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Cocoa Frosty Pod Rot (*Moniliophthora Roreri*(Cif. & Par.) Evans et al) and Its Control in Colombia

Mini review

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Abstract

Cocoa Frosty Pod Rot is a fungal disease that causes great damages to cocoa production in South and Central America. In Colombia it is an endemic disease with incidence levels of 38.6-84.1%. Its best control is through cultural control supported by the timely removal of diseased fruits, especially those that are in critical condition as sources of infection, in weekly rounds for two and a half months, corresponding to the time needed to break the disease cycle. After this period, the removal of diseased fruit is done at the same time as the rounds for harvesting ripe fruits. Diseased fruits that are unhung from the trees are left freely on the ground.

Keywords: Cocoa; Fungus Disease; Control

Introduction

The disease called Cocoa Frosty Pod Rot, in Spanish Monilia or Moniliasis, caused by the fungus (Moniliophthora roreri(Cif. & Par.) Evans et al) (Figure 1), is the most damaging phytosanitary factor in cocoa crops in Colombia, Venezuela, Ecuador, Peru, Bolivia and Central America. It has already been reported in Jamaica, an island in the Antilles, and recently in Brazil.

Figure1:Harvest round of cocoa fruits affected by Cocoa frosty Pod Rot.

There are reports that support the presence of this disease in Colombia for two centuries [1] causing considerable damage to production. It is an endemic disease and the registered incidence fluctuates between 38.6% in the department of Meta and 84.1% in the department of Norte de Santander [2,3].

Its control has been considered from different points of view: chemical, genetic, biological and cultural. However, to date it has been proven that although genetic control through tolerant clones to the disease is the most effective for new plantings, it has no application for crops already established in countries where the disease is present. Biological control is only in its first steps and chemical control has not been effective nor consistent [4]. Cultural control is the most preferred option due to its effectiveness, low cost, safety and long-lasting nature.

Cultural control of Cocoa frosty pod rot in Colombia began in 1963, when Barros [5]demonstrated that by applying good cultivation practices the incidence of the disease was reduced from 17.7% in the treatment without control to 8.8% in the treatment with cultural practices. However, in the cultivation practices of his study he did not mention the role played by diseased fruits as sources of internal or secondary infection.Thanks to the studies on symptomatology by Merchán[4] and Rodríguez [6], on epidemiology by Green [4,7]and on the handling of diseased fruits by Cubillos [8], it was possible to structure a cultural control platform that is the object of this article.

Cultural Control of Cocoa Frosty Pod Rot

For the cultural control of Cocoa frosty pod rot the following points must be taken into account: symptomatology and cycle of the disease, epidemiology, removal and disposal of diseased fruits and pruning of the crop.

Symptoms and Cycle of the Disease

The symptoms of the disease are associated with the age of the fruit at the time of infection. In young fruit (less than three months old), shiny-looking bellies or humps form (Figure 2A). In adult fruit (older than four months), tiny oily spots form under the epidermis (Figure 2B). After a certain time, when the disease has invaded the fruit internally, it turns brown or coffee-colored (Figure 2C). Finally, the fruit ends up white or cream-colored (Figure 2D).

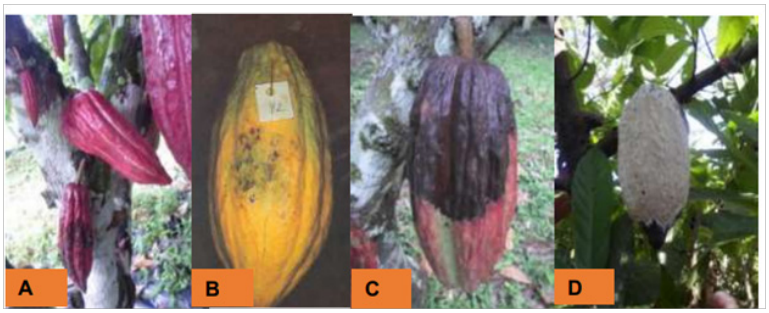

Figure2:

A. In the center Joung fruit with bellies or humps

B. Adult fruit with oily spots

C. Fruit with brown spot

D. White and cream-colored fruit

Normally, the disease cycle lasts between 66 and 74 days (Merchán, 1981; Rodríguez et al, 2005). The first symptoms (bellies or oily spots under the epidermis of the fruit) appear one month after infection; a little after a month, the brown or coffee-colored spot forms and, finally, after a week, the fruit turns white and cream (powdery) which corresponds to the formation of the reproductive structures of the pathogen (spores or conidia).The critical states of the fruits are when they are white or cream-colored functioning as active sources of infection and when they present the brown spot symptom due to the short time it takes for them to become active sources of infection.

Epidemiology

The wind is the main means of dissemination of the pathogen that generates the disease, introducing it into crops that begin production. Over time, the diseased fruits sporulate and become sources of internal infection which, when are spread by the wind, generate epidemic outbreaks.

The diseased fruits that hang from the branches and stems, quickly lose their moisture, possibly due to the consumption of water by the sporulating mycelium; they then become mummified and remain on the tree for several years [9]. Although in this state they are not a powerful source of infection, they remain active as sources of infection to a lesser degree.Green in the years 1975-1979 (cited by Merchán, [4] demonstrated that with a source of infection of 3 sporulated fruits per tree, the incidence of the disease was 55% from the source and 10% in trees located 20 meters from the same source. This indicates that epidemic episodes occur only when there is a large number of diseased fruits hanging from the trees within the crops.

Cubillos[8], González [7], Evans [10] and Cubillos and Ardila [11] found that diseased fruits placed on the ground do not have the capacity to generate infections because their rapid decomposition limits the formation and survival of spores.

Removal and Disposal of Diseased Fruits

According to the disease cycle and to avoid the existence of fruits in critical stages of infection (with brown spots and sporulating) within the crop, these should be removed from the trees once a week for two and a half consecutive months. At the end of this period, the disease cycle is broken and the diseased fruits that appear again can be removed at the same time as the mature fruits, when the usual harvest rounds are made every 2-3 weeks. In this way, effective control of Cocoa frosty pod rot is achieved at a low cost.

The diseased fruits are left freely on the ground without being subjected to any manipulation. Under these conditions, most of the diseased fruits do not manage to sporulate and the sporulated ones stop their activity in a short time due to the rapid decomposition compromised by the saprophytes that inhabit the soil (Figure 3).It is important to note that the removal of diseased fruits should be done as carefully as possible to avoid leaving them behind that could cause new infections.

Pruning the Crop

Pruning cocoa trees is a task that makes it easier to see diseased fruit and lowers the costs of its removing. The height of the trees should not exceed 4 meters and the inner canopy should remain free of unnecessary branches (Figure 4). Pruning is normally done at the end of the harvest season.

Successful Case of Cultural Control

The San José farm, municipality of San Vicente de Chucurí (department of Santander, Colombia), with 18 hectares of cloned crop and 11 years of age had a production of 1,138-945 kilograms per hectare between the years 2017-2021 and an incidence of Cocoa Frosty Pod Rot below 10%. This is the result of the cultural control of Cocoa frosty pod rot (Figure 5).

Figure3:
A. Sporulated fruit recently deposited on the ground.
B. Sporulated fruits after two weeks of being deposited on the ground.

Figure4: Pruning the cocoa tree to facilitate the detection of diseased fruit.

Figure5: Harvest round of ripe fruits in good health. Farm San José, municipality of San Vicente de Chucurí (Santander, Colombia), year 2021.

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