

# New technologies using volatiles for the control of coffee berry bores (*Hypothenemus hampei*)

Carmenza E. Góngora B, Johanna Tapias, Jorge Jaramillo, Ruben Medina, Shams Usmani, Herley Casanova, Pablo Benavides.  
[\\*carmenza.gongora@cafedecolombia.com](mailto:carmenza.gongora@cafedecolombia.com). Cenicafé. National Center of Coffee Research. Colombia. ©Russell IPM.UK  
 \*Grupo de Coloides, Universidad de Antioquia. Colombia



## Introduction

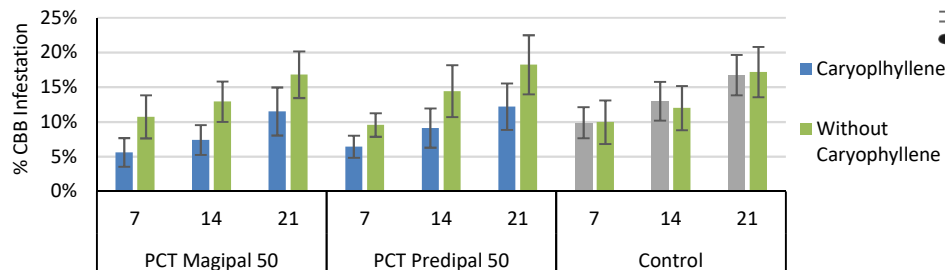
Coffee berry borer (CBB) is the main coffee pest in Colombia, and it is difficult to manage due to its cryptic habits and the constant availability of fruits. The IPM strategy to control CBB is based on cultural control and the use of chemical insecticides and entomopathogens as a complement. So far, the use of attractants and repellent volatiles arrived as a new chemical ecological strategy to be added to the control strategies.

## Materials/Methods

The olfactory preference of CBB was evaluated using a Y-tube olfactometer, in which ripe coffee fruits were accompanied by terpenes identified in the CBB-repellent plant *Lantana camara*, such as:  $\alpha$ -terpinene, farnesene and  $\beta$ -caryophyllene (Castro et al., 2017). The volatiles were evaluated in concentrations between 25 to 200 ppm using 50 CBB independent females and then replicated four times (Gongora et al., 2020). The number of insects reaching each branch of the Y-olfactometer was registered, so the repellent effect was recorded as the proportion of females entering the branch containing only the ripe coffee berries. Furthermore, the protection of coffee fruits in coffee trees was evaluated in the field using two devices produced by Russell IPM containing  $\beta$ -caryophyllene. They were tested at a concentration of 1.5 g in liquid formulation (PTC magipal-50) emitting 450 ppm and semi-solid formulation (PCT predipal-50) emitting 900 ppm.

## Conclusion/Perspectives

$\beta$ -caryophyllene is a promising compound for an integrated pest management program in commercial coffee plantations.



**Figure 1:**  $\beta$ -Caryophyllene repellence assay in field conditions. CBB infestation on coffee trees after 7, 14 and 21 days in field



PTC magipal-50 PTC Predipal-50

## Results/Discussion

the olfactory preference showed that only  $\beta$ -caryophyllene induced a significant and consistent CBB repelling effect at all examined doses, repelling at 25 ppm and higher showing up to 78% repellency at 50 ppm. The results with the devices under field conditions showed that after 20 days, the trees that contained the two types of devices had a reduction between 32 and 42% of fruits attacked by CBB compared with the unprotected trees ( Fig 1). Greater volatilization of the compound was observed in the liquid devices when compared to the semi-solid, where the release of the repellent was slower, ensuring greater volatile permanence in the field over time.

**References:** 1. Castro, A. M., Tapias, J., Ortiz, A., Benavides, P., & Góngora, C. E. (2017). Identification of attractant and repellent plants to coffee berry borer, *Hypothenemus hampei*. *Entomologia Experimentalis et Applicata*, 164(2), 120-130. 2. Góngora, C. E., Tapias, J., Jaramillo, J., Medina, R., Gonzalez, S., Casanova, H., ... & Benavides, P. (2020). Evaluation of Terpene-Volatile Compounds Repellent to the Coffee Berry Borer, *Hypothenemus hampei* (Ferrari) (Coleoptera: Curculionidae). *Journal of Chemical Ecology*, 46(9), 881-890.