

Rummel and Bottrell (1976) conducted a ten year study of the seasonal response of boll weevils to traps in the Rolling Plains of Texas. At the conclusion of the these studies, they reported that the most consistent occurrence was the time of response of boll weevils to traps in the spring. The results in our study conducted over time and space was even less consistent than those of Rummel and Bottrell (1976). The frequency and timing of boll weevil trap captures varies from one area to another and from one year to another depending probably on several factors including weather and pest management practices. Some generalizations can be drawn from one area to another, however the timing of specific events are difficult to predict.

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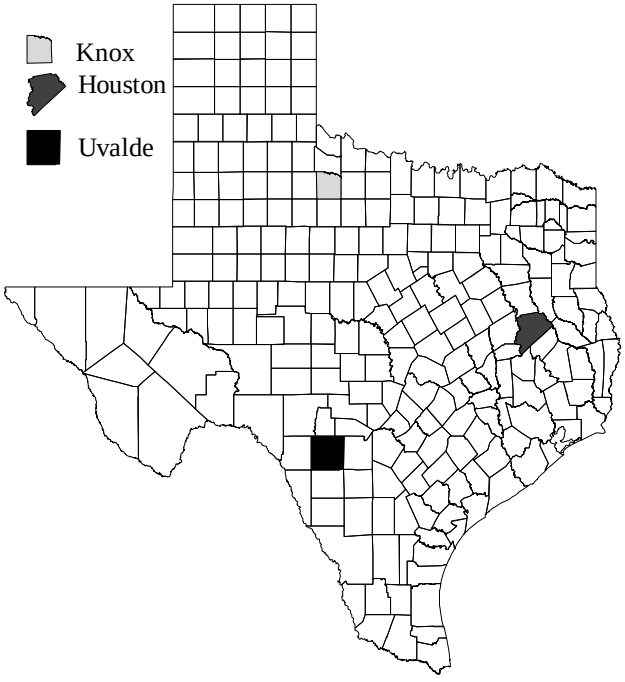

Figure 1. Location of boll weevil movement test areas in Texas, 1995-1997.

Table 1. Comparison of climatic conditions in the three test areas in Texas.

Location (County)	Avg Annual Precip	Avg Date First Frost	Avg Temp (F) (Low) Winter	(High) Summer	Avg Frost-Free Days	Avg Last Frost
Uvalde	23.2	Nov 21	40	96	255	March 10
Knox	24.6	Nov 6	28	98	217	April 3
Houston	41.7	Nov 26	38	95	265	March 6

Table 2. Comparison of first catch of boll weevils in the spring at three Texas study areas.

Location	Avg date of first catch in the spring (Julian date) in indicated location			
(County)	1995[a]	1996	1997	mean
Uvalde	—	07	62	35
Knox	—	100	84	92
Houston	—	82	65	74

[a] Catches during this year are not included in results since the traps were not deployed until late April.

Table 3. Capture of overwintered boll weevils in study areas before first one-third grown square.

Location (County)[b]	Percent of overwintered boll weevils captured in indicated area and year before first 1/3 grown square[a]			
	1995	1996	1997	Mean
Uvalde (May 19)	70.4	41.1	58.9	51.4
Knox (June 21)	88.1	77.8	87.2	82.1
Houston (June 5)	49.5	26.7	—	42.8

[a] Total overwintered boll weevils = captured from first response to first 1/3 grown square + 30 days.
[b] Dates in parenthesis indicate average date of first 1/3 grown square.

Table 4. Comparison of last fall catches of boll weevils in Texas study ares, 1995-1997.

Location	Last date of fall catch in indicated year (Julian date)		
(County)	1995	1996	Mean
Uvalde	358	349	354
Knox	362	351	357
Houston	354	365	359

Table 5. Comparison of the numbers of boll weevils captured at different distances from core cotton fields, 1995-1997[a].

Location	Avg number of boll weevils captured per trap at indicated miles from core cotton field			
(County)	core field	1-3 miles	3-5 miles	5-10 miles
Uvalde	11.3	19.4	21.1	14.3
Knox	1.6	11.4	12.6	14.9
Houston	2.1	3.0	2.1	3.3

[a] Results are an average of 1995 and 1996 catches for Houston county and 1995, 1996 and 1997 for Uvalde and Knox counties.

Table 6. Comparison of average numbers of boll weevils captured in three study areas in Texas, 1995-1997.

Location	Avg number of boll weevils captured/trap/day[a b]	
(County)	Spring	Fall
Uvalde	0.8	3.5
Knox	3.2	3.3
Houston	2.3	2.6

[a] Average results for 1995, 1996 and 1997 for Uvalde and Knox counties and 1995 and 1996 for Houston counties.
[b] Spring = March through June; Fall = September through November.

Table 7. Comparison of the average number of boll weevils per trap per week in study areas (1995-1997).

Date	Avg catch per week in indicated area[a]		
Month	Uvalde	Houston	Knox
January	0.2	0.0	0.0
February	1.5	0.0	0.0
March	2.7	0.7	0.0
April	0.1	0.3	0.0
May	8.6	12.9	2.5
June	6.9	20.5	40.4
July	6.7	20.6	12.2
August	59.7	16.2	2.5
September	64.9	25.6	27.2
October	49.1	10.8	43.4
November	11.6	13.4	25.8
December	4.0	14.6	18.2

[a] Results are expressed as the mean of 1995, 1996, and 1997 in Uvalde and Knox Counties, and 1995 and 1996 in Houston County.