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Defoliation and dieback of cacao in India

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Abstract

Severe defoliation and dieback of cacao were observed in many cacao gardens in India. The symptoms of this disease are described. *Calonectria rigidiuscula* (Berkeley & Broome) Saccardo was consistently isolated from the leaves and stem. Pathogenicity experiments proved that this fungus is the causal organisms. This is the first report of the occurrence of defoliation and dieback of cacao caused by *C. rigidiuscula* in India.

Key words: Colonectria rigidiuscula Theobroma cacao Defoliation

Desfolhamento e morte descendente do cacau na Índia

Resumo

Severo desfolhamento e morte descendente do cacau foram observados em muitos cacauais na Índia. Os sintomas desta doença são descritos. *Calonectria rigidiuscula* (Berkeley & Broome) Saccardo foi sempre isolada das folhas e do caule. Testes de patogenicidade provaram que este fungo é o agente etiológico. Este é o primeiro relato da ocorrência de desfolhamento e morte descendente do cacau causada por *C. rigidiuscula* na Índia.

Palavras-chave: Colonectria rigidiuscula Theobroma cacao Desfolhamento

Ram et al (1972) isolated several species of fungi such as *Botryodiplodia theobromae* Pat., *Phoma* sp., *Phomopsis* sp., *Fusarium* sp. and *Colletotrichum gloeosporioides* Penz. from dieback affected cacao in Bahia. But, in this instance none of the *Fusarium* sp. was found to be pathogenic. This paper reports *Calonectria rigidiuscula* (Berk. & Br.) Sacc. (conidial state: *Fusarium decemcellulare* Brick) as the casual organism of dieback of cacao in India.

During August-September, 1977 and 1978, severe defoliation and dieback of cacao (*Theobroma cacao* L.), previously unreported in India, were seen in many cacao gardens in Kerala and Karnataka states. The infection under natural condition was first seen as small yellow

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spots, which soon turned to brown with a board yellow halo. Such lesions were found spreading rapidly, coalescing to form large necrotic areas. Defoliation occurred, when such lesions covered a major portion of the leaf. The lesions on the fallen leaves continued to enlarge until the whole leaf was completely infected and turned brown. New leaves produced subsequently were also infected, and soon dropped off. Young leaves were more susceptible to the infection than the older ones. Soon after defoliation the infection progressed to the tip of the twigs and continued downwards. On some plants infection on stem portion was also noticed even before the complete defoliation of the infected branches. The infection on the stem appeared as dark brown linear lesions. Such defoliation and stem infection caused severe twig dieback. However, in none of the cases observed, the plants died. Rose-pink growth of the pathogen with abundant sporulation was observed on severely infected leaves and twigs.

Isolations made from the infected leaves and stem consistently yielded *Calonectria rigidiuscula* (Berkeley and Broome) Saccardo. A culture of the fungus has been deposited at the Commonwealth Mycological Institute, Kew (Herb. I.M.I. No. 233543). The fungus grew well and sporulated on potato dextrose agar. There was rose-pink pigmentation in and on the agar medium due to the growth of the fungus. This closely resembled the rose-pink growth of the fungus on infected twigs.

Pathogenicity of the fungus was established on 'Forastero' cacao plants by inoculation. The plants were inoculated as follows:

1. Pricking the leaves and stem with fine needles and immediately spraying with mycelial cum spore suspension in sterile water.

2 Similarly the inoculum was sprayed on uninjured leaves and stem and;

3. Two mm. deep holes were made with a cork borer on the surface of the young and old stem and a disc cut from the sporulating culture was placed in each such hole.

Uninoculated, but wounded controls were also maintained.

Infection was noticed on injured and inoculated leaves and stems of all ages. The lesions on leaves developed very fast. *C. rigidiuscula* could infect both young and older stems, when inoculated by making holes with a cork borer. In case of young soft green stem, only needle punctures were enough for the fungus to infect these. The development of lesions on stems was, however, very slow and in many cases stopped altogether. Crowdy (1947) reported successful inoculation of wounded cacao stem with *C. rigidiuscula*, the causal organism of dieback, and the present studies on inoculation thus corroborate his findings. The spread of the fungus was found to be affected by the condition of the host (Kay 1959; Crowdy, 1947; and Owen 1956).

Kay (1961) reviewed the various factors associated with dieback of cacao with particular reference to mirid damage. Defoliation and dieback of cacao due to cankers caused by *Phy-*

tophthora palmivora were observed in India (Chandra Mohanan, 1978). Crowdy (1947) noticed dieback of cacao when cankers caused by *P. palmivora* were later infected with *C. rigidiuscula*. Several workers have reported that *C. rigidiscula* and *Botryodiplodia theobromae* Pat. are closely associated with the dieback of cacao (Kay, 1961).

C. rigidiuscula was found to be the most important fungus in causing dieback of cacao following mirid attack in Ghana (Owen, 1956). *C. rigidiuscula* has also been reported from W. Malaysia, Sabah, Samoa and Papua-New Guinea in association with *B. theobromae* causing dieback (Booth, 1971). *C. rigidiuscula* is considered as the major pathogen of dieback of cacao and *B, theobromae* and *P. palmivora* are commonly associated with *C. rigidiuscula* (Thorold, 1975).

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