

Charcoal pod rot of cacao—K. K. N. NAMBIAR AND R. RADHAKRISHNAN NAIR, Central Plantation Crops Research Institute, Vittal.—Pod rots of different types have been recorded on cacao (*Theobroma cacao* L.), viz., black pod disease caused by *Phytophthora palmivora* Butler¹, charcoal pod rot due to *Botryodiplodia theobromae* Pat.², *Monilia* pod rot or watery pod rot due to *Monilia roreri*^{1, 3}, *Fusarium* pod rot due to *Fusarium roseum* f. *gibbosum*⁴ and *Thielaviopsis* pod rot due to *Thielaviopsis paradoxa* (de Seynes) Hoehnel². Recently, Turner⁷ reported a pod rot on cacao in Malaya caused by *P. heveae* Thompson. Among the pod rots mentioned above only black pod disease has been recorded in India by Ramakrishnan and Thankappan⁵. Here we record charcoal pod rot caused by *B. theobromae* and by a new fungus, *Macrophoma* sp. in pods of Criollo variety. The disease was observed in the Institute's garden.

Charcoal pod rot due to *B. theobromae* usually takes a heavy toll in the summer months. It was observed during other seasons also. Pods of all ages were susceptible to the disease. The disease started as a pale yellow spot on the crimson background of the pod. The spot later turned brown and then became black in colour. In the advanced stages, the whole pod was involved in the attack (Fig. 1) and later the infected pod dried out and shrivelled remaining on the branch as mummified fruit. The internal tissues are rotten due to infection and the affected beans are black in colour. Bean development is not complete if the infection occurs in the early stages of pods. The surface of such fruit was covered with a large number of black spores giving the appearance of soot. The fungus was identified as *B. theobromae*. The pycnidia are black, erumpent and globose. The conidia are elongate, pale brownish in colour and 2-celled, $20.4-32.4 \times 8.7-15.7 \mu$ in dimension. The immature conidia are hyaline and one-celled.

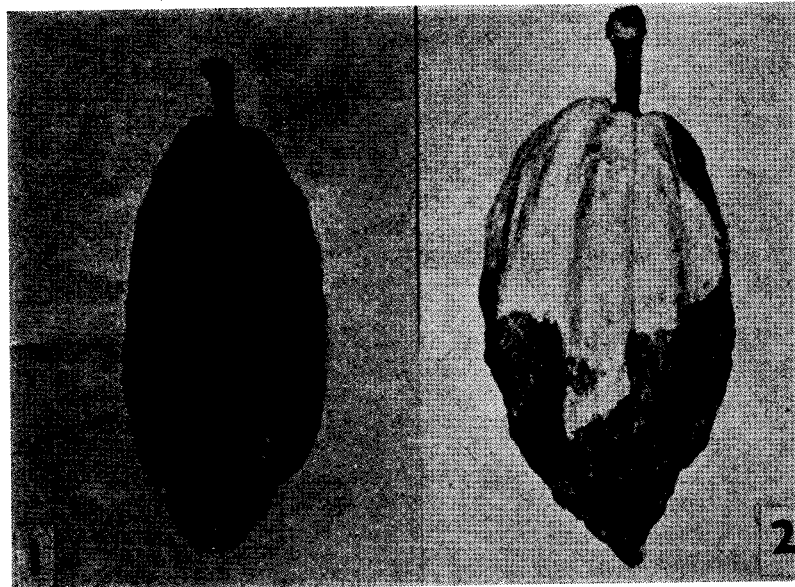


Fig. 1. Charcoal pod rot due to *B. theobromae*.

Fig. 2. Charcoal pod rot due to *Macrophoma*.

The fungus was brought into pure culture. Inoculation of healthy pods was done with a thick spore suspension of the fungus with and without wounding the pods, and the inoculated pods covered with moist polythene bags. Symptoms of the disease appeared in 2-3 days only on pods inoculated after wounding thereby indicating that injury was necessary for infection. In the field, it was observed that pods attacked by squirrels were easily attacked by the disease.

While making routine observations on the above pod rot, the authors noticed another fungus on the affected pod of Criollo variety in March 1970. The fungus was identified as *Macrophoma* sp. The disease resembled charcoal rot caused by *B. theobromae* in all its symptoms (Fig. 2). The mummified fruits were covered with a sooty mass, which was only the spore mass of the fungus. The beans as well as the surrounding tissues inside the affected pod were discolored and emitted a foetid smell.

Mycelial growth and sporulation were abundant on the infected tissue. Mycelium consisted of septate, sub-hyaline and profusely branched hyphae. Large number of pycnidia was produced on the exterior of the pod. The pycnidia were osteolate, which were inconspicuous, globose, erumpent and single, 160-200 μ in diameter; conidiophores short and single; conidia hyaline, thin walled, elliptical, one-celled, 22-33 \times 3.5-7 μ in dimension.

A pure culture of the fungus was maintained on oats agar and used for testing the pathogenicity on cacao pods. Inoculation was done in two ways: (1) a thick spore suspension was sprayed on healthy pods using an atomizer and the pod covered with moist polythene bag, and (2) a tissue plug was removed from the healthy pod with a sterile cork borer of 5 mm dimension and mycelial disc cut out from culture in petri dish with another sterile cork borer of 5 mm dimension was placed in the cavity formed in the pod and tissue plug replaced in position. The periphery of the plug was sealed with wax to prevent entry of water. Suitable uninoculated controls were also maintained. The characteristic symptoms of discoloration etc. appeared on pods inoculated by the second method on the third day, whereas in the unwounded and inoculated pods and control pods there was no infection. The rotting progressed rapidly in the infected pod and the entire pod was involved in the attack in another three days. It is likely that the fungus is a wound parasite and infects the pod in nature through wounds made by insects, squirrels or birds such as woodpeckers.

This is the first record of *Macrophoma* pod rot on cacao in India. The specimen has been deposited in CMI herbarium (IMI 150012). So far, the only record of *Macrophoma* sp. on cacao is that of Bunting³ from Gold Coast. Dr. Punithalingam while identifying the fungus (personal communication) stated: "A *Macrophoma* species answering the description of the present fungus has apparently not been recorded on *T. cacao*. A *Macrophoma* isolate similar to your fungus made from cacao pods was previously sent here by Dr. Broadbent from Nigeria." Thus it appears that the present fungus is a new record on cacao in India.

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