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## **CERATOCYSTIS PARADOXA AND HELICOTYLENCHUS MULTICINCTUS ASSOCIATED WITH ROOT SYSTEMS OF DECLINING BANANAS IN THE REPUBLICA DEMOCRATICA DE SÃO TOMÉ E PRÍNCIPE**

by

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**Summary.** Stunting, poorly growing plants and poor yields, frequently observed in banana plantations during field inspections in the island of São Tomé, were attributed to the decayed root systems. Laboratory examination of rhizomes, suckers and root tissues from declining plants revealed the presence of the spiral nematode *Helicotylenchus multicinctus* and the fungus *Ceratocystis paradoxa*.

After *Radopholus similis* (Cobb) Thorne, the spiral nematode, *Helicotylenchus multicinctus* (Cobb) Golden, is probably the most devastating nematode of banana and plantains. It probably occurs in most of the banana producing regions and has been reported from several African countries (Mc Sorley and Parrado, 1986).

Under certain conditions, rhizomes, suckers and roots of bananas are liable to be infected by several soil-borne fungi, including *Ceratocystis paradoxa* (Moreau) Dade. Infection of banana by this species is usually of little economic importance but, in particular areas, it can induce greater losses than it is sometimes thought because it is capable of causing rapid rot of the infected tissues (Ward-slow, 1972).

A survey was carried out in October 1992 in the island of Sao Tomé (Repubblica Democrática de São Tomé e Príncipe) to determine the causal agents of decline symptoms in some banana growing areas of the island. The results of this investigation are reported in this paper.

### **Material and methods**

Twelve sites, representing the banana growing areas of the island, were sampled in October 1992. Soil, together with roots and rhizome tissues, was taken from the rhizosphere of 4 plants randomly selected in each plantation. Roots were gently washed, comminuted in water in a

blender, and processed by centrifugation for nematode extraction (Coolen and D'Herde, 1972). Nematodes were mounted on permanent slides for morphological and morphometrical studies.

Pseudostem pieces were surface sterilized in 2% of sodium hypochlorite and incubated at 22-23°C for ten days in moist chamber or in Potato Sugar Agar (PSA) in Petri dishes. Ten days later, specimens obtained from the newly developed fungus colonies were identified.

### **Results and discussion**

Features of males and females of *H. multicinctus* were similar to those referred by Siddiqi (1973). *H. multicinctus* occurred in the outer layers of the cortical tissues as well as in the adjacent soil. All life stages were found within the roots and in high population densities (150-390 specimens/g of root) which exceeded those reported by Minz *et al.* (1960) and by Sikora and Schlosser in Lebanon (1973). Distinct cortical lesions (Fig. 1) were observed in most of the roots, while several feeder roots were completely necrotic. The extent of the damage indicates that *H. multicinctus* must be the most important nematode associated with banana in São Tomé.

Vascular and parenchymatic tissues of rhizome and corms were infected by the fungus *C. paradoxa*. Infected rhizome tissues were discoloured and invaded by hyaline,



Fig. 1 - Healthy banana root (B) and infected (A, C) with necrotic cortical lesions caused by *Helicotylenchus multicinctus* on adventitious banana roots.

septate hyphae. In older infected tissues oval, smoky-brown or black conidia were present, and numerous perithecia producing oval ascospores were frequently observed (Fig. 2 A-H).

On saccharose media, effuse, cottony colonies readily formed at 22°C, 10-15 days after inoculation. The mycelium was at first hyaline white, but quickly became grey and finally dark. Vegetative hyphae produced phialophores and clamidospores in the characteristic *Chalara* conidial stage. Perithecia production was never obtained in agar cultures. Although *C. paradoxa* is reported in the literature as a heterothallic species (Dade, 1928; Hunt, 1956), we observed that it also readily produced the perfect stage in a moist chamber. It confirms that in São Tomé the fungus is present with both forms in the same habitat.

Because the nematode and the fungus have a wide host range, the only possible effective method of managing *H. multicinctus* and *C. paradoxa* on bananas is by preventing introduction of infected planting material into uninfested areas.

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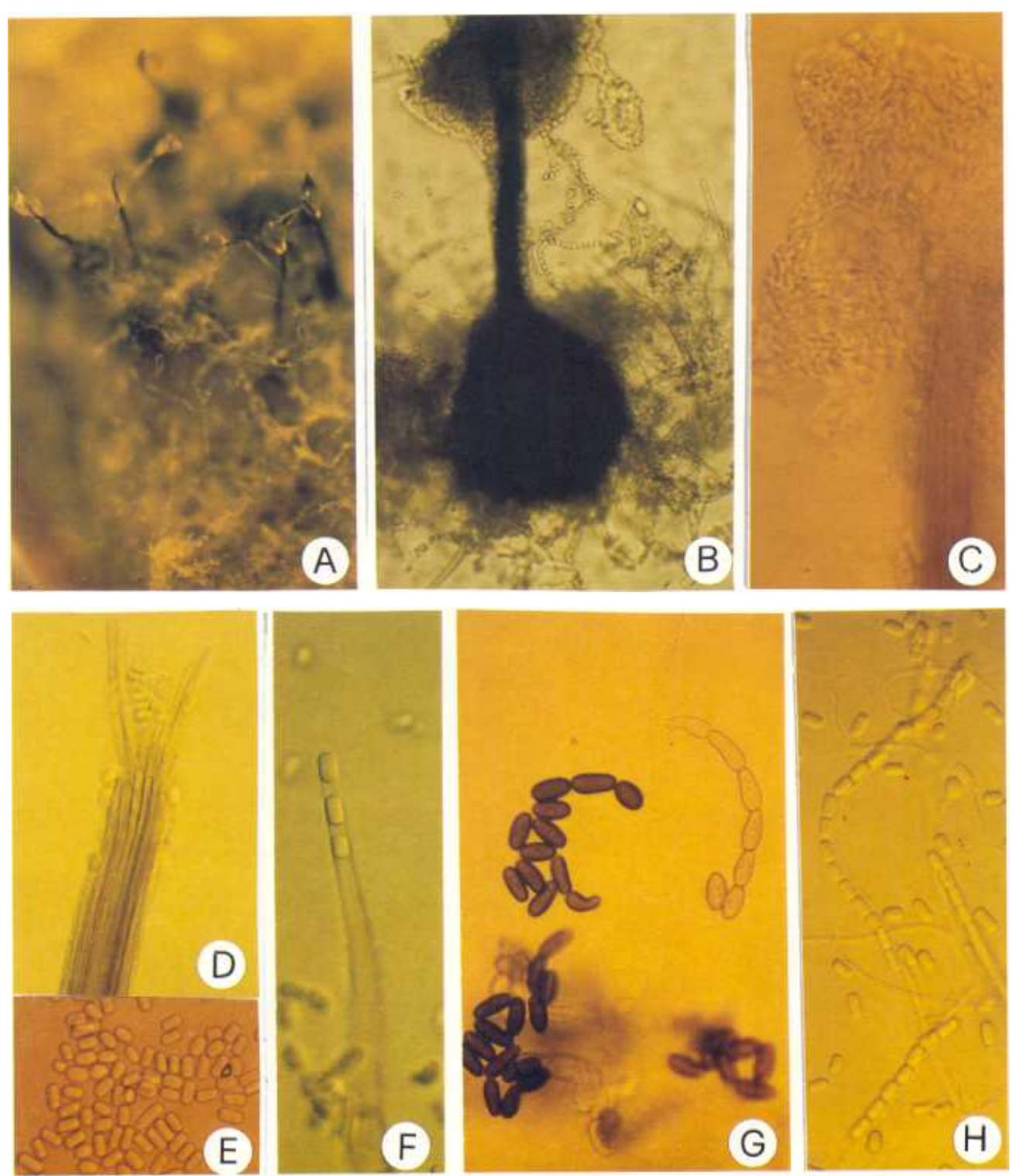


Fig. 2 - *Ceratocystis paradoxa* from declining banana plants: A, B, perfect stage (perithecia) development in naturally infected banana pseudostem tissues; C, ascospores; D, ostiolar hyphae of neck tip; E, conidia; F, conidiophore; G, chlamidospores; H, conidia.