Influence of weed management and parasitoids of lepidopterous pests in intercropped sorghum and maize in southern Honduras[1]

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Abstract. A lepidopterous larval complex consisting of *Spodoptera frugiperda* (J. E. Smith), *Metaponpneumata rogenhoferi* Möschler, *Spodoptera latifascia* (Walker) and *Mocis latipes* (Guenée) (Lepidoptera: Noctuidae) is the principal insect pest constraint to sorghum and maize production in southern Honduras. This insect complex was studied under two weed management systems. The two systems included weed removal at planting and as needed (traditional practice) and weed removal three weeks after planting (experimental practice). Parasitoids of each insect pest were recorded. Although the intercropped sorghum and maize in the delayed weed management system were infested with greater density of weeds during early crop development compared with the crops experiencing the traditional weed removal practice, crop plants in the two systems were infested with the same species of lepidopterous larvae. Crops in the traditional weed management system had a higher density of larvae per plant compared with crops in the delayed weed management system. Eggs and larvae of this lepidopterous complex were attacked by 12 species of parasitoids. Larvae in each weed management system had similar levels of parasitization (11 to 16%) indicating that parasitoid were not influenced by weed management. The crop management system with delayed weed removal had less plant damage by this lepidopterous larval complex compared with the intercropped system experiencing the traditional practice of weed removal shortly after weed emergence. The noncrop vegetation served as early season preferred hosts for the lepidopterous defoliators allowing the young crop plants to escape damaging infestations of the pests.

Key words: Noctuidae, parasitism, lepidopterous pests, weed insect interactions

Resumen: Un grupo de larvas de lepidópteros formado por *Spodoptera frugiperda* (J. E. Smith), *Metaponpneumata rogenhoferi* Möschler, *Spodoptera latifascia* (Walker) y *Mocis latipes* (Guenée) (Lepidoptera: Noctuidae) son la principal plaga insectil que afecta la producción de sorgo y maíz en el sur-este de Honduras. Este grupo de insectos fue estudiado bajo dos sistemas de manejo de malezas. Los dos sistemas consistían en la remoción temprana de malezas al momento de la siembra y después según fuese necesario (práctica tradicional) y la remoción tardía de malezas tres semanas después de la siembra (práctica experimental). Los parasitoides de cada insecto plaga fueron registrados. A pesar que el sorgo y maíz intercalado en el sistema de manejo de malezas tardío fueron infestado con mayor densidad de malezas durante el desarrollo temprano del cultivo comparado con el cultivo que experimentó la remoción temprana de malezas, las plantas en ambos sistemas fueron atacadas por las mismas especies de larvas de lepidópteros. El cultivo en el sistema tradicional de manejo de malezas tuvo mayor densidad de larvas por planta comparado con el cultivo en el sistema de remoción tardía de malezas. Huevos y larvas de este grupo de lepidópteros fueron atacados por 12 especies de parasitoides. Las larvas en cada uno de los sistemas de manejo de malezas sufrieron niveles similares de parasitismo (11 a 16%) indicando que los parasitoides no fueron afectados por el manejo de malezas. El cultivo con el sistema de manejo tardío de malezas experimentó menos daño por el grupo de larvas de lepidópteros comparado con el cultivo intercalado que experimentó la práctica tradicional de remoción temprana de malezas al momento en que emerjan. Las malezas sirvieron como hospederos preferidos durante el inicio del cultivo para los lepidópteros defoliadores permitiendo que las plantas jóvenes del cultivo escaparan al daño por la plaga.

Palabras claves: interacciones malezas insectos, noctuidae, plagas lepidopteras, parasitismo

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INTRODUCTION

Maize, *Zea mays* L., and sorghum, *Sorghum bicolor* (L.) Moench, are important grains produced and consumed in Honduras (Secretaria de Recursos Naturales 1995). Most of the sorghums planted in southern Honduras (a semi-arid region) are late maturing, landrace populations locally called "maicillos criollos" or "maicillos" that are intercropped with early maturing maize by subsistence farmers (Pitre 1988, Gomez 1995). A complex of defoliator lepidopterous larvae, locally called "langosta", is the major insect pest constraint to production of these grain crops in this region (DeWalt and DeWalt 1984, Pitre 1988, Portillo et al. 1991). This lepidopterous complex includes *Spodoptera frugiperda* (J. E. Smith), *Spodoptera latifascia* (Walker), *Metaponpneumata rogenhoferi* Möschler and *Mocis latipes* (Guenée) (Lepidoptera: Noctuidae) (Pitre 1988, Portillo *et al.* 1991). The crop plants may experience extensive defoliation, or the plants may be destroyed during the first 3 weeks of crop growth (Pitre 1988, Portillo 1991, Portillo *et al.* 1991). The cost of additional seed for replanting is high and possibly prohibitive for subsistence farmers (Pitre 1988).

Noncrop vegetation (grasses and legume weeds) in and around production fields serves as host plants for the lepidopterous larvae prior to crop planting (Pitre 1988). When this vegetation is removed, larvae move to crop plants resulting in seedling damage. Pitre (1988), Castro (1990) and Portillo *et al.* (1991) observed that larvae in this complex can feed and subsist on noncrop vegetation before moving onto crop plants to feed. They indicated that weeds in crop fields can act as a buffer for the initial infestation of the lepidopterous population, resulting in less damage to sorghum and maize. Portillo *et al.* (1991) suggested that areas of noncrop vegetation serve as the source habitat (where insects survive and increase in number) of this lepidopterous complex, and that sorghum and maize may serve as a sink habitat (where insect numbers decline) (Pulliam 1988, Lewin 1989), especially for *M. rogenhoferi* and *S. latifascia.*

Many larval and pupal parasitoids of *S. frugiperda,* the most prevalent species in this lepidopterous complex, have been identified (Ashley 1979, 1986, Maes 1989, Wheeler *et al.* 1989, Gladstone 1991, Cave 1993). Cave (1993) reported 26 species of larval and pupal parasitoids of *S. frugiperda* in Honduras. *Mocis latipes* was reported to be parasitized in 3 of its 4 life stages by 30 species of parasitoids (Cave 1992). Castro *et al.* (1989) found two principal parasitoids attacking *S. frugiperda,* namely the nematode *Hexamermis* sp. (Nematoda: Mermithidae), parasitizing up to 65% of larvae collected on sorghum, and *Chelonus insularis* (Cresson) (Hymenoptera: Braconidae) which parasitized 15% of the larvae.

The relationships of sorghum, maize and weeds with the lepidopterous pests and their parasitoids in intercropped production systems need to be investigated. This information can have an influence on the development of an integrated approach to managing this insect pest complex on intercropped sorghum and maize. Weed management in and around intercropped fields affects the noncrop plant population that supports pest and parasitoid populations and ultimately can influence the levels of biological control of the pest complex (Pitre 1988). This research was designed to investigate these relationships in intercropped sorghum and maize in southern Honduras.

MATERIALS AND METHODS

1996 study. The study was conducted at El Chorro in the Department of Valle, a semi-arid area in southern Honduras. This area is located in the foothills at 57 m above sea level with coordinates ca. N13º 31' W87º 40'. Two subsistence farms, one 12,000 m^2 and the other 4,000 m^2, of intercropped sorghum (enhanced tropical Honduran landrace sorghum DMV-179) and maize (early maturity hybrid HR-15) were selected for this study. Traditional crop production practices used by subsistence farmers in this area were followed. These production practices included use of an ox-pulled plow to prepare the land for planting and manual weeding. Maize seeds were planted by hand on June 3 soon after the rainy season began. Sorghum seeds were planted three weeks after maize. Maize and sorghum seeds were planted in hills in alternate rows 80 cm apart with 50 cm between hills. Subsistence farmers in this area call this intercropped system "aporque".

Two experimental treatments were established in a randomized complete block design on each farm (three replications on one farm, one on the other farm). The treatments were: 1) traditional crop production system including manual weed removal prior to planting and during early crop development; 2) traditional crop production system, but with manual weed removal delayed until three weeks after planting. Each treatment plot was 2,000 m². Due to the limited production area on the selected subsistence farm, the second farm (< 0.4 km distance) was used for the fourth replication. The agricultural practices on this farm were the same as those used on the farm with three replications. These farms were selected because they have a history of lepidopterous infestations on the crops.

Data were collected during mid-May through early August with random plant and insect samples taken each week before and after planting. Weeds (noncrop vegetation) were sampled for identification and quantification by taking ten 1 m² samples in each treatment plot, and ten 1 m² samples in vegetation around the treatment plots. Sample sites selected for insect and weed collection within the plots were in areas outside of the central 25 m² of each plot. This central undisturbed area was used for yield samples. Lepidopterous larvae on individual weed species were collected, identified and numbers were recorded for each sample. Larvae were held individually on a wheat germ artificial diet (King et al. 1985) in capped 30 ml transparent plastic cups (Fill-Rite Inc., Newark, New York 07104, USA) in the laboratory for adult or parasitoid emergence and identification. The artificial diet was protected against microbial contamination using 0.04% Phaltan® fungicide (Ortho®), 0.03% Tetracycline, and 0.03% Griseoflavin mixed in 100 g of corn cob grit (The Anderson Cob Division, PO Box 119, Maumee, Ohio, 34537, USA). From 0.3 to 0.4 g of this mixture was placed on the surface of the artificial diet in each plastic cup. Laboratory conditions were 28 ± 4° C (mean ± SD), 78% RH and 12:12 photoperiod. Botany specialists at the Panamerican School of Agriculture, Zamorano, Honduras and in the Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi, identified weeds.

Sorghum and maize samples were taken each week after the crop plants emerged to determine infestation levels of the lepidopterous species and damaged plants (recorded as percent of plants with feeding larvae) within treatment plots. Thirty plants each of sorghum and maize in each treatment plot were sampled using a destructive sampling method (Castro *et al.* 1989). The sample sites were selected as described above for weeds. Age structure of the insects was tabulated as egg, small larva (1st and 2nd instars), medium larva (3rd and 4th instars) or large larva (5th and 6th instars). Each insect specimen (egg or larva) was kept separately and reared in the laboratory as described above. Crop species were related to lepidopterous pest infestation and parasitization level. The lepidopterous and parasitoid adults were identified by insect taxonomists at Zamorano, Mississippi State University and the USDA Systematic Entomology Laboratory, Beltsville, MD, USA.

Yield was recorded by hand-collecting maize ears and sorghum panicles from a 10 m² sample taken in the undisturbed 25 m² area in the central part of each treatment plot. Maize matured earlier than sorghum and was harvested in the last week of August and first week of September. Sorghum was harvested during the second week of January.

Data were analyzed as a randomized complete block design. Sample means were separated with least significant difference (LSD) t-test (SAS 1995). The chi-square test of homogeneity was performed on percent parasitization and percent plant damage (Schefler 1988).

1997 study. The 1997 study was conducted in the same area, at El Chorro, as in 1996 using the same plot size, test design (except all four replications were on one farm), crop varieties and weed management treatments. Sorghum and maize were planted simultaneously in alternate rows 80 cm apart with 50 cm between hills on June 6. Subsistence farmers in this area refer to the intercropped system used as "surco alterno". The change from "aporque" to "surco alterno" planting in 1997 was the farmer´s decision. The planting system selected is usually based on expected weather patterns and availability of seed. Data collection, sampling techniques and frequency and analyses were as described for the 1996 study.

Voucher specimens of the lepidopterous and parasitoid adults were placed in the Mississippi Entomological Museum in the Department of Entomology and Plant Pathology at Mississippi State University.

RESULTS AND DISCUSSION

The lepidopterous pest complex that infested intercropped sorghum and maize during the 1996 and 1997 studies included *S. frugiperda*, *M. rogenhoferi*, *S. latifascia*, and *M. latipes* (Lepidoptera: Noctuidae). *Spodoptera albula* (Walker), a fifth lepidopterous species, was collected on the crops in 1997, but will not be included in detail in this manuscript because of the low infestation level.

Spodoptera frugiperda. *Spodoptera frugiperda* was the predominant species in the lepidopterous complex throughout the growing season in both 1996 and 1997. This species constituted 96% of the lepidopterous population on maize and sorghum in systems with traditional weed management and as well as with delayed weed management in 1996 (Table 1a). In 1997, *S. frugiperda* constituted 77% and 73% of the population on maize, and 72% and 77% on sorghum in systems with traditional weed management and delayed weed management, respectively (Table 2a). The predominance of *S. frugiperda* over the other species in this lepidopterous complex in southern Honduras has been reported previously (Pitre 1988, Portillo *et al.* 1991).

Spodoptera frugiperda larval density increased to a high of 0.33 and 0.36 larvae per maize plant, and 0.17 and 0.20 larvae per sorghum plant in the systems with traditional weed management and delayed weed management, respectively, in 1996 (Table 1a). Larval density increased to a high of 0.66 and 0.63 larvae per maize plant, and 0.63 and 0.53 larvae per sorghum plant in these

Table 1a. Mean ± SD number of lepidopterous larvae per plant and mean ± SD percent of parasitization on lepidopterous larvae in plots with traditional weed management and delayed weed management in 1996.

		Spodoptera frugiperda Maize		*S. frugiperda* Sorghum		*Spodoptera latifascia* Maize		*S. latifascia* Sorghum	
Sample date	Variable	TWM[1]	DWM[2]	TWM	DWM	TWM	DWM	TWM	DWM
Jun 12	no. Larvae/plant	0.20±0.04	0.17±0.09	–[3]	–	0.03±0.03	0.03±0.01	–	–
	% parasitization	30.3±20.5	6.5±2.1	–	–	0.0±0.0	0.0±0.0	–	–
Jun 19	no. Larvae/plant	0.26±0.06	0.23±0.12	–	–	0.00±0.00	0.00±0.00	–	–
	% parasitization	23.1±12.6	26.1±12.3	–	–	0.0±0.0	0.0±0.0	–	–
Jun 26	no. Larvae/plant	0.17±0.08	0.17±0.03	–	–	0.00±0.00	0.00±0.00	–	–
	% parasitization	38.5±21.0	38.5±13.6	–	–	0.0±0.0	0.0±0.0	–	–
Jul 4	no. Larvae/plant	0.23±0.07	0.23±0.04	0.06±0.04	0.03±0.03	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	26.5±8.0	26.1±9.3	50.0±42.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 11	no. Larvae/plant	0.33±0.09	0.36±0.06	0.17±0.12	0.20±0.06	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	9.1±6.0	8.3±6.2	38.5±40.0	30.0±16.5	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 17	no. Larvae/plant	0.26±0.12	0.23±0.09	0.09±0.06	0.06±0.02	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	11.5±5.5	13.0±5.6	33.3±21.0	33.3±20.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 24	no. Larvae/plant	0.33±0.14	0.30±0.08	0.17±0.15	0.17±0.04	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	18.0±8.6	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 31	no. Larvae/plant	0.20±0.09	0.17±0.06	0.13±0.10	0.09±0.06	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Aug 7	no. Larvae/plant	0.23±0.12	0.17±0.04	0.13±0.12	0.13±0.07	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0

[1] TWM = traditional weed management: weed removal prior to planting and during early crop development.

[2] DWM = delayed weed management: weed removal three weeks after planting.

[3] plants not available for sampling

Table 1b. Mean ± SD number of lepidopterous larvae per plant and mean ± SD percent of parasitization on lepidopterous larvae in plots with traditional weed management and delayed weed management in 1996 (Cont.).

		Mocis latipes Maize		*Mocis latipes* Sorghum		Total larvae/plant mean% parasitization Maize		Total larvae/plant mean% parasitization Sorghum	
Sample date	Variable	TWM[1]	DWM[2]	TWM	DWM	TWM	DWM	TWM	DWM
Jun 12	no. Larvae/plant	0.00±0.00	0.00±0.00	--[3]	--	0.23±0.07	0.20±0.10	--	--
	% parasitization	0.0±0.0	0.0±0.0	--	--	30.3±20.5	5.5±2.1	--	--
Jun 19	no. Larvae/plant	0.00±0.00	0.00±0.00	--	--	0.26±0.06	0.23±0.12	--	--
	% parasitization	0.0±0.0	0.0±0.0	--	--	23.1±12.6	26.1±12.3	--	--
Jun 26	no. Larvae/plant	0.00±0.00	0.00±0.00	--	--	0.17±0.08	0.17±0.06	--	--
	% parasitization	0.0±0.0	0.0±0.0	--	--	38.5±21.0	38.5±13.6	--	--
Jul 4	no. Larvae/plant	0.03±0.03	0.03±0.02	0.00±0.00	0.00±0.00	0.26±0.10	0.26±0.6	0.06±0.04	0.03±0.03
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	23.1±8.0	23.1±9.3	50.0±42.0	0.0±0.0
Jul 11	no. Larvae/plant	0.03±0.02	0.03±0.03	0.00±0.00	0.00±0.00	0.36±0.11	0.39±0.09	0.17±0.12	0.20±0.06
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	8.3±6.0	7.7±6.2	38.5±40.0	30.0±16.5
Jul 17	no. Larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.03±0.01	0.26±0.12	0.23±0.09	0.09±0.06	0.09±0.03
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	11.5±5.5	13.1±5.6	33.3±21.0	33.3±20.0
Jul 24	no. Larvae/plant	0.00±0.00	0.00±0.00	0.03±0.03	0.00±0.00	0.33±0.14	0.30±0.08	0.20±0.18	0.17±0.04
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	18.0±8.6
Jul 31	no. Larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.20±0.09	0.17±0.06	0.13±0.10	0.09±0.06
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Aug 7	no. Larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.23±0.12	0.17±0.09	0.13±0.12	0.13±0.07
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0

[1] TWM = traditional weed management: weed removal prior to planting and during early crop development.
[2] DWM = delayed weed management: weed removal three weeks after planting.
[3] plants not available for sampling

respective systems of weed management in 1997 (Table 2a). These infestations levels indicate the number of larvae per plant, whereas the economic threshold is reported to be 40% infested plants (Andrews 1989).

Larvae were found in greater numbers on maize compared with sorghum in both weed management treatments. The preference for maize over sorghum by *S. frugiperda*, as observed in the present study, is consistent with previous observations (Castro *et al.* 1989, Portillo *et al.* 1991). Castro (1990) and Portillo *et al.* (1991) reported greater numbers of *S. frugiperda* larvae on crop plants in plots with weed management than in plots without weed management. *Spodoptera frugiperda* larvae were found principally on the noncrop hosts *Ixophorus unisetus* Presl., *Amaranthus hybridus* L., *Senna obtusifolia* (L.) Irwin & Barneby and *Echinocloa colona* A. L. Link, but also were found on *Ipomoea* sp. and *Sclerocarpus phyllocephalus* Blake in both cropping systems (Table 3).

The range of parasitization of the lepidopterous larvae in the two weed management systems is recorded in Table 4. Parasitization of *S. frugiperda* by *Hexamermis* sp. was as high as 50% on sorghum and 39% on maize in traditional weed management and delayed weed management systems, respectively, in 1996. In 1997, *Hexamermis* parasitization was as high as 30% and 33% on sorghum, and 39% and 57% on maize in traditional and delayed weed management systems, respectively. This endoparasitic nematode survives in the soil and is dispersed when rain splashes nematodes from the soil onto the plants infecting the early instars (1st and 2nd). The nematodes emerge from the larger instars (4th, 5th or 6th) and the host larva eventually dies (Pitre *et al.* 1997). On average 9 (SD=3.8) nematodes emerged from parasitized larvae, with 23 recorded from a single *S. frugiperda* larva. Sorghum and maize in the 6 to 10 leaf stages had greater levels of parasitization than other plant phenological stages for the two treatments in both years. Previous studies indicated that this nematode was the most important natural enemy of *S. frugiperda* in intercropped sorghum and maize in southern Honduras (Castro *et al.* 1989, Pitre *et al.* 1997).

Chelonus insularis which attacks eggs and emerges from young larvae, was the second most important parasitoid attacking *S. frugiperda* (Table 4). This wasp parasitized up to 23% of *S. frugiperda* on maize and 18% on sorghum in early season, but only 2% on average in both systems throughout the 1996 and 1997 growing seasons. *Aleiodes vaughani* (Muesebeck) was another braconid wasp attacking *S. frugiperda* and caused less than 1% parasitization in the two systems in 1997. Four species of Ichneumonidae (Hymenoptera), *Eiphosoma vitticolle* Cresson, *Corsoncus magus* (Cresson), *Corsoncus* sp. and *Temelucha* sp., all which attack the larval stage and emerge from the pupae, parasitized less than 1% of *S. frugiperda* larvae (Table 4). Five species of tachinid parasitic flies, including *Archytas marmoratus* (Townsend), *Lespesia archippivora* (Riley), *Lespesia* sp., *Chetogena* sp. and *Gonia* sp. (Diptera: Tachinidae), were the third most important group of parasitoids, with an average parasitization of less than 2% in both systems and years (Table 4). Although 12 species of parasitoids were found to attack *S. frugiperda* larvae, average percent parasitization was low and not significantly different in both systems during the two years (Tables 1a and 2a). These results provide evidence to support the suggestion by Pitre *et al.* (1997) that weed management does not appear to have an influence on levels of larval parasitization during the growing season.

Metaponpneumata rogenhoferi. A high population of *M. rogenhoferi* larvae occurred over a wide area in southern Honduras in May 1996 and destroyed many early planted (early May) intercropped sorghum and maize fields following the first rains of the year. This ravaging population occurred in the study area about one month prior to emerging of the crops in the field selected for this study. This species was not collected in the study area following the infestation that occurred in May. In 1997 the population of *M. rogenhoferi* was second to that of *S. frugiperda* on sorghum and maize and was greater in the traditional weed management system than in the delayed weed management system during the sampling period (Table 2a). In this year seedling plants experienced drought conditions for several weeks after emergence and the *M. rogenhoferi* infestation destroyed up to 100%

Table 2a. Mean ± SD number of lepidopterous larvae per plant and mean ± SD percent of parasitization on lepidopterous larvae in plots with traditional weed management and delayed weed management in 1997.

		Spodoptera frugiperda Maize		*S. frugiperda* Sorghum		*Metaponpneumata rogenhoferi* Maize		*M. rogenhoferi* Sorghum		*Spodoptera latifascia* Maize	
Sample date	Variable	TWM[1]	DWM[2]	TWM	DWM	TWM	DWM	TWM	DWM	TWM	DWM
Jun 18	no. larvae/plant	0.17±0.04	0.03±0.01	0.13±0.06	0.03±0.02	0.23±0.09	0.20±0.09	0.20±0.09	0.13±0.06	0.19±0.12	0.16±0.09
	% parasitization	18.7±12.5	0.0±0.0	23.0±12.6	0.0±0.0	13.1±6.9	15.0±12.0	15.0±6.9	0.0±0.0	0.0±0.0	0.0±0.0
Jun 25	no. larvae/plant	0.20±0.06	0.13±0.04	0.20±0.06	0.09±0.04	0.20±0.06	0.16±0.06	0.13±0.03	0.10±0.03	0.13±0.06	0.09±0.03
	% parasitization	31.5±14.6	46.1±26.2	30.0±14.3	33.3±12.5	15.7±8.6	18.7±10.5	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 1	no. larvae/plant	0.23±0.08	0.17±0.06	0.17±0.04	0.20±0.12	0.03±0.01	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	39.1±16.0	56.2±20.0	18.0±8.6	33.0±14.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 8	no. larvae/plant	0.46±0.12	0.46±0.14	0.40±0.12	0.36±0.14	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	19.5±12.8	19.6±12.3	30.0±11.9	25.0±10.6	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 15	no. larvae/plant	0.36±0.04	0.30±0.06	0.33±0.09	0.26±0.06	0.0±0.0	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	16.6±12.0	20.0±11.5	18.1±7.3	34.6±16.9	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 22	no. larvae/plant	0.56±0.19	0.56±0.22	0.63±0.21	0.46±0.16	0.0±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	10.7±8.0	10.7±9.0	14.2±5.6	13.0±6.6	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Jul 28	no. larvae/plant	0.63±0.21	0.50±0.24	0.60±0.24	0.43±0.18	0.0±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	4.7±3.6	12.0±8.5	15.0±8.3	13.9±8.6	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Aug 4	no. larvae/plant	0.66±0.24	0.63±0.26	0.53±0.26	0.53±0.24	0.0±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	9.1±4.5	4.8±2.1	11.3±6.6	11.3±9.3	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Aug 11	no. larvae/plant	0.50±0.23	0.46±0.20	0.43±0.19	0.36±0.18	0.0±0.00	0.0±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
	% parasitization	6.0±3.6	6.5±4.2	20.1±13.4	8.3±4.2	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0

[1] TWM = traditional weed management: weed removal prior to planting and during early crop development.
[2] DWM = delayed weed management: weed removal three weeks after planting.

Table 2b. Mean ± SD number of lepidopterous larvae per plant and mean ± SD percent of parasitization on lepidopterous larvae in plots with traditional weed management and delayed weed management in 1997 (Cont.).

		Spodoptera latifascia Sorghum		*Mocis latipes* Maize		*M. latipes* Sorghum		total larvae/ plant mean % parasitization Maize		total larvae/ plant mean % parasitization Sorghum	
Sample date	Variable	TWM[1]	DWM[2]	TWM	DWM	TWM	DWM	TWM	DWM	TWC	DWC
Jun 18	no. larvae/plant	0.16±0.09	0.16±0.08	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.59±0.25	0.39±0.21	0.49±0.15	0.32±0.16
	% parasitization	0.0±0.0	18.7±8.6	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	10.2±8.5	7.6±6.0	12.2±9.4	9.4±6.3
Jun 25	no. larvae/plant	0.10±0.06	0.06±0.03	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.53±0.18	0.38±0.06	0.43±0.06	0.25±0.10
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	17.0±9.2	18.4±9.1	14.1±7.3	11.5±8.2
Jul 1	no. larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.26±0.09	0.17±0.06	0.17±0.04	0.20±0.12
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	34.6±12.5	56.2±20.0	18.0±8.6	30.0±10.5
Jul 8	no. larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.46±0.12	0.46±0.14	0.40±0.12	0.36±0.14
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	19.5±12.8	19.6±12.3	30.0±11.9	25.0±10.6
Jul 15	no. larvae/plant	0.00±0.00	0.00±0.00	0.16±0.08	0.09±0.03	0.13±0.04	0.09±0.03	0.52±0.12	0.39±0.09	0.46±0.09	0.35±0.09
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	11.5±8.4	15.4± 11.5	13.1±6.4	25.7±8.6
Jul 22	no. larvae/plant	0.00±0.00	0.00±0.00	0.03±0.01	0.23±0.09	0.33±0.12	0.20±0.09	0.59±0.20	0.79±0.31	0.96±0.33	0.46±0.16
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	13.0±8.5	9.1±6.6	0.0±0.0	10.2±7.5	11.4±8.7	12.5±5.1	13.0±6.6
Jul 28	no. larvae/plant	0.00±0.00	0.00±0.00	0.13±0.06	0.20±0.08	0.16±0.06	0.26±0.08	0.76±0.21	0.70±0.32	0.76±0.30	0.69±0.26
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	3.9±3.1	8.6±8.5	11.8±6.6	8.7±3.6
Aug 4	no. larvae/plant	0.00±0.00	0.00±0.00	0.06±0.03	0.06±0.03	0.09±0.03	0.03±0.01	0.72±0.24	0.69±0.29	0.62±0.29	0.56±0.25
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	8.3±4.2	4.3±2.1	9.7±5.3	10.7±8.5
Aug 11	no. larvae/plant	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.50±0.23	0.46±0.20	0.43±0.19	0.36±0.18
	% parasitization	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	6.0±3.6	6.5±4.2	20.9±13.4	8.3±4.2

[1] TWM = traditional weed management: weed removal prior to planting and during early crop development.

[2] DWM = delayed weed management: weed removal three weeks after planting.

Table 3. Noncrop host plants of a lepidopterous complex identified in intercropped sorghum and Maize on traditional and delayed weed management systems at El Chorro, Valle, Honduras, during 1996 and 1997.

Host plant	Family	Lepidopterous species
Senna obtusifolia (L.) Irwin & Barneby	Fabaceae	*S. frugiperda, M. rogenhoferi, S. latifascia, S. albula*
Bromelia caratas Kurt.	Bromeliaceae	*M. rogenhoferi, S. latifascia*
Ixophorus unisetus Presl.	Poaceae	*S. frugiperda, M. latipes*
Amaranthus hybridus L.	Amaranthaceae	*S. frugiperda, M. rogenhoferi S. latifascia*
Ipomoea sp.	Convolvulaceae	*S. frugiperda, M. rogenhoferi S. latifascia, S. albula*
Melampodium divaricatum (Rich. ex pers.) DC	Convolvulaceae	*M. rogenhoferi*
Portulaca oleracea (L.)	Portulacaceae	*M. rogenhoferi, S. latifascia S. albula*
Echinocloa colona A. L. Link	Cyperaceae	*S. frugiperda, M. latipes*
Mimosa pigra L.	Fabaceae	*M. rogenhoferi*
Sclerocarpus phyllocephalus Blake	Asteraceae	*S. frugiperda*
Sida acuta Burn	Malvaceae	*M. rogenhoferi*
Baltimora recta L.	Asteraceae	*M. rogenhoferi*

Table 4. Parasitoids species of a lepidopterous complex, range of parasitization, host species, and host plants of insect pests in intercropped sorghum and Maize on traditional and delayed weed management systems at El Chorro, southern Honduras in 1996 and 1997.

Parasitoid species	Range % parasitization	Host species	Stage attacked	Stage of emergence	# parasitoid per host	Host plant
Hexamermis sp. (Mermithidae)	0-57	*S. frugiperda* *M. rogenhoferi* *S. latifascia* *S. albula*	small larva	large larva	1 to 23	sorghum, maize
Chelonus insularis (Braconidae)	0-23	*S. frugiperda*	egg	large larva	1	sorghum, maize
Lespesia archippivora (Tachinidae)	0-6	*S. frugiperda* *M. rogenhoferi*	small larva	large larva or pupa	1 to 3	sorghum, maize, *S. obtusifolia*
Archytas marmoratus (Tachinidae)	0-5	*S. frugiperda* *M. rogenhoferi* *S. latifascia* *M. latipes*	small larva	pupa	1	sorghum, maize
Lespesia sp. (Tachinidae)	0-1	*S. frugiperda*	small larva	large larva or pupa	1	sorghum, maize
Chetogena sp. (Tachinidae)	0-1	*S. frugiperda*	small larva	large larva pupa	1	sorghum, maize
Gonia sp. (Tachinidae)	0-1	*S. frugiperda*	small larva	large larva or pupa	1	sorghum, maize
Eiphosoma vitticolle (Ichneumonidae)	0-1	*M. rogenhoferi* *S. frugiperda*	small larva	large larva	1	*S. obtusifolia*
Corsoncus magus (Ichneumonidae)	0-1	*S. frugiperda*	small larva	pupa	1	sorghum
Corsoncus sp. (Ichneumonidae)	0-1	*S. frugiperda*	small larva	pupa	1	*S. obtusifolia*
Temelucha sp. (Ichneumonidae)	0-1	*S. frugiperda*	small larva	pupa	1	maize
Aleiodes vaughani (Braconidae)	0-1	*S. frugiperda*	small larva	large larva	1	maize

of the crop plants in many fields planted early in the season. Farmers that planted later, when the rains resumed, escaped this pest infestation and crop destruction. Traditionally, farmer plant soon after the first rains in late April or early May, but the pattern of rainfall in 1997 was unusual. Those farmers that lost their crop early, but had additional seed or could afford to purchase more seed, had to replant their fields.

Previous studies indicated the importance of *M. rogenhoferi* early in the season in some years as this species caused seedling damage and destroyed early planted fields (Pitre 1988, Portillo *et al.* 1991, Pitre *et al.* 1997). *Metaponpneumata rogenhoferi* larvae were observed on May 21, 1997 feeding on *S. obtusifolia*, a broadleaf herb, growing around production fields before sorghum and maize were planted. The first generation of *M. rogenhoferi* appeared to develop on this weed host, and possibly other weeds (Table 3), as well as on the grain crops planted in early May. A relatively small number of *M. rogenhoferi* larvae were collected on June 28 on *S. obtusifolia* growing around production fields. These larvae appeared to represent the second generation of this species developing in the production area.

Metaponpneumata rogenhoferi larvae were parasitized principally by *Hexamermis* sp. with less than a mean of 5% parasitization in both weed management treatments (Table 4). *Lespesia archippivora, A. marmoratus* and *E. vitticolle* each parasitized a mean less than 1% of *M. rogenhoferi* larvae. Others observed this low level of parasitization of *M. rogenhoferi* in this area during previous studies (Pitre *et al.* 1997).*Senna obtusifolia*, *Ipo-*

moea sp., *Bromelia caratas* Kurt., *A. hybridus*, *Melampodium divaricatum* (Rich, ex pers.) DC, *Portulaca oleracea* (L.), *Mimosa pigra* L., *Sida acuta* Burn, and *Baltimora recta* L. were observed to be hosts of *M. rogenhoferi* in and/or around production fields (Table 3), with *S. obtusifolia* being the most heavily infested. Apparently, these weeds are important hosts for the first generation of *M. rogenhoferi*. The weeds serve as an alternate food source for *M. rogenhoferi* larvae when the crops are in seedling stages.

Spodoptera latifascia. *Spodoptera latifascia* ranked third in level of infestation of the lepidopterous species on sorghum and maize seedling plants in both weed management systems during the study period in 1996 (Table 1a) and 1997 (Table 2a). This early season pest was not found on the crops after the first week (Table1a) and second week (Table 2a) of sampling. Castro (1990), Portillo *et al.* (1991) and Pitre *et al.* (1997) indicated that this species was present only during the early stages of development of the sorghum and maize crops in southern Honduras. Noncrop vegetation observed to be hosts for this species included *S. obtusifolia*, *P. oleracea*, *B. caratas*, *A. hybridus*, and *Ipomoea* sp. (Table 3). These plants served as hosts for the first generation of *S. latifascia* in the study area. Parasitization level was low (less than 5%) in both weed management systems. *Hexamermis* sp. was responsible for most of the parasitization of *S. latifascia; A. marmoratus* parasitized this species at an extremely low level (Table 4).

Mocis latipes. *Mocis latipes* infested sorghum and maize plants at levels up to 0.03 larvae per plant during the 4th and 5th week (maize), and 6th and 7th week (sorghum) of sampling in the two weed management systems during 1996 (Table 1b). In 1997, *M. latipes* infestation levels increased to 0.16 and 0.23 larvae per maize plant in mid-season during a period of drought in traditional and delayed weed management systems, respectively (Table 2b); and 0.33 and 0.26 larvae per sorghum plant during the same period in traditional and delayed weed management systems, respectively (Table 2b). Larvae were present in the field from the 4th to the 8th week of crop development and were most frequently encountered on *I. unisetus* and *E. colona* in both weed management systems (Table 3). *Archytas marmoratus* was the only parasitoid found to parasitize *M. latipes* in this study (Table 4).

Spodoptera albula. *Spodoptera albula* larvae were observed in May and early June on *S. obtusifolia*, *Ipomoea* sp. and *P. oleracea* around the crop production fields. Larvae were observed in low numbers on sorghum and maize only during the first week of crop development. *Hexamermis* sp. was responsible for less than 5% parasitization of *S. albula* larvae.

Table 5. Mean ± SE number of weeds per square meter (n=10) in intercropped sorghum and Maize plots with the field traditional weed management or delayed weed management, and in the area of noncrop vegetation around at El Chorro, Valle, Honduras, during 1996 and 1997.

	1996				1997		
Sample date	TWC[1]	DWC[2]	VAF[3]	Sample date	TWC	DWC	VAF
Jun 11	12.4a±4.2[4]	32.1b±3.8	112.8c±6.2	Jun 5	16.5a±2.5	38.9b±5.8	147.6c±8.1
Jun 18	18.8a±6.9	58.6b±5.5	141.4c±8.5	Jun 12	23.7a±4.2	54.2b±4.3	158.3c±9.5
Jun 25	29.3a±4.5	66.5b±6.0	137.2c±10.4	Jun 19	28.2a±4.6	72.6b±5.5	124.5c±8.6
Jul 11	23.0a±3.6	16.9a±4.2	121.9b±8.6	Jun 26	24.6a±3.0	16.0a±2.9	118.4b±7.5
Jul 8	26.7a±5.1	23.2a±4.6	125.5b±8.5	Jul 4	21.3a±4.1	24.8a±3.8	116.6b±8.4
Jul 15	18.6a±4.0	33.4a±2.8	114.1b±6.9	Jul 11	22.4a±3.6	27.2a±3.2	97.1b±7.3
Jul 22	24.9a±5.3	31.5a±4.7	98.7b±7.5	Jul 17	16.7a±2.8	22.7a±2.7	63.8b±6.8
Jul 28	21.7a±4.8	26.0a±5.6	68.2b±6.8	Jul 24	12.0a±2.6	25.5a±4.0	42.5b±5.3
Aug 4	19.8a±2.5	24.8a±2.5	72.1b±5.3	Jul 31	14.4a ±3.2	20.2a±2.8	46.9b±3.0
Aug 11	26.2a±3.0	28.6a±4.2	76.6b±6.1	Aug 7	11.6a±2.9	18.6a±2.2	44.5b±4.4

1 TWC= traditional weed management

2 DWC=delayed weed management

3 VAF= vegetation around the field

4 Mean values in same row within a year with similar letters do not differ significantly (P=0.1); t-test (SAS Institute 1995).

Weed infestation. As would be expected, the cropping system with delayed weed management was infested with more weeds per square meter than the system with traditional weed management, particularly during the three weeks after planting when the differences between the two weed management treatments were most apparent (Table 5).

Lepidopterous complex infestation. Maize was infested at a greater level by this lepidopterous complex during the first three weeks after emergence of the crop in the traditional weed management system compared with the delayed weed management system during 1996 (X^2 = 9.86, df=2, P<0.05) and 1997 (X^2 = 6.89, df = 2,

Table 6. Mean ± SD percent maize plants (n=4) infested and damaged in intercropped sorghum and maize by a lepidopterous larval complex in traditional weed management or delayed weed management at El Chorro, Valle, Honduras, during 1996 and 1997.

	1996			1997	
Sample date	TWC[1]	DWC[2]	Sample date	TWC	DWC
Jun 12	34.3±4.6*	20.6±3.9*	Jun 18	38.2±4.2*	23.5±25*
Jun 19	36.5±4.2*	18.9±4.6*	Jun 25	39.3±4.6*	24.6±30*
Jul 26	21.3±3.8	20.3±4.0	Jul 1	23.4±2.5	29.0±4.6
Jul 4	23.6±4.5	21.6±3.5	Jul 8	26.0±3.6	28.5±5.3
Jul 11	36.3±5.0	38.3±2.8	Jul 15	26.9±3.9	30.8±3.8
Jul 17	32.0±3.5	26.6±2.6	Jul 22	38.0±3.7	32.5±4.3
Jul 24	26.6±3.9	30.0±3.8	Jul 28	42.9±4.9	36.0±3.9
Jul 31	20.2±3.3	23.3±3.0	Aug 4	32.3±4.2	28.6±3.5
Aug 7	23.0±2.9	20.6±3.3	Aug 11	36.6±4.6	32.3±4.3

[1] TWC = traditional weed management
[2] DWC =delayed weed management
* Values in same row within a year are not homogeneous
1996 (X^2 = 9.86, df=2, P=0. 05)
1997 (X^2 = 6.89, df=2, P=0. 05)

Table 7. Mean ± SD percent sorghum plants (n=4) infested and damaged in intercropped sorghum and maize by a lepidopterous larval complex in traditional weed management or delayed weed management at El Chorro, Valle, Honduras, during 1996 and 1997.

	1996			1997	
Sample date	TWC[1]	DWC[2]	Sample date	TWC	DWC
	[3]		Jun 18	26.6±4.2*	18.0±2.7*
Jun 19	--	--	Jun 25	38.3±5.6*	20.6±3.1*
Jul 26	--	--	Jul 1	22.4±4.6	23.0±3.8
Jul 4	26.9±5.5*	14.5±3.0*	Jul 8	30.0±5.1	30.9±3.6
Jul 11	22.1±4.0*	10.3±3.2*	Jul 15	38.9±6.1	26.2±2.9
Jul 17	12.4±2.6	16.6±4.5	Jul 22	44.5±5.8	28.5±2.0
Jul 24	29.9±5.2	18.0±4.1	Jul 28	32.6±4.3	36.0±3.5
Jul 31	18.5±4.6	13.9±3.9	Aug 4	36.6±5.2	32.4±4.6
Aug 7	23.3±5.8	16.5±3.6	Aug 11	30.3±4.8	28.3±3.6

[1] TWC = traditional weed management
[2] DWC =delayed weed management
[3] Plants not available for sampling
* Values in same row within a year are not homogeneous, 1996 (X^2 = 7.14, df=2, P<0. 05), p1997 (X^2 = 6.78, df=2, P<0. 05)

P<0.05) (Table 6). The same relationship was experienced for sorghum in traditional compared with delayed weed management systems during 1996 ($X^2 = 7.14$, df=2, P<0.05) and 1997 ($X^2 = 6.78$, df=2, P<0.05) (Table 7). This lepidopterous complex on sorghum and maize exceeded the established economic threshold (40% plant infestation, Andrews 1989) only in late July in 1997.

Parasitization. Total parasitism rates of the lepidopterous larvae on sorghum over the nine sample dates were similar between traditional and delayed weed management cropping systems; these rates were 15% and 16% in 1996 ($X^2 = 0.012$, df=2, P=0.05) (Table 1b) and 15% and 14% in 1997 ($X^2 = 0.002$, df=2, P=0.05) respectively, (Table 2[b]). The larvae on maize in the traditional and delayed weed management systems also had similar parasitization rates [13% and 15%, respectively, in 1996 ($X^2 = 0.208$, df=2, P=0.05) (Table 1[b]); 11% and 13%, respectively, in 1997 ($X^2 = 0.228$, df=2, P=0.05) (Table 2[b])]. Portillo *et al.* (1997) reported that parasitoids of this complex did not appear to have any great influence on lepidopterous pest populations.

Crop yield. No significant differences (P>0.1) in yield were observed between systems with traditional weed management or delayed weed management for either sorghum (757 ±170 kg/ha) or maize (2555 ±763 kg/ha). However, plots with weed management delayed three weeks after planting had slightly greater yield than the traditional weed management system, but required more total farm labor for weed removal by manual weeding. These data corroborate results reported by Portillo *et al.* (1997).

CONCLUSIONS

Although the intercropped sorghum and maize planting system with delayed weed management (three weeks after planting) had more weeds during the early period of sorghum and maize growth than the traditional weed management system (weed removal at planting and as needed), the two systems were infested with the same complex of lepidopterous larvae over the same sampling period. The two crops in the delayed weed management system were damaged less than the crops in the traditional weed management system. Parasitization of the larvae by nematodes and insect parasitoids was about the same in both systems. Delaying total weed management until two to three weeks after crop planting can result in the weeds harboring part, if not most, of the initial infestation of lepidopterous larvae early in the growing season, thus limiting damage to the grain crops. This cultural practice could have considerable influence on *M. rogenhoferi* and *S. latifascia* which occur in the production area early in the development of the crops. As a result, damage to sorghum and maize seedling plants by these two species may be reduced without any negative effect on yield by weed competition..

The levels of parasitization of the larvae in this lepidopterous complex varied among species and at times were as high as 50-56% percent of the collected individuals. *Hexamermis* sp. was the most important parasitoid attacking the larvae. This soil inhabiting nematode is most effective during the early to mid- growing season when it is dispersed as rainfall splashes onto the young plants. The nematode comes in contact with the lepidopterous larva on the foliage of the small plants. However, the parasitoids of these larvae did not have a significant influence in reducing the pest infestations below damaging levels in the cropping systems investigated and would not appear to be a significant part of a pest management strategy developed basically around biological control and one to be employed by subsistence farmers in southern Honduras. Additionally, the results obtained in the present study suggest that the populations of parasitoids and their effectiveness in reducing infestations of the lepidopterous larvae on sorghum and maize in southern Honduras apparently are not significantly influenced by weed management strategies. Large scale validation of the proposed weed management system for control of lepidopterous pests on intercropped sorghum ad maize needs to be conducted to facilitate the transfer and implementation of this technology.

Acknowledgments: We thank Richard Brown, Gary Lawrence and Hector Portillo for critical reviews of this manuscript. Special appreciation is extended to Antonio Molina and Jorge Araque for weed collection and identification, to Rafael Caballero, Terry Schiefer, Richard Brown, Paul March, and Norman Woodley for identification of insects. The research was supported in part by the government of Honduras, the United States Agency for International Development (USAID), through the PL 480 Title I Program, and the International Sorghum and

Millet Collaborative Research Support Program (INTSORMIL), USAID development grant LAG-G-00-96-90009-00, with participation by Project Manejo Integrado de Plagas en Honduras (USAID/Honduras, Project No. 522-0362), Escuela Agricola Panamericana (EAP), Zamorano, Honduras. This research was conducted under the memorandum of understanding between the Ministry of Natural Resources (MNR) of the government of Honduras and INTSORMIL, Acuerdo No. 152, Tegucigalpa, D.C., February 8, 1993. Joint contribution of MNR, EAP, and MSU. The views and interpretations in this publication are those of the authors and should not be attributed to USAID.

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