UF IFAS Extension UNIVERSITY of FLORIDA

EENY-151

Velvetbean Caterpillar, *Anticarsia gemmatalis* (Hübner) (Insecta: Lepidoptera: Noctuidae)[1]

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids, and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

The velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner), is the most damaging foliage feeding pest of soybean in Florida and the southeastern U.S. Infestations of the caterpillar occur in the late summer months and can cause great damage to soybean and other legume crops if not managed. The caterpillar is able to strip fields of soybean foliage in five to seven days (Wilkerson et al. 1986). Management of the velvetbean caterpillar can be achieved through use of natural enemies, insecticides, and various cultural practices.

Distribution

The velvetbean caterpillar is native to the tropical and subtropical areas of the Western Hemisphere and was first found in Florida in 1903 (Hinds and Osterberger 1931). The velvetbean caterpillar is a permanent inhabitant of tropical America and migrates northward into the southeastern United States every year. The caterpillar overwinters in the southern tip of Florida and moves north during the summer months. *Anticarsia gemmatalis* is an annual problem from June through September in Florida, Georgia, and Alabama. Infestations of velvetbean caterpillar are less severe in the western United States.

Figure 1. Adult velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner), with folded wings.
Credits: Lyle J. Buss, UF/IFAS

Figure 2. Last instar of a velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner).
Credits: Lyle J. Buss, UF/IFAS

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Life Cycle and Description

Velvetbean caterpillars are active and will spring from plants and wiggle rapidly when disturbed. Individuals less than one-half inch long "loop" when they crawl and are often misidentified as soybean loopers (Sprenkel 1999). The life cycle of the velvetbean caterpillar is completed in about four weeks during the summer but takes longer in the fall. The number of generations occurring depends on the dispersal and arrival of adults. Velvetbean caterpillar moths overwinter in southern Florida and begin moving northward in early summer. They arrive in north Florida by mid-August and are very abundant by September.

Egg

The egg of the velvetbean caterpillar is prominently ribbed, slightly oval, and white until just before hatching, when it turns pink. The egg is 1 mm to 2 mm (~1/16 –1/8 in) in diameter and flattened on the lower surface. Eggs are laid singly on the undersides of leaves, although in heavy infestations eggs may be found on the upper surfaces of leaves, on the petioles and even on the stems (Watson 1916). The egg stage usually lasts about three days when laid in August and September but requires a week or more when laid later in the fall.

Larvae

Newly hatched larvae feed on the shell of the egg they emerge from, leaving only the portion attached to the leaf. There are usually six instars of the velvetbean caterpillar. The larvae are extremely variable in coloration and markings throughout the instars. The majority have prominent dark longitudinal lines and narrow lines of white, yellow or pink. The larvae spend about two days in the first instar and grow from 2.5 mm (1/8 in) to 6 or 7 mm (~1/4 in) before molting. The head is light brown, rounded and bilobed. The body of the first instar velvetbean caterpillar is a uniform light green without any longitudinal stripes. The prolegs on abdominal segments 3 and 4 are smaller than those on segments 5 and 6.

In the second instar, the black border to the lateral line appears and the first pair of abdominal prolegs is about one-fourth as long as the third pair. The second pair of prolegs is one-half as long as the third. The second, third, fourth and fifth instars each last three to four days and the larva attains an average length of 9 mm (~1/2 in), 16 mm (~3/4 in), and 25 mm (1 in), respectively. The sixth instar lasts from five to 25 days and the caterpillar becomes gradually lengthened and can grow up to 48 mm (~ 2 in). In the prepupal stage the larvae shrink to a length of 25 mm (1 in) and turn mahogany brown with few if any longitudinal lines (Watson 1916).

Figure 3. Dark form of a velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner).
Credits: Lyle J. Buss, UF/IFAS

Figure 4. Green form of a velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner).
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Figure 5. Last instar of a velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner), newly molted.
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Pupa

The pupa of the velvetbean caterpillar is light green until it is about a day old, when it turns brown. The pupa is smooth and averages 18 to 20 mm (~3/4 in) in length and 4 to 6 mm (~1/8 in) in width. It lies directly underneath the soil surface at a depth of about 2 cm (~3/4 in) in loose, earthen cells. Lee and Johnson (1990) found that pupae are found on and below the soil but never on the plant. The majority (84.5%) of the pupae was found less than 2 cm (< 3/4 in) under the soil surface. The pupal stage usually lasts about seven days in late summer, and eleven days in early fall.

Adult

The adult moth is variable in patterning and coloration with a wingspan of 30 to 38 mm (~1¼–1½ in). The forewings of the velvetbean caterpillar moth vary from ash gray to light yellowish-brown to dark reddish brown. The hind wings are light brown with a row of light colored spots near the margin. A dark diagonal line extends across both sets of wings when the wings are fully extended.

Figure 6. Adult velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner), pinned.
Credits: Lyle J. Buss, UF/IFAS

Figure 7. Adult velvetbean caterpillar, *Anticarsia gemmatalis* (Hübner), with wings extended.
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Host Plants

Soybean (*Glycine max*) is the primary host of the velvetbean caterpillar, but it will feed on many other species including peanut, kudzu, velvetbean, horse beans, cotton, cowpea, coffeeweed, black locust, hairy indigo, lespedeza, sesbania, and white sweetclover (Waters and Barfield 1989). Legumes are the preferred host plant of the velvetbean caterpillar.

Damage

Velvetbean caterpillars cause damage by consuming foliage. Newly hatched larvae strip the leaf, beginning with the lower epidermis and mesophyll. They continue feeding until the end of the second instar, eating all the soft leaf material and leaving only the veins intact (Watson 1916). Eventually the velvetbean caterpillar consumes the entire leaf. Once the upper leaves and lower leaves have been consumed, foliage in the middle and lower canopy is consumed and complete defoliation may result (Roberts and Guillebeau 1999). The velvetbean caterpillar may also attack tender stems, buds, and small bean pods.

Natural Enemies

Several species of parasitoids attack the velvetbean caterpillar. The most predominant parasitoid of the velvetbean caterpillar is *Winthemia rufopicta* (Bigot) (Diptera: Tachinidae). Among the wasp parasitoids, *Euplectrus puttleri* Gordh (Hymenoptera: Eulophidae) and *Meteorus autographae* Muesebeck (Hymenoptera: Braconidae) have been observed parasitizing the velvetbean caterpillar (Daigle *et al*. 1990). Among the observed predators of the velvetbean caterpillar are the ground beetles, *Calosoma sayi* Dejean, *Calleida decora* (Fabricius) and *Poecilus chalcites* (Say) (all Coleoptera: Carabidae); the tiger beetles *Megacephala carolina* (Linnaeus) and *Megacephala virginica* (Linnaeus) (both Coleoptera: Carabidae); the striped earwig, *Labidura riparia* (Pallas) (Dermaptera: Labiduridae) and the red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae). Vertebrate predators such as birds, frogs, and rodents also act as natural enemies to the velvetbean caterpillar. Predation has been observed to be a significant factor in management of the velvetbean caterpillar. Lee et al. (1990) observed that predation was the principal mortality factor of the velvetbean caterpillar, accounting for 52.5 to 95.2% of mortality in field plots.

Several pathogens, mainly fungi, have been associated with the velvetbean caterpillar. The most important pathogens are the fungi *Nomurea rileyi* and *Entomophthora* sp. These pathogens contribute significantly to the natural control of the velvetbean caterpillar.

Management

Sampling

Direct observation of velvetbean caterpillars on the plant during the early stages of growth in the spring is the best sampling option due to the plant's small size. As the plant grows a sweep net can be used to sample larval populations. A net is swept through the plant canopy a given number of times and then the insects are counted. Adult moth populations can be sampled using blacklight and pheromone traps. Pheromone traps should be placed at canopy height and are

good indicators of velvetbean caterpillar moth presence. Once moths are detected, searching for eggs and larvae is the next step.

Insecticides

Insecticides are commonly used in the southeastern states to prevent velvetbean caterpillar damage. Studies indicate that the velvetbean caterpillar is more susceptible to insecticides when they are applied to insect resistant strains of soybean plants (Rose et al. 1988, Rowan et al. 1991). Resistant plants alone, however, do not serve to significantly reduce velvetbean caterpillar feeding on soybean (Beach and Todd 1988). A preventative treatment of insecticide provides the most promising results in controlling velvetbean caterpillar.

Cultural Techniques

The most effective cultural practice employed in the southeastern states is that of early planting and/or early maturing varieties of soybean plants. Early planting allows soybean plants to mature before the velvetbean caterpillar populations become high. McPherson and Bondari (1991) found that late season velvetbean caterpillars in Georgia were more abundant in soybeans planted in early June than those planted in early May. The use of trap crops (crops that attract the pest) planted near soybean is also effective in the southeastern states. Early-planted soybeans often serve as a trap crop for the adults. Tillage seems to have no significant effect on velvetbean caterpillar populations (Funderburk et al. 1990).

Host Plant Resistance

Partial resistance to the pest is present in some soybean varieties but is inadequate for complete protection. Resistant soybean plants do not decrease velvetbean caterpillar feeding. The only effect is slowed consumption which reduces weight gain and growth rates in the early stadia (Beach and Todd 1988).

Biological Control

Several pathogens have been shown to reduce the abundance of velvetbean caterpillar. Richter and Fuxa (1984) found that velvetbean caterpillars were susceptible to a nuclear polyhedrosis virus (NPV) and the bacterium *Bacillus thuringiensis* (*Bt*). The most effective parasitoid of the velvetbean caterpillar is the tachinid fly *Winthemia rufopicta* (Bigot).

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