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Source: Florida Entomologist, 90(4) : 759-761

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/0015-4040(2007)90[759:POFALN]2.0.CO;2

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PARASITOIDS OF FALL ARMYWORM (LEPIDOPTERA: NOCTUIDAE) FROM A TRADITIONAL MAIZE CROP IN THE MEXICAN STATE OF YUCATAN

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Studies on the natural enemies of the fall army worm (FAW), *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae) have reported a great diversity of associated parasitoids. Approximately 150 species of FAW parasitoids from 13 families have been recorded occurring in the Americas (Molina-Ochoa et al. 2003). Twenty-two species have been reported for Mexico, and species composition seems to vary throughout the country (Molina-Ochoa et al. 2004). In Northern states of Mexico parasitoids associated to FAW are entirely hymenopterans, whereas FAW parasitoid assemblages in some Southern states, i.e., Tabasco, Quintana Roo and Chiapas, include wasps and tachinid flies (Macháin et al. 1975; Zapata 1984; Cabrera & García 1985; Molina-Ochoa et al. 2001).

Here we report for the first time parasitoids of FAW from the Southern Mexican state of Yucatan. Direct FAW larval collections were performed within a traditional maize crop (*Zea mays* Linnaeus) located 9 km from the locality of Teya Yucatan, from July 19th to Sep 27th 1999. All FAW larvae detected on plants in 3 transects (composed by 1 meter square quadrants) within a 2-hectares area were collected for 3 d continuously fortnightly (totaling 5 surveys during the overall period). Collections corresponded with the rainy season, and started 3 weeks after maize seeding and ended when maize was ready for harvest. The maize crop was part of a "milpa", agro-system associating maize, bean, squash, chilli, and other crops, which was the main cropping system during the pre-Hispanic period and still in use in some parts of Mexico. The milpa was surrounded by a patch of tropical deciduous dry-forest, and other maize crops.

FAW larvae collected were taken to the laboratory, and individually maintained in rustical rearing cages. They were fed daily with tender leaves of maize until the eventual pupation and emergence of the adult lepidopteran or the parasitoids. We calculated the percentage of parasitism = (Total FAW larvae positive for parasitoids/Total FAW larvae collected) $\times$ 100 (Pair et al. 1986).

From 174 FAW larvae collected, 13.22% were parasited with 4 species of parasitoids (12 were parasited by dipterans and 11 by hymenopterans); the remaining larvae became moths. The parasitoids species collected were *Lespesia archippivora* (Riley) (10 specimens), *Archytas marmoratus* (Townsend) (4 specimens), *Winthemia* sp (4 specimens) (Diptera: Tachinidae), and *Euplectrus plathypenae* Howard (172 specimens) (Hymenoptera: Eulophidae). The taxonomic determination was made by the authors, and voucher specimens are deposited at the Coleccion Entomologica Regional of the Universidad Autonoma de Yucatan.

Lespesia archippivora and *E. plathypenae* represented the most abundant parasitoid species. This is the first report of *L. archippivora* for the Mexican state of Yucatan. Based on our results, it seems that species composition of FAW parasitoids in this locality of Yucatan is composed of widely-distributed species (Molina-Ochoa et al. 2003). *Lespesia archippivora* is a gregarian facultative endoparasitoid of several species of Lepidoptera (e.g., Arctiidae, Danaidae, Geometridae, Lycaenidae, Noctuidae, Ninphalidae, Papilionidae, Pieridae, Pyralidae, and Yponomeutidae) (Arnaud 1978), including economically important genera of lepidopteran pests (e.g., *Spodoptera*, *Trichoplusia*, and *Heliothis*). It is probably the most common parasitoid of FAW in Central America (Cave 1993), and distributed from Canada to South Mexico (Benaway 1963). *Archytas marmoratus* is a polyphagous solitary larval-pupal endoparasitoid of numerous species of Noctuidae, including many important pest species from the genera *Agrotis*, *Helicoverpa*, *Heliothis*, *Hyblaea*, *Leucania*, *Mocis*, *Pseudaletia*, and *Spodoptera* (Arnaud 1978; Ravlin & Stehr 1984; Maes 1989). It is distributed from U.S.A. throughout the Neotropics (Cave 1993). *Winthemia* hosts include in the Neartic region larvae of Noctuidae and some Sphingidae and Geometridae (Guimarães 1972). We were unable to identify the *Winthemia* specimens collected, but tentatively propose our specimens as *Winthemia quadripustulata*, according to their morphological features. The only hymenopteran species emerged, *E. plathypenae*, is a gregarian ectoparasitoid of Lepidoptera larvae. Known hosts include the genera *Anticarsia*, *Helicoverpa*, *Leucania*, *Mocis*, *Pseudaletia*, *Pseudoplusia*, *Spodoptera* and *Trichoplusia* (King & Saunders 1984; El-Heneidy 1985; Cave 1992, 1993, 1995). It is widely distributed in America.

In Teya Yucatan, as observed in other Southern Mexican states, FAW larvae-parasitoid assemblage is composed by tachinid and hymenopterans; but flies seem to be dominant. Studies in Tabasco have reported 4 species of parasitoids, 3 of them are dipterans *Archytas* and *Spallanizia* (Tachinidae) (Zapata 1984). In Chiapas, tachinid flies species of *Archytas*, *Lespesia*, and *Winthemia* are reported as well as hymenopterans *Rogas* (presumably *Aleiodes*) (Braconidae) and *Euplectrus* (Eulophidae) (Ruíz 1985; Espinosa 1986). In

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TABLE 1. PERCENTAGE OF PARASITISM FROM FAW LARVAL (n = 174) COLLECTED WITHIN A TRADITIONAL MAIZE CROP (JUN-SEP 1999) FROM THE LOCALITY OF TEYA, YUCATAN, MEXICO.

	Surveys					
	1	2	3	4	5	Average
Lespesia archippivora	—	15.38	—	—	2.78	9.08
Archytas marmoratus	3.23	3.85	3.57	1.89	—	3.14
Winthemia sp.	9.68	—	—	—	—	9.68
Euplectrus plathypenae	—	3.85	28.57	1.89	2.78	9.27
Total	12.90	23.08	32.14	3.77	5.56	

Quintana Roo (Peninsula of Yucatan), *Archytas* sp, *Lespesia archippivora* (Tachinidae), *Pristomerus spinator* (Ichenumonidae) and *Chelonus* sp (Braconidae) have been reported representing 41% larval parasitism (Carrillo 1980).

This contrasts with FAW larvae-parasitoids assemblages reported from other regions of Mexico. Reports from Northern Mexican states (Sonora, Baja California, and Tamaulipas) and Colima, Michoacan, Sinaloa, Nayarit, and Jalisco (among the Pacific coast), include exclusively hymenopterans: Braconidae (*Chelonus*, *Cotesia*, and *Meteoros*); Ichneumonidae (*Campoletis*, *Ophion*, and *Pristomerus*) and 1 species of Eulophidae, *Euplectrus platyhypenae* (Macháin et al. 1975; Carillo 1980; Pacheco 1985; Molina-Ochoa et al. 2001). In Morelos, Central Mexico is also composed by hymenopterans (*Chelonus insularis* (Braconidae), *Pristomerus spinator* and *Campoletis* sp (Ichneumonidae) (Cabrera & García 1985; Salazar et al. 1987). In Veracruz (among the Gulf of Mexico coast), the only reported parasitoids of FAW are *Trichogramma* sp (Trichogrammatidae) and *Euplectrus* sp (Eulophidae) (Carrillo 1980).

After 5 surveys (Table 1), only 23/174 FAW larvae were positive for parasitoids (13.22% overall percentage of parasitism); twelve FAW larvae contained dipteran parasitoids (6.9%) and eleven FAW larvae had *Euplectrus plathypenae* (6.32%). Individual low percentages of parasitism seem to be a feature of Tachinidae-FAW larval populations (Ashley 1986), as observed in Teya; but the percentage of parasitism caused by *E. plathypenae* was lower than others reported (i.e., Molina-Ochoa et al. 2004). All the species emerging from FAW immatures are primary koinobionts, attacking larval stages and killing the host, as larvae or pupae. According to our results, no single parasitoid species exerted significant mortality throughout a major portion of FAW larval population in Teya, but when combined can cause from 20-30% of FAW larval-pupal mortality.

SUMMARY

We report for the first time parasitoids of *Spodoptera frugiperda* larval populations from a traditional maize crop in the Mexican state of Yucatan. Species found are *Lespesia archippivora*, *Archytas marmoratus*, *Winthemia* sp. (Diptera: Tachinidae), and *Euplectrus plathypenae* (Hymenoptera: Eulophidae).

REFERENCES CITED

ARNAUD, P. H., JR. 1978. A Host-parasite Catalog of North American Tachinidae (Diptera). United States Department of Agriculture, Miscellaneous Publication No. 1319. 860 pp.

ASHLEY, T. R. 1986. Geographical distributions and parasitization levels for parasitoids of the fall armyworm, *Spodoptera frugiperda*. Florida Entomologist 69: 516-524.

BENEWAY, D. F. 1963. A revision of the flies of the genus *Lespesia* (*Archaetoneura*) in North America (Diptera: Tachinidae). Univ. Kansas Sci. Bull. 44: 627-686.

CABRERA, R. J., AND F. GARCÍA. 1985. Parasitismo natural sobre gusano cogollero *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae) en el estado de Morelos. Sociedad Mexicana de. Entomologia, p. 54 En Resumenes XX Congreso Nacional de Entomología. Ciudad Victoria, Tamaulipas, México.

CARRILLO, H. 1980. Determinación del parasitismo natural en larvas de gusano cogollero, *Spodoptera frugiperda* (J. E. Smith) en Quintana Roo. Folia Entomol. Mexicana 45: 111-112.

CAVE, R. D. 1992. Inventary of parasitic organisms of the striped grass looper, *Mocis latipes* (Lepidoptera: Noctuidae) in Honduras. Florida Entomol. 75: 592-598.

CAVE, R. D. 1993. Parasitoides larvales y pupales de *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae) en Centroamérica con una clave para las especies encontradas en Honduras. Ceiba 34: 33-56.

CAVE, R. D. 1995. Manual para el Reconocimiento de Parasitoides de Plagas Agrícolas en América Central. Zamorano Academic Press Honduras. 202 pp.

EL-HENEIDY, A. H. 1985. Biological aspects on *Euplectrus plathypenae* How. (Hymenoptera: Eulophidae), a larval parasitoid of the fall armyworm, Spodoptera frugiperda J. Smith (Lepidoptera: Noctuidae). J. Agric. Sci. Mansoura Univ. 10: 1535-1539.

ESPINOSA, M. J. 1986. Parasitismo sobre *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae) en maíz en dos sistemas de labranza y cuatro fechas de siembra, en Villa Flores, Chiapas. Sociedad Mexicana de. Entomologia, pp. 82-83 En Resúmenes XXI Congreso Nacional de Entomología. Monterrey, Nuevo León, México.

GUIMARÃES, J. H. 1972. A revision of the genus *Winthemia* Robineau-Desvoidy in America north of Mexico (Diptera, Tachinidae). Arq. Zool. 22: 27-112.

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KING, A. B., AND J. L SAUNDERS. 1984. Las Plagas Invertebradas de Cultivos Anuales Alimenticios en América Central. Administración de Desarrollo Extranjero, London. 182 pp.

MACHÁIN, L. M., MARTÍNEZ, J. L., SIFUENTES, AND J. L. CARRILLO. 1975. Principales Plagas de los Cultivos del Valle de Mexicali y sus Enemigos Naturales. Folleto técnico No. 57. INIA-SAG Mexico. 50 pp.

MAES, J. M. 1989. Catálogo de los insectos controladores biológicos en Nicaragua. Volúmen III. Insectos parasitoides. Rev. Nicar. Entomol. 10: 1-138.

MOLINA-OCHOA, J., J. J. HAMM, R. LEZAMA-GUTIÉRREZ, M. LÓPEZ-EDWARDS, M., M. GÓNZÁLEZ-RAMÍREZ, AND A. PESCADOR-RUBIO. 2001. A survey of fall armyworm (Lepidoptera: Noctuidae) parasitoids in the Mexican states of Michoacan, Colima, Jalisco, and Tamaulipas. Florida Entomol. 84: 31-36.

MOLINA-OCHOA, J., J. E. CARPENTER, E. A. HEINRICHS, AND J. E. FOSTER. 2003. Parasitoides and parasites of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in the Americas and Caribbean basin: an inventory. Florida Entomol. 86: 254-289.

MOLINA-OCHOA, J., J. E. CARPENTER, R. LEZAMA-GUTIÉRREZ, J. E. FOSTER, M. GÓNZÁLEZ-RAMÍREZ, C. A. ANGEL-SAHAGÚN, AND J. FARÍAS-LARIOS. 2004. Natural distribution of hymenopteran parasitoids of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) larvae in Mexico. Florida Entomol. 87: 461-204.

PACHECO, M. F. 1985. Plagas de los Cultivos Agrícolas en Sonora y Baja California. Libro técnico No. 1, Campo Agrícola Experimental Valle del Yaqui, CIANO, INIA, SARH Mexico. 414 pp.

PAIR, S. D., J. R. RAULSTON, A. N. SPARKS, AND P. B. MARTIN. 1986. Fall Armyworm (Lepidoptera: Noctuidae) parasitoids: Differential spring distribution and incidence on corn and sorghum in the Southern United States and Northeastern México. Environ. Entomol. 15: 342-347.

RAVLIN, F. W., AND F. W. STEHR. 1984. A revision of the genus *Archytas* (Diptera: Tachinidae) for América North of México. Misc. Publ. Entomol. Soc. Am. 58: 10-38.

RUIZ, N. R. 1985. Insectos parásitos de larvas de *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae) de dos municipios en el estado de Chiapas, México. Sociedad Mexicana de. Entomologia, p. 55 En Resúmenes XX Congreso. Nacional de Entomología. Cd. Victoria, Tamaulipas, México.

SALAZAR, P. A., R. Y. ESQUIVEL, AND J. CABRERA. 1987. Fluctuación poblacional de los parásitos naturales del gusano cogollero *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae) en siembras escalonadas de maíz de riego. Lab. CEZACA 1986-87. Inf. Prog. Entomol. P-V 1987. CIFAP- Estado de Morelos, INIFAP, SARH Mexico. 19 pp. S/No.

ZAPATA, M. R. 1984. Enemigos naturales de Spodoptera frugiperda, Mocis latipes y *Diatrea* spp. en el cultivo de maíz. Sociedad Mexicana de Entomologia, p. 56 En Resúmenes XIX Congreso Nacional de Entomología. Guanajuato, Guanajuato, México.

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