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Egg parasitoids of the leafhopper *Rhabdotalebra flava* Catalano (Hemiptera: Cicadellidae) on *Handroanthus* in Argentina

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Parasitoides oófilos de la chicharrita *Rhabdotalebra flava* Catalano (Hemiptera: Cicadellidae) sobre *Handroanthus* en Argentina

RESUMEN. Se citan parasitoides de huevos de *Rhabdotalebra flava* Catalano (Hemiptera: Cicadellidae) en la provincia de Tucumán, Argentina. Los huevos fueron colectados durante el verano en hojas de *Handroanthus impetiginosus* (Mart. ex DC.) Mattos (Bignoniaceae). Se identificaron dos especies: *Anagrus atomus* (L.) (Mymaridae) y *Epoligosita mexicana* (Viggiani) (Trichogrammatidae), siendo estas nuevas asociaciones entre hospedador y parasitoide.

PALABRAS CLAVE. *Anagrus*. Chicharritas. *Epoligosita*. Mymaridae.

ABSTRACT. The aim of this study is to report egg parasitoids associated to *Rhabdotalebra flava* Catalano (Hemiptera: Cicadellidae), in Tucumán province, Argentina. During the summer, *Handroanthus impetiginosus* (Mart. ex DC.) Mattos (Bignoniaceae) leaves with eggs of *Rhabdotalebra flava* were collected. Two species of parasitoids, *Anagrus atomus* (L.) (Mymaridae) and *Epoligosita mexicana* (Viggiani) (Trichogrammatidae) were identified as new host-parasitoid associations.

KEYWORDS. *Anagrus. Epoligosita.* Leafhoppers. Mymaridae.

Cicadellidae, one of the most numerous families of Hemiptera, includes phytophagous insects known as leafhoppers. One of the most interesting aspects of this family is its phytosanitary importance, because its members transmit pathogens to many host plants, causing diseases (Nault & Ammar, 1989). Typhlocybinae is the second most important subfamily in terms of size, with about 5,000 described species known worldwide (McKamey, 2002). These species are agricultural pests because of the mechanical damage they cause to the leaves (called "stippling" and "hopperburn") in crops such as bean, potato, apple tree, and grapevine, resulting in significant economic losses (Backus et al., 2005). Species in this subfamily are also vectors of pathogens such as phytoplasma 16Sr III (X-disease), known to be the cause of the garlic decline disease, having a great impact in Argentina (Catalano, 2011).

Rhabdotalebra flava Catalano is a micro leafhopper of yellowish color with dark brown spots. This species lives on leaves of *Handroanthus pulcherrimus* (Sandw.) Grose and *H. impetiginosus* (Mart. ex DC.) Mattos (Bignoniaceae) in Tucumán Province. Catalano et al. (2010) have observed damage caused by *R. flava* on top of leaves of the plant hosts. Both adults and immature stages live in the abaxial surface of leaves causing little yellowish dots until they turn yellowish to dark brown (Catalano et al., 2010).

The parasitoids are antagonists that can be divided

into two guilds: those attacking eggs, and those affecting nymphs and adults (Cronin & Strong, 1993). Eggs of several leafhoppers are commonly parasitized by members of Mymaridae and Trichogrammatidae (Hymenoptera: Chalcidoidea), as well as by some species of other Chalcidoidea such as Aphelinidae and Eulophidae. According to Freytag (1985), many of these species can reach attack levels close to 100%. Denno & Roderick (1990) have proven that mortality caused by these egg parasitoids constitutes a key factor in the population dynamics of some species of leafhoppers.

In Argentina, researches about the host-parasitoid associations of Typhlocybinae have been poorly developed. There are some studies dealing with parasitoids of nymphs and adults, attacking species of *Empoasca* Walsh, that belong to the family Dryinidae (Hymenoptera) (Paradell, 1995; Guglielmino & Olmi, 1997, 2006; Virla & Olmi, 1998). Publications about parasitoids that affect eggs of Typhlocybinae in Argentina seem to be absent. The aim of this contribution is to report egg parasitoids associated to *R. flava*.

Leaves of *H. impetiginosus* were collected during summer (November to March), in San Miguel de Tucumán, Tucumán, Argentina (26° 49' 47'' S; 65° 13' 20'' W). Twenty weekly samples took place, with a total of 60 leaves of *H. impetiginosus per* collection. At the laboratory, leaves with eggs were transferred to Petri dishes containing wet tissue paper on the bottom and covered with polyethylene film to avoid desiccation as well as to contain the emerging nymphs and/or wasps (Fig. 1 A, B). The dishes were checked daily to ensure leaf quality until the emergence of all the adult wasps in case the eggs were parasitized.

The parasitoid specimens were preserved in 70% ethanol and later slide-mounted in Hoyer's medium following the traditional practices (Luft Albarracin et al., 2017). All emerging parasitoids were identified using specific keys (Pinto, 2006; Triapitsyn, 2015) and by comparison with the original description of the species (Pinto & Viggiani, 1987). Identification of leafhoppers was made using specific keys (Young, 1952; Catalano et al., 2010). Voucher specimens were deposited at the entomological collection of the Instituto Fundación Miguel Lillo, San Miguel de Tucumán, Tucumán, Argentina (IMLA).

The females of *R. flava* deposit eggs isolated on *H. impetiginosus* leaves, and the eggs are completely covered by plant tissue. The parasitized eggs of *R. flava* were easily recognized by presenting a dark coloration in contrast to unparasitized eggs, with transparent to whitish coloration. A single wasp emerges in parasitized eggs, through a circular hole made close to the apical end of its host egg. Ten specimens of parasitoids emerged from the collected eggs. There were two parasitoids identified: one female and two males of *Anagrus atomus* (L.) (Mymaridae) (Fig. 1 C, D); plus four females and three males of *Epoligosita mexicana* (Viggiani) (Trichogrammatidae) (Fig. 1 E, F).

Anagrus atomus is a member of the "*atomus*" species group. This species is characterized by F3 without sensory ridges, F4-F5 with 1 sensory ridges; F6 with two sensory ridges; F2 and F3 together much longer than F6, at least by almost 1/2 of their combined length; bare area on forewing disc short; forewing with longest marginal setae much longer than maximum fore wing width; 3 or 4 rows of microtrichia present anterior to bare area (Chiappini, 1987, 1989). *Anagrus atomus* is widely distributed in several countries of the Northern hemisphere. It is a common, solitary egg parasitoid of several Cicadellidae (mainly Typhlocybinae) and some Delphacidae (Triapitsyn, 2015).

Material examined. Argentina, Tucumán, San Miguel de Tucumán, emerged from an egg of *R. flava* , M. J. Amiune col., 6.iii.2016, 1 female and 1 male, 28.iii.2016, 1 male.

The other parasitoid is *E. mexicana*, which is characterized by presenting the body yellow; eyes and ocelli blackish; tips of mandibles yellowish brown; forewings with basal third and substigmal area infuscated; antenna with scape three times as long as wide; funicle segment as long as wide; club not clearly divided in two segments, twice the length of pedicel, club five times as long as the funicle segment; fore wing 3.0 as long as wide; ovipositor occurring about half length of gaster, about as long as hind tibia (Pinto & Viggiani, 1987). *Epoligosita* Girault is a widely distributed genus which contains 22 species (Pinto, 2006). Only *E. mexicana* occurs in the New World. In Argentina, this species was reported in Northern provinces (Chaco, Formosa, and Salta) (Pinto, 2006; Santos et al., 2009). At the moment, the known hosts associated to *E. mexicana* were two Typhlocybinae species, *Dikrella cockerelli* (Gillette) and *Erythroneura ziczac* Walsh in Mexico (Pinto & Viggiani, 1987), and *Leptopharsa heveae* Drake & Poor (Hemiptera: Tingidae) eggs in Brazil (Santos et al., 2009).

Material examined. Argentina, Tucumán, San Miguel de Tucumán, emerged from an egg of *R. flava* , M. J. Amiune col., 13.i.2016, 1 male, 19.i.2016, 1 female, 2 males, 28.iii.2016, 3 females.

This is the first time that the parasitoids *A. atomus* and *E. mexicana* are reported in Argentina associated to eggs of *R. flava.* Altieri & Nicholls (2000) have observed that conserving natural enemies populations (*i.e.* Trichogrammatidae) could lead to a long-term regulation of pest species, under the assumption of an appropriate cultural agroecosystem management; this procedure would guarantee an optimal environment to increase both abundance and efficiency of parasitoid and predators. Under these conditions, biological control can become a self-perpetuating strategy, with low cost of control and a minimum (or non-existent) environmental impact (Flint & Roberts, 1988). There are many reports of *Anagrus* Haliday species acting against Typlocybinae leafhoppers, such as *Erytroneura* spp., which are important pests of grapevine crops at

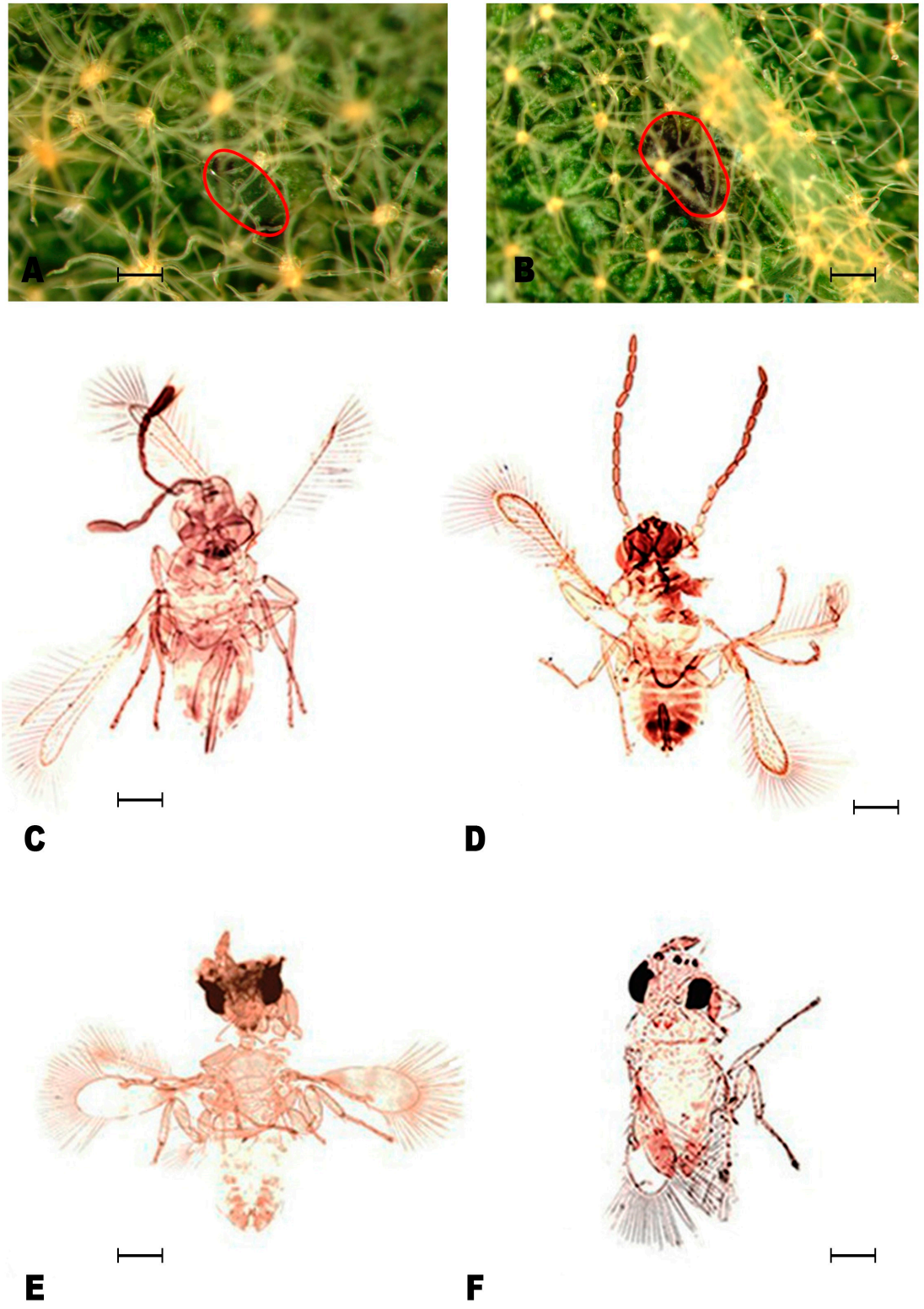

Fig. 1. A. Unparasitized eggs of *Rhabdotalebra flava* on *Handroanthus impetiginosus*. B. Parasitized eggs of *Rhabdotalebra flava* on *Handroanthus impetiginosus*. C. *Anagrus atomus*, female. D. *Anagrus atomus*, male. E. *Epoligosita mexicana*, female. F. *Epoligosita mexicana*, male.

Northwestern USA (Williams & Martinson, 2000; Prischmann et al., 2007).

In this way, future studies could be carried out, in which *H. impetiginosus* plants play a role of insect benefit reservoir with the possibility of being used as "curtains" or "border plants", as well as "vegetal corridors". These techniques could stimulate the movement of parasitoids to crops of high economic importance for Argentina.

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