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Priority in removing diseased fruits for the control of cacao frosty pod rot (*Moniliophthora Roreri* (Cif. & Par.) Evans *et al*)

Abstract

Cacao frosty pod rot is an exclusive disease of the fruit that is considered one of the main causes of low yields of the crop in Central and South America. Its control is based on the timely removal of critical sources of infection, especially fruits in a state of recent sporulation (one to three weeks after the process begins) and with symptoms of brown spot, which are the ones that generate the main epidemic outbreaks and, as a consequence, significantly decreasing production and the quality of the grain.

Keywords: fungus disease, sources of infection, control

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Introduction

Cacao frosty pod rot, caused by the fungus *Moniliophthora roreri* (Cif. & Par.) Evans *et al,* is an aggressive disease that affects the fruits of the crop, reducing the yields and quality of the raw material in Central and South America. It has already been reported in Jamaica, an island in the Antilles, and in Acre state of Brazil. In Colombia it is an endemic disease that causes production losses between 30-50%.

It has been proven that the control of Cacao Frosty Pod Rot is achieved through cultural control, fundamentally removing diseased fruits from the trees in weekly rounds for two and a half consecutive months, leaving them freely on the ground.[1] After that time, the removal of the diseased fruits is done simultaneously with the harvesting of the ripe fruits, a practice that the grower usually does every two to three weeks (Figure 1).

Figure 1 Cacao fruit with Frosty pod rot unhung from the tree and freely left on the ground.

However, to facilitate removal operations it is important to define which fruits are in critical condition as sources of crop infection, such as sporulated fruits and those with brown spot symptoms. The first are active sources of infection and fruits with brown spot take a short time (7-9 days) to become active sources of infection.

Sporulated fruits as main sources of infection

The newly sporulated fruits, Figure 2, constitute the main source of infection, retaining that potential for up to three weeks after the sporulation process start.[2]

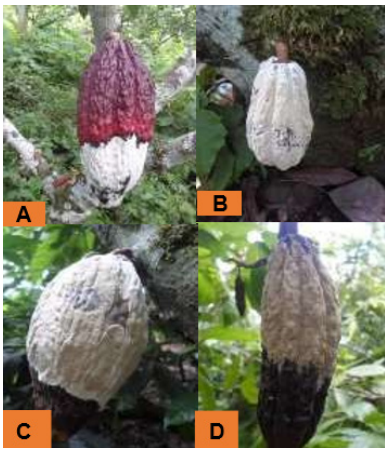

Figure 2 Sporulated fruits:

A- with mycelium in formation.

B- with one week of sporulation.

C and D- with two-three weeks of sporulation.

Ending three weeks they begin to lose sporulation potential and after seven weeks these fruits have substantially lost it, which is reflected in the change in color and the formation of thin crusts of dispersed spores on the surface of the fruits (Figure 3).

Figure 3 Diseased fruit seven weeks after the sporulation process began.

Over time, the sporulated fruits mummify and can remain hanging on the tree for several years, without the capacity to trigger epidemic episodes but retaining the identity of the primary inoculum (Figure 4).[3]

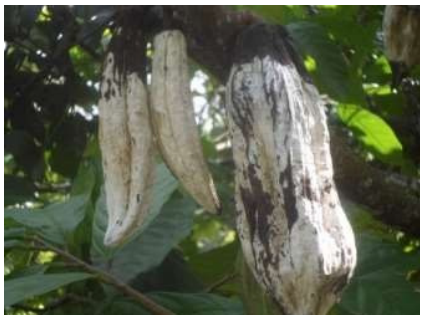

Figure 4 Mummified fruits with great loss of their sporulation capacity.

Porras[4] in Costa Rica, determined that from one fruit the spore release capacity was 546 thousand units collected in 15 cm bags in diameter during the first month of forming the stroma or mycelium and 500 spores per bag after two months of forming it. This confirms that are the newly sporulated fruits the unique responsible for the large infection episodes.

Priority in the removal of diseased fruits as critical sources of infection

The sporulated fruits with the greatest capacity of infection are those that are found between one and three weeks after the process began. And, also fruits with brown spot symptoms (Figure 5) so they take about one week to become sources of infection. Fruits with the symptoms of bellies or tiny sub-epidermal oily spots are not in critical condition as infection source and so is no urgent its detachment from the trees. Consequently, the weekly removal practice should focus on the newly sporulated fruits that are generators of epidemic outbreaks and those that show symptoms of brown spot. As this practice progresses, the sporulated fruits and with brown spots disappear and it is thus easier to also remove the mummified fruits that remain on the trees.

Figure 5 Fruit affected by Cacao frosty pod rot with symptoms of brown spot.

The best indicator of the control of Cacao frosty pod rot is the absence or minimal presence of sporulated fruits and with symptoms of brown stain hanging on the cacao trees.

In this way, cultural control of the Cacao frosty pod rot becomes an effective, simple and very low-cost practice.

One example of results of the cultural control mechanism of the Cacao frosty pod rot

The La ILusión farm, located in the Champitas village, municipality of Chigorodó (department of Antioquia, Colombia), with a population of 800 nine-year-old cloned cacao trees, recorded a production of 1,116 - 982 kilograms of cacao in grain, with an incidence of Frosty pod rot below 1.5% in the years 2022-2023 respectively, applying the control model already described. It is the result that is achieved through the implementation of this cultural control management of the Cacao frosty pod rot (Figure 6).

Figure 6 Harvest round of November 2023. Farm La ILusión, municipality of Chigorodó (Antioquia department, Colombia). Observe the good sanitary state of the ripe fruits.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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