

6.5 Biological Control of *Thaumastocoris peregrinus* (Hemiptera: Thaumastocoridae) in *Eucalyptus* Plantations in Brazil: An Update

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South America has suffered problems with many invasive pests in forest plantations, mainly in *Eucalyptus* (Myrtaceae). The bronze bug, *Thaumastocoris peregrinus* Carpintero and Dellapé (Hemiptera: Thaumastocoridae), was detected in Brazil in 2008 (Wilcken *et al.*, 2015) and infested 245,000 ha of eucalyptus plantations in 2012, causing reduction of 10-15 % in wood production and losses of US\$ 330 million during 2010-2015. The main management strategy is based in biological control, using the egg parasitoid, *Cleruchoides noackae* Lin and Huber (Hymenoptera: Mymaridae), introduced from Australia in 2012, and native predators and entomopathogenic fungi (Wilcken *et al.*, 2015).

The egg parasitoid *C. noackae* is the main biocontrol agent and it has been reared in the laboratory and released throughout the country. This parasitoid has arrhenotokous parthenogenesis and an adult longevity of 1.1 and 3.6 days without and with food, respectively (Mutitu *et al.*, 2013; Souza *et al.*, 2016). The life cycle duration of *C. noackae* (egg-adult) varies according temperature (L.K. Becchi, 2017, pers. comm.). Bioassays and field evaluations showed a parasitism rate of 50-60% by *C. noackae* (Barbosa *et al.*, 2017) (Table 6.5.1).

Table 6.5.1. Total number of eggs and adults, adults emergence (%), and sex ratio (mean \pm SE) of *Cleruchoides noackae* from *Thaumastocoris peregrinus* eggs per day (Barbosa *et al.*, 2017).

Site	Eggs (n)	Adults (n)	Emergence (n)	Sex ratio
Laboratory	230	123	53 \pm 3	0.69 \pm 0.02
Field	660	342	52 \pm 3	0.65 \pm 0.02

The egg parasitoid was released in ten Brazilian states, releasing 33,438 individuals in 2014, 118,432 individuals in 2015, 100,400 individuals in 2016 and 4,000 individuals until May, 2017, totaling 256,270 parasitoids released.



Figure 6.5.1. *Cleruchooides noackae* female parasitizing egg of *Thaumastocoris peregrinus*.

Native predators were recorded preying on nymphs and adults of *T. peregrinus* in both field and laboratory conditions. Larvae of *Chrysoperla externa* (Hagen) (Neuroptera: Chrysopidae) and nymphs of *Supputius cincticeps* (Stål) (Heteroptera: Pentatomidae) preyed on 10.4 and 10.3 *T. peregrinus* nymphs, respectively, during 24 hours (Barbosa et al., 2010; Souza et al., 2012), and *Atopozelus opsimus* Elkins (Hemiptera: Reduviidae) preyed on two adults of *T. peregrinus* during one hour (Dias et al., 2014).

Considering microbial control, entomopathogenic fungi, such as *Beauveria bassiana* (Balsamo-Crivelli) Vuillemin (Clavicipitaceae), have been used in aerial spraying and natural epizootics of *Fusarium proliferatum* (Matsush.) Nirenberg ex Gerlach & Nirenberg, *F. equiseti* (Corda) Saccardo (Nectriaceae) (Veloza, 2015) and *Zoophthora radicans* (Brefeld) Batko (Entomophthoraceae) (Mascarin et al., 2012) have caused extensive mortality of the pest.

After four years of initial releases of *C. noackae* in eucalyptus plantations in Brazil, the infested area has been reduced to 18.8 % (app. 46,000 ha) compared to 2012 data, demonstrating the effectiveness of classical biological control of bronze bug in Brazil.

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