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Source: Southwestern Entomologist, 47(1) : 119-122

Published By: Society of Southwestern Entomologists

URL: <https://doi.org/10.3958/059.047.0111>

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Species of Trichogrammatidae¹ on Alfalfa (*Medicago sativa* L.) in the Comarca Lagunera, Mexico

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Abstract. Alfalfa (*Medicago sativa* L.) is attacked by pests that cause serious damage when not controlled. Among the insect pests are pea aphid, *Acyrtosiphon pisum* Harris; spotted alfalfa aphid, *Therioaphis maculata* Buckton; armyworm, *Spodoptera exigua* Hübner; alfalfa leafhopper, *Empoasca fabae* Harris; and three-cornered alfalfa hopper, *Spissistilus festinus* Say. In the Comarca Lagunera, insecticides seldom are used to control alfalfa pests that are regulated by beneficial insects. However, species that provide this service are little known. The objective of this study was to identify Trichogrammatidae collected with a sweep net each week from 3 March to 30 December 2011 in an alfalfa plot at the Unidad de Producción 18 de Julio at Universidad Autónoma Chapingo at Bermejillo, Durango. Species identified were *Aphelinoidea* nr. *roja* Triapitsyn 2005; *Oligosita sanguina* Girault 1911; *Paracentrobia punctata* Howard 1897; *Ufens* nr. *simplipenis* Owen 2005; and *Trichogramma pretiosum* Riley 1879. *A.* nr. *roja*, *O. sanguinea*, *P. punctata*, *T. pretiosum*, and *U.* nr. *simplipenis* on alfalfa are new records for Mexico. With the exception of *T. pretiosum*, the other species are pest insects with sucking habits.

Introduction

The Lagunera Region, delineated by several municipalities in the States of Coahuila and Durango, raises 250,877 cattle that require 3,529 tons of alfalfa (*Medicago sativa* L.) and produce 2,613,578 liters of milk per year (El Siglo de Torreón 2020). Great diversity and abundance of insect pests are favored by conditions in which alfalfa is grown. More than 100 species of insect pests cause damage, but not all occur in a specific place or at the same time. Among the most important in alfalfa of the Lagunera Region are pea aphid, *Acyrtosiphon pisum* Harris (Hemiptera: Aphididae); spotted alfalfa aphid, *Therioaphis maculata* Buckton (Hemiptera: Aphididae); armyworm, *Spodoptera exigua* Hübner (Lepidoptera: Noctuidae); alfalfa leafhopper, *Empoasca fabae* Harris (Hemiptera: Cicadellidae); and three-cornered alfalfa hopper, *Spissistilus festinus* Say (Hemiptera: Membracidae). The insects can cause serious damage to quality and quantity of alfalfa produced (Summers et al. 1985).

¹Hymenoptera: Chalcidoidea

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Beneficial insects naturally regulate pests, but knowledge of their diversity and abundance in alfalfa is not well known. A few studies such as that of Ortiz (2010) found *Aphidius ervi* Haliday (Hymenoptera: Braconidae), *Trioxyx* sp., and hyperparasitoids *Alloxysta* sp. and *Pachyneuron* sp. in *A. pisum* and *Therioaphis trifolli* Monell (Hemiptera: Aphididae) aphids in a study in the State of Michoacán. Caballero et al. (1990) found braconids *Meteorus pulchricornis* Wesmael and *Homolobus truncatoides* van Achterberg (Hymenoptera: Braconidae), ichneumonid *Hyposoter didymator* Thunberg (Hymenoptera: Ichneumonidae), and tachinid *Gonia bimaculata* Wiedeman (Diptera: Tachinidae) associated with *S. exigua* and *S. littoralis*. Trichogrammatids attack eggs of a wide variety of Lepidoptera, Hemiptera, and Coleoptera. Some trichogrammatid genera have a restricted host range, while others are polyphagous. For example, *Megaphragma* is associated only with Thysanoptera eggs, while *Poropoea* parasitizes Attelabidae (Coleoptera) eggs. In contrast, *Trichogramma* species are not markedly specific to their hosts because they develop in species of various families of Lepidoptera and other orders. Genera such as *Hydrophylita* and *Prestwichia* attack eggs of aquatic insects Odonata, Notonectidae (Hemiptera), and Dytiscidae (Coleoptera) (Pinto 1995). Reviews indicated 811 species in 83 genera of Trichogrammatidae worldwide, with three of the general recently described with 11 species: *Adryas* with eight species, *Kyuwia* with two species, and *Pachamama* with one (Owen and George 2003, Owen and Pinto 2004, Pinto and George 2004, Pinto and Owen 2004).

Materials and Methods

A 1-ha alfalfa plantation was planted at the Unidad de Producción 18 de Julio at Universidad Autónoma Chapingo at Bermejillo, Durango, with geographical coordinates 23° 54' N latitude and 103° 37' W longitude, and 1,130 m above sea level. The climate of the area is dry with rain in summer, average annual rainfall of 239 mm, percentage of winter rains of less than 5%, and thermal oscillation from 7 to 17°C (García 1973).

Insects were collected once a week from 3 March to 30 December 2011. The alfalfa was not treated with pesticides. On each sampling date, 100 sweeps by insect net were made in a zigzag pattern along the entire length and width of the plot. At the end of sampling, the bag was removed from the net, and the insects were put into ethyl acetate in a lethal chamber, then into a container with 70% alcohol for subsequent cleaning and identification.

Insects collected were identified to family, genus, or species. For identification of Trichogrammatidae, permanent preparations were made based on methodology by García (2006). Descriptions and keys by Douthett and Viggiani (1968), Gauld and Bolton (1993), Goulet and Huber (1993), Gibson et al. (1997), Pinto (1998), Walker et al. (2005), and González (2006) were used to identify families, genera, and species of parasitoid hymenopterans.

Results and Discussion

In total, 4,783 specimens from the Chalcidoidea superfamily were collected. Of the specimens, 2,279, 1,035, 814, 221, 136, 115, 105, 41, 27, eight, and two were Eulophidae, Pteromalidae, Eurytomidae, Mymaridae, Trichogrammatidae, Figitidae, Torymidae, Encyrtidae, Aphelinidae, Chalcididae, and Signiphoridae, respectively.

The 136 specimens of Trichogrammatidae were separated by date and genus, and species were determined as *Aphelinoidea* nr. *roja* Triapitsyn, Walker & Bayoun (Hymenoptera: Trichogrammatidae) (Fig. 1), *Oligosita sanguina* Girault (Fig. 2), *Paracentrobia punctata* Howard (Fig. 3), *Trichogramma pretiosum* Riley (Fig. 4), and *Ufens* nr. *simplipenis* Owen (Figs. 5a,b). Of the total number of specimens of the family collected, most trichogrammatids (32) were collected on 14 April. On 9, 23, and 30 March, 4 April, and 20 July, at least 11 specimens were collected. In contrast, no specimen of Trichogrammatidae was collected on 4, 11, and 19 May, 29 June, or 17 August. The period with most trichogrammatids was 9 March to 27 April.



Fig. 1. Antenna of *Aphelinoidea* nr. *roja*.



Fig. 2. Antenna of *Oligosita sanguina*.



Fig. 3. Antenna of *Paracentrobia punctata*.

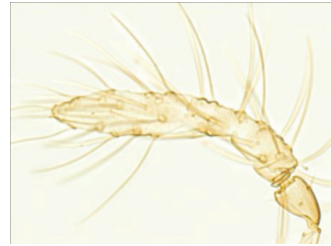


Fig. 4. Antenna of *Trichogramma*



Fig. 5a. Antenna of *Ufens* nr. *simplipenis*.

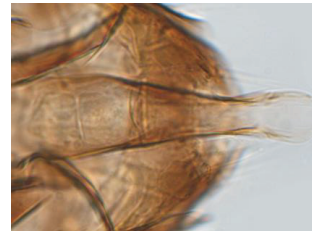


Fig. 5b. Genitalia of *Ufens* nr. *simplipenis*.

The hosts and distribution of genera and species of Trichogrammatidae are diverse. The genus *Aphelinoidea* has 36 species of which nine were described in the New World. The genus is divided into three subgenera: *Lathromeroides*, *Encyrtogramma*, and the subgenus with *A. oblita* De Santis (South America), *A. plutella* Girault, *A. roja* Triapitsyn, Walker and Bayoun, *A. semifuscipennis*, and *A. zarehi* Triapitsyn, Walker and Bayoun (the last four described for North America). Its distribution in Mexico has been reported from Baja California Norte, Baja California Sur, Campeche, Chiapas, Colima, Guerrero, Nuevo León, San Luis Potosí, Sinaloa, Tamaulipas, and Veracruz (Pinto 2006). Cicadellidae (*Circulifer tenellus* Baker) and Fulgoridae (Timberlake 1924, Trjapitzin 1995, Walker et al. 2005) were reported as hosts. On *Oligosita* Walker, Pinto and Viggiani (2004) transferred 46 species of the

144 previously assigned to *Oligosita* to *Pseudoligosita*, and of the 98 species that remained in *Oligosita*, only *O. americana* Girault, *O. clarimaculosa* Girault, *O. sanguina* Girault, and *O. subfasciatipennis* Girault were reported from North America.

In Mexico, *Oligosita* was registered in the States of Baja California Sur, Campeche, Chiapas, Colima, Guerrero, Jalisco, Mexico City, Morelos, Nuevo León, Quintana Roo, Sinaloa, Tamaulipas, Veracruz, and Yucatán. It has been registered as a parasitoid of leafhoppers (Hemiptera: Cicadellidae) (Pinto 2006). The number of species described of *Paracentrobia* Howard is 43 (Pinto 2006). By 2006, the genus was not reported in the New World, including Mexico. However, Virla et al. (2009) reported *Paracentrobia* nr. *subflava* parasitizing *Dalbulus maidis* DeLong & Wolcott at Jalisco. Ávila-Rodríguez et al. (2010) reported 20 genera of Trichogrammatidae, of which *Paracentrobia* was in the States of Chihuahua, Coahuila, Durango, Guerrero, Jalisco, Nuevo León, Sinaloa, and Sonora. The genus also is associated with Auchenorrhyncha (Hemiptera) pest insects. The genus *Trichogramma* Riley has 210 species of which 68 are in North America. The species of this genus are parasitoids of eggs of pests mostly in the order Lepidoptera. The genus is divided into three subgenera: *Trichogramma* with 173 species, *Vanlisus* with four species, and *Trichogrammanza* with three species. The subgenus *Trichogramma* is cosmopolitan, *Trichogrammanza* is known only in Australia and New Zealand, and *Vanlisus* is found in Central America, Baja California Sur (Mexico), and Australia (Pinto 1998). García-González (2006) determined native species of *Trichogramma* in cabbage *Brassica oleracea* L., cotton *Gossypium hirsutum* L., maize *Zea mays* L., orange *Citrus sinensis* (L.) Osbeck, serrano pepper *Capsicum annuum* L., soybean *Glycine max* (L.), sugarcane *Saccharum officinarum* L., sunflower *Helianthus annuus* L., tomato *Lycopersicon esculentum* P. Mill., and walnut *Carya illinoensis* W. in six states of Mexico. *T. pretiosum* Riley was found in cabbage, cotton, maize, orange, serrano pepper, soybean, sunflower, tomato, and walnut, but not sugarcane; *T. fuentesi* Torre in maize and walnut; *T. exiguum* Pinto and Platner in maize, and *T. deion* Pinto and Oatman and *T. atopovirilia* Oatman and Platner in sugarcane. Stern and Bowen (1963) reported *Trichogramma semifumatum* (Perkins) as one of the best biological control agents for *Colias eurytheme* Boisds in southeastern California. *C. eurytheme* is the main pest of alfalfa in this state of Mexico. The genus *Ufens* Girault had 43 species described worldwide in 2011. Three species recognized in the New World are *U. niger* Ashmead, *U. ceratus* Owen, and *U. principalis* Owen (Pinto 2006, Owen 2011). The main hosts are hemipteran eggs (Pinto 1998). *U. simplipennis* reproduces in *Circulifer* (syn. *Eutettix*) *tenellus* (Baker), *Aceratagallia abrupta* Oman, and *Homalodisca* sp. (Hemiptera: Cicadellidae) in Baja California and the United States. It is also associated with host plants such as Chenopodiaceae *Atriplex lentiformis* (Torr.) S. Watson, *Chenopodium* sp., *Monolepis* sp., and *Salsola* sp., *Pluchea sericea* (Nutt.) Coville (Asteraceae), *Sida hederacea* (Dougl.) Torr. (Malvaceae), *Plantago erecta* E. Morris (Plantaginaceae), *Lycium* sp. (Solanaceae), *Tamarix* sp. (Tamaricaceae), and vine (Vitaceae). The species was reported in Baja California Sur, Distrito Federal, Nuevo León, and Zacatecas in Mexico (Owen 2011).

Except *Trichogramma*, species in alfalfa samples were related to insect pests of hemipterans with sucking habits. *A. nr. roja*, *O. sanguinea*, and *P. punctata* were reported by García-González et al. (2013) from samples collected with yellow pan traps at the INIFAP Matamoros Coahuila vine plantation. They are new records on alfalfa for Mexico. *T. pretiosum* already was recorded parasitizing the yellow butterfly, *Colias* sp., on alfalfa although according to existing information, the collection site was not reported, so it was concluded the species is a new report for the State of

Durango and on alfalfa in Mexico. *U.* near *simplipennis* is a new record for the State of Durango and for alfalfa. In conclusion, alfalfa has diverse and abundant parasitoid hymenopterans, which allows the crop in the future to be used as a natural reservoir of native beneficial insects.

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