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SUITALBILITY OF POTENTIAL WILD HOSTS OF *DIAPHANIA* SPECIES IN SOUTHERN FLORIDA

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ABSTRACT

The cucurbit weed, *Melothria pendula* L., was found to be an important wild host of pickleworm, *Diaphania nitidalis* (Stoll) and the melonworm, *Diaphania hyalinata* (L.), in southern Florida. Laboratory feeding tests showed that foliage of another abundant cucurbit weed, *Momordica chorantia* L., was unfavorable for larval survival, yet both insect species were found on this plant in field samples. It is believed that pickleworm larvae can develop on *Momordica* flowers and fruit, while melonworms found on *Momordica* may constitute a host race or sibling species.

RESUMEN

El cucurbitáceo *Melothria pendula* L., se encontró ser un importante hospedero salvaje de *Diaphania nitidalis* (Stoll), y de *Diaphania hyalinata* (L), en el sur de la Florida. Pruebas de alimentación en el laboratorio indicaron que el follaje de otro cucurbitáceo más abundante, *Momordica chorantia* L., fue desfavorable para la sobrevivencia de las larvas, sin embargo, ambas especies de insecto fueron encontradas en muestras de campo de esta planta. Se cree que *D. nitidalis* puede desarrollarse en las flores y el fruto de *Momordica*, mientras que *D. hyalinata* encontrado en *Momardica*, pudiera constituir una raza de hospedero o una especie hermana.

The pickleworm, *Diaphania nitidalis* (Stoll), and the melonworm, *Diaphania hyalinata* (L.), are damaging pests of cucurbit vegetables in the southeastern U. S. Because both species and their host plants are susceptible to freezing temperatures and no evidence for diapause has been reported, it is generally agreed that in the U. S. they overwinter in Florida with the northernmost extent of their overwintering range dependent on the severity of the weather (Hayslip and Genung 1950, Dupree et al. 1955, Elsey 1982). Recently, a cooperative project between the U. S. Vegetable Laboratory, Charleston, S. C. and the University of Florida, AREC, Homestead, FL was initiated to study the population dynamics of pickleworm and melonworm in southern Florida with emphasis on their winter biology. One goal of this study was to better understand the role of wild cucurbits as hosts for *Diaphania* species. This portion of the study was focused on *Melothria pendula* L., creeping cucumber, and *Momordica chorantia* L., wild balsam apple, because these are the most abundant cucurbit weeds in Florida. Both species colonized fencerows, ditchbanks and abandoned fields. Their growth habits have been described by Orsenigo et al. (1977).

MATERIALS AND METHODS

Larval survival on the two weeds was determined as follows: Five newly-hatched larvae of pickleworm or melonworm from the stock colonies maintained at Charleston were placed between 2 leaf disks (ca. 7cm diam.) of either *Melothria* or *Momordica*. The disks were laid on a piece of moist filter paper inside a 100mm x 15mm plastic petri dish and the lid was secured with a strip of ParaFilm®. Ten dishes (dish=rep) were prepared for each larva-host combination, and larvae on 10 dishes of cucumber leaf disks were used as a check. Each test was continued until all larvae had either molted or died. In this test as in other laboratory tests, larvae were held at 27°C and 40-60% humidity. Data was analyzed by use of Tectronix® Plot 50 statistical program (Annon. 1979) for one-way analysis of variance and differences in means detected by the "simple contrasts" section of the program.

Survival and feeding success of F_1 larvae of melonworms collected from *Momordica* in Florida were compared to that of melonworms from the stock colony in two separate tests. In one test 10 newly-hatched larvae of each strain were placed on *Momordica* leaves in 100 x 15mm plastic dishes (3 dishes per strain). In another test, one fourth stage larva of each strain was placed in a dish with *Momordica* leaves (10 dishes per strain). In both tests, ability to feed on *Momordica* and survival were noted. Since the melonworm stock colony at Charleston might differ genetically from wild melonworms in southern Florida, we compared the ability of ten late-instar larvae collected from cucumber at Homestead, FL and ten collected from *Momordica* to feed on *Momordica* foliage in individual plastic dishes.

The ability of pickleworms to survive on *Momordica* flowers was tested by placing

three newly-hatched larvae in 60 x 15mm plastic dishes with either three *Momordica* flowers or 1 cucumber flower (approx. 3 times the size of *Momordica* flowers). Ten dishes were prepared for each plant species. Flowers were replaced daily and survival and development were evaluated after three days.

Larval preference or avoidance of *Melothria* and *Momordica* foliage was compared against cucumber and each other. Two 2.8cm leaf discs of different species were laid opposite one another on moist filter paper in 100mm x 15mm plastic petri dishes. Leaf discs were ca. 1.2cm apart and in this space were placed 10 newly-hatched pickleworm or melonworm larvae from stock colonies. Ten dishes were prepared for each trial, with two trials run for each comparison. After 24h the larvae on each leaf disc were counted. Chi square tests wre used to test the hypothesis of equal number of larvae on the respective entries.

Samples of *Melothria* and *Momordica* consisting of 12 to 100 linear meters of vine were collected each week at Homestead (2/83-10/84) and every two weeks at Key Largo (2/83-8/84), Clewiston (2/83-8/84), and South Bay (10/83-8/84). The amount of vine sampled varied depending on its availability. Vines were taken to the laboratory and leaves, flowers and fruit were checked for *Diaphania* larvae. To determine the number of *Melothria* fruits necessary for pickleworm larval development, larvae were reared on fruits in the laboratory at 25°C. The results obtained were used to estimate the number of pickleworm larvae per sample using this formula:

$$\text{Est. larvae/sample} = \text{larvae present} + \frac{\text{Fruits consumed}}{\text{Fruits consumed/larva}}.$$

Results and Discussion

Laboratory tests using insects from the stock culture indicated that *Melothria* was a more suitable host than *Momordica* for both pickleworm and melonworm. Newly-hatched larvae of both species survived well on *Melothria* foliage although their early development was somewhat slower compared to development on cucumber (Table 1). Pickleworms fed readily and consumed an average of 3.71 ± 0.25 SD *Melothria* fruits per larva. This figure is used as a constant in the denominator for calculating pickleworm density in *Melothria* samples from the field. Newly-hatched larvae placed on Momordica would not feed and they died (Table 1). Both species avoided *Momordica* in larval preference tests, favoring either cucumber or *Melothria* (Table 2). Pickleworm larvae favored cucumber over *Melothria* but melonworms appeared to have no preference between these hosts.

Field data (Table 3) verified the suitability of *Melothria* as a host for both species. Pickleworms and melonworms were found on this weed at all sampling locations. Both moth species, particularly melonworm, were found on *Momordica* (Table 3) despite the negative results in the laboratory. However, we found that newly-hatched pickleworm larvae, while shunning foliage, could survive and slowly develop on *Momordica* flowers although not as well as on cucumber flowers. After 3 days, survival on *Momordica* flowers was 53.3% ± 23.3 SD with 33.3% molting to the second stage. On cucumber flowers, survival was 93.3 ± 21.1 SD with 92.9% molting. We further observed that pickleworm larvae could feed and develop on fruits of *Momordica*. These facts would explain the occasional pickleworm found on *Momordica*, but does not explain the presence of the melonworm which is a foliage feeder and does poorly on flowers and fruit. However, we discovered that progeny of melonworms collected from *Momordica* ate *Momordica* leaves and developed normally while larvae from the Charleston stock colony and those collected from cultivated cucurbits at Homestead would not feed. Ten fourth-stage larvae, progeny of melonworm collected from *Momordica*, all survived and

TABLE 1. SURVIVAL AND 1ST STADIUM DURATION OF 1ST INSTAR PICKLEWORM AND MELONWORM LARVAE.

Host	% survival		Days to first molt	
	Pickleworm	Melonworm	Pickleworm	Melonworm
Cucumber	84.0a	94.0a	2.1a	2.2a
Melothria	78.0a	90.0a	3.7b	2.8b
Momordica	0b	0b	—	—

[a]Means followed by the same letter are not significantly different ($P < 0.05$).

TABLE 2. PERCENT DISTRIBUTION OF *Diaphania* LARVAE ON LEAF DISCS IN PAIRED COMPARISONS OF CUCUMBER, *Melothria* AND *Momordica*.[a]

	% of larvae found on:[b]		
	Cucumber	*Melothria*	*Momordica*
Pickleworm	83.3	16.7	—
	99.2	—	.8
	—	100	0
Melonworm	45.8	54.2	—
	95.0	—	5.0
	—	97.5	2.5

[a]Average of two tests.
[b]χ^2sig. difference at .01 except melonworm comparison of cucumber vs. *Melothria* which was N.S.

TABLE 3. NUMBER OF PICKLEWORM AND MELONWORM LARVA ON *Melothria pendula* AND *Momordica chorantia* AT 4 LOCATIONS IN SOUTHERN FLORIDA.

	No. of Samples	Total number of larvae	
		Pickleworm[a]	Melonworm
Melothria	156	241	44
Momordica	134	4	54

[a]Estimated number of larvae/sample = larvae/sample + $\frac{\text{No of fruits damaged}}{3.71}$.

pupated when fed *Momordica* while stock colony larvae either would not feed or fed sparingly and died. Newly-hatched larvae from the *Momordica* strain were also able to establish themselves on *Momordica* with 97% of the 30 larvae placed on *Momordica* foliage surviving to the 2nd stage while all of the stock colony larvae died before molting. This striking difference in feeding behavior may indicate the rare evolution of a sympatric host race or sibling species.

Field and laboratory results indicate that *Melothria* is an important alternate host of both pickleworm and melonworm while *Momordica* is much less important for pickleworm. More work is needed to elucidate the genetic nature of melonworm adaption to *Momordica*.

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PREDICTION OF LARVAL INFESTATION IN PASTURE GRASSES BY *SPODOPTERA FRUGIPERDA* (LEPIDOPTERA: NOCTUIDAE FROM ESTIMATES OF ADULT ABUNDANCE

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ABSTRACT

The seasonal fluctuations of adult *Spodoptera frugiperda* (J. E. Smith) populations were monitored for a 75-week period in pastures on a cattle farm in French Guiana. Adults were monitored using blacklight traps and sticky traps baited with (Z)-9-dodecen-1-ol acetate, an attractant for *S. frugiperda* males. Larval populations were sampled weekly using sweep nets. Significant correlations were obtained between adult captures for both trapping methods used and relative larval abundance. The highest correlation coefficient was obtained between weekly captures of moths in sticky traps and relative larval abundance one week later. The highest populations of moths and larvae were observed during the rainy seasons, and the lowest during the dry seasons. Results obtained in these experiments demonstrate that it is possible to use sticky traps baited with (Z)-9-dodecen-1-ol acetate in a system to warn growers of possible significant infestations of *S. frugiperda* larvae in pastures in French Guiana.

RESUMEN

Las fluctuaciones estacionales de las poblaciones adultas de *Spodoptera frugiperda* fueron seguidas durante 75 semanas en las pastos de una finca de cría de ganado en Guayana Francesa. Los adultos fueron seguidos por medio de trampas de luz negra y trampas pegajosas cebadas con (Z)-9-dodecen-1-ol acetato, un atrayente para los machos de *S. frugiperda*. Se recogieron muestras de poblaciones larvales cada semana, empleando el método de la red de siega. Correlaciones significativas fueron obtenidas entre las capturas de adultos por ambas trampas y la abundancia relativa de larvas. El coeficiente de correlación más elevado fue obtenido al comparar las capturas semanales de los adultos con trampas pegajosas y la abundancia relativa de larvas una semana más