International Journal of Tropical Insect Science Vol. 31, No. 1–2, pp. 118–121, 2011 doi:10.1017/S1742758411000117

Short Communication

Evaluation of *Trichospilus diatraeae* (Hymenoptera: Eulophidae) as parasitoid of the eucalyptus defoliator *Euselasia eucerus* (Lepidoptera: Riodinidae)

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(Accepted 5 April 2011; First published online 13 May 2011)

Abstract. Lepidopteran pests have occurred in eucalyptus plantations in Brazil since 1948, reaching high population levels, reducing tree growth and causing considerable losses in wood production. The control of defoliating caterpillars in eucalyptus forests is complex, mainly due to the large extent of forest plantations and tree height, necessitating the aerial application of chemical or biological insecticides. Due to this complexity, alternative control methods have been proposed, for instance biological control through the use of parasitoids. *Trichospilus diatraeae* Cherian & Margabandhu, 1942 is a gregarious pupal parasitoid that preferentially attacks species of the order Lepidoptera. This is the first report of *T. diatraeae* parasitizing pupae of the eucalyptus defoliator *Euselasia eucerus* Hewitson in Brazil. This parasitoid offers new perspectives for the biological control programmes of this species in eucalyptus plantations in Brazil.

Key words: Eucalyptus, forest pests, *Euselasia eucerus*, biological control, *Trichospilus diatraeae*, pupal parasitoid

Introduction

Trichospilus diatraeae Cherian & Margabandhu, 1942 (Hymenoptera: Eulophidae) is a gregarious pupal parasitoid mainly of many Lepidoptera (Bouček, 1976). It has been recorded as a parasitoid of the families Crambidae (Cherian and Margabandhu, 1942), Noctuidae (Ètienne and Viette, 1973), Pyralidae (Ètienne and Viette, 1973; Bouček, 1976; Bennett *et al.*, 1987), Nymphalidae (Bouček, 1976), Geometridae (Bennett *et al.*, 1987), Pieridae (Torres-Bauza, 1994), Arctiidae (Paron and Berti-Filho, 2000) and Oecophoridae (Oliveira *et al.*, 2005).

In 1963, *T. diatraeae* was imported from India to Trinidad and Tobago (Antilles) and the USA using *Diatraea* spp. (Lepidoptera: Crambidae) as hosts (Bennett *et al.*, 1987). *Trichospilus diatraeae* was released to control pests of grasses in Senegal, with *Chilo suppressalis* Walker (Lepidoptera: Crambidae) as host (Bordat *et al.*, 1977). Ètienne and Viette (1973) and Ètienne (1975) reported *T. diatraeae* in the Reunion and Mauritius Islands parasitizing the sugarcane pests *Melanitis leda* L. and *Hedylepta indicata* F. (both Lepidoptera: Crambidae), as well as

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Polydesma umbricola Boisduval (Lepidoptera: Noctuidae) and the conifer pest *Trichopolydesma collutrix* (Geyer) (Lepidoptera: Noctuidae). This parasitoid was used for the biological control of noctuid cotton pests in Madagascar using *Ephestia kuehniella* Zeller (Lepidoptera: Pyralidae) as a host for multiplication (Bournier, 1975). On the Comores Islands, Brenière *et al.* (1985) released *T. diatraeae* against the maize pest *Chilo partellus* Swinhoe (Lepidoptera: Crambidae). Tests with *T. diatraeae* were carried out in the USA to control the corn borer *Diatraea lineolata* Walker (Lepidoptera: Pyralidae) (Rodriguez-del-Bosque and Smith, 1989). Betbeder-Matibet (1990) studied the mass rearing of *Chilo sacchariphagus* Bojer (Lepidoptera: Crambidae) to produce *T. diatraeae* as biocontrol agent. This parasitoid was recorded in *Dismorphia spio* Godart (Lepidoptera: Pieridae) pupa on *Inga vera* (Willd.) (guaba) (Leguminosae) (Mimosoideae) in Puerto Rico (Torres-Bauza, 1994).

Lepidopteran pests can cause significant damage to eucalyptus plantations in Brazil (Zanuncio *et al.*, 1993, 1998, 2001; Bernardino *et al.*, 2007). *Euselasia eucerus* (Hewitson) (Lepidoptera: Riodinidae), also reported as *Euselasia apisaon* (Dalman) (Zanuncio *et al.*, 1990; Murta *et al.*, 2008), is a native insect to Brazil, and its caterpillars are commonly found on *Eucalyptus* spp. Its population grows rapidly, causing outbreaks in eucalyptus plantations in São Paulo, Rio Grande do Sul, Santa Catarina and Minas Gerais States (Zanuncio *et al.*, 1994). The developmental cycle of *E. eucerus* is completed on *Eucalyptus* trees. The adult female lays its egg clusters on leaves. Caterpillars show gregarious behaviour and pupate on leaves (Zanuncio *et al.*, 1990). *Euselasia eucerus* eggs are naturally parasitized by *Trichogramma maxacalii* Voegelé & Pointel, *Trichogramma demoraesi* Nagaraja and *Trichogramma acacioi* Brun, Moraes & Soares (all Hymenoptera: Trichogrammatidae). Its caterpillars and pupae are predated by *Podisus nigrispinus* (Dallas), *Brontocoris tabidus* (Signoret), *Supputius cincticeps* (Stål) and *Alcaeorrhynchus grandis* (Dallas) (all Heteroptera: Pentatomidae), and the entomopathogenic fungus *Paecilomyces fumosoroseus* (Wize) infects its pupae (Brun *et al.*, 1983; Oliveira *et al.*, 2000; Murta *et al.*, 2008). Despite having all these natural enemies, there is no specific biocontrol agent against the pupal stage used under field conditions. Currently, there is no specific mass-rearing system for *Trichogramma* spp. in place for control of *E. eucerus* in Brazil. The predator bugs can feed on larval and pupal stages of *E. eucerus,* and these species can be reared under ambient conditions. However, the number of predators produced is low considering the size of the eucalyptus plantation area in Brazil and the dispersion capacity of the pest in the field. Moreover, complementary action of different natural enemies can achieve better control levels in the field.

The objective of this study was to evaluate the impact of *T. diatraeae* as a pupal parasitoid of the eucalyptus defoliator *E. eucerus* as a potential alternative to chemical control of the pest.

Materials and methods

Parasitoids used in this study were originally collected on pupae of *Iridopsis* sp. (Lepidoptera: Geometridae) in eucalyptus plantations in Curvelo, Minas Gerais State, Brazil, in 2009. Since then thereafter, a laboratory culture has been maintained, using pupae of *Thyrinteina arnobia* (Stoll) (Lepidoptera: Geometridae) as hosts. Zaché *et al.* (2010) described the parasitoid rearing technique in detail. *Euselasia eucerus* eggs were collected in eucalyptus clonal plantation in Anhembi, São Paulo State (Brazil). Larvae were reared under ambient conditions on *Eucalyptus urophylla* S.T. Blake (Myrtaceae) leaves. Upon pupation, 15 pupae were offered to *T. diatraeae* females in a 1:1 (parasitoid:host) ratio for 72 h. Thereafter, the

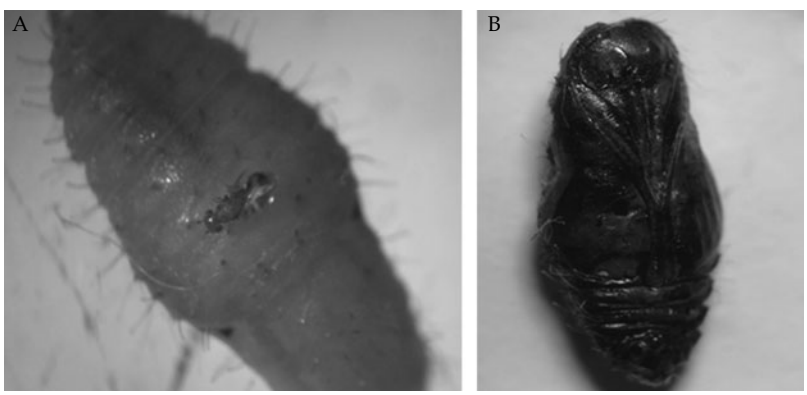

Fig. 1. A, *Trichospilus diatraeae* female parasitizing a *Euselasia eucerus* pupa; B, emergence hole of the parasitoid in a mummified pupa

females were removed, and containers with *E. eucerus* pupae were maintained in a climatic chamber at 26 ± 2°C, 60 ± 10% relative humidity and a 12 h photophase. The following parameters were determined: level of parasitism, number of emerged and not emerged parasitoids and duration of the egg–adult cycle. The pupae of *E. eucerus* were dissected to evaluate the non-emerged parasitoids.

Results and discussion

The level of parasitism reached 100%, with an emergence rate of 86.6%. A mean of 168.4 (± 0.33 SE) parasitoids per pupa emerged, while only 1.1 (± 0.34 SE) parasitoids per pupa did not emerge. The *T. diatraeae* egg–adult cycle was 18.4 (± 0.98 SE) days in *E. eucerus* pupae.

These results demonstrate for the first time, under controlled conditions, the ability of *T. diatraeae* to parasitize the pupae of *E. eucerus*, a species of the Riodinidae family (Fig. 1). In Brazil, the introduction of *T. diatraeae* is believed to have been accidental, and its first occurrence was recorded in 1996 on pupae of Arctiidae (Lepidoptera) in Piracicaba, São Paulo State (Paron and Berti-Filho, 2000). In 2001, the parasitoid was reported on the pupae of *Cerconota anonella* (Sepp) (Lepidoptera: Oecophoridae) in soursop *Annona muricata* L. (Annonaceae) plantations in Planaltina, Distrito Federal (Brazil) (Oliveira *et al.*, 2001). With regard to lepidopteran forest pests in Brazil, *T. diatraeae* was collected from a pupa of *T. arnobia* on eucalyptus in Minas Gerais State (Pereira *et al.*, 2008). In 2010, Zaché *et al.* reported parasitism of *T. diatraeae* in a pupa of the eucalyptus defoliating looper *Melanolophia consimilaria* (Walker) (Lepidoptera: Geometridae), a pest that pupates in the soil. More studies are needed to determine the potential of *T. diatraeae* for the biological control of lepidopteran pests in Brazilian eucalyptus plantations, as this biocontrol agent could possibly reduce the use of chemical and biological insecticides for pest control in eucalyptus.

Acknowledgements

We are grateful to the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior for funding this study and Eucatex Forest Company for allowing insect pest collections in the field.

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