Project: Application of cell, tissue and organ culture to *Eucalyptus* improvement, particularly in relation to resistance to *Phytophthora cinnamomi*.

Personnel: Dr. E. Davison, Dr. J. McComb, Mr. I. Bennett, Dr. I. Tommerup

Objectives:

1. To test for resistance to *P. cinnamomi* amongst jarrah (*Eucalyptus marginata*) by cloning trees that show apparent resistance to the disease and trees that are apparently dying from the disease. Clonal lines will be infected with the fungus in test tube, pot and field trials and their reactions compared.

2. To examine the early stages in infection of jarrah roots by *P. cinnamomi* zoospores to determine whether or not the host response indicates the presence of a mobile toxin.

3. To examine the early infection stages of *P. cinnamomi* zoospores on jarrah callus from supposedly resistant and susceptible trees. If the callus culture reactions do parallel field observations then callus cultures can be used to screen for resistance in field populations not yet exposed to the disease.

4. If evidence is obtained for the presence of a toxin (no. 2 above) then the toxin will be extracted and its effect on roots and callus cultures compared with the effect of the intact fungus. It may be possible to use the toxin to screen for resistant trees and to select for novel resistance generated in cultures.

Progress: Work has begun on the first two objectives. The mycological research has been supported by a grant from the W.A. Dieback Foundation since July 1981, while the tissue culture aspects are funded by a Commonwealth Postgraduate Award to I. Bennett and a Reserve Bank grant for a half-time technical assistant (Ms. M. Slade). From July 1982 the Dieback Foundation will also cover the assistant for the tissue culture work.

Mycological research The first Professional Officer, Ms. E. Carter initiated development of suitable methods for examining the fungus in host roots, using interferance microscopy and staining methods. She also set up methods for producing the aseptic zoospores required for controlled inoculations. It was found that the outer cell layers of roots of tissue cultured plants whose roots had grown in agar were slightly different from the roots of seedlings grown in sand. After Ms. Carter's departure in January, the new graduate assistant, Ms. C. Tonkin is investigating this further, to establish whether or not it will be necessary to develop rooted plantlets in sand before such tissue cultured plants can be reliably used for pathogen testing. The early stages of infection after zoospore attachment are also being studied.

Tissue culture Shoot cultures have been set up from 6 seedlings and it is interesting that these clones vary widely in rooting ability. From 2-80% of the shoots will root, but the percentage rooting is on average far higher than that observed when explants are taken from mature trees.

Shoot cultures have also been established from 7-9 mature trees selected because they are surviving in dieback areas, or they are resistant to leaf miner, or they are fast-growing. These clones too vary in rooting ability; from 2-80% rooting being observed with most lines being at 5% or lower. Decreasing the levels of the various major mineral nutrients in the medium has been shown to improve rooting percentages.

Callus lines have been set up from stamen explants from 20 trees, and this material will be used to study the callus/zoospore interaction once the early stages of infection on roots is sufficiently understood.

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