

The cocoa pod borer and its control

Abstract

The Cocoa pod borer (*Carmenta foraseminis* (Busck) Eichlin) is a moth that damages cocoa pods, especially when they reach adulthood, affecting the quality of the raw material. Understanding the insect's life cycle, the symptoms and signs of infestation on the pod, the damage it causes, and its control methods is essential to prevent this insect from becoming a threat to cocoa production.

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Introduction

The Cocoa pod borer (*Carmenta foraseminis* (Busck) Eichlin), also called the black Carmenta in Venezuela and Cigarreta in Peru, is a moth with transparent wings (Figure 1) that feeds from the pods as a larva or worm, completing all stages of its life cycle until it reaches adulthood.



Figure 1 Adult male of the Cocoa pod borer.

In Colombia, it has been reported in some regions of the departments of Antioquia, Cundinamarca, Tolima, Huila, Caquetá, and Norte de Santander. Its presence is confirmed in Panama, Venezuela, and Peru.

Life cycle, symptoms, and signs

The moth lives 71 days between egg to adult: 7 days in the egg stage, 36 days in the larval stage, 21 days in the pupa stage, and 7 days in the adult stage.¹

Normally, the symptoms in infested fruit correspond to freckles or premature yellowing (Figure 2). The freckles indicate that the insect is completing its life cycle inside the fruit, while premature yellowing is a symptom of fruit abortion or fruit set. The latter occurs when the female lays her eggs on relatively young fruits



Figure 2 A, freckle symptom. B, premature yellowing.

External signs of the attack of the borer on the fruit are the presence of debris or excrements on the hole built by the larva in the prepupa stage and suppurations or liquids that come out through the exit hole of the adult (Figure 3).



Figure 3 A, waste and fecal matter on the adult's exit orifice. B, liquids suppurating from the adult's exit orifice.

Damages

The damage caused by the fruit borer is normally indirect, as the larva feeds primarily on the placenta and mucilage of the grains. However, it is moisture and secondary biological agents that deteriorate and preferment the grains after the adult emerges (Figure 4). Occasionally, some grains are found gnawed by the larvae, but this is not common (Figure 5).



Figure 4 Preferment grains in fruit infested by the pod borer.



Figure 5 Cracks in the grain caused by larvae of the pod borer.

Figure 6 shows the poor appearance of the beans extracted from fruits infested from the Pod borer compared to those that were not infested in process of dried after their fermentation. Quality control analyses by the Compañía Nacional de Chocolates from Colombia demonstrated that processed beans from fruits affected by the pod borer exhibited unpleasant odors and flavors, rendering them unusable for industrial purposes.



Figure 6 Grain drying process. A, poor appearance of grains affected by the pod borer. B, good appearance of healthy grains.

Control

Initially, bagging the fruits that are formed on the trees was shown to be an effective control practice, but its high cost makes it unsuitable for recommendation.

Varón et al.² recommend cultural and complementary practices for controlling the pod borer, such as tree pruning, weekly removal of infested fruits, bagging infested fruits, and covering infested fruit husks with thick black plastic sheeting, monitoring adults

using McPhail traps, and applying entomopathogenic products. However, this set of practices is complex and expensive.

Consequently, the results of the chemical control recommended by Cubillos,³ consisting of spraying Deltamethrin at a concentration of 25 ppm on adult fruits during the months of highest egg-laying (August-September),¹ are considered to be the best control option to date. When the larvae emerge from the eggs, they break through the epidermis to penetrate the fruit, so allowing lethal contact with the insecticide.

In inoculation trials of cocoa borer larvae with the entomopathogenic nematode *Steinernema* spp., conducted by Cubillos,⁴ a 100% mortality rate was observed using 100,000 Juvenile Infective units. However, Rosmana et al.⁵ demonstrated that similar results are achieved with a dose of 10,000 Units in the case of Cocoa pod borer from Asia. It is worthwhile to conduct field trials testing this lower dose of the nematode.

Conflicts of interest

Author declare that no conflicts of interest.

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