# Bionomics of Oncometopia tucumana (Hemiptera: Cicadellidae), a Sharpshooter from Argentina, With Notes on its Distribution, Host Plants, and Egg Parasitoids

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# BIONOMICS OF *ONCOMETOPIA TUCUMANA* (HEMIPTERA: CICADELLIDAE), A SHARPSHOOTER FROM ARGENTINA, WITH NOTES ON ITS DISTRIBUTION, HOST PLANTS, AND EGG PARASITOIDS

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Abstract

Bionomics of the proconiine sharpshooter *Oncometopia tucumana* Schröder (Hemiptera: Cicadellidae) from northern Argentina is reported. Leafhoppers were monitored during the entire season in a citrus orchard in Horco Molle, Tucumán Province, and also sampled in Jujuy and Salta Provinces. The sharpshooters were found from spring to late fall; they overwinter as adults and females do not lay eggs from Apr to Oct. *Oncometopia tucumana* is polyphagous, 12 plants in 11 families were recorded as its hosts for the first time. Egg masses of *O. tucumana* were attacked by 3 parasitoid species, *Gonatocerus annulicornis* (Ogloblin), *G. metanotalis* (Ogloblin), and *G. tuberculifemur* (Ogloblin) (Hymenoptera: Mymaridae), that collectively produced egg mortality close to 60%. *Gonatocerus annulicornis* was the main egg parasitoid, emerging from nearly 80% of the parasitized eggs.

Key Words: Proconiini, *Oncometopia*, seasonal occurrence, Mymaridae, *Gonatocerus*

Resumen

En este trabajo se informan aspectos biológicos del proconino *Oncometopia tucumana* Schröder (Hemiptera: Cicadellidae) en el norte de Argentina. Las chicharritas fueron monitoreadas durante todo un año en un cultivo de citrus en Horco Molle, provincia de Tucumán, así como en las provincias de Jujuy y Salta. Estas chicharritas fueron encontradas desde la primavera hasta finales del otoño, pasando el invierno como adultos y sus hembras no depositan huevos durante dicho período, entre abril y octubre. *Oncometopia tucumana* es polífaga y habiendo sido registrada en 12 plantas hospedadoras, pertenecientes a 11 familias. Las posturas de *O. tucumana* son atacadas por tres especies de parasitoides, *Gonatocerus annulicornis* (Ogloblin), *G. metanotalis* (Ogloblin) y *G. tuberculifemur* (Ogloblin) (Hymenoptera: Mymaridae), quienes en conjunto producen una mortalidad de huevos cercana al 60%. *Gonatocerus annulicornis* fue el principal parasitoide oófago, emergiendo de aproximadamente un 80% de los huevos parasitizados.

Translation provided by the authors.

The tribes Proconiini and Cicadellini, commonly referred to as sharpshooters (Hemiptera: Cicadellidae: Cicadellinae), represent the largest group of xylem-feeding leafhoppers and include most of the known vectors of xylem-born phytopathogenic organisms (Rakitov & Dietrich 2001). The glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis* (Germar), is a well-known vector of the bacterium *Xylella fastidiosa* that causes Pierce's disease of grapes and phony peach disease in the USA and Mexico. In California, USA, production of wine and table grapes is under threat due to the efficiency of the GWSS in vectoring this pathogen (Blua et al. 1999).

*Oncometopia* Stål is widely distributed in the New World, from northern USA to Argentina, and is the most largest genus of the Proconiini, or proconiine sharpshooters. Some species are of significant economic importance, e.g., *O. orbona* (Fabricius) and *O. nigricans* (Walker), are vectors of *X. fastidiosa*, and *Oncometopia facialis* (Signoret) is involved in *X. fastidiosa* transmission in citrus and coffee in Brazil that causes citrus variegated chlorosis (Lopes 1999; Yamamoto et al. 2002). Two species of *Oncometopia* occur in Argentina: *O. facialis* in Misiones Province (Remes Lenicov et al. 1999) and *O. tucumana* Schröder in northern Argentina (Schröder 1959; Young 1968), with a recent record from Horco Molle, Tucumán Province (Takiya & Dmitriev 2004-2006).

Since Dec 2000, the USDA-ARS South American Biological Control Laboratory, Hurlingham, Buenos Aires, Argentina (SABCL) has been conducting a survey of egg parasitoids of the proconiine sharpshooters in South America for the neoclassical biological control program against the *H. vitripennis* in California. This approach is based on the "new association" strategy (Pimentel 1963, 1991; Hokkanen & Pimentel 1989) that involves selection of natural enemies of the species closely related to the target pest, with which the natural enemies have not had a previous association. Short distances in the taxonomic proximity between the host and the target species increase the probability of success (Van Driesche & Bellows 1996). Studies in South America on the biology and natural enemies of the proconiine sharpshooter genera closely related to *Homalodisca* Stål are of particular interest. This study is focused on *O. tucumana* due to the close relationship between the genera *Oncometopia* and *Homalodisca* (Young 1968). We investigated seasonal occurrence, host plants (for feeding and oviposition), oviposition substrates, and egg parasitoid complex of *O. tucumana* in cultivated and surrounding wild areas in Tucumán Province of Argentina.

## Material and Methods

### Seasonal Abundance in a Citrus Orchard

Temporal occurrence and abundance of *O. tucumana* and its egg parasitoids were estimated in a 4-ha abandoned 40-years-old lemon orchard, surrounded by wild vegetation located in Horco Molle, Tucumán Province in the Yunga's rainforest (26°46'50.1"S, 65°19'38.3"W; elevation: 703 m; annual precipitation: 1250 mm; summer mean temperature (Jan): 23.8°C, winter mean temperature (Jul): 11.3°C). The sampling was conducted weekly from mid Sep 2003 to late Jun 2004, and consisting in searching at random during 45 min for the egg masses on leaves and stems. Fifteen trees were checked during each sampling session. In addition, shrubbery plants surrounding the lemon trees were checked. Nymphs and adults were sampled by sweeping with a standard entomological net on the same plants where the visual search for eggs was conducted. The collected sharpshooters were taken to the laboratory, sexed, and some of them preserved as voucher specimens.

### Distribution and Host Plants

A non-systematic search for *O. tucumana* and its egg parasitoids was made on the wild plants and 2 agricultural crops in 58 sites between 26°22' to 27°58'S and 64°33' to 65°44'W, in the following 3 areas: southern Andean Yunga's region, Chaco region, and the ecotone between both regions in Tucumán Province. In addition, the 2 main entomological collections in Argentina: Museo de Ciencias Naturales, La Plata, Buenos Aires (MLPA) and Instituto y Fundación "Miguel Lillo", San Miguel de Tucumán, Tucumán (IMLA), were consulted for specimens of this sharpshooter.

Yunga's is a submontane and montane evergreen forest with altitudes between 500 and 2000 m. This forest is characterized by a great variation in rainfall; being all tropical, frequently foggy, and has a low annual range of temperature. Annual precipitation range of the Yunga's forest is between 1000 and 2000 mm; the dry season lasts 2 to 5 months. Chaco is a tropical deciduous dry forest with annual precipitation ranging from 500 to 900 mm; the dry season lasts 5 to 8 months. Chaco is a wooded region where the average temperature in the coldest month is greater than 13°C; it is widely disturbed by agricultural activities.

The survey was conducted between Dec 2002 and Dec 2005. Most samples from crops were collected on citrus (mainly lemon) and a few also on corn. The wild vegetation was surveyed by searching on the plants that surrounded the crops and also on the plants growing along roadways. The plants were sampled for adult sharpshooters by different methods according to plant size and structure. Herbs and small shrubs were sampled by sweeping or by hand-beating over a white plastic tray (30 × 27 × 17 cm) or a sheet (100 × 100 cm). Medium and large shrubs were sampled by hand-beating over a tray or a sheet. All plants sampled for adults were also checked for egg masses.

### Egg Parasitoids

Egg masses of *O. tucumana* were removed from the plants and kept separately for parasitoid emergence in Petri dishes with the bottom lined with wet tissue paper. Each Petri dish was covered with plastic food wrap to avoid dehydration of the eggs and the leaves. Subsequently, nymph and parasitoid emergence was recorded; the specimens were preserved in 70% ethanol, labeled, and identified. Egg masses that did not have any developed embryos or parasitoid pupae were not considered.

Voucher Specimens

Insect voucher specimens were deposited in IMLA and the Entomological Research Museum, University of California at Riverside, California, USA. Plant voucher specimens were deposited in SABCL.

## RESULTS

Seasonal Abundance in a Citrus Orchard

*Oncometopia tucumana* was collected from spring to late fall (Fig. 1). No adults or nymphs were found from Jul to mid Oct (winter to spring). First egg masses were collected at the beginning of the growing season (Oct). However, first adults were observed in Nov (middle of spring). Oviposition occurred from Oct to the end of Mar (spring to summer); no egg masses were found from Apr through early Oct (Fig. 1).

The sex ratio of *O. tucumana* was male biased (2.5:1; $n = 517$). When the sex ratio was calculated monthly, it was still male biased but the proportion of males started to decrease with time, so that the sex ratio reached approximately 1:1 during the fall (Apr to May) (Fig. 2). Like other proconiine sharpshooters, females of *O. tucumana* lay eggs endophytically as a cluster, oriented nearly parallel to one another, and the egg masses are coated with brochosomes (Rakitov 2004) (Fig. 4).

In total, 45 egg masses (413 eggs) were collected during the study, with 34 masses found on the leaves (75.6%) and 11 (24.4%) on the stems. All egg masses on the leaves were located in the abaxial surface, and we never found more than 1 per leaf.

Sharpshooter Distribution and Host Plants

We found *O. tucumana* in 10 sites (27.6% of the sampled sites) in non-disturbed areas of both the Yunga's rainforest (60%) (Horco Molle, Lules, Yerba Buena, Los Nogales, Tafí Viejo, and Santa Lucia), and the ecotone between Yunga's and Chaco regions (40%) (El Manantial, La Rinconada, Macomitas, and San Miguel de Tucumán). *Oncometopia tucumana* was always found in the Yunga's rainforest, mostly in non-disturbed areas of the foothills of San Javier Mountains. The egg masses collected from corn were obtained in subsistence crops surrounded by dense natural vegetation. In addition, in IMLA we found 2 male specimens from Embarcación (Salta Province), 6.ii.1950, collected by Golbach, and 4 female specimens from Aguas Calientes (Jujuy Province), 1.iv.2004, collected by G. Logarzo; both localities have typical rainforest vegetation and are located in the ecotone between Yunga's and Chaco region.

The pattern of plant utilization was influenced by the host plant species. Some plants supported only adults while others supported both adults and eggs. Adults of *O. tucumana* were collected on 12 host plants from 11 different families (Table 1). However, most collections were made on 2 plant species from 2 different families: shrub verbena, *Lantana camara* (Verbenaceae) and yellow trumpet-flower, *Tecoma stans* (Bignoniaceae). No eggs

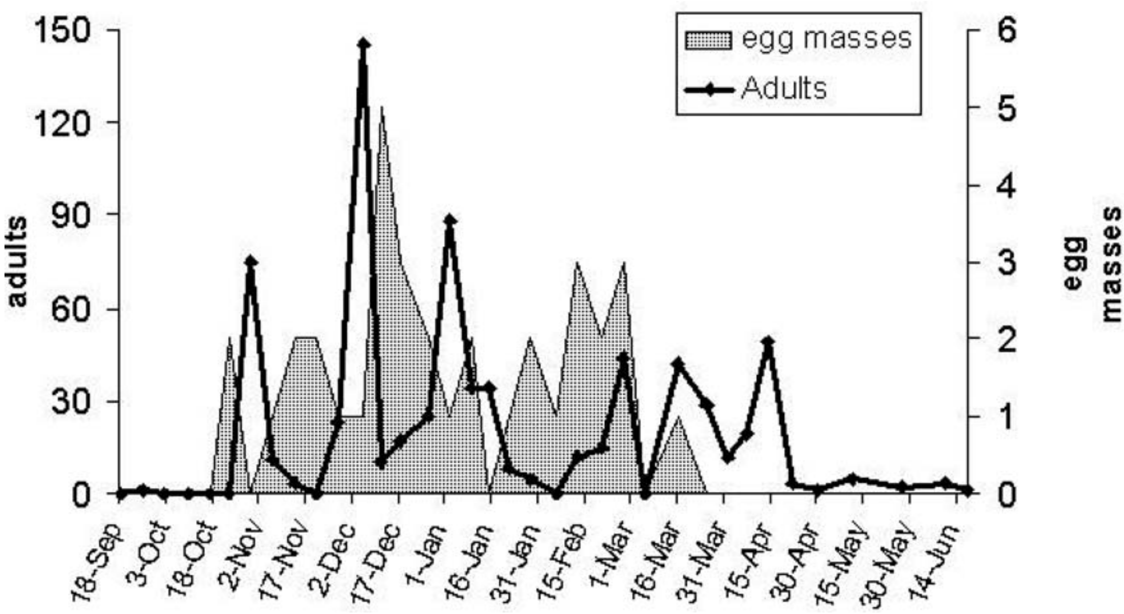


Fig. 1. Weekly occurrence of *Oncometopia tucumana* in an abandoned citrus orchard at Horco Molle (Tucumán Province, Argentina) during 2003 and 2004.

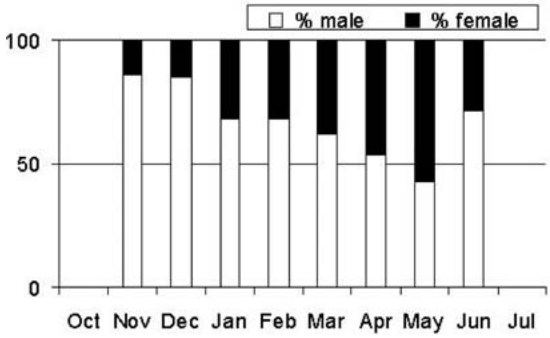


Fig. 2. Seasonal sex ratio rate of *Oncometopia tucumana* in an abandoned citrus orchard at Horco Molle (Tucumán Province, Argentina) during 2003-2004.

were found on those plants. The plants mostly utilized for oviposition were Tucumán cedar, *Cedrela lilloi* (Meliaceae), and lemon, *Citrus limon* (Rutaceae), which account for more than 76% of the collected eggs. Three plants were found as occasional oviposition hosts, on which the sharpshooter individuals, however, were never found: guava, *Psidium guajava* (Myrtaceae), flame berry, *Urera caracasana* (Urticaceae), and Johnson grass, *Sorghum halepense* (Poaceae). Most of the ovipositional hosts were trees and shrubs (Table 1).

On average, an egg mass contained 9.7 ± 3.6 eggs (range: 2-18). However, the size of the egg masses varied depending on the host plant. Egg masses on corn leaves contained more eggs than those on citrus stems or on glossy privet bush, *Ligustrum lucidum* (Oleaceae), leaves (Table 2). The host plant also affected the number of egg masses collapsed or preyed upon (30% on Tucumán cedar and 14% on *Citrus* spp.).

### Egg Parasitism of *O. tucumana* in the Citrus Orchard

In the abandoned lemon orchard, 43 egg masses with the total of 413 eggs were collected. Parasitoids were responsible for 40.0% of the total egg mortality, 8.2% of the eggs were preyed upon or collapsed, and 51.8% (165 eggs) were not parasitized (the host nymphs emerged). Three mymarid (Hymenoptera: Mymaridae) species were identified from the 108 parasitoids collected: 86 individuals of *Gonatocerus annulicornis* (Ogloblin) (79.63%), 13 individuals of *G. tuberculifemur* (Ogloblin) (12.04%), and 9 individuals of *G. metanotalis* (Ogloblin) (8.33%). All of these were solitary parasitoids. *Gonatocerus annulicornis* was the most important in terms of occurrence, abundance, and incidence, occurring from early Nov to late Feb. *Gonatocerus tuberculifemur* appeared in Jan and Feb, while *G. metanotalis* was only obtained from the egg masses laid during Feb. The egg masses of *O. tucumana* laid during early spring (Oct) and late summer (Mar) were not parasitized (Fig. 3).

### Egg Parasitism Relative to *O. tucumana* Distribution and Host Plants

During the survey, the overall percentage of the parasitized eggs was 61.6% of the 1699 collected eggs. The rate of attack varied according to the collection site, the host plant, and the part of the plant used for oviposition, i.e., a leaf or a stem. The same 3 species of Mymaridae, which were collected in the citrus orchard, were also obtained throughout the entire surveyed area. *Gonatocerus annulicornis* was the most abundant egg parasitoid, with 66.7% of the emerged wasps. Interestingly, *G. annulicornis* was the only egg parasitoid

TABLE 1. HOST PLANTS ON WHICH ADULTS AND/OR EGG MASSES OF *ONCOMETOPIA TUCUMANA* WERE COLLECTED IN TUCUMÁN PROVINCE, ARGENTINA.

| Plant species (Family) | Common name | Adults frequency | Egg masses frequency |
|---|---|---|---|
| *Lantana camara* (Verbenaceae) | Shrub Verbena | +++ | – |
| *Tecoma stans* (Bignoniaceae) | Yellow Trumpet-flower | +++ | – |
| *Cedrela lilloi* (Meliaceae) | Tucumán Cedar | ++ | +++ |
| *Citrus limon* (Rutaceae) | Lemon | ++ | +++ |
| *Diadenopteryx sorbifolia* (Sapindaceae) | "Ivirá Píhú" | ++ | + |
| *Zea mays* (Poaceae) | Corn or Maize | + | +++ |
| *Ligustrum lucidum* (Oleaceae) | Glossy Privet Bush | + | ++ |
| *Ruprechtia laxiflora* (Polygonaceae) | "Viraró" or "Virarú" | + | + |
| *Bauhinia forficata* (Fabaceae) | Brazilian Orchid Tree | + | + |
| *Psidium guajava* (Myrtaceae) | Guava or "Goyavier" | – | ++ |
| *Urera caracasana* (Urticaceae) | Flame Berry | – | + |
| *Sorghum halepense* (Poaceae) | Johnson Grass | – | + |

(+++) frequently found in 50-80% of the examined plants; (++) scarce, found in 10-49% of the examined plants; (+) rare, found in less than 10% of the examined plants; (–) never found.

TABLE 2. NUMBER OF EGGS MASSES AND EGG OF *ONCOMETOPIA TUCUMANA* ON DIFFERENT HOST PLANTS.

| Plant species | Egg mass location | Number of egg masses found | Number of eggs per egg mass (Mean ± SD) |
|---|---|---|---|
| *Citrus limon* | Leaf | 96 | 9.7 ± 3.7 [ab] |
| | Stem/shoot | 17 | 8.8 ± 3.1 [b] |
| *Cedrela lilloi* | Leaf | 12 | 11.8 ± 3.1 [a] |
| | Stem/shoot | 8 | 5.9 ± 1.7 |
| *Zea mays* | Leaf | 21 | 11.8 ± 3.4 [a] |
| *Ligustrum lucidum* | Leaf | 9 | 7.8 ± 2.9 |
| *Psidium guajava* | Leaf | 5 | 9.2 ± 4.1 |
| *Urera caracasana* | Leaf | 1 | 6 |
| | Stem/shoot | 1 | 8 |
| *Diadenopteryx sorbifolia* | Leaf | 2 | 10.0 ± 2.8 |
| *Bauhinia forficata* | Leaf | 2 | 7 ± 1.4 |
| *Sorghum halepense* | Leaf | 1 | 10 |
| *Ruprechtia laxiflora* | Leaf | 1 | 12 |

Means followed by the same letter are not significantly different ($P > 0.05$; Tukey test).

emerged from the egg masses laid on stems (Table 3, Fig. 4). Multiparasitism of the same egg mass was very unusual, occurring in only 2 egg masses among the 176 egg masses examined, both on lemon leaves (the first egg mass was collected on 9 Jan 2004, with the total number of host eggs of 12; 10 of those were parasitized by *G. tuberculifemur* and 2 by *G. annulicornis*). The second egg mass was collected on 27 Feb 2004, with the total number of host eggs of 6; 3 of them were parasitized by *G. tuberculifemur* and 1 by *G. metanotalis*. From the parasitized egg masses located on trees or robust scrubs, *G. annulicornis* was consistently obtained more frequently (in up to 80% of cases) than *G. metanotalis* or *G. tuberculifemur*. On corn plants, the dominant species was *G. metanotalis*, which emerged from 34% of the eggs (247 eggs were examined) (Table 3).

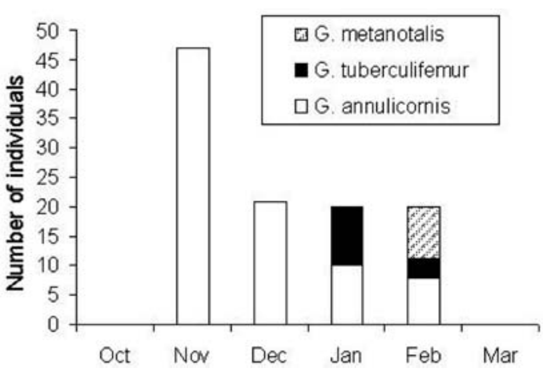


Fig. 3. Seasonal distribution of the egg parasitoids of *Oncometopia tucumana* in an abandoned citrus orchard at Horco Molle (Tucumán Province, Argentina).

## DISCUSSION

In the old citrus orchard surrounded by the dense vegetation of the Yunga's rainforest, *O. tucumana* occurred throughout spring to late fall. We do not have evidence of where this species overwinters. However, we presume that like *Tapajosa rubromarginata* (Signoret), a common proconiine sharpshooter that inhabits the same area, *O. tucumana* overwinters as adult. Also, like *Oncometopia alpha* Fowler attacking *Salix* sp. and *Populus* sp. in the USA (Nielson et al. 1975), *O. tucumana* has a reproductive quiescence during approximately 6 months (Apr to Oct). Similar to *H. vitripennis* (Daane et al. 2004), we found egg masses about 2 weeks before any adult *O. tucumana* was collected, indicating that this sharpshooter exploits some plants located outside of the examined area and visits the citrus orchard to oviposit during hours different from our sampling effort (mostly near midday). The adult sex ratios were male biased, but females were proportionally more abundant during the end of summer and the beginning of fall. Similar observations were made for the corn leafhopper, *Dalbulus maidis* (DeLong & Wolcott) in the same area (Virla et al. 2003).

The Proconiini and other xylem feeding leafhoppers have evolved with many unusual adaptations such as host switching to maximize nutrient uptake (Mizell & Andersen 2001). The ability to disperse, locate, and utilize host plants is essential for the proconiine sharpshooters because the

Fig. 4. *Oncometopia tucumana* egg mass coated with brochosomes on a citrus stem, and a female of *Gonatocerus annulicornis* leaving after parasitizing it (inside the circle).

nitrogen in the xylem fluid is diluted and highly variable, not only between the host plant species, but also within a single plant over time (Tipping et al. 2004). This triggers different seasonal patterns in utilization of the host plants (Brodbeck et al. 1990; Milanez et al. 2001). We found that *O. tucumana* exploits 12 host plants from 11 families, both native and introduced. Similar observations were made for *H. vitripennis* in the USA, which is highly polyphagous and feeds on hundreds of plant species from at least 37 families (Andersen et al. 2005). *Oncometopia tucumana* showed different patterns of plant utilization for feeding and oviposition. Adults preferred to feed on shrub verbena and yellow trumpet-flower whereas the preferred plants for oviposition were lemon, Tucumán cedar, and corn. *Homalodisca vitripennis* has similar patterns, showing different host preferences for feeding and oviposition (Redak et al. 2004; Daane et al. 2004).

Generally, the egg masses of *O. tucumana* were deposited on the abaxial surface of the leaves (only 1 per leaf), but in lemon, Tucumán cedar and flame berry, we found about 1/3 of them on green stems. On average, the egg masses, coated with brochosomes, contained 9.5 eggs. The oviposition habits of this sharpshooter are consistent with those recorded for some other members of Proconiini (Turner & Pollard 1959; Almeida & Spotti Lopes 1999; Rakitov 2004). On the contrary, Logarzo et al. (2006) reported that *Anacuerna centrolinea* (Melichar) usually lays more than 1 egg mass per leaf, each containing 3.9 eggs on average, and these small egg masses are laid on both sides of the leaf.

About 10% of the collected egg masses were preyed upon. Laboratory assays revealed that an unidentified species of Nabidae (Hemiptera), collected from grasses at Horco Molle, preyed upon eggs of *O. tucumana* and *T. rubromarginata*. The eaten eggs look empty but had the cuticle and the chorion intact (E.G.V., unpublished data). However, by far the most important egg mortality factor was egg parasitism. In the USA, the summer generation of *H. vitripennis* collapses due to the heavy egg parasitism and other mortality factors (Castle et al. 2005). Egg masses of *O. tucumana* were attacked by 3 mymarid parasitoids (*G. annulicornis, G. metanotalis* and *G. tuberculifemur*) that all together produced egg mortality near to 60%.

TABLE 3. EGGS PARASITOIDS OF *ONCOMETOPIA TUCUMANA* ON DIFFERENT HOST PLANTS.

| Host plant | Substrate | Number of eggs (egg masses) | % of parasitized eggs | % of parasitoid species attacking eggs | | |
|---|---|---|---|---|---|---|
| | | | | *Gonatocerus annulicornis* | *Gonatocerus metanotalis* | *Gonatocerus tuberculifemur* |
| *Citrus limon* | Leaf | 928 (96) | 64.9 | 81.2 | 18.8 | * |
| | Stem | 149 (17) | 53.0 | 100.0 | | |
| *Cedrela lilloi* | Leaf | 142 (12) | 57.0 | 80.0 | 20.0 | |
| | Stem | 47 (8) | 34.0 | 100.0 | | |
| *Zea mays* | Leaf | 247 (21) | 72.9 | 11.1 | 77.8 | 11.1 |
| *Ligustrum lucidum* | Leaf | 70 (9) | 34.3 | 100.0 | | |
| *Psidium guajava* | Leaf | 46 (5) | 65.2 | 100.0 | | |
| *Urera caracasana* | Leaf | 6 (1) | 0.0 | | | |
| | Stem | 8 (1) | 100.0 | 100.0 | | |
| *Diadenopteryx sorbifolia* | Leaf | 20 (2) | 100.0 | 100.0 | | |
| *Bauhinia forficata* | Leaf | 14 (2) | 42.9 | 100.0 | | |
| *Sorghum halepense* | Leaf | 10 (1) | 0.0 | | | |
| *Ruprechtia laxiflora* | Leaf | 12 (1) | 0.0 | | | |

*Only appears in multiparasitized egg masses, see text.

Velema et al. (2005) stated that the brochosomes covering the egg masses of *H. vitripennis* significantly decreased oviposition efficacy of *Gonatocerus ashmeadi* Girault. Although the egg masses of *O. tucumana* were heavily coated with brochosomes, egg parasitoids successfully attacked at least 30% of the eggs, reaching 76.2% parasitization rate on corn. *Gonatocerus annulicornis* was the most effective parasitoid in the highly diverse, elevated foliage environment, emerging from over 80% of the parasitized eggs (including on lemon). The incidence of *G. metanotalis* on scrubs or trees was low (less than 20%), but this species was responsible for a 77.8% parasitism of the egg masses on corn plants. The incidence of *G. annulicornis* parasitizing eggs of *O. tucumana* on corn was low. Perhaps, the guild of egg parasitoids is structured by parasitoid habitat preference and not as much by interspecific competition as suggested by Hoddle & Irvin (2003) for *G. ashmeadi*, *G. triguttatus*, and *G. fasciatus* attacking egg masses of *H. vitripennis*. Interestingly, *G. tuberculifemur* was always found in the multiparasitized egg masses with both *G. annulicornis* and *G. metanotalis*.

In California, grape, citrus, apple, *Xylosma* sp., cherry, and flowering pear were the most preferred ovipositional plants for *H. vitripennis* (Blua et al. 1999; Daane & Johnson 2005). All of these plants are trees, vines, or shrubs. The ability of *G. annulicornis* to successfully locate and oviposit in these plants offers a great possibility for its utilization in a new association biological control program. Since Mar 2001, this parasitoid has been successfully reared from eggs of *H. vitripennis* at the USDA-APHIS Mission quarantine facility in Edinburg, Texas (Logarzo et al. 2005). *Gonatocerus annulicornis* is widely distributed in Argentina (Jujuy, Salta, Tucumán, Misiones, Formosa, Corrientes, Catamarca, San Juan, and Mendoza Provinces), including some very dry areas as Luján de Cuyo in Mendoza Province or Caucete in San Juan Province (G.A.L., unpublished data.) suggesting that this parasitoid species could be efficient in this kind of environment.

This work encourages further laboratory studies on the biology and host range of *G. annulicornis*, in order to assess its potential as a neoclassical biological control agent for *H. vitripennis*.

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