Notas Científicas

A low-cost trap for Cerambycidae monitoring in forest plantations in Brazil

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Abstract – The objective of this work was to evaluate the use of a low-cost trap to capture Cerambycidae in different seasons in planted forests in Brazil. Thirty polyethylene-terephthalate trap bottles per hectare were used, disposed at every 50 m. The traps were red painted and contained glass flasks with a mixture of ethanol, methanol and benzaldehyde. There were soap and water at the trap bottom. The traps were checked biweekly for beetle presence. Sampling time required one minute per sample, and traps were easy to use. Total sampling cost, including materials and labor, was US$ 13.46 per sample. Six Cerambycidae species were captured along the dry and rainy seasons.

Index terms: integrated pest management, pest monitoring, sampling cost, wood borer.

Armadilha de baixo custo para monitoramento de Cerambycidae em plantações florestais no Brasil

Resumo – O objetivo deste trabalho foi avaliar o uso de uma armadilha de baixo custo, para capturar Cerambycidae em diferentes épocas do ano, em florestas cultivadas no Brasil. Foram utilizadas 30 armadilhas de garrafas de polietileno-tereftalato por hectare, posicionadas a cada 50 m. As armadilhas eram de cor vermelha e continham frascos de vidro com mistura de etanol, metanol e benzaldeído. Na parte inferior da armadilha, havia água e sabão. A cada duas semanas, as armadilhas foram verificadas quanto à presença de besouros. O tempo de amostragem necessário foi de 1 min por amostra e as armadilhas foram de fácil manuseio. O custo total de amostragem, incluindo materiais e mão de obra, foi de US$ 13,46 por amostra. Seis espécies de Cerambycidae foram capturadas nas estações secas e chuvosas.

Termos para indexação: manejo integrado de pragas, monitoramento de pragas, custo de amostragem, broca de madeira.

In Brazil, 4,000 species of 1,000 Cerambycidae genera have been reported (Martins, 1997). They are associated with several forest species, such as *Eucalyptus* spp. (Zanuncio et al., 2005), *Piptadenia macrocarpa* L., *Caesalpinia ferrea* L. and *Tamarindus indica* L. (Monné, 2005), and fruit trees, such as *Mangifera indica* L. (Paz et al., 2008). The presence of Cerambycidae (wood borers) has become relatively common in forest plantations (Zanuncio et al., 2005). The most efficient way for its management is the systematic monitoring, which allows control measures to be taken.

The monitoring of insect pest populations based on trap captures is a critical component of integrated pest management (IPM) and has been the main focus of many ecological studies during the last four decades. Because insecticide applications are more effective when control decisions are based on population levels, one method to reduce insecticide use is the efficient monitoring of pests, in order to determine the correct timing of pesticide applications (Nansen et al., 2008). Research works on insect pest monitoring use traps in the borders of the target crops to assess if the pests are approaching the crop of interest (Esker et al., 2004). Most trapping studies in forests have been performed with light-traps and traps with pheromones (Reddy et al., 2005; Martins et al., 2006), but there are no studies on the use of polyethylene-terephthalate (PET) bottles with attractants for Cerambycidae.

The objective of this study was to evaluate the use of a low-cost trap to capture Cerambycidae in forest plantations in Brazil in different seasons of the year.

The study was performed from March 2007 to June 2009, with weekly assessments at a 18.1-ha coffee plantation [*Coffea arabica* L. (Rubiaceae), Catuaí variety] with a population of 83,300 plants of 1.7–1.9-m height. The plantation was located very close to a mixed forest plantation, in Ponte Nova, MG, Brazil, at 20º33"42' S and 42º53"42' W, and at 667.5 m altitude.

To test the capacity of the traps to capture Cerambycidae, the forest species close to the coffee crop were first identified. The main species standing between the trap – at the edge of the coffee plantation – and the tree species were: *Eucalyptus grandis* W. Hill ex Maid. (Myrtaceae), *Piptadenia macrocarpa* Benth. (Mimosaceae), *Mimosa sordida* and *Mimosa scabrella* Benth. (Fabaceae), *Caesalpinia ferrea* Mart. (Fabaceae), *Tamarindus indica* L. (Fabaceae), *Plathymenia reticulata* Benth. (Fabaceae), *Mangifera indica* L. (Anacardiaceae), cinnamon *Nectandra megapotamica* Mez (Lauraceae), *Hevea brasiliensis* (Willd ex A. Juss.) Müll.Arg. (Euphorbiaceae) and *Urochloa decumbens* (Stapf.) R.D. Webster (Syn. *Brachiaria decumbens* Stapf) (Poaceae).

For adult Cerambycidae monitoring, traps made of 2-L PET bottles were used. A rectangular lateral opening (30x15 cm) was made in each bottle to allow the entrance of adult Cerambycidae. The bottles were painted with red oil paint and attached to coffee plants with number 12 galvanized wire at 1.5-m height above the ground (Fernández & Cordero, 2005). A 10-mL glass flask containing an attractant-based bait was fixed inside the trap (Figure 1). The flasks were closed with a rubber lid with two perforations, through which two stainless steel bands (1.2-mm diameter x 10-mm long) were inserted for attractant release. The attractant was composed of a 1:3 mixture of ethanol and methanol (Vetec, Rio de Janeiro, Brazil), with 1% benzaldehyde (volatile disperser agent). Mixtures of alcohols have been used as attractants for Cerambycidae (Brockerhoff et al., 2006). The bottle lid was used to close the trap bottom, so that the trap held 120 mL of water containing 5% neutral soap for capturing adult Cerambycidae.

The traps were spaced apart by 50 m in the borders of the coffee plantation, in order to capture adult Cerambycidae before they reach the forests. The trap openings were positioned in a way that the attractant's plume could be dispersed by the wind. Thirty traps per hectare were used. Initially, the content of the traps with adult Cerambycidae were collected with the use of plastic bags (with 150-mL volume each). The plastic bags were sealed to avoid the loss of insects during transportation and storage. Identification was provided for crop, collection data and trap number. Traps were checked biweekly. At sampling, the beetles were collected and the volume of the attractants and of water plus soap was completed. The plastic bags containing the adult Cerambycidae were taken to the laboratory, where specimens were identified, whenever possible, as for their genus and species, using available taxonomic keys and the reference collection at the Universidade Federal de Viçosa (Viçosa, MG, Brazil).

For the calculation of the trap costs, the following materials were considered: a PET bottle painted red, 10-mL glass flasks, number 12 galvanized wire, attractants (ethanol, methanol and benzaldehyde),

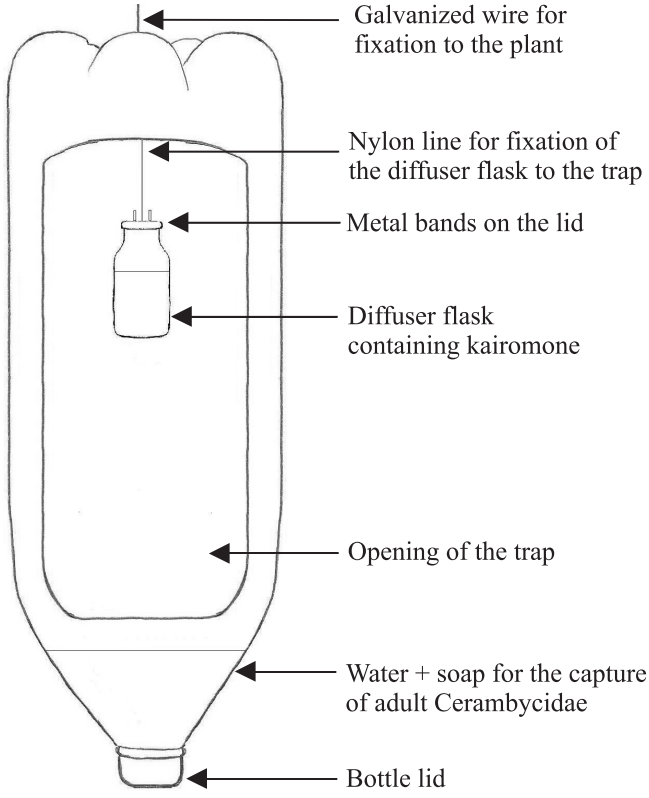

Figure 1. Red polyethylene-terephthalate (PET) bottle with attractant (glass flask), used as a trap to capture Cerambycidae in coffee fields in Ponte Nova, Minas Gerais state, Brazil. From March 2007 to June 2009.

soap, 500-mL flask washers, 5-L plastic bottles for the addition of water and soap to the trap bottles, and 50-mL plastic jars to store the insects. The trap servicing time was measured as the interval between the collection of the liquid inside the trap and the replacement of this liquid. The manual labor cost for processing samples was calculated as the time spent for the counting of insects in a sample plus the walking from one sample to the next.

Six species of Cerambycidae were collected: *Eburodacrys sexmaculata* (Oliv.), *Ommata (Agaone) viridis* Goun., *Chydarteres dimidiatus* (Fabr.), *Martinsellus signatus* (Gyllen.), *Trachelissa* sp. and *Trachyderes succinctus* (L.). The highest mean number of *T. succinctus* and *E. sexmaculata* caught in traps was observed in December 2007; the highest number of *M. signatus* and *O. viridis* was observed between May and June 2007 (Figure 2). The mean

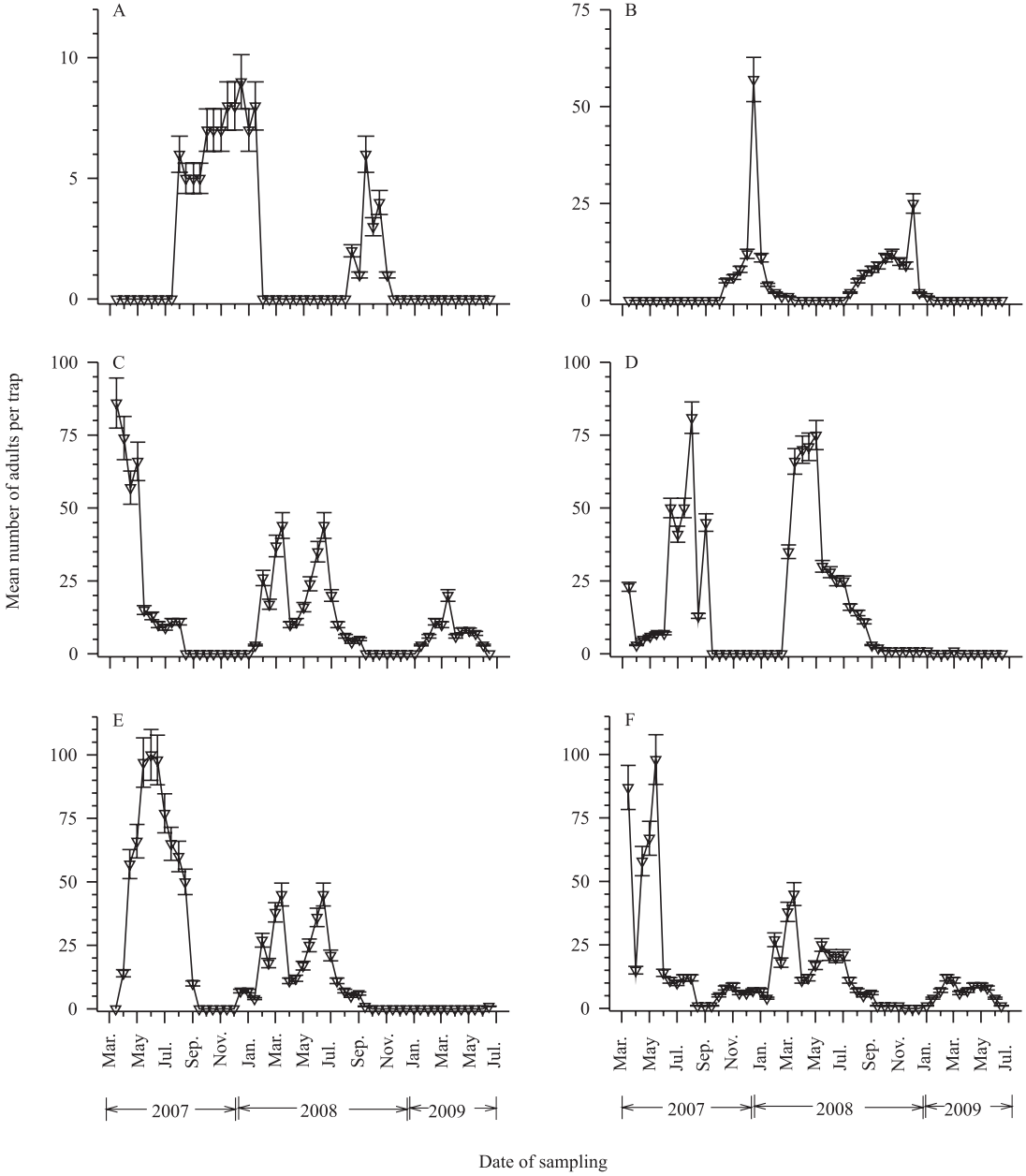

Figure 2. Average±standard error of Cerambycidae captured per trap from March 2007 to June 2009: *Trachyderes succinctus*, A; *Eburodacrys sexmaculata*, B; *Trachelissa* sp., C; *Chydarteres dimidiatus*, D; *Martinsellus signatus*, E; and *Ommata (Agaone) viridis*, F.

number of *C. dimidiatus* caught in traps was higher in July-August 2007 and April-May 2008, compared to the other periods. *Trachelissa* sp. found in traps showed the highest density in March 2007. Altogether, 746 specimens of *C. dimidiatus*, 806 of *T. succinctus*, 99 of *E. sexmaculata*, 208 of *O. viridis*, 1,038 of *Trachelissa* sp. and 810 *M. signatus* were collected.

In general, the population peaks Cerambycidae species (*Trachelissa.* sp., *C. dimidiatus*, *M. signatus* and *O. viridis*) occurred between March and July (dry season). Populations of *T. succinctus* and *E. sexmaculata* showed higher densities between September and December (rainy season). There are no studies reporting the times of occurrence of all these Cerambycidae species. However, our data agree with the ones reported by Dall'Oglio & Peres (1997) who reported a greater number of adults of *T. succintus* and *Eburodacrys* sp. between September and October. Paz et al. (2008) found a higher density of adults of *E. sexmaculata* and *T. succinctus* in trees of mango (*M. indica* L.) in the state of Piauí, Brazil, in the rainy season (April-May), which corresponds to the rainy season in Ponte Nova, MG. These authors associated the weather with the possible population density variations of these insects. Low peaks or absence of peaks of Cerambycidae species in 2009 may have occurred because the evaluation did not encompass the whole year, and the pest populations fluctuate from year to year.

The mean sampling time recorded was 55 seconds and the cost of a trap was about US$13.76 per sample, including the cost of sample processing. The service time and cost of the trap are low, in comparison to other sampling methods. For Pedigo & Rice (2008), sampling must be carried out as quickly as possible, since fertilizer application, irrigation, disease and weed control, staking and harvest are very expensive activities. The use of these traps for Cerambycidae sampling can be considered feasible, since it allow collecting, data processing and decision making in one day, besides being of low cost.

According to Flint & Gouveia (2001), a trap can be considered an optimal sampling device when it is inexpensive and easy to handle. Our surveys between 2007 and 2009 have demonstrated that the new trap design is effective in catching Cerambycidae in commercial crops with forests in all seasons of the year.

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