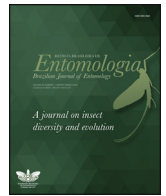




REVISTA BRASILEIRA DE
Entomologia
A Journal on Insect Diversity and Evolution

www.rbentomologia.com



Biology, Ecology and Diversity

Biology of *Blepyrus clavicornis* (Compere) (Hymenoptera: Encyrtidae), a parasitoid of *Pseudococcus viburni* (Signoret) (Hemiptera: Pseudococcidae)

V.C. Pacheco da Silva^{a,b,*}, M.S. Garcia^a, M. Botton^b

^a Universidade Federal de Pelotas, Pós-Graduação em Fitossanidade, Departamento de Fitossanidade, Pelotas, RS, Brazil

^b Embrapa Uva e Vinho, Bento Gonçalves, RS, Brazil

ARTICLE INFO

Article history:

Received 28 November 2016

Accepted 24 May 2017

Available online xxx

Associate Editor: Adeney de Freitas Bueno

Keywords:

Biological control

Chalcidoidea

Obscure mealybug

Parasitism

ABSTRACT

Encyrtids (Hymenoptera: Encyrtidae) are the most important and diverse group of natural enemies of mealybugs (Hemiptera: Pseudococcidae). *Blepyrus clavicornis* (Compere) is the most common parasitoid associated with *Pseudococcus viburni* (Signoret) in the Serra Gaúcha region, Brazil. We conducted laboratory studies to assess the development time, sex ratio, adult longevity, host stage selection for parasitism, and effect of food on the longevity of adult females of *B. clavicornis*. The experiments were conducted in a climate chamber at $25 \pm 1^\circ\text{C}$, $70 \pm 10\%$ RH and 12:12 L:D photoperiod. The solitary parasitoid *B. clavicornis* parasitized third-instar and adult female stages of *P. viburni*. The development time was more than 30 days (31.75 ± 0.38 for females and 30.02 ± 0.34 for males) when *B. clavicornis* laid eggs in adult mealybug females, and 35 days (36.50 ± 0.50 for females and 34.24 ± 0.43 for males) on third-instar mealybug nymphs. The wasps did not survive longer than four days when they were fed only water, while females survived for about 30 days when fed with honey. The lifespan of females is about 20 days longer than the lifespan of males. Although *B. clavicornis* can provide significant natural control, reducing the number of individuals in the next generation by parasitizing advanced mealybug instars, we consider it unpromising for use in applied biological-control programs. Furthermore, the predominance of males in the progeny observed here suggests that *P. viburni* may not be the most suitable or preferred host for *B. clavicornis*.

© 2017 Sociedade Brasileira de Entomologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Mealybugs (Hemiptera: Pseudococcidae) are common pests in fruit production (Franco et al., 2009; Daane et al., 2012). The obscure mealybug *Pseudococcus viburni* (Signoret) is a cosmopolitan and polyphagous species found in 56 countries. It feeds on members of nearly 90 plant families and 240 genera (García et al., 2016), and is one of the main pest species of vineyards (*Vitis* spp., Vitaceae) in Brazil as well as other countries of the Americas (Correa et al., 2012; Daane et al., 2012; Pacheco da Silva et al., 2014). *P. viburni* also attacks other plants of economic importance, such as apples (Rosaceae) and pears (Rosaceae) (Ciampolini et al., 2002; Dapoto et al., 2011). It feeds on the leaves, trunks, cordons, canes, fruits and roots of host plants. Similarly to other mealybug species, *P. viburni* causes damage to leaves and grape clusters due to its copious secretion of honeydew, which provides a substrate for the development

of sooty mold, responsible for losses in productivity, marketability and quality of grapes (Daane et al., 2012). Moreover, the species has been related to the transmission of *Grapevine leafroll associated virus* and *Grapevine Trichovirus A* and *B*, viruses that cause vineyard degeneration, and losses in the productivity and quality of clusters (Garau et al., 1995; Golino et al., 2002).

The obscure mealybug is presumed to have originated in the Neotropical Region (Charles, 2011), where a wide diversity of its natural enemies, mainly parasitoids (Hymenoptera: Encyrtidae), are present (Pacheco da Silva et al., in preparation). Biological and chemical control have been used against mealybugs, however, chemical control is often not successful due to their cryptic habit and the presence of hydrophobic waxes on the body surface (Franco et al., 2009). Hence, biological control is a good alternative method for suppressing mealybug pest populations.

The parasitoid wasp genus *Blepyrus* Howard is a little-studied group that probably originated in the New World (Noyes, 2000). Most of the 18 described species are restricted to the Americas (4 species in South America, 14 in Central America and 8 in North America); except for *Blepyrus insularis* (Cameron), which occurs

* Corresponding author.

E-mail: vtorcezar@gmail.com (V.C. Pacheco da Silva).

<http://dx.doi.org/10.1016/j.rbe.2017.05.003>

0085-5626/© 2017 Sociedade Brasileira de Entomologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Please cite this article in press as: Pacheco da Silva, V.C. et al. Biology of *Blepyrus clavicornis* (Compere) (Hymenoptera: Encyrtidae), a parasitoid of *Pseudococcus viburni* (Signoret) (Hemiptera: Pseudococcidae). Rev. Brasil. Entomol. (2017). <http://dx.doi.org/10.1016/j.rbe.2017.05.003>

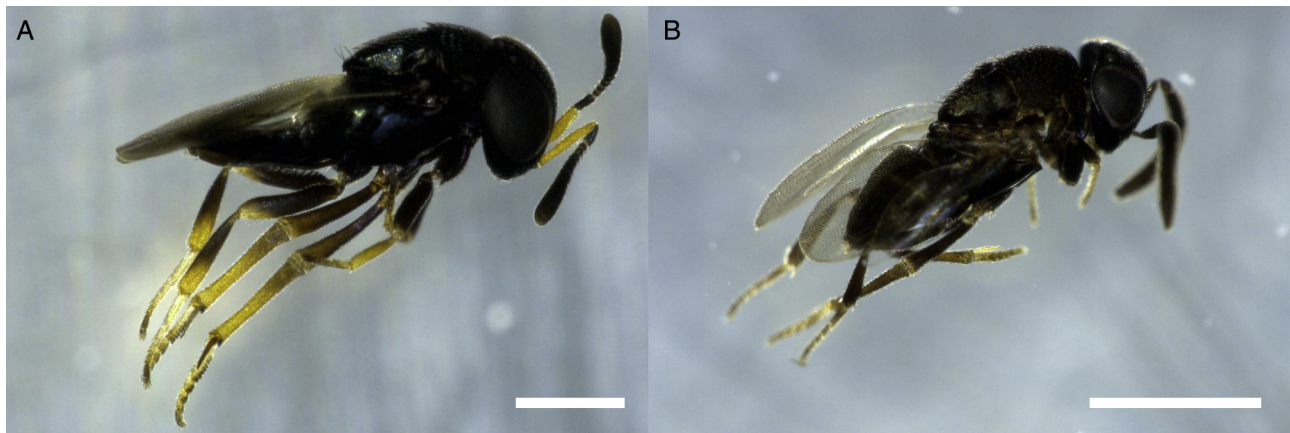


Fig. 1. (A) *Blepyris clavicornis* female and (B) male. Scale: 1 mm.

worldwide. In southern Brazil, *Blepyrus clavicornis* (Compere), a solitary koinobiont endoparasitoid, is the commonest parasitoid developing in *P. viburni* (Pacheco da Silva et al., in preparation). Adult females of *B. clavicornis* are dark metallic blue, with part of antenna and legs yellowish and black. The body is about 2.0–3.5 mm in length (Fig. 1A) (Noyes, 2000). Males are smaller (2.0 mm long) and more hairy than females, with black bodies (Fig. 1B). Members of the genus are associated mainly with the mealybug genera *Pseudococcus* Westwood and *Dysmicoccus* Ferris (Noyes, 2016). No information about the development, reproduction and host selection of *B. clavicornis* is available.

Knowledge of the biological characteristics of natural enemies is essential in order to select potential species for use in biological-control programs. In this study we investigated certain biological characteristics of *B. clavicornis*, as a primary parasitoid of *P. viburni*.

Material and methods

Mealybug culture

A colony of *P. viburni* was established using field-collected insects from a commercial strawberry field in Farroupilha, Rio Grande do Sul (RS), Brazil (29°08.705' S, 051°24.773' W). Adult females were identified as *P. viburni* using the key of Williams and Granara de Willink (1992). The colony was kept in the laboratory of entomology at Embrapa Grape and Wine, Bento Gonçalves, RS. Mealybugs were maintained in sprouted potatoes *Solanum tuberosum* L. (Solanaceae), reared in plastic containers with a volume of 1 L (14 cm diameter × 9 cm deep), closed with a cover with a 10 cm-diameter aperture covered with muslin to allow ventilation and prevent the crawlers from escaping. Colonies were kept in a climate chamber at 25 ± 1 °C, 70 ± 10% RH and in total darkness.

Parasitoid culture

The rearing colony of *B. clavicornis* was established in the laboratory from adults emerged from mummified *P. viburni* individuals collected in the same commercial area where the mealybugs were collected during 2014 and 2015. The species was identified by Dr. Daniel Alejandro Aquino (National University of La Plata, La Plata, Argentina). Parasitoids were reared in acrylic cages (15 cm × 20 cm × 24 cm) with four 5 cm-diameter apertures covered with muslin to allow ventilation, and one 15-cm aperture with a sleeve consisting of a muslin tube, on *P. viburni* reared on sprouted potatoes. Parasitoid adults were fed weekly, with a streak of honey diluted in corn syrup (50:50) on aluminum foil. The colony was maintained under the same conditions as the mealybug colonies,

except for the photoperiod for the parasitoids, which was 12:12 L:D (preliminary observations showed that there is no parasitism of *B. clavicornis* in total darkness). Colonies were kept in separate facilities to avoid parasitoid contamination. In order to obtain newly emerged adults for experiments, mummies were transferred with a fine paintbrush into individual gel capsules and kept in climate chambers in the same conditions described above.

Choice and no-choice test for host selection

To determine the host-stage preference of the parasitoid, the experiments were conducted in arenas consisting of a plastic container of 500 mL (11 cm diameter × 7.5 cm deep) with a cover with an 8 cm-diameter aperture closed with a muslin. Each cage contained a disk of filter paper to absorb the excess honeydew, a piece of aluminum foil (2 × 4 cm) with a streak of honey diluted in water (50:50), and a mealybug-infested sprouted potato.

Choice and no-choice tests were performed. In the choice test, 60 mealybugs, 15 from each instar (crawlers, second instar, third instar, and young adult females) were provided in the cages. To allow the mealybugs to attach to the sprouted potatoes, they were introduced into the cages 24 h before they were provided to the parasitoids. The mealybug instar was estimated according to the body length: first nymphal instar (<0.5 mm); second nymphal instar (0.8–1.0 mm); third nymphal instar (1.5–1.8 mm) and young adult females (2.8–3.2 mm) (the measurements are the mean length of at least 15 insects for each stage). Newly emerged adult couples were kept together after their emergence, and after three days they were introduced into an arena for 24 h, after which they were removed from the cage.

In the no-choice test, 20 mealybugs, all from the same instar, were provided in each cage, using the same method described above. After 24 h kept with the parasitoids, mealybugs were separated according to their stage and placed on new sprouted potatoes.

Mealybugs were observed daily and any changes were recorded. When a mummy was observed, it was removed and placed in a gel capsule until emergence. The sex ratio (number of females/(number of females + number of males), measured at emergence, and the percentage of parasitism were evaluated. At least 10 replications were carried out for both the choice test and the no-choice test. Experiments were carried out in the climate room (25 ± 1 °C, 70 ± 10% RH and 12:12 L:D photoperiod).

Determination of development time and longevity of adult wasps

For this experiment 20 young adult females and 20 third-instar nymphs fixed on sprouted potatoes were exposed to each couple

Download English Version:

<https://daneshyari.com/en/article/8877256>

Download Persian Version:

<https://daneshyari.com/article/8877256>

[Daneshyari.com](https://daneshyari.com)