

PHYTOPHTHORA CANKER OF CACAO IN THE CAROLINE ISLANDS

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Abstract

The first reported outbreak of an epidemic of bark canker of Criollo cacao, caused by Phytophthora palmivora in the Caroline Islands, Western Pacific is described. The disease is characterized by trunk girdling cankers which kill large trees in 30 to 60 days. Prior to succumbing, affected trees burst into flower. Calonectria rigidiuscula is present as a secondary in affected bark. The proven pathogen is apparently a different strain of P. palmivora from those common in Central America. Effective control measures include the roguing and burning of badly diseased trees, using sterilized pruning tools, covering pruning wounds with coal tar and excising the cankers.

INTRODUCTION

Bark canker was first noted on a single Criollo cacao tree in late 1961 on an islet in the lagoon of Ponape, Eastern Caroline Islands. Six months later a dozen trees adjacent to this first diseased tree and a few trees in a planting about 3 miles away were observed to be harboring the disease. Suddenly, in the fall of 1962, nearly all of the trees of these two plantings, about

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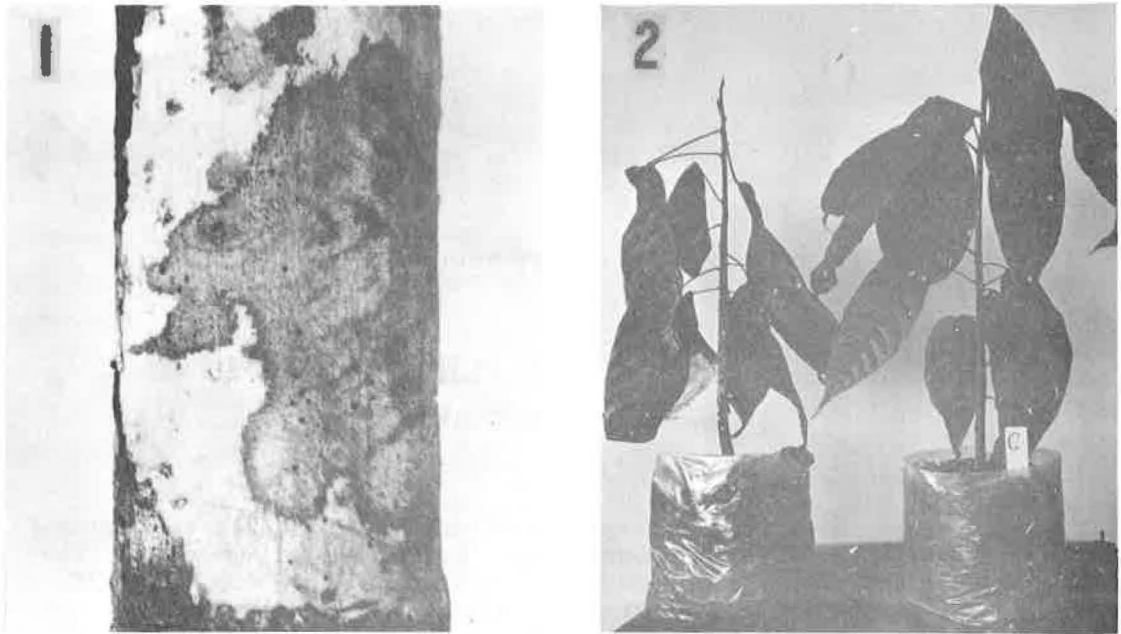


FIGURE 1. Typical *Phytophthora cacao* bark canker. This 7-year-old tree with a trunk measuring about 6 inches in diameter was entirely free of disease 2 months prior to the taking of this photograph.

FIGURE 2. *Phytophthora palmivora* pathogenicity test. The 3-month-old Criollo cacao seedling on the left wilted on the eleventh day after inoculation. A healthy Criollo seedling is shown at right.

1200 trees, became diseased. The disease spread along one side of the island (about 20 miles) from similiar such loci of infestation, destroying in this outbreak about 2000 trees. Practically all of the trees attacked were of the Criollo variety, although a few were hybrid types.

SYMPTOMS

The disease is characterized by a brown band of necrosed bark spreading around the trunk, usually beginning from the site of a pruning or other wound or at the bark suture in the main jorquette. By inserting bits of diseased bark under the bark of healthy trees 4 to 6 inches in diameter, cankers were produced which completely encircled the trunks in 30 to 60 days. When the bark is pared back (Fig. 1) the affected cambium is seen to be watery to gummy and of a dull brownish-gray color, which often, but not always, assumes a claret hue on exposure. The necrosis does not extend into the wood beyond the cambial layer.

When the canker is large, or has nearly encircled the trunk, the tree typically sheds the major portion of its leaves and a new flush of smaller leaves is put forth. Concurrently, the tree bursts into bloom with an enormous number of flowers, often literally covering the branches. Large numbers of cherelles develop but fail to mature before the tree succumbs.

ISOLATION OF THE PATHOGEN

Interior bits of necrotic bark from the margins of active lesions consistently yielded the conidial stage of *Calonectria rigidiuscula* (Berk. & Br.) Sacc. when plated out on PDA. The asci and ascospores of this fungus are readily observed on the bark of trees killed by the disease.

As the disease syndrome exactly parallels a brown bark rot of cacao reported from the Philippine Islands (3,4), attributed to *Calonectria rigidiuscula*, pure cultures were tested for pathogenicity on seedlings and adult trees by a variety of inoculation techniques. All tests

failed to reproduce the disease. The fungus made only superficial penetration into healthy bark, which invasion was later walled off by callus tissue. These results confirm the findings of S. H. Crowdy (1).

As the Criollo plantings in Ceylon and Java were decimated at the turn of the century by a canker disease caused by *Phytophthora palmivora* Butl. (5), and *Phytophthora* canker has been reported in other cacao-growing areas, sections of cacao branches containing cankers were sent to the co-author at the University of California, Riverside. Using the selective medium of Eckert and Tsao (2), which employs three antibiotics to inhibit bacteria and non-phycomycetes, he readily obtained *P. palmivora* from the lesions. Subsequently, numerous isolations made at Ponape by the same technique yielded *P. palmivora*. These isolants proved to be virulent pathogens. They killed Criollo seedlings in 11 days (Fig. 2) and produced cankers that girdled trees of 4 inches or more in diameter in 18 days. The Ponape isolates are slightly different in cultural appearance from two cacao isolates of *P. palmivora* from Central America, and did not form oospores when paired with either CR 1, from Costa Rica (A₁ type) or 4002, from Mexico (A₂ type isolated by S. Romero). Apparently the strain from Ponape differs in mating type from either of those from Central America. No previous report of an outbreak of cacao bark canker, caused by *P. palmivora*, from the Caroline Islands is found in the literature.

CONTROL

Field experiments showed the disease to be easily transmitted by mechanical means. Pruning knives contaminated by cutting through diseased bark were used to prune chupons or small branches of healthy trees. Nearly all became infected. Contaminated pruning knives were rendered innocuous by rinsing them in a .5% solution of sodium hypochlorite. All wounds made on healthy trees with sterilized tools and covered with tar healed, whereas 8% of wounds so inflicted but left uncovered developed cankers.

In consideration of these findings, an intensive eradication and sanitation program was launched in early 1963. All diseased trees were rogued by burning and farmers were instructed to sterilize pruning tools and to cover the wounds with coal tar. Losses from bark canker were reduced ten-fold, from more than 2000 newly diseased trees in 1962 to 185 in 1963. The number of cacao trees developing canker in 1964 was 65. The total population of Criollo cacao on Ponape is estimated at about 150,000 plants.

During 1963 a therapy technique was developed for trees with cankers in an early stage, or extending less than half-way around the trunks. It consists of paring away diseased bark, flooding the resulting wound with a .5% sodium hypochlorite solution, and covering it with coal tar. More than 90% of such treated trees recovered.

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