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STINK BUG POPULATION DYNAMICS IN SOUTH G EORGIA CROP SYSTEMS

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Abstract

The diversity, abundance, and timing of phytophagous stink bug populations were evaluated in south Georgia mixed crop field trials during the cotton growing season. The most prevalent species was the southern green stink bug, *Nezara viridula* Linnaeus, followed by the brown stink bug, *Euschistus servus* (Say), and the the green stink bug, *Acrosternum hilare* (Say). Replicated plots of Bt and non-Bt cotton (early and late-planted at one location), peanuts, and soybeans were sampled by shake cloth for adult and nymphal stink bug numbers and species. Populations were significantly greater in soybeans than in cotton or peanuts. In cotton, population peaks appeared to correspond with peak fruiting and no significant preference was observed for Bt or non-Bt varieties. In soybean, *N. viridula* populations were highest during pod fill.

Introduction

Successful eradication of the boll weevil in Georgia and increased plantings of Bt cotton for defense against the bollworm complex have resulted in greatly reduced insecticide usage (Leonard and Emfinger 2002). These have coincided with increased populations of phytophagous pentatomids in Georgia crop systems. Greene et al. (2001) predicted an increasing significance of stink bugs in cotton production as new insecticide chemistries having little activity against hemipterans are used for controlling lepidopteran pests. Currently in the Georgia Coastal Plain, the most commonly encountered stink bug pests include the southern green stink bug, *Nezara viridula* Linnaeus, the green stink bug, *Acrosternum hilare* (Say), and the brown stink bug, *Euschistus servus* (Say). Georgia cotton is typically grown in mixed crop ecosystems that include soybean and peanuts, both of which can serve as hosts for stink bugs. Bundy and McPherson (2000) found total stink bug numbers greater in soybean than adjacent cotton in three field seasons from 1996-1998. The objective of this study was to observe the diversity, abundance, and timing of phytophagous stink bug populations on Bt and non-Bt cotton and how they might compare with populations in neighboring soybean and peanut plantings.

Materials and Methods

Tift Co. Trial

Non-Bt and Bt-cotton, soybeans, and peanuts were planted at the Lang-Rigdon Farm of the University of Georgia's Coastal Plain Experiment Station in Tift County, Georgia, on 28 May 2004. The non-Bt cotton was DPL 458B/RR, the Bt cotton was FM 989, the soybean variety was DPL 5915RR (Group V), and the peanut variety was Georgia Green. Plots were 12 rows by 90 ft long, with a 36 inch row spacing and 5 replications per treatment. Four shake cloth samples were made weekly in each plot from 15 July to 21 September. The numbers of nymphs and adults of the southern green stink bug, the green stink bug, and the brown stink bug were recorded. Since only a very small number of *E. tristigmus* and *E. quadrator* were observed, they were recorded as *E. servus.*

Plains Trial

Non-Bt and Bt-cotton, soybeans, and peanuts were planted at the University of Georgia's Branch Experiment Station in Plains, Sumter County, Georgia, on 10 May 2004. The non-Bt cotton was DPL 5690/RR, the Bt cotton was DPL 458B/RR, the soybean variety was DPL 5915RR (Group V), and the peanut variety was Georgia Green. In addition, both cotton treatments were duplicated in a late planting on 10 June 2004. Plots were 24 rows by 110 ft long, with a 36 inch row spacing and 4 replications per treatment with the exception of late-planted Bt cotton that had only two replications due to a planting error. Shake cloth samples and data collection were made as above from 18 June to 8 October. In the case of the late-planted cotton, both Bt and non-Bt, sampling did not begin until 16 July.

Data from both trials were analyzed using the SAS General Linear Models procedure, followed by separation of significantly different means using Duncan's New Multiple Range Test, with $p<0.05$ as the upper limit for significance.

Results

The highest overall stink bug abundance occurred in soybeans at both the Tift Co. and Plains locations (Figs. 1 and 5). At both sites, *N. viridula* was the most common species encountered, in agreement with the findings of Bundy and McPherson (2000) in south Georgia and Steede et al. (2003) in south Mississippi. Stink bug abundance was not significantly different in early vs. late-planted cotton (Table 1; Figs. 7-10). Peak abundance of *N. viridula* coincided with pod filling of soybeans and boll set and filling in both early and late-planted Bt and non-Bt cotton (Figs. 1, 5, 7-10). No seasonal pattern was evident in *E. servus* populations for sampled crops (Figs. 1-10). Extremely low numbers were encountered of *A. hilare, E. tristigmus,* and *E. quadrator.* Sampling in peanuts yielded very low numbers of *N. viridula* and *E. servus* (Table 1; Figs. 2 and 6), but shake samples appeared to underestimate the total number present in the crop by visual observations.

Discussion

Peak abundance of *N. viridula* coincided with pod filling of soybeans and boll set/filling in both the early and late-planted Bt and non-Bt cotton. In soybeans, Schumann and Todd (1982) found the greatest *N. viridula* population increases during pod fill (R5 and R6) as in our study. In cotton, Bundy and McPherson (2000) found peak stink bug abundance during the period when all sizes of developing bolls were present.

No seasonal pattern seemed evident in *E. servus* populations, with relatively low numbers throughout. Though we found no significant differences in Bt vs. non-Bt cotton, there is some indication that stink bug abundance is greater in Bt cotton during boll fill. At the Plains location, the non-Bt cotton had ca. ½ as many bolls as the Bt cotton due to bollworm damage. Bollworm pressure at the Tift Co. location was very light. Roberts et al. (2003) reported slightly higher stink bug damage in 40 Bt cotton fields compared with 39 non-Bt cotton fields in eight south Georgia counties. This may have been due to significantly more lepidopteran insecticide sprays in the non-Bt fields. In our study, none of the plots received any insecticide applications.

The extremely low stink bug abundance in peanuts may not have been an accurate assessment. Increased boll damage has been observed in portions of cotton fields adjacent to peanuts (personal communication, Philip M. Roberts, Univ. of Georgia). Shake sampling appears to be unsuitable for stink bugs in peanuts; sweep sampling or suction sampling may be superior and merit investigation.

Conclusion

As suggested by other researchers, the attractiveness of soybeans may make them useful as a trap crop in managing stink bugs in cotton. The crop system dynamics of stink bugs are complex and will require further study before we can understand the role of the landscape in stink bug problems.

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Table 1. Mean weekly abundance of stink bugs per 4 shake cloth samples, pooled across dates Means followed by the same letter are not significantly different (P>0.05).

	Tift Co.			Plains	
Crop	*N. viridula*	*E. servus*	Crop	*N. viridula*	*E. servus*
soybeans	9.14a	2.16a	soybeans	13.75a	1.22a
Bt cotton	1.06b	0.18b	Bt early	2.20b	0.15b
non-Bt cotton	1.12b	0.12b	non-Bt early	1.95b	0.25b
			Bt late	2.04b	0.14b
			non-Bt late	1.93b	0.14b
peanuts	0.72b	0.1b	peanuts	0.68b	0.17b

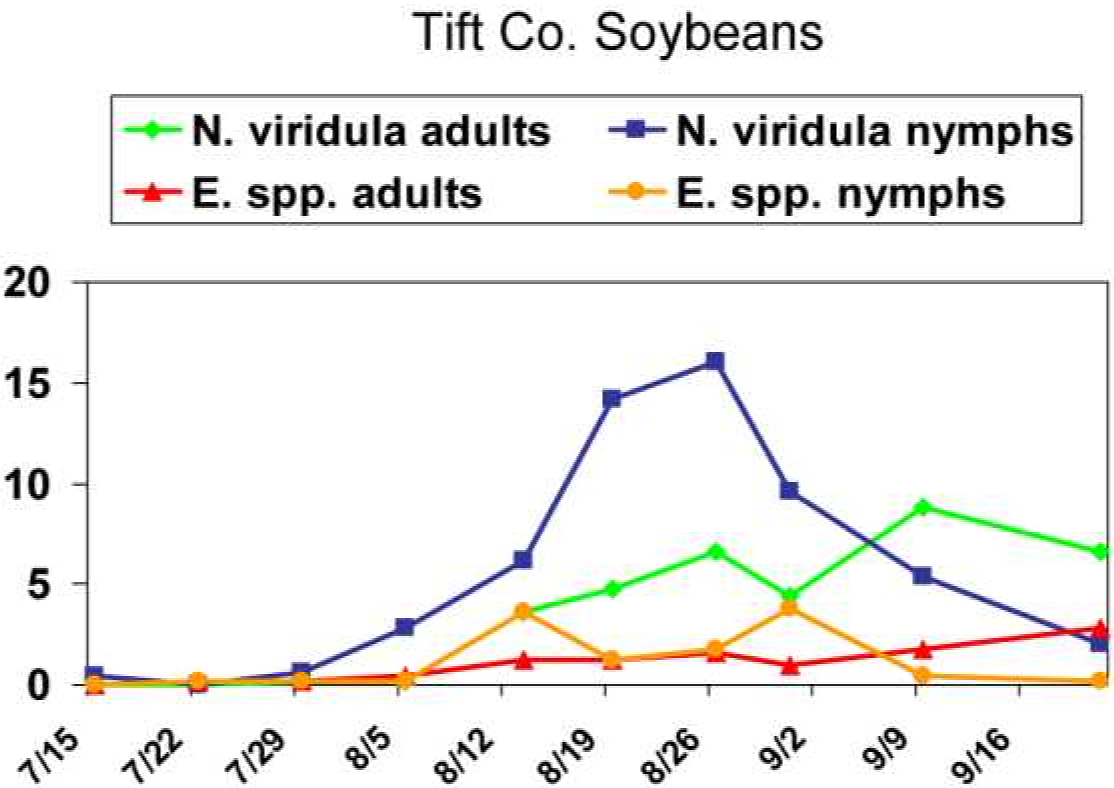

Figure 1. Average no. stink bugs per four shake cloth samples in Group V soybeans. Tift Co. 2004.

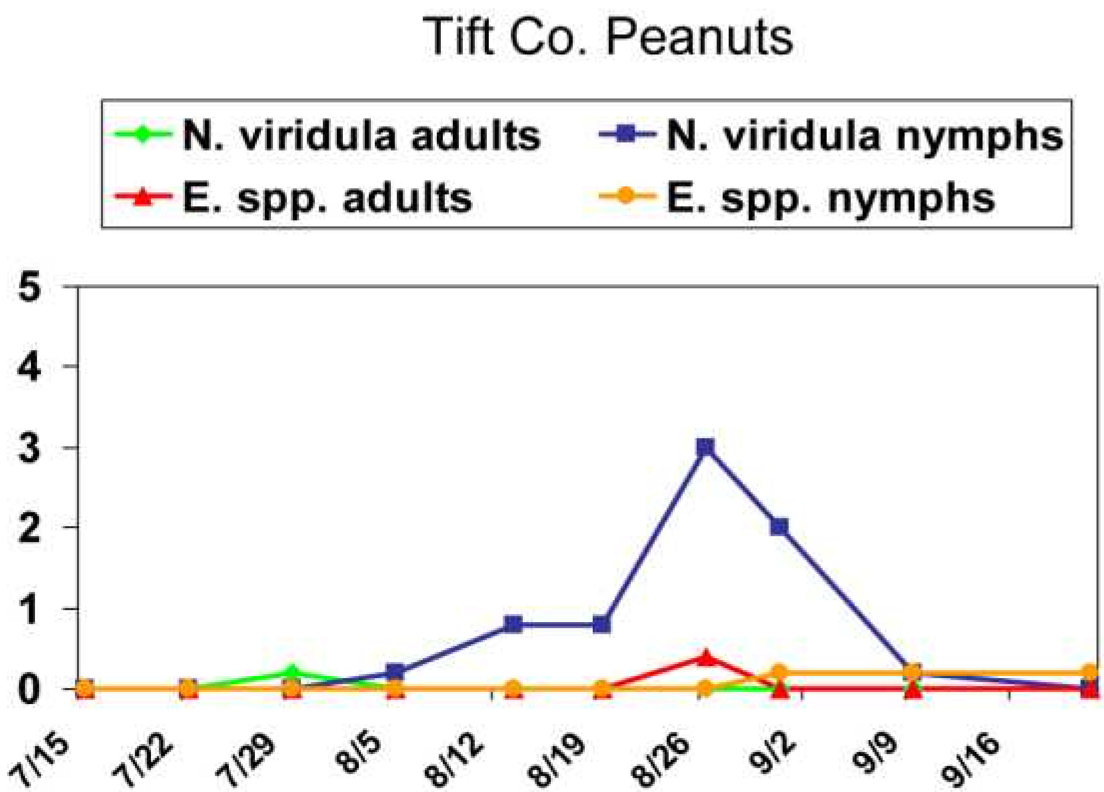

Figure 2. Average no. stink bugs per four shake cloth samples in peanuts. Tift Co. 2004.

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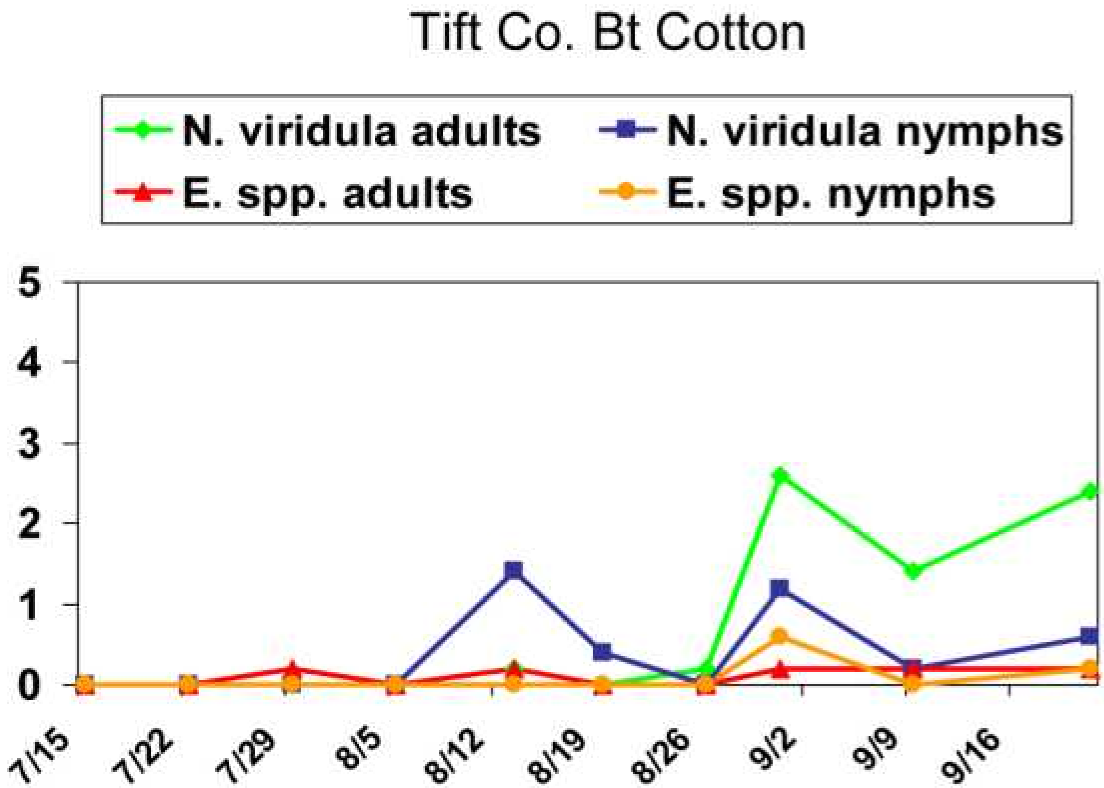

Figure 3. Average no. stink bugs per four shake cloth samples in Bt cotton. Tift Co. 2004.

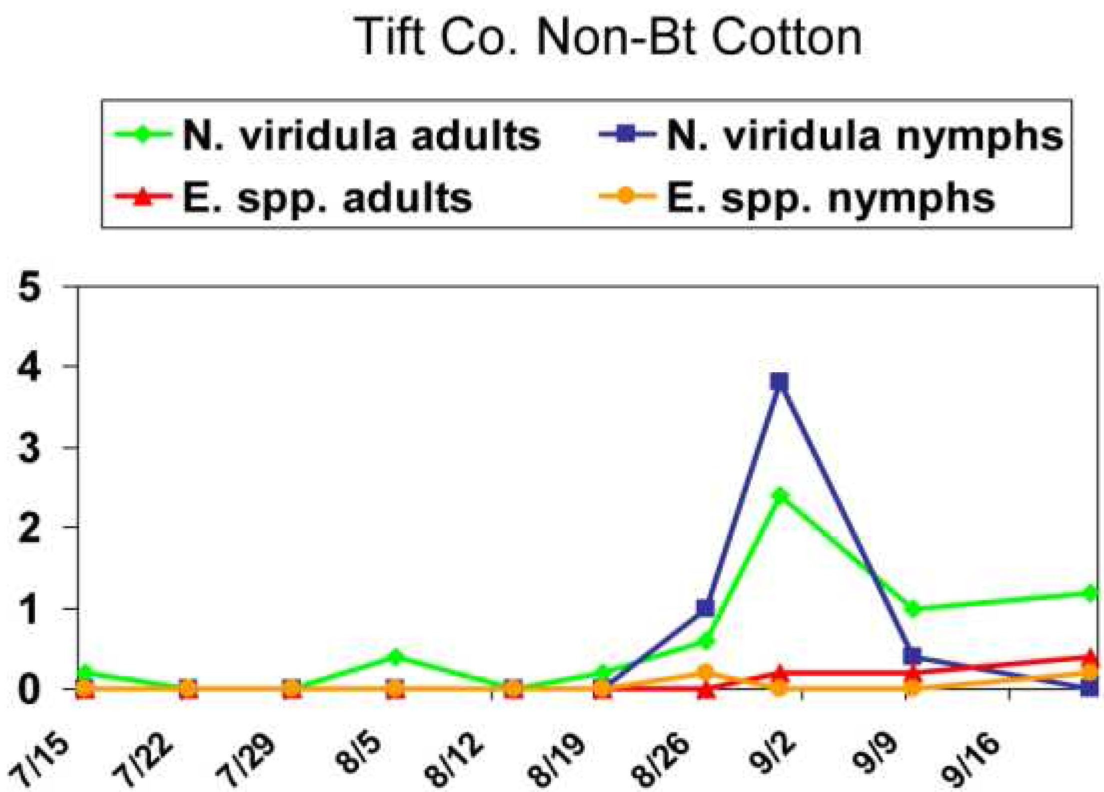

Figure 4. Average no. stink bugs per four shake cloth samples in non-Bt cotton. Tift Co. 2004.

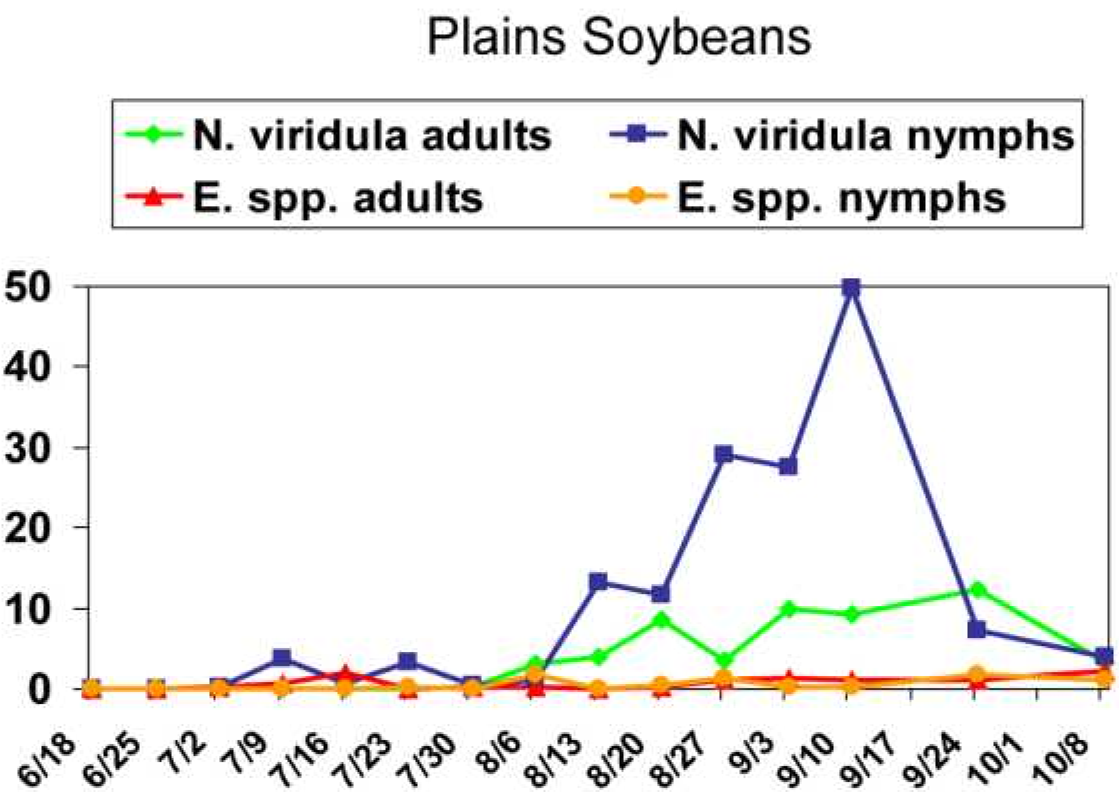

Figure 5. Average no. stink bugs per four shake cloth samples in Group V soybeans. Plains, GA. 2004.

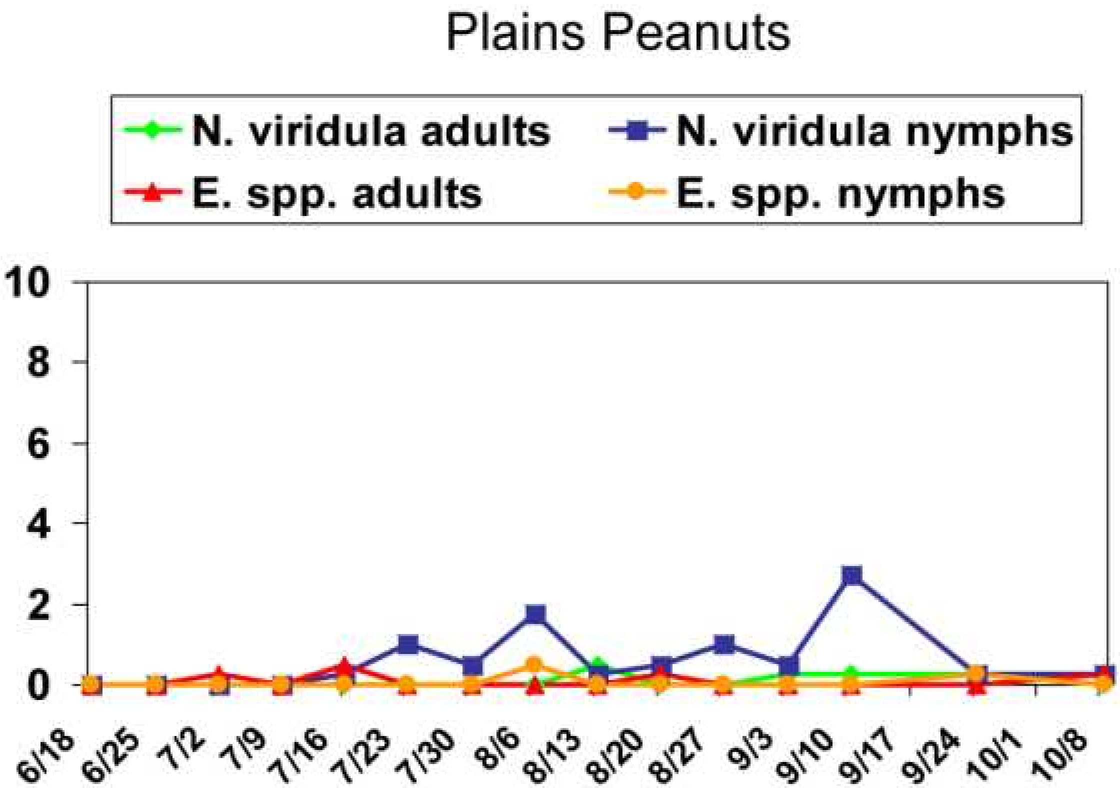

Figure 6. Average no. stink bugs per four shake cloth samples in peanuts. Plains, GA. 2004.

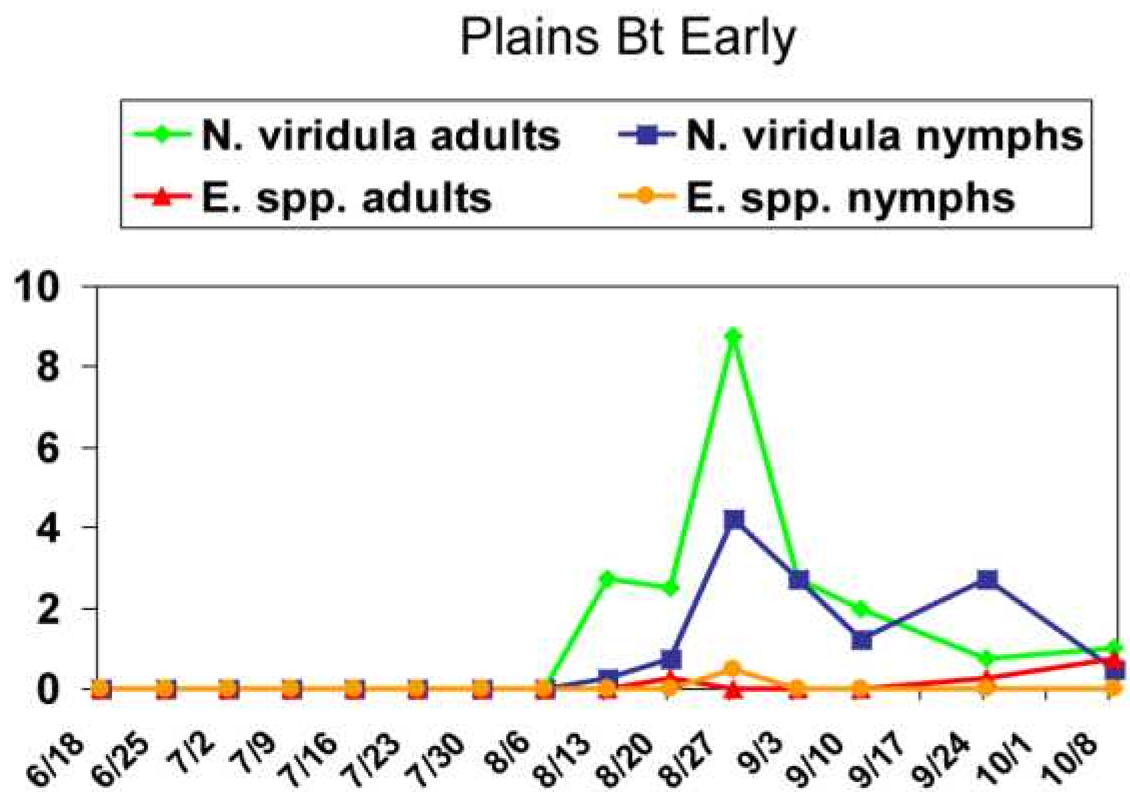

Figure 7. Average no. stink bugs per four shake cloth samples in early-planted Bt cotton. Plains, GA. 2004.

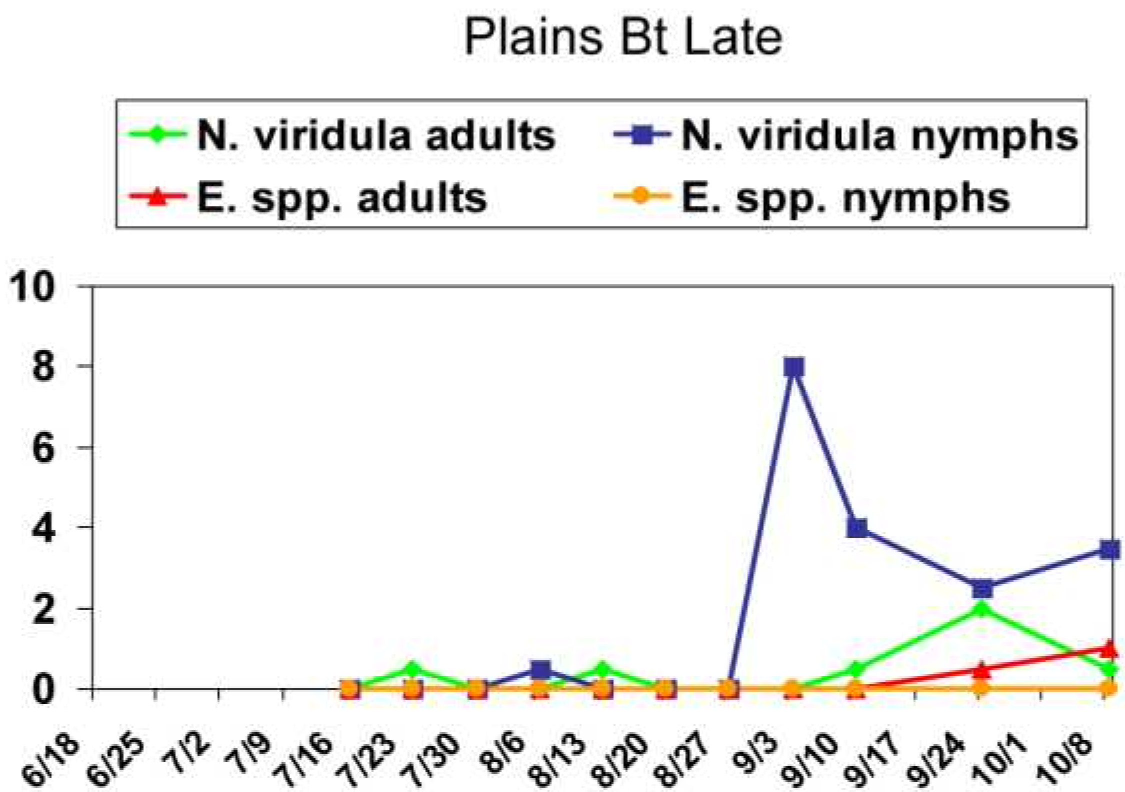

Figure 8. Average no. stink bugs per four shake cloth samples in late-planted Bt cotton. Plains, GA. 2004.

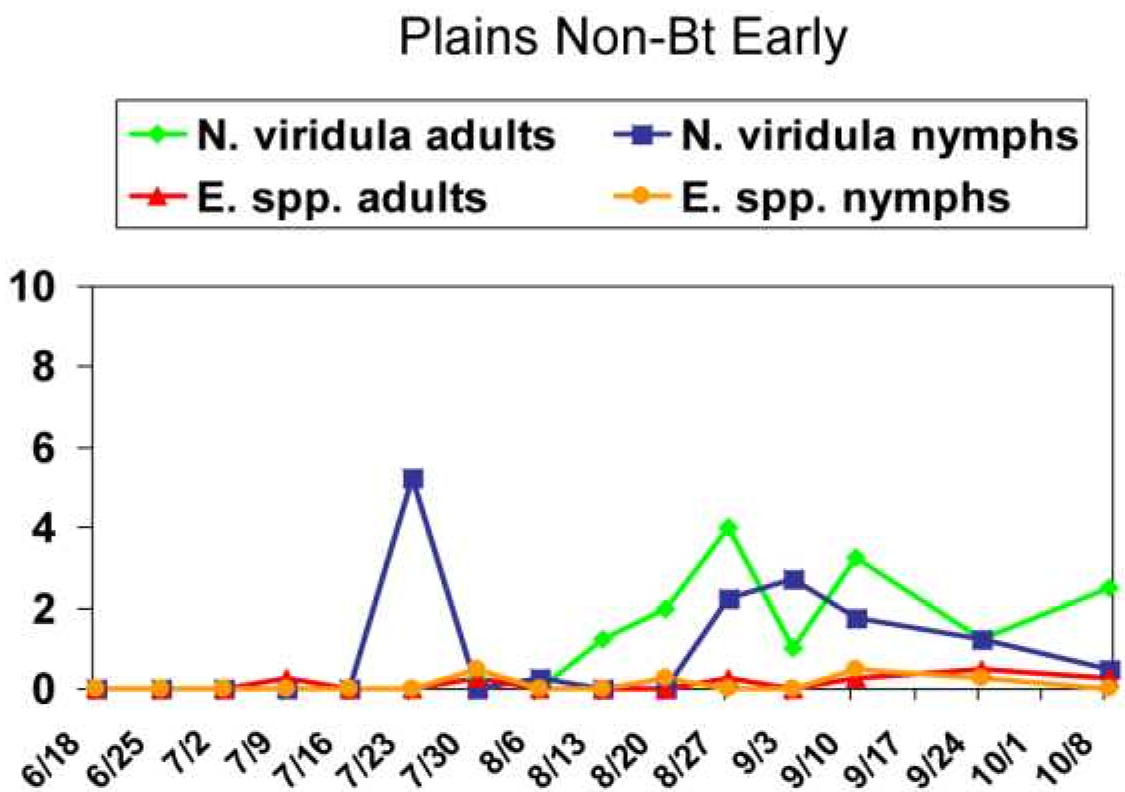

Figure 9. Average no. stink bugs per four shake cloth samples in early-planted non-Bt cotton. Plains, GA. 2004.

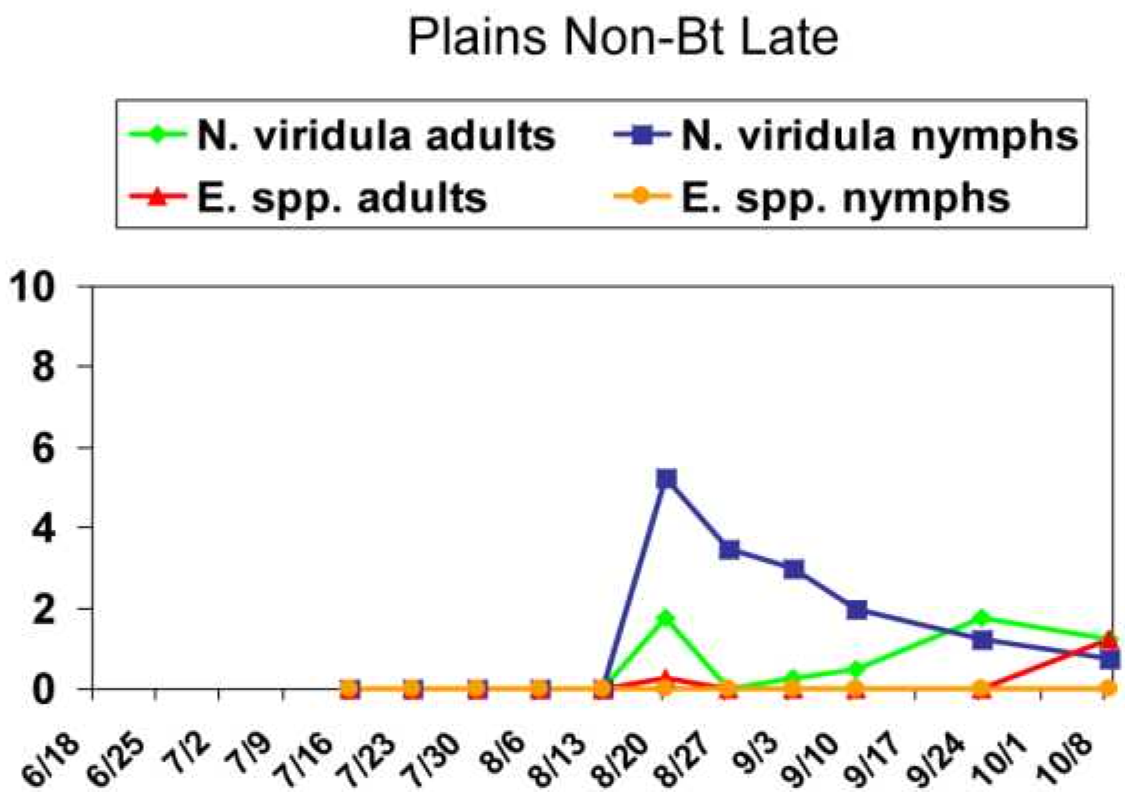

Figure 10. Average no. stink bugs per four shake cloth samples in late-planted non-Bt cotton. Plains, GA. 2004.