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Scientific note

Trichogramma (Hymenoptera: Trichogrammatidae) species as an agents of biological control of *Oxydia vesulia* (Lepidoptera: Geometridae)

Trichogramma (Hymenoptera: Trichogrammatidae) como agentes de control biológico de *Oxydia vesulia* (Lepidoptera: Geometridae)

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Abstract: Lepidoptera defoliators are important pests of *Eucalyptus*. This research aimed to evaluate the potential of *Trichogramma acacioi* and *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae) to control the eucalyptus defoliator *Oxydia vesulia* (Lepidoptera: Geometridae). Biological parameters and parasitism rate of *Trichogramma* on eggs of *O. vesulia* were evaluated under laboratory conditions. *Trichogramma pretiosum* did not parasitized eggs of *O. vesulia* but more than 93% of *T. acacioi* females parasitized eggs of this defoliator, showing its potential for the biological control of this Lepidoptera.

Key words: Eggs parasitoid. Biological control. *Eucalyptus*. Lepidoptera.

Resumen: Los lepidópteros defoliadores son importantes plagas de *Eucalyptus*. El objetivo de este trabajo fue evaluar el potencial de *Trichogramma acacioi* y *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae) para controlar el defoliador del eucalipto *Oxydia vesulia* (Lepidoptera: Geometridae). Los parámetros biológicos y la tasa de parasitismo de *Trichogramma* en huevos de *O. vesulia* fueron evaluados en condiciones de laboratorio. *Trichogramma pretiosum* no parasitó esta especie, pero más de 93% de las hembras de *T. acacioi* presentaron parasitismo en los huevos de este defoliador, mostrando su potencial para el control biológico de este lepidóptero.

Palabras clave: Parasitoide de huevos. Control biológico. *Eucalyptus*. Lepidoptera.

Introduction

Lepidoptera defoliators are found in *Eucalyptus* plantations and their importance is increasing due to frequent outbreaks and damage (Oliveira *et al*. 2008; Pereira *et al.* 2008). This group includes species of the genus *Oxydia* (Lepidoptera: Geometridae) which have been collected in population outbreaks in the Brazilian States of Minas Gerais, São Paulo (Zanuncio *et al.* 1994), Maranhão (Zanuncio *et al.* 1992), Goiás (Alves *et al.* 1994) and Bahia (Santos *et al.* 2002). Outbreaks of these species have been controlled with different methods, but especially with chemical insecticides which can have negative impact on the environment (Zanuncio *et al.* 1994; Zanuncio *et al.* 2001; Oliveira *et al*. 2003). Therefore, there is a need to develop alternative control methods for this kind of pest (Zanuncio *et al.* 1991). The release of *Trichogramma* species, which have been widely used in many crops, represents one of the techniques that have shown good results to control pest, especially in species of Lepidoptera (Bueno *et al.* 2009).

Some species such as *Trichogramma demoraesi* Nagaraja, 1983, *Trichogramma soaresi* Nagaraja, 1983, *Trichogramma manicobai* Brun, Moraes & Soares, 1984, *Trichogramma caiaposi* Brun, Moraes & Soares 1984, *Trichogramma maxacalii* Voegelé and Pointel, 1980, *Trichogramma acacioi* Brun, Moraes & Soares, 1984 and *Trichogramma pratissolii* Querino and Zucchi, 2003 are recorded occurring in eucalyptus plantations (Oliveira *et al*. 2003; Soares *et al.* 2007; Vianna *et al.* 2007). But it is necessary to evaluate the interaction between these parasitoids and the host target because species of *Trichogramma* have a great variation in behavior and preference (Bueno *et al.* 2009). For this reason, the objective of this research was to evaluate the ability of *T. acacioi* and *Trichogramma pretiosum* Riley, 1879 (Hymenoptera: Trichogrammatidae) to parasitize eggs of *Oxydia vesulia* (Cramer, 1779) (Lepidoptera: Geometridae).

The biological characteristics of *T. acacioi* and *T. pretiosum* were studied using eggs of *O. vesulia* obtained from adults originating from caterpillars collected in a eucalyptus plantation and reared with *Eucalyptus cloeziana* F. Muell.. The experiment was carried out at 25±1ºC, 75±10% relative humidity and 14h photoperiod. Twenty-five fresh eggs of *O. vesulia* were glued onto a piece of blue cardboard (3.5 x 0.5cm) with Arabic gum (30% diluted) and were offered to the parasitoids on the same day. Each cardboard was placed in a glass tube with one parasitoid female with maximum age of 24h and honey droplets were offered as food. The cardboard was removed from the tubes after 24 hours and kept in a plastic bag under the same conditions as described above. Fifteen replicates were done for each parasitoid species. The percentage of females that parasitized, the parasitism rate (number of eggs parasitized/number of eggs in the cardboard), embryonic period (between egg to adult emergence), emergence rate (eggs with a hole made were counted to evaluate), number of individuals/egg, sex ratio (number of females/number of females + males) and longevity of female offspring were evaluated.

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Females of *T. pretiosum* did not parasitize eggs of *O. vesulia* although *T. acacioi* parasitized 93.3% of those (Table 1). Some factors that may explain the host rejection by the parasitoid are size, format and texture of the host eggs (Schmidt 1994; Oliveira *et al.* 2000; Moreira *et al.* 2009) and these factors can also affect the behavior of *Trichogramma* and their capacity to parasitize a specific host (Schmidt and Smith 1987). In the field, host eggs of these two parasitoid species may have a different size. In our study, the strain of *T. pretiosum* was collected in areas which tomato was grown, parasitizing eggs of *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae) while *T. acacioi* were collected in arboreal environments, with avocado orchards occurring in *Nipteria panacea* Thierry-Mieg, 1892 (Lepidoptera: Geometridae) eggs. Probably *O. vesulia* eggs have sizes more similar to those accepted by *T. acacioi* than by *T. pretiosum*.

The parasitism rate of *T. acacioi* on eggs of *O. vesulia* was around 15%, lower when compared to the performance of this parasitoid on eggs of *Anagasta kuehniella* Zeller, 1879 (Lepidoptera: Pyralidae) and *Sitotroga cerealella* (Olivier, 1789) (Lepidoptera: Gelechiidae) (Pratissoli *et al.* 2009). However, it is important to emphasize that the size of the eggs are different, being the *O. vesulia* eggs bigger than those from the factitious host. Bueno *et al.* (2009) reported that the size of the egg can influence the number of eggs laid per female of *Trichogramma*. The results found in this work showed a larger number of individuals produced per egg of *O. vesulia* than those from alternative host. On the other hand, in the same host, the parasitism by different species of *Trichogramma* can vary, because the number of eggs of *O. vesulia* parasitized by *T. acacioi* was higher than that by *T. maxacalii* (Oliveira *et al.* 2003).

The parasitism it is an important factor in the selection of the species or strain of parasitoids, and in the field this biologic characteristic can be especially important to determine the best species (Bueno *et al.* 2009). This higher parasitism indicates that *T. acacioi* should present better potential in controlling *O. vesulia*. The viability, sex ratio, number of individuals per egg, female longevity and duration of the embryonic period found to *T. acacioi* (Table 1) was similar to those of *T. maxacalii* on eggs of this defoliator (Oliveira *et al.* 2003).

Trichogramma acacioi may be used with *T. maxacalii* to control eggs of the Lepidoptera defoliator *O. vesulia*. Additionally, further studies should be developed to define the potential of these parasitoids as biological control agents of Lepidoptera defoliators of *Eucalyptus* species.

Table 1. Means and standard error of the percentage of females that parasitizing females, parasitism rate, duration of embryonic period, emergence rate, number of individuals per egg, sex ratio and longevity of offspring females of *Trichogramma acacioi* (Hymenoptera: Trichogrammatidae) on eggs of *Oxydia vesulia* (Lepidoptera: Geometridae).

Characteristics	*Trichogramma acacioi*
Parasitizing females (%)	93.3 ± 1.72
Parasitism rate (%)	14.9 ± 0.60
Duration of embryonic period	10.08 ± 2.60
Emergence rate (%)	89.9 ± 2.10
Number of individuals/egg	3.01 ± 0.07
Sex ratio	0.46 ± 0.03
Longevity of offspring females (days)	1.51 ± 0.02

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