THE BIOLOGY, ECOLOGY AND TAXONOMY OF
PHYTOPHTHORA CITRICOLA IN NATIVE PLANT COMMUNITIES IN
WESTERN AUSTRALIA

by

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This thesis is presented for the degree of
Doctor of Philosophy of Murdoch University 1996.
I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

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ACKNOWLEDGMENTS

I would like to express my sincerest gratitude to my supervisors Dr Bryan Shearer and Dr Giles Hardy for their unceasing encouragement and support throughout the period of this project.

My thanks also go to Sue Broughton, Carla Wilkinson, Joanne Robinson and Ian Colquhoun of Alcoa of Australia Limited for assistance, particularly during the extensive sampling and baiting required to determine the distribution of *P. citricola* in the northern jarrah forest; Matthew Williams for statistical advice; Dave Coates and Vicki Hamley for assistance with electrophoresis; Murdoch University for providing glasshouse facilities; and Neil McMulkin of RGC Eneabba for his involvement in the survival trials.

Special thanks go to Brendan, for being there.

I also acknowledge the financial support of the Minerals and Energy Research Institute of Western Australia, and the Department of Conservation and Land Management for provision of facilities.
The objectives of the project were to develop an understanding of the disease dynamics caused by *Phytophthora citricola* in native plant communities in the south of Western Australia. Prior to 1983, the pathogen had only been reported twice from Australian forests. Since then, *P. citricola* has been extensively recorded from plant communities north and south of Perth, and is currently the second most frequently recovered *Phytophthora* species from the northern jarrah forest and the northern sandplains.

The objectives were addressed by examining the biology, ecology and taxonomy of isolates of *P. citricola* local to the southwest. Examination of the intraspecific variation of *P. citricola* by isozyme analysis resolved three major electrophoretic subgroups (SG), and these were aligned with morphological and cultural variation within the species. One electrophoretic SG was confined to forested areas. This SG differed from other SGs in sporangial dimensions, growth rate on two media and *in vitro* sensitivity to phosphonate. A redescription of the species may be warranted.

*P. citricola* was positively associated with two roads in the northern jarrah forest. Road surfaces were sampled, then soil overburden was removed and the surface of the concreted lateritic layer beneath was sampled. Isolation of *P. citricola* declined away from the road into the adjacent forest and was more frequently recovered from the caprock (up to 1 metre below soil surface) than from the soil surface. The most probable source of introduction was from infested soil on vehicles using the roads.

Oospores were shown to be produced in two soils, a lateritic gravelly loam and sand, and in plants. In soil, the electrophoretic SG confined to the forest (loamy soil) produced only limited numbers of oospores in the sandy soil of the northern sandplain. The restriction of this SG to the forested areas is probably physiological, rather than limited dispersal, with the SG
currently occupying the full extent of its range. Estimation of the relative persistence of oospores, zoospores and plant material colonised by *P. citricola* established that only oospores (either free in soil or in colonised plant material) were important in long term survival in soil. Oospores were still viable after six months at two field sites, and after 18 months in soil in the laboratory.

Phosphonate is currently the most promising method of control of *Phytophthora* induced disease in native plant communities of the southwest. The efficacy of phosphonate against *P. citricola* was examined *in vivo* and *in vitro* against two SGs. Phosphonate successfully inhibited lesion growth of both SGs *in vivo*, but of only one electrophoretic subgroup *in vitro*.

The ecological implications of infestation of native plant communities in the southwest of Australia are discussed.
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