WINTER SURVIVAL AND HOSTS OF THE VELVETBEAN CATERPILLAR IN FLORIDA[1]

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ABSTRACT

Velvetbean caterpillar larvae, *Anticarsia gemmatalis* Hübner, were collected throughout the winter at Homestead, Lake Worth, Ruskin, and Bartow, Florida. Year-round oviposition and larval development are indicated in South and Central Florida. Larvae were collected as late as March at Turtle Mound and Anclote in Central Florida, but were scarce, and the populations may not have survived the winter in these areas. No larvae were collected after Dec. or Jan. at Sanford, Yankeetown, and Gainesville, Florida; thus, velvetbean caterpillar populations did not appear to survive the winter in Northcentral Florida.

Velvetbean caterpillars were found most frequently on the following winter hosts: *Vigna luteola* (Jacq.), *Phaseolus lathyroides* L., *Dolichos lablab* L. (hyacinth bean), and *Pueraria lobata* (Willd.) (kudzu). They were also found on the following plants: *Indigofera hirusta* L., *Desmodium floridanum* Chapm., *Galactia spiciformis* Torr & Gray, *Rhynchosia minima* (L.), *Pachyrizus erosus* (L.), *Canavalia miritima* (Aub.), and *Phaseolus speciosus* H. B. K.

Extensive defoliation of soybeans each year in Southeastern United States by the velvetbean caterpillar (=VBC), *Anticarsia gemmatalis* Hübner, is a serious threat to soybean production in this region. Large quantities of insecticides are directed against this pest each year. Watson (1916) suggested that because the VBC lacked the ability to remain dormant, it did not survive the winter in the soybean production areas of North Florida. He suggested that the VBC reinvaded southeastern U.S. each year from overwintering refuges in South Florida and Cuba. Since little is known about the winter biology of the VBC, the objective of this research was to identify the hosts on which it lived during the winter and to determine how far north the VBC survived during the winter.

WINTER SURVIVAL

We sampled a variety of leguminous plants during the 4 winters 1971-75. Sample techniques remained consistent at each site but differed somewhat at different sites. At locations where host material was abundant, we sampled for 5 min with a D-vac®. At locations where host material was limited we sampled the available host with a D-vac® for 5 min or less.

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At locations where host plants were widely scattered we sampled with a sweepnet. Larvae were laboratory-reared to adults to confirm their identity as *A. gemmatalis*.

VBC were found on wild hosts during the winter 1971-72 near Bartow (Polk Co.), Lake Worth (Palm Beach Co.), Homestead (Dade Co.), and Key Largo (Monroe Co.). The next winter, 1972-73, the hosts at these locations were sampled at 2 week intervals. VBC were collected throughout the winter at Homestead and were absent in Bartow only in April (Table 1.). Larvae were collected at Lake Worth until the host was destroyed by road crews. Since VBC appeared to survive the winter in Central Florida, we extended the search to potential winter hosts in Central and Northcentral Florida during the winter, 1973-74. We collected VBC in: Gainesville (Alachua Co.), Anclote (Pasco Co.), Ruskin (Hillsborough Co.), Turtle Mound (Volusia Co.), and Sanford (Seminole Co.). In March 1974 we traveled through North Florida and southern Alabama (Franklin, Liberty, and Bay counties in Florida and Baldwin Co. in Alabama) and sampled the following hosts but found no VBC: *Vigna* sp., *Vicia* spp., *Galactia* spp., *Desmodium* spp., and kudzu (*Pueraria lobata* (Willd.)). During the winter, 1974-75, we sampled wild hosts at the following locations in peninsular Florida: Gainesville (Alachua Co.), Yankeetown (Levy Co.), Turtle Mound (Volusia Co.), Hudson and Anclote (Pasco Co.), Ruskin (Hillsborough Co.), Turtle Mound (Volusia Co.), Sanford (Seminole Co.), Bartow (Polk Co.), Lake Worth (Palm Beach Co.), Homestead (Dade Co.), and Key Largo (Monroe Co.). The number of VBC collected at these locations is summarized in Table 1.

VBC of all sizes were collected throughout the winter at Homestead (1972-73 and 1974-75), Lake Worth (1974-75) and Ruskin (1974-75). All sizes of larvae were also collected throughout the winter (1972-73 and 1974-75) at Bartow in spite of the nearly complete defoliation of the host. The VBC populations increased rapidly when the host recovered. We concluded that there was oviposition and larval development throughout the winter in these areas. At Turtle Mound and Anclote, larvae were collected as late as March, but larvae were scarce, so VBC populations may not have survived the winter in these areas. At Sanford, Yankeetown, and Gainesville, large larvae were collected as late as Dec. or Jan. These larvae had apparently survived from the fall oviposition and small larvae were not observed at these locations until May. We concluded that except during unusually mild winters, VBC did not survive the winter in these areas, and larvae were absent after Dec. or Jan. Watson (1932) concluded that because there were no killing frosts, VBC survived in Gainesville during the winter of 1931-32. The distribution of VBC populations surviving the winter in Florida is presented in Fig. 1.

In 1927 it was concluded that VBC did not survive in North Florida because its host plants were frost sensitive and the VBC could not lie dormant (Anonymous 1927). We observed a severe reduction in available hosts, but small patches of host survived the winter. VBC appear to be sensitive to direct exposure to cold temperatures. After a -3°C freeze in Nov. 1974, dead VBC were observed hanging from frost-killed host (*Indigofera hirsuta* L.), but some larvae may have survived in the leaf litter. G. R. Green (personal communication) found that few VBC moths emerged from larvae that were field-reared during the winter in North Florida. Watson (1916)

TABLE 1. NUMBERS OF VELVETBEAN CATERPILLARS COLLECTED ON 7 HOSTS AT 10 LOCATIONS IN FLORIDA DURING 3 WINTERS, 1972-75. HOSTS WERE SAMPLED AS FOLLOWS: a). HOST WAS SAMPLED WITH A D-VAC® FOR 5 MIN, b). AVAILABLE HOST WAS SAMPLED WITH A D-VAC® FOR 5 MIN OR LESS, c). AVAILABLE HOST WAS SAMPLED WITH A SWEEPNET.

Location	Host	Sample Type	Year	Sample data compiled by months							
				Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Gainesville	Kudzu[1]	b	72–73		4						
		b	73–74			1					
		b	74–75			1	0	0	0	1	2
	Alfalfa[2]	a	74–75				0	0	0	0	2
Yankeetown	Vigna[3]	b	74–75		5	0	0	0	0		
Hudson	Kudzu[1]	a	74–75		*	*		0	0	3	
Anclote	Vigna[3]	b	73–74		1			1			
		b	74–75		7	0	1	1	0		
Ruskin	Vigna[3]	b	73–74			2					
		b	74–75		19	2	2	6	1		
Turtle Mound	Vigna[3]	b	73–74			3		0			
		b	74–75		2	0	0	1	0		
Sanford	Kudzu[1]	b	74–75						0		
Sanford	Soybean[6]	a	74–75						0		
	Vigna[3]	b	73–74			1		*			
Bartow	Kudzu[1]	a	72–73	1	12	4	3	3	0	23	
		a	73–74		3	many		0			
		a	74–75		3	1	1	9	10	13	
Lake Worth	Vigna[3]	b	72–73	13	17	6	*	0	0	6	
		c	74–75		15	3	1	1	1	2	

TABLE 1. (Continued)

Location	Host	Sample Type	Year	Sample data compiled by months							
				Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Homestead	Kudzu[1]	b	72–73	8	*	*					
		b			*	*		2			
	Phasiolus[4]	c	72–73			130	63	21	74	23	
		c	74–75					1	2		
	Hyacinth-bean[5]	a	74–75		24	19	22	9	41	11	
	Soybean[6]	a	74–75				0	0	22	38	
Key Largo	Galactia[7]	b	72–73	12	19	2	4	0	0	0	
		b	74–75		8	0	0				

[1]*Pueraria lobata* (Willd.)
[2]*Medicago sativa* L.
[3]*Vigna luteola* (Jacq.)
[4]*Phaseolus lathyroides* L.
[5]*Dolichos lablab* L.
[6]*Glycine max* (L.)
[7]*Galactia spiciformis* Torr & Gray
*No host present

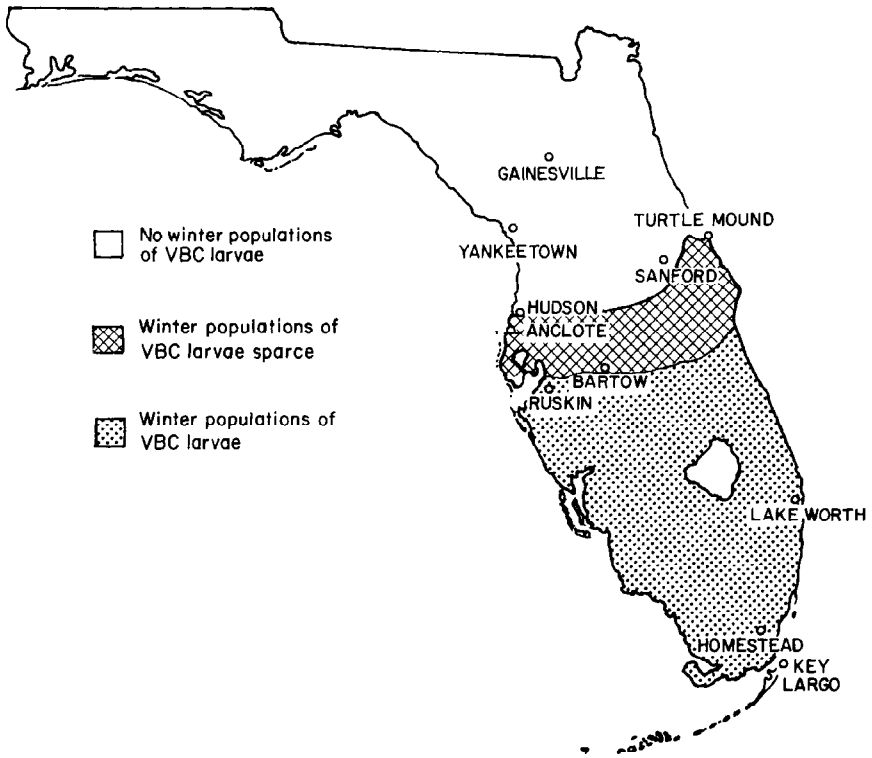

Fig. 1. Distribution of winter populations of velvetbean caterpillars (=VBC) in Florida.

reported a pupal period of 10-11 days for VBC pupating in Sept., but a pupal period of 47-48 days for larvae pupating in late Nov. He suggested that VBC could survive the winter as pupae with only a slight increase in pupal period. He also found that pupae survived when placed on the ground overnight during a -6°C freeze. Small numbers of pupae may survive some winters in Northcentral Florida.

In 1975, VBC moths apparently reinvaded North Florida in early May since small larvae were collected in Hudson and Gainesville in early May after extensive samples in March and April yielded no larvae. Watson (1916) reported that the first VBC moths were usually collected in light traps in North Florida in July and Aug. He recovered a moth in Gainesville as early as March 4 during an unusually mild winter (Watson 1932).

Winter Hosts

We collected VBC on the following host plants:

1. *Vigna luteola* (Jacq.). This small vine grows in ditches and other weedy situations throughout Florida. Vines in protected situations remained green throughout the winter. Single vines were usually scattered among other vegetation but extensive mats were located in Yankeetown, Anclote, Ruskin, and Turtle Mound. Since this plant was so widespread and abundant

and VBC were found on it so consistently, we believe it is the most important winter host of the VBC.

2. *Phaseolus lathyroides* L. This weed grows in orchards and along fence rows in South Florida. Large numbers of VBC were collected from this plant, so we believe it is also an important winter host of the VBC.

3. *Dolichos lablab* L. or hyacinth bean. This is a large coarse vine much like kudzu (*P. lobata*). It is sometimes planted as a ground cover or as a forage plant. It was an important overwintering host for *Heliothis* spp. in Georgia (Gross, Young, and Forbes 1975). In Homestead a 16 ha field of hyacinth bean supported large VBC populations in Dec. and Jan. 1974-75, and was severely defoliated. In March the foliage became stunted and chlorotic, but it recovered somewhat by April and May. VBC populations were present all winter. This plant is an excellent winter host for VBC, but it is not widely distributed in South Florida.

4. *Peuraria lobata* (Willd.) or kudzu. This is a well-known host of the VBC (Watson 1916, Ford et al. 1975). It has been widely planted as a ground cover and as a forage plant and grows wild in many areas. Over most of its range this vine was defoliated in winter, but in Central and South Florida it sometimes escaped defoliation. In Gainesville, 3 kudzu patches were observed: the first patch was on low ground and was completely killed back on the first night of freezing temperatures (-3°C); the second patch was on high ground and was severely defoliated, but some vines were protected under pine trees and survived the winter; the third patch was on a downtown construction site and survived both winters (1973-74, 1974-75) with minimal frost damage, and new foliage was present all winter. A large VBC was recovered at the construction site in January 1974 and 1975. At Hudson, kudzu remained completely defoliated until Feb. 1975. At Homestead, the kudzu remained defoliated from December until Feb. 1972-73 and 1974-75. At Bartow, the kudzu was severely defoliated in Dec. all 3 winters, but a few vines with old leaves survived at the top of the hill. In 1973 the kudzu was killed back a second time in March. At Bartow new foliage appeared within a few weeks following defoliation and VBC populations appeared to survive the winter. Kudzu does not appear to be a reliable winter host for VBC in most areas, but it appears to be very important as an early spring host on which VBC populations develop during their northward dispersal. Kudzu apparently supports them until they invade susceptible crops such as soybeans during the summer.

5. *Indigofera hirsuta* L. and 6. *Desmodium floridanum* Chapm. Large numbers of VBC were collected from these weeds in fall.

7. *Galactia spiciformis* Torr and Gray. Large numbers of VBC were collected from this vine on Key Largo, Fla., in Nov. and Dec. 1972 and 1974, but the populations disappeared in Jan. and Feb. even though the host remained in good condition all winter.

8. *Rhynchosia minima* (L.) and 9. *Pachyrizus erosus* (L.). VBC were found on these ornamental plants on Key Largo, Fla. in the fall.

10. *Canavalia maritima* (Aubl). This is a common vine in coastal regions of Florida. VBC were collected from this plant at Juno Beach and at other locations. Larvae of *Anticarsia repugnalis* (Hübner), a congener of the VBC, also occur on this plant. *C. maritima* does not seem to be an important VBC host.

11. *Phaseolus speciosus* H. B. K. Only 1 VBC was collected from this vine at Anclote in a D-vac sample.

In addition to the 11 hosts just listed, VBC are known to occur on the following leguminous crops: soybeans, peanuts, velvetbeans, cowpeas, and alfalfa. The first 4 crops are generally planted in spring and VBC populations reach economically damaging levels in July and August. In Gainesville, alfalfa remained in good condition all year but the VBC were not found on it during the winter. Ellison (1942) also reported that alfalfa remained in good condition all winter in Louisiana, but no VBC could be found on it during the winter. Ford et al. (1975) listed several additional hosts for VBC in other parts of the Western Hemisphere. Watson (1916) listed velvetbeans, kudzu, and Canavalia sp. as hosts of VBC in Florida.

All known VBC hosts are legumes but under some conditions VBC have been found on other plants. Douglas (1930) observed that VBC migrated from a defoliated soybean field to a nearby cotton field. Heppner and Habeck (1976) reported finding a VBC on *Polygonum punctatum* Elliot and suggested it migrated there from some other host in the vicinity. A VBC was observed molting on coffee weed, *Cassia obtusifolia* L., in a soybean field but it was not observed feeding on the weed. It is notable that all the important VBC hosts in Florida are non-native plants. This suggests that the VBC is also a non-native insect in Florida.

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