STINK BUGS IN A COTTON/SOYBEAN ECOSYSTEM: IMPACT ON QUALITY AND YIELD

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Abstract

Stink bug numbers were very low in south Georgia in 1996. *N. viridula* was most common followed by *A. hilare*, and *E. servus*, respectively. Pentatomids numbers were much higher in 1997. *N. viridula* was most common followed by *E. servus*, and *A. hilare*, respectively. Stink bugs were significantly more abundant in soybeans than cotton for both years. Seasonally, the Group VII soybean had more stink bugs than the Group V, and there were no differences in abundance between Bt and non-Bt cotton. The apparent preference of stink bugs for soybean suggests that this plant might be used as a trap crop for cotton. Analysis of stink bug-induced boll damage resulted in a 3-way interaction with variety, size, and date.

Introduction

Stink bugs have been reported as pests of cotton since the beginning of the twentieth century (Morrill 1910). However, the heavy use of insecticides to control the boll weevil and the budworm/bollworm complex kept stink bug numbers low. The recent eradication of the boll weevil in the southeast, and the use of Bt cotton to control the budworm/bollworm complex have greatly reduced the amount of insecticides used on cotton. This has led to increased numbers of pentatomids (Barbour et al. 1988), especially in Bt cotton (Turnipseed and Greene 1996; Greene and Turnipseed 1996; Bachelor and Mott 1996; Turnipseed et al. 1995). The most important stink bug pests of cotton in the southeast are the southern green stink bug, *Nezara viridula* (L.), the green stink bug, *Acrosternum hilare* (Say), and the brown stink bug, *Euschistus servus* (Say) (Roach 1988). Pentatomids feed on developing seeds and lint (Barbour et al. 1988), causing shedding of young bolls, yellowing of lint, and reduction in harvestable locks (Roach 1988; Wene and Sheets 1964). Stink bugs are also a major pest in soybeans. They feed on the seeds, foliage, blooms, and stems of the plant (McPherson et al. 1994). The result is shriveled seeds that are often discolored (McPherson et al. 1994), reduction in oil content (Daugherty et al. 1964), and reduction in yield (McPherson 1996).

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Materials and Methods

Separate large plots (0.1 ha) of cotton and soybean were planted in May of 1996 and 1997. The two varieties of soybean used were NK S5711 (Group V) and Braxton (Group VII), and the cotton varieties were DPL 5415 and NuCotn 33b (Bt cotton). This study was conducted at two sites each year. In 1996, the two sites were located at Bowen and Ponder Farms near Tifton, GA. In 1997, the two sites were located at Lang Farm near Tifton and Attapulgus Farm, located approximately 100 miles southwest of Tifton. At each site, plots were arranged in a randomized block design with four replications.

All were sampled weekly using a sweep net (38-cm diameter). Two random 25 sweep samples were taken in each plot. Each was bagged, labeled, returned to the lab, and frozen until it could be counted. Sampling was initiated when plants were large enough for sweeping and continued until plant maturity. At harvest, the quality of soybean seed was assessed by rating for stink bug damage (none, light, moderate, and heavy) on two random sets of 100 seeds per plot . Cotton and soybean were harvested manually or mechanically, and yields were analyzed statistically using analysis of variance in a randomized complete block design with repeated measures.

Stink bug damage was determined on three sizes of bolls (small, medium, and large) for five dates at each farm by randomly collecting at least 75 bolls of each size and variety. They were returned to the lab for examination, and were rated as damaged if warts were present on inside carpel wall. Damage was analyzed using a randomized complete block design with repeated measures.

Results and Discussion

1996

Stink bug numbers were very low in south Georgia during this season, probably due to a late frost. Both Ponder and Bowen farms showed significantly greater numbers of stink bugs (p=.0003 and .0027, respectively) in soybeans than in cotton. The Group V and Group VII soybean varieties had significant differences in stink bug numbers (p=<.05) at Bowen, but not at Ponder. Pentatomids were most numerous in the Group VII soybean for both farms. There were no significant differences between stink bug numbers in Bt and non-Bt cotton. In both crops, *N. viridula* was most abundant, followed by *A. hilare*, and *E. servus*. Other stink bugs recovered from cotton were *Thyanta custator* and *E. quadrator* (fig. 1). Additional stink bugs recovered from soybean were *E. quadrator*, *E. obscurus*, *E. tristigmus*, *T. custator*, *Oebalus pugnax*, and *Piezodorus guildinii* (fig. 2).

Bt cotton produced a significantly greater yield than non-Bt cotton at both farms (p<.05), and there were no significant differences between yields of the soybean varieties (table 3).

1997
Stink bugs were much more abundant in south Georgia during this season. Both Lang and Attapulgus farms had significantly more stink bugs in soybeans than cotton (p=.0x and .0001, respectively). The Group V and Group VII soybean varieties had significant differences in stink bug numbers at Attapulgus (p=<.05), but not at Lang. As in 1996, stink bug numbers were greatest in the group VII soybean variety, and there were no significant differences between stink bug numbers in Bt and non-Bt cotton. In both crops, *N. viridula* was most abundant followed by *E. servus*, and *A. hilare*. Other stink bugs recovered from cotton were *T. custator* and *O. pugnax* (fig 3). Additional stink bugs recovered from soybean were *E. quadrator*, *O. pugnax*, *P. guildinii*, and *T. custator* (fig. 4).

Bt cotton produced a significantly greater yield than non-Bt cotton at Lang (p<.05), but not at Attapulgus. As in 1996, there were no significant differences in yield for the soybean varieties (table 3).

The percentage of damaged soybeans was greater (table 2) than the previous year (table 1).

Stink bugs preferred soybeans over cotton for both seasons. The pentatomids began arriving in both varieties of soybeans at the beginning of pod formation, When the Group V soybean reached maturity, the bugs migrated to the still maturing Group VII soybean. There was no significant movement of stink bugs into cotton due to the availability of soybeans for the entire season. This opens up the possibility of using soybeans as a trap crop for cotton.

Boll Damage
Analysis of damaged bolls resulted in a 3-way interaction with variety, size, and date. There appeared to be a steady increase in damaged bolls as the season progressed (figs. 5 and 6).

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Table 1. Percentage of stink bug-damaged soybean seed (1996).

FARM	VARIETY	NONE	LIGHT	MODERATE	HEAVY
Bowen	NK S5711	98.0%	1.0%	1.0%	0.0%
Ponder	NK S5711	96.0%	2.0%	2.0%	0.0%
Bowen	Braxton	95.0%	4.0%	0.4%	0.4%
Ponder	Braxton	88.0%	9.0%	2.0%	1.0%

Table 2. Percentage of stink bug damaged-soybean seed (1997).

FARM	VARIETY	NONE	LIGHT	MODERATE	HEAVY
Att.	NK S5711	72.0%	20.0%	6.0%	2.0%
Lang	NK S5711	71.0%	17.0%	9.0%	3.0%
Att.	Braxton	1.9%	29.9%	10.6%	57.6%
Lang	Braxton	2.2%	42.0%	32.2%	23.5%

Table 3. Average yields for 1996 and 1997.

Cotton:			Soybean:		
Year	Variety	Yield	Year	Variety	Yield
1996	DPL 5415	1829.3 lb/acre	1996	NKS5711	31.0 bu.acre
1997	DPL 5415	1377.7 lb/acre	1997	NKS5711	32.4 bu/acre
1996	NuCotn 33b	2530.5 lb/acre	1996	Braxton	34.5 bu/acre
1997	NuCotn 33b	2112.2 lb/acre	1997	Braxton	32.7 bu/acre

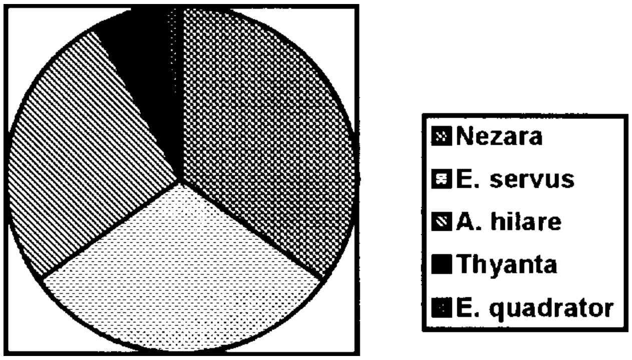

Figure 1. Seasonal proportions of stink bug species in cotton, 1996.

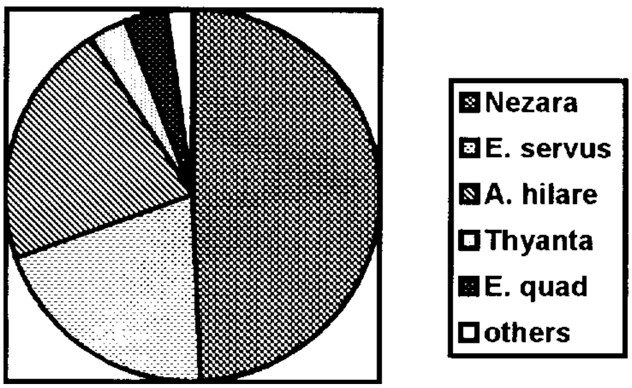

Figure 2. Seasonal proportions of stink bug species in soybean, 1996.

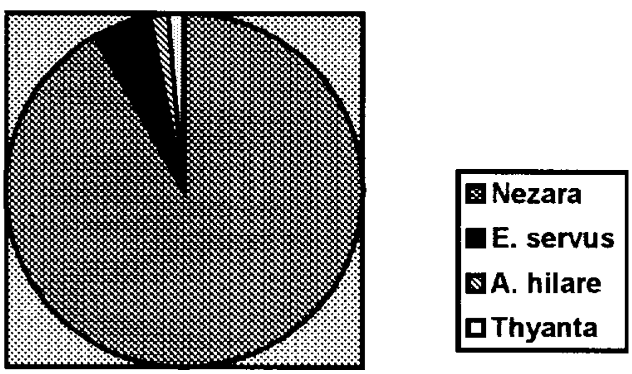

Figure 3. Seasonal proportions of stink bug species in cotton, 1997.

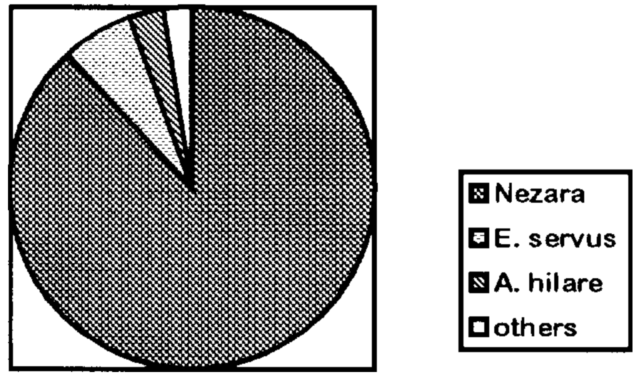

Figure 4. Seasonal proportions of stink bug species in soybean, 1997.

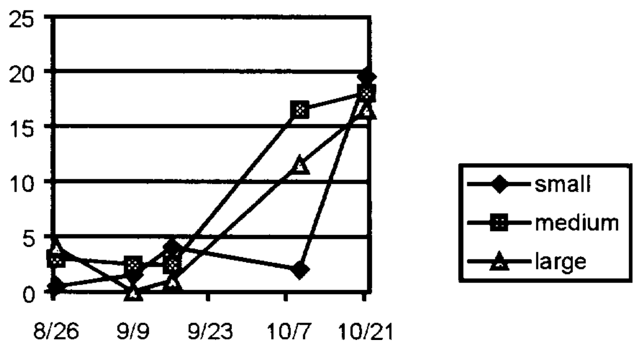

Figure 5. Percentage of non-Bt cotton bolls with internal stink bug damage, Attapulgus Farm.

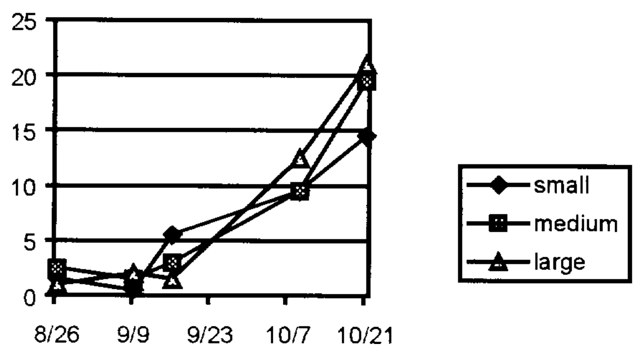

Figure 6. Percentage of Bt cotton bolls with internal stink bug damage, Attapulgus Farm.