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THE EFFECT OF THE DURATION OF HYPOXIA ON PHENOLIC ACCUMULATION IN ROOTS OF CLONAL *EUCALYPTUS MARGINATA* AND THEIR SUBSEQUENT INFECTION WITH *PHYTOPHTHORA CINNAMOMI*.

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INTRODUCTION

Roots of *E. marginata* exposed to hypoxia show increased resistance to infection by *P. cinnamomi* (1). A more rapid production of phenolics has previously been shown to be related to increased resistance in clonal *E. marginata* (2). Phenolics are secondary plant metabolites formed from the phenylpropanoid pathway and are involved in both chemical (phytoalexins) and physical (strengthening of the cell wall) plant defence (3). In this study, the effect of the duration of hypoxia on infection development and phenolic accumulation in *E. marginata* inoculated with *P. cinnamomi* was examined.

MATERIALS AND METHODS

Seven month old clones of *E. marginata*, resistant to the pathogen *P. cinnamomi*, were grown in aeroponics chambers that could be sealed to allow the manipulation of oxygen levels (1). Roots grown under normal oxygen were compared with those that had been exposed to hypoxia (2 mg O₂ l⁻¹) for 2, 5, 11 or 29 days before restoration of normal oxygen conditions. Roots were inoculated with zoospores of *P. cinnamomi* immediately after each hypoxic treatment. Infected roots were harvested 3 days after inoculation. Non-inoculated roots were harvested 3 and 6 after the hypoxic treatments. Lesion length and the level of soluble and bound phenolics in the apical cm of roots were determined.

RESULTS AND DISCUSSION

Lesion development was reduced significantly in roots inoculated immediately after hypoxia and measured 3 days later (Figure 1a). Soluble phenolic levels were always lower and bound phenolic levels always higher in infected roots than in non-infected roots regardless of the duration of the hypoxic pre-treatment (data not shown). However, the phenolic levels in the root at the time of inoculation may be important in restricting subsequent lesion development. Bound phenolic levels (Figure 1c), but not soluble phenolic levels (Figure 1b) reflect the reduction in lesion size after hypoxia.

Increases in wall bound phenolics have been related to the resistance to infection by *Puccinia recondita* (4). Perhaps the role of phenolics in *E. marginata* in suppressing mycelial growth of *P. cinnamomi* is not a chemical effect of soluble phenolics on mycelial growth, but rather the mycelia are halted by a physical barrier of phenolics deposited in cell walls.

ACKNOWLEDGEMENTS

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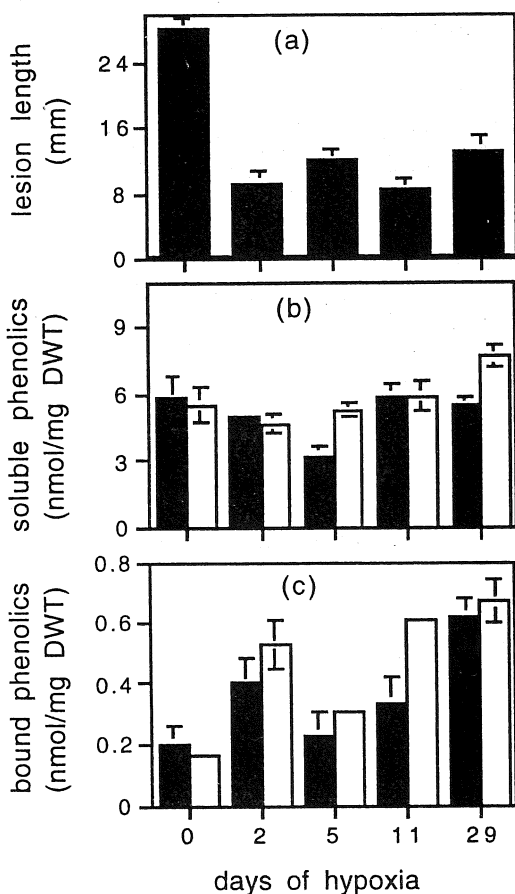


Figure 1. (a) lesion development in roots inoculated immediately after 0-29 days of hypoxia. (b) soluble and (c) bound phenolic levels in the apical cm of non-infected roots 0 (■) and 3 (□) days after hypoxia.