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NEW OR UNUSUAL RECORDS

First report of the canker pathogen *Endothia gyrosa* on *Eucalyptus* in South Africa

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During country-wide surveys of *Eucalyptus* plantations for Cryphonectria canker, cankers distinctly different from those usually associated with *Cryphonectria cubensis* were observed. These cankers were less severe and were exemplified by cracked and slightly swollen areas on the bark. *Endothia gyrosa*, a well-known pathogen of woody plants including *Eucalyptus* spp., was consistently associated with these cankers. The pathogen is easily distinguished from *C. cubensis* by the presence of orange–brown stromata and non-septate ascospores. Inoculations on *Eucalyptus grandis* resulted in lesions similar to those observed on naturally infected trees. The disease associated with *E. gyrosa* is widespread in South Africa, and research is required to establish control strategies.

The forestry industry in South Africa depends almost entirely upon plantations of intensively propagated species of *Eucalyptus* and *Pinus*. At present, *Eucalyptus* species account for almost 50% of the plantation area and current trends are towards propagation of trees from cuttings. Clonal propagation has resulted in fears that diseases could result in reduced productivity (Wingfield *et al.*, 1991). The recent discovery of *Cryphonectria cubensis* (Bruner) Hodges in South African plantations (Wingfield *et al.*, 1989) has heightened this concern.

During a field survey in 1990 to establish the distribution of *C. cubensis* in South Africa, a number of more common but less severe cankers were observed (Fig. 1a). These cankers were exemplified by cracked and slightly swollen areas on the bark, and were more superficial than cankers caused by *C. cubensis*. Cankers occur over the entire surface of the bole but are most prominent at the base. Instead of long-necked pycnidia typical of *C. cubensis*, bright orange–brown stromatic pycnidia and perithecia were present. Perithecia (Fig. 1b) were embedded in the stromata, with necks protruding from the surface. Asci (Fig. 1c) were unitunicate with a non-amyloid apical refractive ring, and contained eight ascospores. Ascospores (6·8–11·2 × 1·5–2·0 μm) were usually cylindrical, slightly curved non-septate and hyaline (Fig. 1c). Conidia (Fig. 1d) were produced by means of phialidic development, and under moist conditions were extruded to form an orange spore mass at the surface of the stromata, similar to those seen with *C. cubensis*. Conidia were unicellular (2–4·3 × 1·0 μm), hyaline, rod shaped and slightly curved. These characteristics were consistent with those of the canker pathogen, *Endothia gyrosa* (Schw.) Fr. (Barr, 1978; Roane, 1986; Walker *et al.*, 1985). Symptoms on *Eucalyptus grandis* trees were also similar to those described for *Endothia gyrosa* by Walker *et al.* (1985) on *Eucalyptus saligna*.

Endothia gyrosa, along with its *Endothiella* anamorph, is a canker pathogen of tree species in many parts of the world. It has a wide host range, but is known primarily as a pathogen of pin oak (*Quercus palustrus*) causing pin oak blight (Roane *et al.*, 1974). In Virginia, USA, *E. gyrosa* has been found inciting disease or inhabiting moribund tissue of sweet gum (*Liquidamber styraciflua*), northern red oak (*Q. borealis*), water oak (*Q. nigra*), willow oak (*Q. phellos*) and silver maple (*Acer saccharinum*) (Roane *et al.*, 1974). *Endothia gyrosa* also occurs as a canker pathogen of *Eucalyptus* in Australia (Old *et al.*, 1986; Walker *et al.*, 1985), and Portugal (Spaulding, 1961). On *Eucalyptus*, *E. gyrosa* causes stem cankers similar to, but less severe than, those caused by the well-known and serious pathogen *C. cubensis*.

Single-ascospore and conidial isolates of *E.*

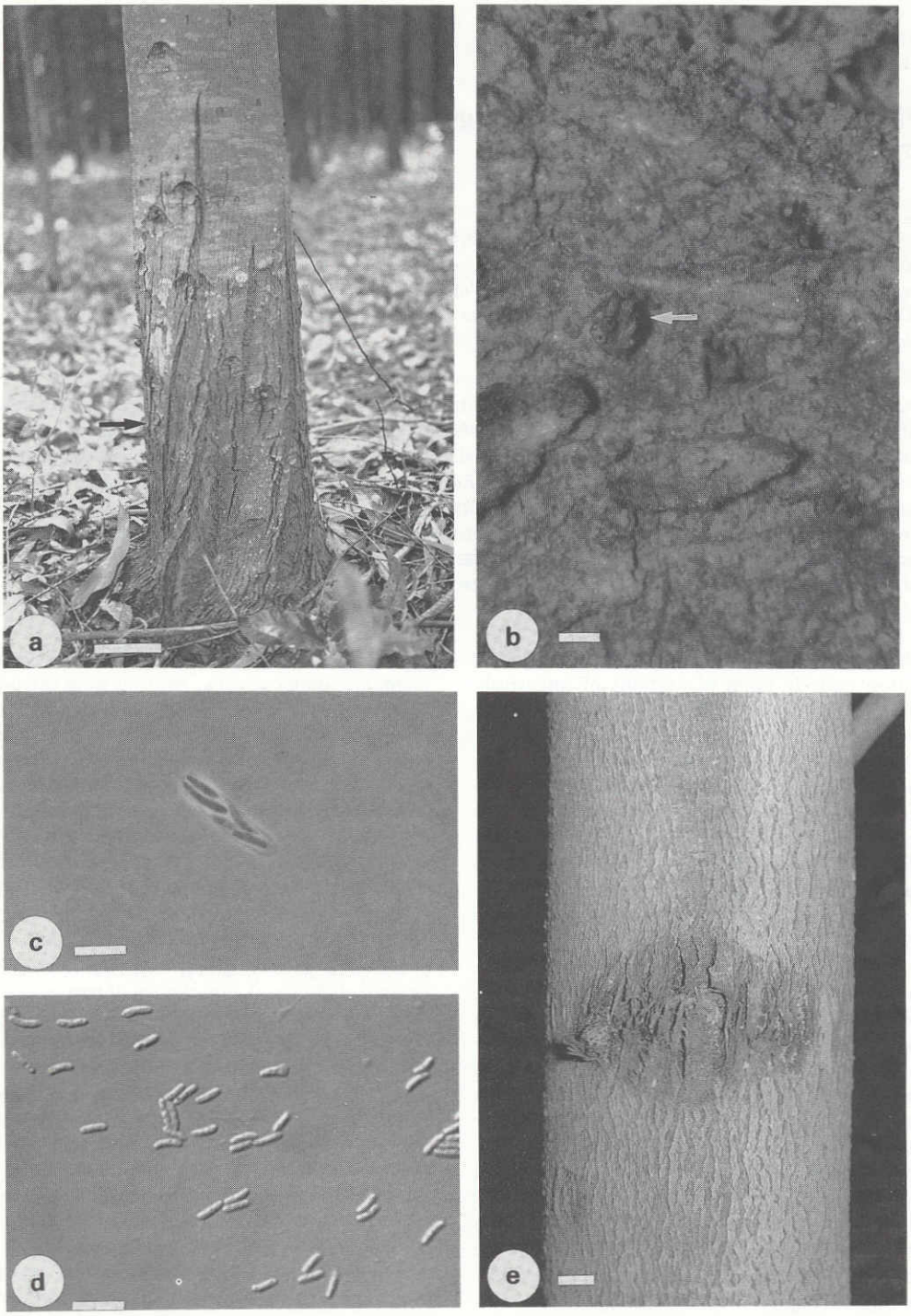

Fig. 1. Symptoms and spore types associated with *Endothia gyrosa*. (a) *Eucalyptus grandis* naturally infected with *E. gyrosa* (arrow) (bar = 100 mm). (b) Necks (arrow) of perithecia protruding from the surface of stromata (bar = 1 mm). (c) Ascus with ascospores (bar = 10 μm). (d) Conidia (bar = 5 μm). (e) Canker on *E. grandis* 3 months after artificial inoculation with *E. gyrosa* (bar = 10 mm).

gyrosa were made by removing conidia and ascospores from the necks of pycnidia and perithecia. Dilutions of the above were made in sterilized water, transferred to 2% malt extract agar (MEA) plates and incubated for 24 h. After germination, single-ascospore and conidial isolates were transferred to MEA plates. Initially white, the colonies turned orange after 6–10 days. Conidiomata were produced after incubation at 25°C for 2 weeks.

Pathogenicity tests on *Eucalyptus grandis* were made during December 1990 at Kwambonambi (northern Natal). The isolate used was collected from the same area and found to be representative in pathogenicity of other local isolates in preliminary pathogenicity tests. Twenty trees were inoculated with *E. gyrosa* and a further 20 served as controls. Inoculation points were made at approximately 1·3 m above ground level. An 11-mm-diameter piece of bark was removed with a cork borer and replaced with an agar disc from a 2-week-old MEA culture of *E. gyrosa*. Sterile MEA discs were used for control inoculations. After inoculation, wounds were sealed with masking tape.

Inoculated trees were examined 6 weeks and 3 months after inoculation. Lesions (Fig. 1e) developed on all inoculated trees, but not on control trees. After six weeks, lesion width ranged from 25 to 65 mm with an average of 48·6 mm. Symptoms 3 months after artificial inoculations included a swollen and cracked area around the point of inoculation. Bright-orange stromata were abundant on the cankers. These symptoms were similar to those found on naturally infected trees. *Endothia gyrosa* was reisolated easily from cankers resulting from artificial inoculations.

Endothia gyrosa appears to have a wide host range among *Eucalyptus* species: it has been found on *E. grandis*, *E. nitens* and *E. urophylla* as well as hybrids of *E. grandis* with *E. camaldulensis* and *E. urophylla* during preliminary surveys. Numerous trees in certain clonal plantations are heavily infected by the pathogen and this could have serious implications for the South African forestry industry. Unlike *C. cubensis*, that is restricted to warm, high rainfall areas of South Africa (Van der Westhuizen *et al.*, 1991), *E. gyrosa* appears to have a much wider distribution.

Water stress is known to increase the susceptibility of pin oak to colonization by *E. gyrosa* (Appel & Stipes, 1984). Periodic droughts occur in South Africa, and this could enhance the damage caused by *E. gyrosa*. Further studies including screening of *Eucalyptus* clones are urgently needed in order to alleviate future losses associated with *E. gyrosa*.

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