Proboscidea louisianica: An Unreported Host of *Heliothis virescens* (Lepidoptera: Noctuidae)[1]

M. L. Laster

United States Department of Agriculture
Agricultural Research Service
Southern Insect Management Laboratory
P. O. Box 346
Stoneville, MS 38776 USA

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ABSTRACT The tobacco budworm, *Heliothis virescens* (F.), was found to be strongly attracted to devil's claw, *Proboscidea louisianica* (Mill.) Thellung, plants. Of 160 larvae collected from the plants in 1992, 99.4% were *H. virescens*, 0.6% were *Helicoverpa zea* (Boddie), 42.5% died from infection by undetermined disease pathogens, and 11.3% *H. virescens* were parasitized by *Cardiochiles nigriceps* Vierick. Of 112 larvae collected from *P. louisianica* in 1994, 90.2% were *H. virescens*, 9.8% were *H. zea*, 59.8% died from infection by undetermined pathogens, and 26.7% *H. virescens* were parasitized by *C. nigriceps*. Feeding studies showed that *P. louisianica* was a nutritionally poor host for *H. virescens*, backcrosses of *H. subflexa* X *H. virescens*, and *H. zea;* when compared with their development on semisynthetic diet, development was much slower, pupal weights were lower, and survival rates were lower for larvae fed *P. louisianica* than for those fed semisynthetic diet. None of the backcross or *H. zea* and only one *H. virescens* female developed on *P. louisianica* survived to reproduce. This study reports *P. louisianica* as a new host record for *H. virescens*. Data show that *H. virescens* can survive and reproduce on this plant and that *P. louisianica* could be a major host of *H. virescens* in the Mississippi Delta if it were to become widespread.

KEY WORDS *Heliothis virescens, Helicoverpa zea, Proboscidae louisianica*, new host

The tobacco budworm, *Heliothis virescens* (F.), has long been recognized as an important pest of agricultural crops (Barber 1937). This species in its southerly distribution is active from March or April (depending on ambient temperatures) until frost, a period which extends beyond the growing season of any single host plant species (Snow and Brazzel 1965). Consequently, a succession of both wild and cultivated plants is necessary for the buildup and sustenance of damaging populations of this pest. Many plant species have been reported as hosts of the tobacco budworm (Chamberlin and Tenhet 1926, Barber 1937, Brazzel et al. 1953, Nuenzig 1963, Snow and Brazzel 1965, Payne and Polles 1974, Roach 1975, Laster et al. 1976, Stadelbacher 1979). Most of these reports are based on larvae collected from plants and give no evidence of the insect's reproductive capabilities on these plants.

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I, herein, describe the collection, growth, and reproduction of *H. virescens* on *Proboscidea louisianica* (Mill.) Thell., a previously unreported host.

Proboscidea louisianica is in the family Martyniaceae. It is native to the U.S., grows in row crops (Mercer et al. 1987), along stream banks, and in waste places, and is distributed from Georgia to northern Mexico, north to West Virginia, southern Ohio, southern Indiana, Illinois, and Minnesota (Fernald 1991). Its growth is spontaneous northward, and it is sometimes cultivated for its young pods which are used for pickles. Common names associated with plant include unicorn plant, devil's claw, ram's horn, and probiscis flower (Correll and Johnson 1970, Fernald 1991). The plant grows infrequently in the delta of Mississippi and occurs from April to frost. *Proboscidea louisianica* plants heavily infested with lepidopterous larvae were found growing in a soybean, *Glycine max* (L.) Merrill, field in Washington Co., MS, 22 September 1992. The field was located on the bank of the Bogue Phalia, a tributary of the Sunflower River which drains much of the delta area of Mississippi. *Proboscidea louisianica* plants were not found in other fields for some distance along both sides of the Bogue Phalia. Therefore, it is assumed that *P. louisianica* plants in this field originated from planting seed contaminated with *P. louisianica* seed.

Materials and Methods

The soybean field heavily infested with *P. louisianica* plants was about 15 ha in size. *Proboscidea louisianica* plants were flowering and fruiting and lepidopterous larvae were numerous on terminals, flowers, leaves, and fruit. *Cardiochiles nigriceps* Vierick adults, a hymenopterous parasite of some lepidopterous larvae, were numerous around the plants. Larvae (n = 160) were collected from the *P. louisianica* plants 23-25 September 1992. The field was fallowed during 1993, and *P. louisianica* plants were not allowed to grow. No agricultural crop was grown in the field in 1994 but 112 larvae were collected from *P. louisianica* plants from 20 July to 1 August. Larval species were determined using characters listed by Brazzel et al. (1953). Larvae collected during both years were placed individually in 30-ml clear plastic diet cups on a semisynthetic diet (Berger 1963). All larvae were held for pupation and the incidence of parasitism and disease was recorded. Because *C. nigriceps* do not survive in *Helicoverpa zea* (Boddie) (Lewis and Brazzel 1966), percent parasitism was determined for *H. virescens* only.

Because *P. louisianica* appeared to be an attractive host to *Heliothis*, feeding studies were initiated to determine growth, ratio and survival of *H. virescens*, backcross of the *H. subflexa* X *H. virescens,* and *Helicoverpa zea* when fed *P. louisianica* plant parts (leaves, terminals, flowers, buds, and young fruit) compared to the semisynthetic diet. Reproduction of *H. virescens* developed on *P. louisianica* was determined by mating emerging adults and verifying larval production. Plant parts were surface sterilized with a 1.0% sodium hypochlorite solution before feeding to reduce disease contamination. Fresh plant material was supplied every two days initially and daily as larvae grew larger. Larvae were held individually in 30-ml diet cups with the designated food source in an environmental chamber at 30°C and a photoperiod of 14:10 (L:D) h. Treatments were three insect types and two diets. The data were analyzed as a 3 X 2 factorial in a completely random design with four replications of 30 larvae for each treatment.

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Survival data were arcsine transformed and analyzed using ANOVA procedure (SAS Institute 1989).

Results and Discussion

Of 160 collected from *P. louisianica* in 1992, 99.4% were *H. virescens,* 0.6% were *H. zea*, 42.5% died from infection by undetermined disease pathogens, 46.3% survived to pupation, and 11.3% were parasitized by *C. nigriceps.* Of 112 larvae collected from *P. louisianica* in 1994 and placed on semisynthetic diet, 90.2% were *H. virescens,* 9.8% were *H. zea*, 59.8% died from infection by undetermined disease pathogens, 16.1% survived to pupation, and 26.7% were parasitized by *C. nigriceps.* Results from these larval collections indicate that *H. zea* moths were not as attracted as *H. virescens* moths to *P. louisianica* plants at the time collections were made because only 10 of 272 (one in 1992 and nine in 1994) larvae collected from the plants were *H. zea.* The high numbers of *C. nigriceps* observed around *P. louisianica* were a result of the high infestation of *H. virescens* larvae, as evidenced by the number of parasitized larvae. Plant attractancy to the backcross was not evaluated in this study.

There were no significant differences in the rate of development and survival of insect types within diets ($F = 2.04$; df = 2; $P = 0.14$) (Table 1). However, there was a significant difference in the rate of development and survival of insect types between diets ($F = 240.40$; df = 1; $P = 0.0001$). Survival on *P. louisianica* was 4.2, 7.5, and 0.8% for *H. virescens*, backcross, and *H. zea*, respectively, while the survival on semisynthetic diet was 55.8, 72.5, and 70.8% for *H. virescens*, backcross, and *H. zea*, respectively. There was no significant interaction between insects and diets ($F = 2.25$; df = 2; $P = 0.14$).

Extended larval development period, low pupal weights and low survival of all insect types fed on *P. louisianica* compared to those fed on semisynthetic diet (Table 1) indicate the *P. louisianica* may not be a nutritious host for these species. From a total of 120 larvae of each type fed on *P. louisianica,* two *H. virescens,* three backcross, and one *H. zea* emerged as adults. All backcross, one *H. virescens,* and *H. zea* adult died without mating. The one female *H. virescens* that mated deposited 585 eggs with 72% hatch.

Data from these studies show that *H. virescens* was strongly attracted to *P. louisianica* and *H. zea* was attracted to the plant to a lesser extent. If this plant should become widespread in the Mississippi Delta, it could be a major mid- and late-season host for *H. virescens* and possibly for *H. zea.*

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Table 1. Life stage duration and pupal weight of *H. virescens* (HV), Backcross of *H. subflexa* X *H. virescens* (BC) and *H. zea* (HZ) developed on *P. louisianica* and semisynthetic diet.

	Larval Stage (days)			Pupal Stage (days)			Pupal wt. (mg)		
				P. louisianica					
	$\bar{X}$	SD	Survival	$\bar{X}$	SD	n	$\bar{X}$	SD	Survival
HV	25.0 a	5.1	5 a	10.5	0.7	2 a	146 a	29	5 a
BC	21.7 a	3.4	9 a	11.3	2.5	3 a	169 a	40	9 a
HZ	22.0 a	–	1 a	11.0	–	1 a	165 a	–	1 a
				Semisynthetic diet					
HV	14.8 b	2.2	68 b	12.0	2.5	44 b	312 b	52	63 b
BC	13.9 b	2.1	81 b	13.6	3.7	58 b	320 b	46	75 b
HZ	14.3 b	1.8	91 b	10.6	1.7	82 b	386 b	63	84 b

Means followed by the same letter within a column are not significantly different at the 0.05 level of probability.

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