NECTARIED AND NECTARILESS COTTON CULTIVARS AS NECTAR SOURCES FOR THE ADULT SOYBEAN LOOPER[1]

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ABSTRACT

Moths of the soybean looper (SBL), *Pseudoplusia includens* (Walker), were released into 1.8 × 3.7 m field cages (10 male:female moth pairs/cage) containing nectaried (floral and extrafloral nectaries) or nectariless (no extrafloral nectaries) cotton cultivars. Cages containing moths were left undisturbed for 7 days, at the end of which time, plants within cages were sampled for SBL eggs. In three separate tests conducted in 1982, 1983, and 1984, moths oviposited significantly more eggs/plant in caged nectaried cotton than in caged nectariless cotton. High larval SBL populations in cotton-soybean agroecosystems are attributed to SBL moth utilization of cotton nectars to increase fertility and fecundity prior to oviposition in nearby soybean fields. Thus, use of nectariless cotton cultivars may reduce SBL pest populations on soybean by decreasing the amount of cotton nectar available.

Key Words: Oviposition, field cage tests, soybean looper moth, nectaried and nectariless cottons.

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INTRODUCTION

Adults of a number of lepidopterous pest species require a source of carbohydrate to increase their reproductive potential (Lukefahr and Martin 1964; Shorey 1963). This carbohydrate source can be supplied by nectars from various weed species (Collins 1984; Nuttycombe 1930) or, in the case of cotton, *(Gossypium hirsutum* L.) from the crop itself (Adjei-Maafo and Wilson 1983; Benschoter and Leal 1974; Jensen et al. 1974). Cotton nectars may provide an adult food source for pests of crops other than cotton. Burleigh (1972) noted that larval populations of the soybean looper (SBL), *Pseudoplusia includens* (Walker), in Louisiana were greater on soybean *[Glycine max* (L.) Merrill] in agroecosystems which included both cotton and soybean. Similar observations of SBL pest outbreaks on soybean from cotton production areas have been made from regions of south Georgia (Beach and Todd, unpublished data). Jensen et al. (1974) found that SBL moth pairs provided ten cotton blossoms per day produced as many eggs as moths provided 10% honey solutions. They advanced the hypothesis that SBL moth utilization of cotton nectars is the major reason for SBL outbreaks on soybean grown near cotton.

Traditional cultivars of cotton produce nectars from extrafloral nectaries located on leaf midribs, squares, and bolls as well as from floral nectaries (Tyler

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1908). New strains of nectariless cotton (cotton which lacks extrafloral nectaries) reduce the oviposition of several lepidopterous cotton pests compared to nectaried strains in field cage tests (Lukefahr et al. 1965; Lukefahr and Rhyne 1960). Use of nectariless cottons to reduce cotton pest populations may also reduce SBL pest populations on nearby soybean. We evaluated both nectaried and nectariless cotton strains as nectar sources for SBL moths.

MATERIALS AND METHODS

All tests were conducted at the Coastal Plain Experiment Station, Tifton, GA, during 1982, 1983, and 1984. The nectaried cotton variety 'GA 72-56' and the nectariless cotton variety 'Stoneville 825' were planted in parallel rows with 2 rows of nectaried cotton adjacent to 2 rows of nectariless cotton. Standard agricultural practices were used in all 3 years. The herbicides pendimethalin (Prowl® 1.1 kg AI/ha preplant) and fluometuron (Cotoran® 2.2 kg AI/ha preemergence) were used for weed control. Azinphos-methyl (Guthion® 1 kg AI/ha) and methomyl (Lannate® 0.4 kg AI/ha) were applied as needed for cotton insect control.

Approximately 10 - 14 days prior to testing, 1.8 $\times$ 1.8 $\times$ 3.7 m metal cage frames covered by Saran® screens (140 mesh/cm^2) equipped with metal zipper entrances were placed over 2 row wide sections of one of the cotton types. Cage sites were selected so that approximately equivalent plant populations would be present in all cages. At least 7 days prior to testing, cage interiors, caged plants, and the soil surface were thoroughly sprayed with 1% (AI) azinphos-methyl to remove all insects.

Preliminary tests in 1982 were conducted with each cage containing one row soybean and one row of either nectaried or nectariless cotton. However, because SBL moths readily oviposited onto cotton foliage in cages where soybean foliage was absent, soybean was not needed as an ovipositional substrate. In addition, moths showed no ovipositional preference between the two cotton types when released into a 1.8 $\times$ 1.8 $\times$ 3.7 m field cage containing equal amounts of both cotton types (mean $\pm$ SE of 2.4 $\pm$ 0.5 eggs/plant on nectaried cotton and 2.6 $\pm$ 0.8 eggs/plant on nectariless cotton). Thus, all subsequent tests were conducted with cages containing rows of cotton so that moths would have a larger number of plants on which to forage for nectars.

Test 1 was conducted during 1982 August, test 2 during 1983 Sept., and test 3 during 1984 Sept. Treatments consisted of cages containing nectaried cotton and cages containing nectariless cotton. Treatments were completely randomized with three cages per treatment in test 1, six cages per treatment in test 2, and seven cages per treatment in test 3.

In all tests, 10 male-female SBL moth pairs obtained from a laboratory colony were released into each cage. Unfed moths less than 24 hours old were released into cages and allowed seven days to feed on available nectar sources, mate, and oviposit on plants prior to sampling. Whole plants within cages were sampled and number of SBL eggs/plant recorded. Six plants/cage were sampled in test 1, with 10 plants/cage sampled in test 2 and test 3. The number of eggs/plant in the two treatments was compared within each of the three tests utilizing Student's T-test (P = 0.05).

RESULTS AND DISCUSSION

In tests 1 and 2, moths oviposited significantly more eggs/plant in nectaried cotton cages versus nectariless cotton cages (Table 1). Although numbers of eggs/plant were lower on both cotton strains in test 3 than in the two previous tests, the number of eggs/plant was significantly lower in nectariless cotton cages.

Table 1. Mean number of SBL eggs per plant 7 days after release of 10 male-female moth pairs per cage in field cages containing nectaried or nectariless cotton cultivars.

Date (Test)	No. cages per treatment	Number of eggs/plant*	
		Nectaried	Nectariless
Aug. 1982 (1)	3	15.4 ± 3.0	9.0 ± 2.1 *
Sept. 1983 (2)	6	14.4 ± 1.6	1.9 ± 0.3 *
Sept. 1984 (3)	7	4.8 ± 0.9	0.2 ± 0.1 *

*Mean ± SE. Pairs within a test followed by an asterisk are significant different, Student's T-test, $P = 0.05$.

Throughout these tests, SBL eggs were found on leaf undersides distributed in the upper half of plant canopies. No oviposition occurred on screening or frames.

These results indicate that SBL moths provided a nectaried cotton cultivar produced significantly more eggs than moths provided a nectariless cotton cultiver. Widespread grower usage of nectariless cotton strains to reduce oviposition by insect pests of cotton may reduce SBL moth oviposition on soybean in these regions. However, in natural situations, SBL moths would not be restricted to small areas and could forage over larger areas in search of nectar. Thus, other nearby sources of nectar may need to be considered in order to minimize SBL damage to soybean.

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