OVIPOSITION PREFERENCE OF *SPODOPTERA LATIFASCIA* (LEPIDOPTERA: NOCTUIDAE) FOR SORGHUM, MAIZE AND NON-CROP VEGETATION

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ABSTRACT

Oviposition preferences of *Spodoptera latifascia* (Walker) (Lepidoptera: Noctuidae) for sorghum [*Sorghum bicolor* (L.) Moench (Poaceae)], maize [*Zea mays* (L.) (Poaceae)], and various non-crop species were examined in field cage experiments. A higher percentage (pooled means) of the total number of eggs per plant were laid on *Amaranthus* sp. (probably *A. hybridus* L. or *A. viridis* L.) (Amaranthaceae) 24%, maize 32%, and *Ixophorus unisetus* (Presl.) Schlecht (Poaceae) 26%, than on *Ipomoea* sp. [(probably *I. purpurea* (L.) Jacq.] (Convolvulacea) 2%, *Melampodium divaricatum* (Rich. ex pers.) Dc. (Asteraceae) 6%, *Portulaca oleracea* L. (Portulacaceae) 7%, and sorghum 3%. Only maize had a significantly higher percentage of the total number of eggs laid per plant than the other plant species in one of two experiments. Plant growth stage (seedling vs. older) did not appear to influence oviposition on any of the plant species tested. Moths exhibited a wide host oviposition range in our cage experiments. In contrast, eggs were collected only from *Amaranthus* sp., *I. unisetus*, and maize in the field in southern Honduras, suggesting that *S. latifascia* oviposition response in nature may be somewhat restricted to certain non-crop species and maize. Our data support results from previous investigations revealing the potential benefits of non-crop host plants in reducing damage by *S. latifascia* to sorghum and maize in intercropped production fields during the early growing season in southern Honduras.

Key Words: *Spodoptera latifascia*, oviposition preference, sorghum, maize, non-crop plants

RESUMEN

Las preferencias de ovoposición de *Spodoptera latisfacia* (Walker) (Lepidoptera: Noctuidae) en sorgo [(*Sorghum bicolor* (L) Moench (Poaceae)], maíz [*Zea mays* (L) Poaceae] y varias especies de plantas no cultivadas fueron examinadas en experimentos de campo en jaulas. Un porcentaje más alto del número total de huevos por planta fue puesto en *Amaranthus* sp. (probablemente *A. hybridus* L. o *A. viridis* L.)(Amaranthaceae), maiz, e *Ixophorus unisetus* (Presl.) Schlecht (Poaceae), con medias del 24%, 32% y 26%, respectivamente. En *Ipomoea* sp. [probablemente *I. purpurea* (L.) Jack.]

(Convolvulaceae), la media fue del 2%, en *Melampodium divaricatum* (Rich ex pers.) Dc. (Asteraceae) del 6%, en *Portulaca oleracea* L. (Portulacaceae) del 7%, y en sorgo del 3%. Sólo en uno de los dos experimentos el maiz tuvo un porcentaje de huevos significativamente más alto. El estado de crecimiento (plántula o planta más vieja) no pareció influenciar la ovoposición en ninguna de las especies probadas. Las polillas exhibieron un amplio rango de hospedantes de ovoposición en los experimentos en jaulas. Los huevos fueron sólo colectados de *Amaranthus* sp., *I. insertus*, y maiz en el campo en el sur de Honduras, sugiriendo que la respuesta de ovoposicion de *S. latisfacia* en la naturaleza debe estar restringida a ciertas especies no cultivadas y al maiz. Los datos apoyan los resultados de investigaciones previas revelando el potencial benenficioso de las plantas hospedantes no cultivadas en la reducción del daño al sorgo y al maiz en la producción de campos intercosechados durante la estación temprana en el sur de Honduras.

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The armyworm, *Spodoptera latifascia* (Walker), is an important insect pest of sorghum [*Sorghum bicolor* (L.) Moench (Poaceae)] and maize [*Zea mays* (L.) (Poaceae)] seedlings in southern Honduras (Pitre 1988). This species, along with others in an insect pest complex including *S. frugiperda* (J. E. Smith) and *Metaponpneumata rogenhoferi* (Moschler), can cause sorghum and maize seedling losses as high as 27% during the first three weeks of crop growth (Portillo et al. 1994).

S. latifascia is a polyphagous species, the larvae of which are reported to feed on and cause economic damage to cowpea, soybean, cotton, and young eucalyptus trees in Brazil (Silva & Magalhaes 1980, Santos et al. 1980, Habib et al. 1983) and many other crops in Honduras (Howell 1980, Passoa 1983) and Barbados (Ingram 1978). Population dynamics studies of the langosta complex in southern Honduras revealed that *S. latifascia* and *M. rogenhoferi* caused damage to sorghum and maize early in the growing season; however, larvae were not found on sorghum or maize at other times (Portillo et al. 1991). Results from the same study showed that *S. latifascia* larvae occurred in higher numbers on sorghum and maize in areas with weed control than in areas with weeds.

The reasons for the sudden appearance and disappearance of *S. latifascia* and *M. rogenhoferi* from intercropped sorghum and maize fields in southern Honduras have not been elucidated. There is insufficient evidence to suggest that predators and parasitoids are responsible for the sudden disappearance of these two species (Portillo 1991). Laboratory feeding performance studies with *S. latifascia* indicated that some broadleaf non-crop species common to southern Honduras were better hosts than sorghum or maize (Portillo 1991, 1994) and, furthermore, plant host phenology (seedling versus older plants) significantly affected its biology. Laboratory studies showed that non-crop plants were preferred by *S. latifascia* immatures over sorghum and maize, and it was suggested that non-crop vegetation, particularly broadleaf weeds, in production fields may reduce crop damage by attracting larvae of this insect pest and serving as hosts (Portillo et al. 1996). However, knowledge of the relative oviposition preferences of this insect is lacking.

The objective of this study was to determine oviposition preferences of *S. latifascia* for seedling (representing plant growth stages at the beginning of the season, e.g., when *S. latifascia* population peaks) and older plants (representing advanced plant growth stages as they would appear later in the growing season, e.g., when *S. latifascia* population declines) of sorghum, maize, and five common non-crop plant species present during the growing season in southern Honduras.

MATERIALS AND METHODS

Adult Fecundity and Mortality

Information on the reproductive behavior of *S. latifascia* females is limited or un-available. Therefore, a preliminary study was conducted to obtain data on oviposition patterns and adult mortality. This information served as a guide for selection of moths of specific ages to be used in oviposition preference experiments.

A laboratory colony was initiated with 208 third- and fourth-instar larvae col-lected in a maize field at El Conchal on the coastal plains (coordinates ca. 13°31' N, 87°43' W, at sea level) in the Department of Valle in southern Honduras in early to mid-May, 1990. Newly emerged females (n=25) from the first laboratory generation were placed individually in paper bags (13 × 8 × 27.3 cm) containing a single one to two-day-old male and a honey-water food source (Portillo & Pitre 1992). Moths were held at 24±5°C and 12:12 [L:D] photoperiod. Males were removed after 3 nights. Eggs laid (masses) in the bags were counted every 2 to 3 days, at which time the female was provided with a new bag and fresh food.

Cage Experiments

Four experiments were conducted in field cages during 1991 and 1992 at Zamo-rano, Honduras. Plant species common to southern Honduras, where *S. latifascia* lar-vae had been collected, were selected for the experiments. These species were also present in the area around Zamorano. Plant species tested included sorghum, maize, *Ixophorus unisetus* (Presl.) Schlecht (Poaceae) (the most prevalent grass species on the coastal plains in southern Honduras), and four common non-crop broadleaf spe-cies that commonly inhabit production fields in southern Honduras. The broadleaf species included *Amaranthus* sp. (probably *A. hybridus* L. or *A. viridis* L.) (Amaran-thaceae), *Portulaca oleracea* L. (Portulacaceae), *Ipomoea* sp. [(probably *I. purpurea* (L.) Jacq.] (Convolvulaceae), and *Melampodium divaricatum* (Rich. ex pers.) Dc. (Asteraceae). Two phenological growth stages, seedlings (2-4 leaves unfolded for grass plants and 2-6 true leaves or leaf pairs unfolded for broadleaf plants which repre-sented the growth stage of crops and/or surrounding non-crop vegetation 1-3 weeks after crops were planted, as well as the time when the *S. latifascia* population peaked) and older plants (5-8 leaves unfolded for grass plants and from 9 true leaves or leaf pairs unfolded to full bloom for broadleaf plants which represented the growth stage of crops and/or surrounding non-crop vegetation 4-6 weeks after crops were planted, and the time when the *S. latifascia* population declined) were included for each plant species in experiments 1 and 2 (1991). Because seedlings of some species were not available when plants were collected in the field, only one stage (4-6 leaves unfolded for grass plants and 6-9 true leaves or leaf pairs unfolded for broadleaf plants) was in-cluded in experiments 3 and 4 (1992). To obtain plants at the desired test growth stages, non-crop plant species in earlier growth stages than those desired for testing were transplanted from the field into pots (11.5 cm diam and 25.5 cm height) and were held in wet soil in a shade house for 2-4 days until they recovered from the stress caused by transplanting. Sorghum and maize plants were obtained from staggered plantings of landrace sorghum and maize (seeds obtained from farmers in southern Honduras) in pots in the greenhouse. In Experiments 1 and 2, the test design was a factorial with randomized complete blocks; factors included plant species (n=7) and plant growth stages (n=2). In Experiments 3 and 4 the test design included only plant species as treatments in a randomized complete block. A total of six (Experiments 1 and 2) and five (Experiments 3 and 4) plants were included per test species and growth stage in each of 6 and 5 replications in Experiments 1 and 2, and Experiments

3 and 4, respectively. Potted plants were placed inside $1.8 \times 1.8 \times 1.8$ m saran screen cages (Chicopee Mfg. Co., Gainesville, GA 30503) set up in the field. Plants of each species were placed in rows in a randomized complete block design, with growth stages (Experiments 1 and 2) of each species placed side-by-side (Fig. 1).

The insect test colony for Experiments 1 and 2 was initiated with 295 third- and fourth-instar larvae collected from a maize field near El Conchal in late May, 1991. Second laboratory generation adults from this field population were used in the experiment. A second colony was initiated with 194 third-and fourth-instar larvae collected in early June, 1992 from a maize field in the same location as in 1991, and second laboratory generation adults of this colony were used for Experiments 3 and 4.

Newly emerged moths were placed in paper bags as described above, with each bag containing two females and one male. Males were allowed to remain in the bags for three nights. A mating success of 84% was achieved using this technique (as observed in the adult fecundity and mortality study described above). Bags were held at $23\pm6°C$ (Experiments 1 and 2) and $22\pm6°C$ (Experiments 3 and 4) and 12:12 [L:D] photoperiod until females were seven-to-eight days old. Females were released into the saran screen cages in the field for oviposition on the test plants between 1600-1700 hours. Three replications (1 cage each) were used in Experiments 1 and 2. Fifteen seven-day-old females were released into each of three replications in Experiment 1 and 28 eight-day-old females in each of three replications in Experiment 2. A 30% honeywater food source was made available to the moths by placing cotton balls soaked with the honey solution inside a 30 ml plastic cup. Cups were hung at a height of about 1 m above the soil on the inside walls of the cages (2 per side) by hooking the cups to the screen with paper clips. Females remained in the cages for 3 nights after which time the cages were opened to flush the moths. Plants were removed from the cages and searched for egg masses. Leaves with egg masses were removed from the plants and the number of eggs per mass were counted under a stereoscope in the laboratory. Moths were released in Experiment 1 on 15 July. On 19 July plants used in the first experiment were returned to the cages (using test design described above) and moths were released into the cages for Experiment 2. Moth ovipositional behavior bias due to possible chemical markers on previously used test plants may have been minimal because of the removal of egg masses along with the leaves on which they were laid. Ambient conditions for both experiments were $23\pm7°C$ and 12:12 [L:D] photoperiod.

In Experiment 3, two replications were included in one cage in which 75 seven-day-old females were released on 31 July and confined for 3 nights. In Experiment 4 three replications were conducted (one per cage) and 38 seven-day-old females were released in each cage on 3 August. Eggs in Experiment 4 had to be removed after two nights instead of three to avoid losing the replications to rain expected on the third night. In Experiment 1, moths laid a considerable number of egg masses on the cage screen. Therefore, to compensate for egg masses laid on the screen instead of on the plants, the number of moths released per cage was increased in the following experiments. Plants and experimental procedures utilized were as described for Experiments 1 and 2. Experiments were conducted at $22\pm7°C$ and 12:12 [L:D] photoperiod. The average percentage of the total number of eggs laid per plant on each plant species and growth stage was analyzed by ANOVA and means were separated by Tukey's HSD Method (SAS Institute 1985). Percent data were subjected to arcsin square root transformation before analysis (Steel & Torrie 1980).

Field Observations

Crop and non-crop plants in and around intercropped sorghum and maize production fields on the coastal plains in southern Honduras were sampled for *S. latifascia*
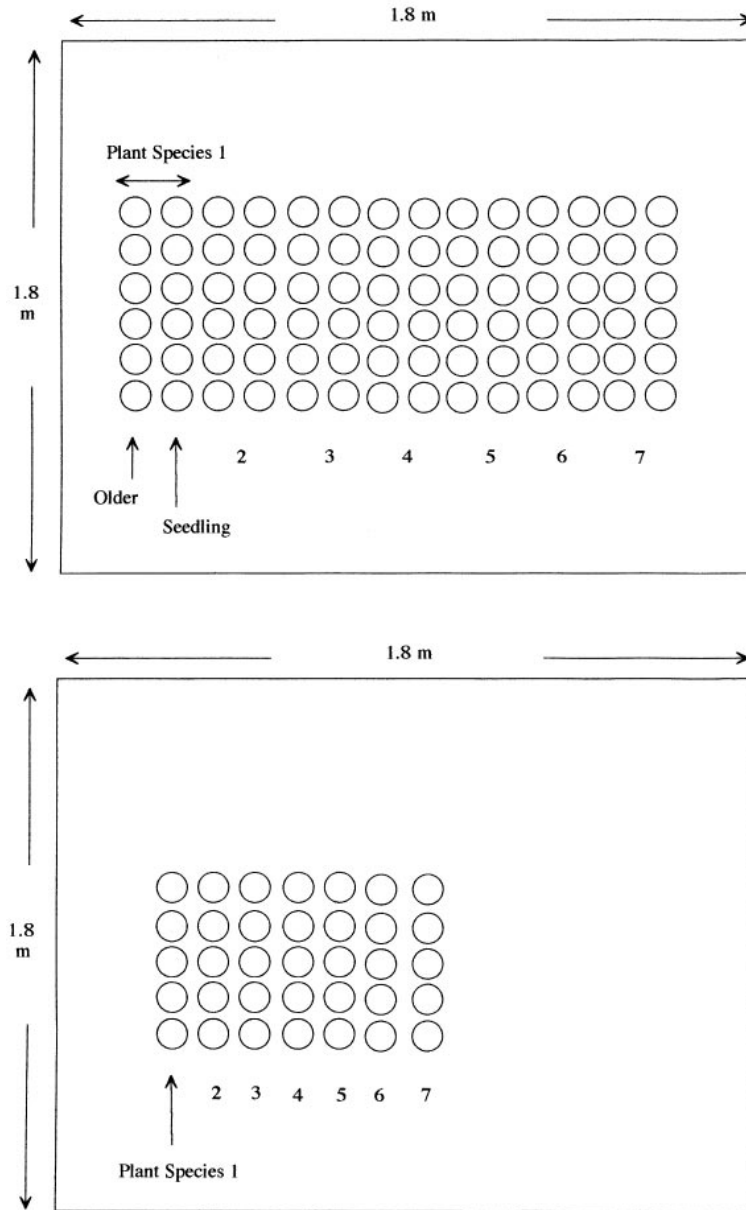
Fig. 1. Field cage experimental layout of treatments (plant species/growth stage) in oviposition preference experiments with *Spodoptera latifascia*. Panamerican School of Agriculture, Zamorano, Honduras. Experiments 1 and 2 (top), Experiments 3 and 4 (bottom). Rows with the different plant species were randomized in each replication.

eggs in 1990, 1991, and 1992. Samples were not taken in the foothills (same coordinates as the plains but 52 m above sea level) because the density of non-crop species was too low for comparisons to be made among species at the time this insect was a problem in production fields. Plant species selected for the cage experiments were given most attention in the sampling process. One hundred plants of each of the test species were examined for *S. latifascia* egg masses in three fields during a three-week period in June 1990. In 1991, 200 plants of each test species were sampled in each of four fields during a 5-day period in mid-to-late May (May 17-21). In 1992, one hundred plants of each test species were examined in each of four fields in June (June 9-11). Egg masses collected were placed in 29.6 ml plastic cups filled with 2 ml of agar in the bottom and transported to the laboratory. The egg masses then were placed in petri dishes (1 egg mass per dish) with a damp paper towel in the bottom and identified by source of collection. Neonate larvae were fed pinto bean artificial diet (Perkins 1979) until attaining a size appropriate for species identification. Statistical analysis was not performed on the data because of unequal densities of plant species in the crop production areas. Thus, data are presented as collected for discussion.

<center>RESULTS</center>

Adult Fecundity and Mortality

In the preliminary study four females did not lay fertile eggs, therefore data from these moths were excluded. An oviposition peak occurred on the seventh day after moth emergence (Table 1). After a reduction in the number of eggs laid per moth from days 9 to 13 following emergence, a second oviposition peak was observed 16 days after moth emergence followed by a rapid decline in fecundity (Table 1). In studies with a related species, *S. frugiperda* (J. E. Smith), Simmons & Rogers (1994) collected data that showed two fecundity peaks (about 4 and 8 days after moth emergence) throughout the lifespan of female moths, with a sharp decline after the second peak. In our study moth mortality began and rapidly increased after the second oviposition peak. The second peak in oviposition observed in our study, and in fecundity observed by

TABLE 1. FECUNDITY AND MORTALITY OF *SPODOPTERA LATIFASCIA* FEMALES IN THE LABORATORY.

Days After Moth Emergence	No. Eggs Laid/Moth (Mean±SD)	n	% Mortality
4	136±349	21	0
7	504±1175	21	0
9	324±489	21	0
11	310±485	21	0
13	309±372	21	0
16	807±698	19	24
18	272±340	12	52
20	341±397	8	67
23	324±261	7	81
25	20±37	5	100

Simmons & Rogers (1994), may be viewed as a result of a survival instinct through which aging moths invest their last resources into reproduction. Female moths in our study had an average longevity of 22±3 days. Habib et al. (1983) reported that *S. latifascia* female moths held at 27±5°C had average (range) longevities of 13±1 (6-19) and 12±1 (10-22) days when larvae were reared on cotton and soybean, respectively. The lower average temperature (24±5°C) at which moths were held in our study, and a different larval host may have caused an increase in their average longevity. A significant increase in *Heliothis virescens* (F.) female moth longevity with a decrease in temperature, moths living as long as 37±3 days when held at 15.6°C, was reported by Henneberry & Clayton (1991). In addition to this temperature effect, Nadgauda & Pitre (1983) reported significant differences in *H. virescens* female moth longevity when larvae of this insect were reared on soybean, cotton or artificial diet. Based on these preliminary results of *S. latifascia* female moth fecundity and longevity, 7 to 8 day-old moths were selected for the oviposition preference experiments.

Cage and Field Oviposition Preference

S. latifascia moths laid eggs on only maize, *Amaranthus* sp., and *I. unisetus* in Experiments 1 and 2 (Table 2). In contrast, eggs were laid on all test plant species in Experiments 3 and 4. A greater percentage of the total number of eggs were laid on maize and *I. unisetus* than on the other test host plants. In Experiments 1 and 2, there was no significant interaction between plant species and plant growth stage (F=0.67; df=6; P=0.68 and F=0.57; df=6; P=0.75, respectively), and plant growth stage did not influence the oviposition response of the moths (F=0.15; df=1; P=0.70 and F=0.59; df=1; P=0.45). The ovipositional response of *S. latifascia* showed only a marginally significant difference among the plant species in Experiment 1 (F=2.44; df=6; P=0.053) but was significantly different in Experiment 2 (F=3.21; df=6; P=0.0169); however, all plant hosts were similarly attractive for oviposition in Experiment 3 (F=0.56; df=6; P=0.75) and Experiment 4 (F=0.54; df=6; P=0.77).

A greater number of plants and fewer moths were used per replication in Experiments 1 and 2 (84 plants and 15-28 moths) than in Experiments 3 and 4 (35 plants and 38 moths), thus there were fewer moths per plant in Experiments 1 and 2. A reduction in the number of moths may have resulted in limited oviposition on the less attractive hosts in Experiments 1 and 2. On the other hand, plant species not receiving eggs in Experiments 1 and 2 may have had eggs oviposited by chance in Experiments 3 and 4, since the number of moths per plant was increased. Egg masses laid on the cage screen were not considered in the analysis.

In sampling for *S. latifascia* eggs in the field in 1990, four egg masses were found on *Amaranthus* sp., two on maize, and one on *I. unisetus*. In 1991, one egg mass was found on *I. unisetus*, five on maize, and none on other broadleaf species. *S. latifascia* egg masses were not found on any of the plant species searched in 1992.

DISCUSSION

Previous larval feeding preference studies indicated that the same broadleaf species tested in this study were preferred by *S. latifascia* larvae over sorghum and maize (Portillo et al. 1996). Furthermore, larval developmental performance studies indicated that the same broadleaf species were suitable hosts for *S. latifascia* development (Portillo 1994). Sorghum, maize, and the grass *I. unisetus* were viewed as poor hosts and/or did not sustain *S. latifascia* larval growth, development, or ultimately reproduction (Portillo 1994). However, in the present study *S. latifascia* moths showed

TABLE 2. OVIPOSITION PREFERENCE OF SPODOPTERA LATIFASCIA ON PLANT SPECIES OF DIFFERENT AGES IN CAGE EXPERIMENTS.

Plant Species	Plant Age	Plant Height (cm)[1]		Mean Percent of Total No. Eggs/Plant (Mean No. Eggs/Plant±SEM)		
		Exp. 1 & 2	Exp. 3 & 4	Exp. 1	Exp. 2	Exp. 3 & 4[7]
Amaranthus sp.	Seedling[2]	8±1	—[6]	12 (67±67) a[5]	6 (52±52) ab	—[6]
	Older[3]	66±9	18±3[4]	0 (0±0) a	12 (110±110) ab	9 (57±52) a
Portulaca oleracea	Seedling	5±1	—	0 (0±0) a	0 (0±0) b	—
	Older	9±1	19±2	0 (0±0) a	0 (0±0) b	12 (54±24) a
Ipomoea sp.	Seedling	5±1	—	0 (0±0) a	0 (0±0) b	—
	Older	5±3	23±10	0 (0±0) a	0 (0±0) b	3 (15±9) a
Melampodium divaricatum	Seedling	6±1	—	0 (0±0) a	0 (0±0) b	—
	Older	38±1	15±3	0 (0±0) a	0 (0±0) b	8 (40±20) a
Sorghum	Seedling	8±1	—	0 (0±0) a	0 (0±0) b	—
	Older	74±4	42±11	0 (0±0) a	0 (0±0) b	9 (34±22) a
Maize	Seedling	20±2	—	6 (35±35) a	51 (79±44) a	—
	Older	73±9	70±10	35 (104±76) a	18 (84±52) a	33 (80±21) a
Ixophorus unisetus	Seedling	14±3	—	25 (40±40) a	10 (90±90) ab	—
	Older	41±7	27±5	22 (26±13) a	3 (24±24) ab	26 (93±41) a

[1]Mean±SD of 5 and 25 plants/treatment in Experiment 1 and Experiment 2, respectively.
[2]2-4 leaves unfolded for grass plants and 2-6 true leaves or leaf pairs unfolded for broadleaf plants.
[3]5-8 leaves unfolded for grass plants and 9 true leaves or leaf pairs unfolded to full bloom for broadleaf plants.
[4]4-8 leaves unfolded for grass plants and 6-9 true leaves or leaf pairs unfolded for broadleaf plants.
[5]Means followed by the same letter are not significantly different (P=0.05) by Tukey's HSD Method (Steel & Torrie 1980).
[6]Treatments not included.
[7]Because of non-significant differences, a pooled analysis (F=1.1; df=6; P=0.39) with data from experiments 3 and 4 is presented.

similar oviposition preferences for maize as well as for the non-crop species *Amaranthus* sp. and *I. unisetus*, thus, indicating that *S. latifascia* may not be very selective in choosing a host for oviposition. The imperfect relationship between oviposition preference for specific plant species and developmental performance of offspring on these plants has been considered problematical in the theory of insect/plant interactions (Wiklund 1974, Thompson 1988). Adult oviposition preference for and larval developmental performance on some plant species has been observed to have a close relationship (Singer et al. 1988). However, this favorable relationship between oviposition preference and larval developmental performance was not observed in pierid butterflies by Courtney (1981) or in *Papilio machaon* L. by Wiklund (1974). Although adults used in our study were reared on pinto bean diet rather than on any of the hosts tested, one might expect that adults would not consistently choose, as ovipositional hosts, plants (i.e., maize and *I. unisetus*) that are fatal or at least not wholesome to the immature stages. A review of the genetic covariance in preference and developmental performance by Thompson (1988) indicated that these biological parameters can vary either together or independently. The insect may have a wide host range for oviposition, but satisfactory developmental performance may be limited to certain hosts, which seems to occur with *S. latifascia*. It has been suggested that oviposition preference for a new host plant species may evolve before developmental physiology (of larvae) if the insect is exposed to abundant novel hosts (i.e., sorghum and maize in this case) (Futuyma 1983).

Oviposition on *I. unisetus* and *Amaranthus* sp. occurred at about the same frequency (percent of total eggs laid per plant) as on maize, and oviposition on the other broadleaf species was similar to that on sorghum in the cage experiments, indicating that non-crop species in production fields may be attractive for oviposition by *S. latifascia* females. With larvae preferring to feed on some non-crop species when compared with sorghum and maize, there should be an overall reduction in damage to the crops if these hosts are abundant. Thus, weed management practices which promote abundance of those species should contribute to lower insect damage to sorghum and maize (Portillo 1994).

Since *S. latifascia* appears to have only one damaging generation annually on sorghum and maize in southern Honduras, the value of controlling the pest population on non-crop plants is questionable. Agricultural practices in the sorghum and maize agroecosystems in southern Honduras include limited weed control because most farmers do not use chemical herbicides. However, the use of tractors and ox-pulled plows in the preparation of fields for planting on the coastal plains and the slash and burn practices in the foothills usually create conditions where crop emergence occurs at the time when non-crop plants may not be present. These conditions usually are associated with high insect damage to sorghum and maize, especially in the foothills. Farmers who do not have money to purchase insecticides in areas where *S. latifascia* and related species in the pest complex are limiting sorghum and maize production might be advised to synchronize crop planting with emergence and establishment of non-crop plants in fields prepared for planting. However, the implementation of this practice may be difficult in most areas in southern Honduras where farmers are urged to plant with the onset of rains in order to ensure seed germination and stand establishment and reduce the probability of drought stress to crops as the season progresses. Studies on the effects of delayed planting date on crop establishment and yield are needed to elucidate the impact of this practice. Also, the impact of interspecific competition between weeds and crop plants on crop yield compared with the injury losses by insects during the growing season in delayed plantings needs elucidation. A literature review by Andow (1991) indicated that net yield gains in fields intermingled with weeds occurred only rarely and only when losses to insect in-

jury were severe in monoculture. Severe crop damage by *S. latifascia* and other species in the pest complex is observed often in southern Honduras; thus, the benefit of weeds in reducing pest damage to crops is likely to outweigh any reduction in crop yield due to weed competition. However, the nature of these relationships needs further investigation. Additionally, ovipositional preference studies with *S. latifascia* and other species in this pest complex under field conditions are needed to confirm our results.

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