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EARLY-SEASON DISPERSAL OF COTTON FLEAHOPPERS (PSEUDATOMOSCELIS SERIATUS)

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Abstract

The cotton fleahopper, *Pseudatomoscelis seriatus*, is an early-season pest of cotton which occasionally achieves major pest status. Abrupt, unpredictable fleahopper infestations complicate cotton pest management. A field study was conducted in the Brazos Valley, Texas, to determine patterns of fleahopper dispersal from fields with substantial growth of turnipweed and other known or suspected wild hosts. Fleahopper dispersal was monitored using sticky traps placed around the perimeter of three plots with significant growth of turnipweed. Despite low captures, traps captured significantly more fleahoppers on the southern side of plots. Differences between captures on the outside and inside of traps were significant only at one site, which indicated immigration to, rather than emigration from, the site. The findings will lead to more effective prediction and more timely management of fleahoppers in cotton.

Introduction

The cotton fleahopper is an early-season pest of cotton in central Texas. Fleahoppers feed on small developing squares, causing damaged squares to fall. Identification of plant hosts fostering early-season fleahopper populations may provide an opportunity to detect these damaging populations before they move into fruiting cotton.

During 2003, J. F. Esquivel (unpubl. data) identified fleahoppers in turnipweed (*Rapistrum rugosum*), a previously unreported host. The temporal occurrence of turnipweed (mid-Apr. to early May) was in synchrony with developing cotton in the area. Suh et al. (2004) observed significant fleahopper activity in developing cotton when an adjacent turnipweed plot was mowed, suggesting movement into cotton. Suh et al. (2003) evaluated different colors and placements of sticky traps to monitor fleahopper activity in cotton.

The objective of this study was to monitor fleahopper dispersal from turnipweed. Confirmation of turnipweed as an early-season host for fleahoppers may lead to cultural management practices for this weed. The combination of fleahopper population density data and fleahopper dispersal data will help identify the potential impact of fleahopper utilization of, and dispersal from, this host on subsequent infestations in cotton.

Materials and Methods

Three plots (1 to 10 ha) with substantial growth of turnipweed were located in the Brazos River Bottom. One site was located at the Storey pecan orchard (SO) at the Texas A&M University farm in Burleson County. A second site was located on South Astin Road (SAR) in a mixed area of pasture and woods surrounded by row crops. The third site was located on Sandy Point Road (SPR) and was comprised of a pasture surrounded by trees on the eastern and southern sides and dense brush along the northern and western fence lines. Traps were deployed at the SO site from Mar. 15 until the plot was mowed on May 4. Trapping began on Apr. 7 at the SAR site and on Apr. 14 at the OSR site; trapping concluded on May 27 at both sites.

In all plots, white sticky traps (bottoms of Pherocon 1C traps; Trécé, Salinas, CA) were mounted on poles with the top of the trap at a height of 2 m (Figure 1). The color and placement of the sticky traps were selected to reduce attractancy and capture fleahoppers that were dispersing farther than between adjacent plants (C. P. Suh, pers. comm.). Four traps were placed along each of the four “sides” of each plot. Sides were identified as cardinal directions (e.g., N=north) and replicates numbered sequentially from 1 to 4 in a clockwise manner (Figure 2). Traps were aligned perpendicular to the assigned cardinal direction of each side (e.g., traps were aligned east-west on the north and south sides of the plots even when the borders were not aligned with the cardinal directions). New traps were labeled with the site, date, and trap identification before being delivered to the field. Exposed traps were wrapped carefully in plastic wrap (to protect captured insects), removed from the poles, placed in boxes, and returned to the laboratory for identification of fleahoppers. Traps were collected and replaced daily (Mon.-Fri. during April) between 8:00 a.m. and 12:00 noon. Sweep net samples were collected in the turnipweed on Mon. and

Thurs. immediately after the exposed sticky traps were collected. After the sweep net sampling was completed, new sticky traps were mounted on the poles. Exposed traps were examined using an illuminated magnifying lens to count the number of fleahoppers contained within a 4x7 rectangular grid on both sides of the traps.

Due to low captures, daily captures were pooled for the four replicates along each side (trapline) of the plots. Capture data were subjected to analysis of variance using the SAS procedure PROC MIXED (SAS Institute 2000). Means corresponding to the main effects site, direction (i.e., side of plot), side of trap, and terms for their interactions were included in the model. Main effects and significant interactions were evaluated using the ADJUST=TUKEY options of the LSMEANS statement of PROC MIXED (SAS Institute 2000). Denominator degrees of freedom were estimated using the Kenward-Rogers adjustment in the MODEL statement of PROC MIXED (SAS Institute 2000).

Results and Discussion

All of the main effects in the model were significant (site, F=12.66; df=2, 760; $P < 0.01$; direction [side of plot], F=13.64; df=3, 760; $P < 0.01$; and side of trap, F=13.76; df=1, 760; $P < 0.01$). Overall, captures were highest at the SAR site (0.7 $\pm$ 0.06 fleahoppers trapline^{-1} day^{-1}). There was no significant difference between captures at the SPR (0.4 $\pm$ 0.06 fleahoppers trapline^{-1} day^{-1}) and SO (0.2 $\pm$ 0.07 fleahoppers trapline^{-1} day^{-1}) sites. Captures were highest along the southern side of the plots (0.8 $\pm$ 0.07 fleahoppers trapline^{-1} day^{-1}), but were not different between the eastern (0.2 $\pm$ 0.07 fleahoppers trapline^{-1} day^{-1}), western (0.3 $\pm$ 0.07 fleahoppers trapline^{-1} day^{-1}), and northern (0.3 $\pm$ 0.07 fleahoppers trapline^{-1} day^{-1}) sides of the plots. Captures were higher on the outside of the traps (0.6 $\pm$ 0.05 fleahoppers trapline^{-1} day^{-1}) than on the inside of the traps (0.3 $\pm$ 0.05 fleahoppers trapline^{-1} day^{-1}).

Captures were significantly higher on traps along the southern side of the plot (1.7 $\pm$ 0.12 fleahoppers trapline^{-1} day^{-1}) than on traps along the other sides of the plot at the SAR site. Captures were not different along the four sides of the SO plot. At the SPR site, only the captures along the southern (0.5 $\pm$ 0.12 fleahoppers trapline^{-1} day^{-1}) and eastern sides (0.1 $\pm$ 0.12 fleahoppers trapline^{-1} day^{-1}) were significantly different.

More fleahoppers were captured on the outside of traps (1.1 $\pm$ 0.09 fleahoppers trapline^{-1} day^{-1}) than on the inside of traps (0.3 $\pm$ 0.09 fleahoppers trapline^{-1} day^{-1}) at the SAR site, but there was no difference between captures on either side of the traps at the SO and SPR sites. Although a net flux (emigration or immigration) was not detected at the SO or SPR sites, immigration was detected at the SAR site.

Captures on the outside of traps along the southern side (3.3 $\pm$ 0.17 fleahoppers trapline^{-1} day^{-1}) were significantly higher than captures on the inside of traps along the northern side (0.3 $\pm$ 0.17 fleahoppers trapline^{-1} day^{-1}) of the SAR plot. The net flux of fleahoppers from south to north across the SAR site indicated that fleahoppers were dispersing from outside sources and immigrating to the SAR site. No other captures on the outside of traps were significantly different from captures on the inside of traps along the opposite side of the plots.

Sweep net collections in turnipweed revealed an order of magnitude decrease in adult fleahopper populations from 2003 to 2004, and no nymphs were collected in 2004 which suggested a migrant population (J. F. Esquivel, in press). Because captures were relatively low during the 2004 study, analysis of the association between captures and atmospheric factors is not presented here. Future research will attempt to increase the number of fleahopper captures for correlation with daily atmospheric factors including wind speed and wind direction.

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Disclaimer

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Figure 1. Sticky trap placed next to a plot with substantial growth of turnipweed.

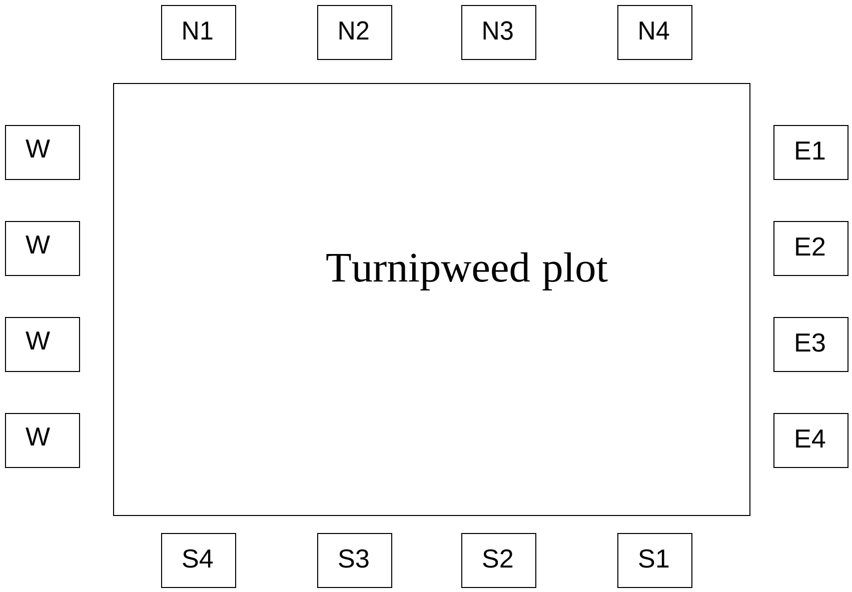

Figure 2. Diagram of the placement of sticky traps around the perimeter of plots.