PROJECT 4

THE CONTROL AND MANAGEMENT OF *PHYTOPHTHORA MEGASPERMA* IN THE NATIVE PLANT COMMUNITIES OF WESTERN AUSTRALIA

S.A. Carstairs and L. Newcombe

A primary scope item of the *Phytophthora megasperma* research program was to:

- **Investigate control measures for *P. megasperma*.**

This scope item may be subdivided into at least three discrete research areas:

1. To investigate strategies for reducing the rate of spread of dieback at sites infected by *P. megasperma* pathogens.

2. To investigate strategies for reducing dispersal of *P. megasperma* into uninfected plant communities.

3. To compare the relative pathogenicities of taxa within the *P. megasperma* complex, and other field occurring Phytophthoras.

1. REDUCING SPREAD OF DIEBACK AT SITES INFECTED BY *P. MEGASPERMA* PATHOGENS

Bellgard *et. al.* have initiated a research program which aims to determine the effectiveness of Phosphonate applied to vegetation at a *P. megasperma* infested site in the Fitzgerald River National Park as a barrier to contain or slow the spread of the pathogen. To date there has been little spread in either treated or control areas. **This area of research is ongoing.**

2. REDUCING DISPERSAL OF *P. MEGASPERMA* INTO UNINFECTED PLANT COMMUNITIES

Much of what *Phytophthora* researchers believe they know about the mechanism(s) of dispersion of *P. megasperma* inoculum throughout the conservation estate of Western Australia is based on existing knowledge of dispersion of *P. cinnamomi* inoculum, the basis for which has been provided by Podger (1968, 1972). Podger observed that there was a marked tendency for dieback disease caused by *P. cinnamomi* to be most extensive in areas with a history of frequent or recent utilisation, and aerial photographs showed a strong association between the occurrence of dieback caused by *P. cinnamomi* and road ways. Further, although few patches of dieback caused by

P. cinnamomi were located in areas remote from roading or logging, in these cases there was evidence of the passage of vehicles or heavy equipment in the course of fire suppression, mining exploration, or firewood cutting (Podger 1972). Consequently, Podger (1972) concluded that inoculum of *P. cinnamomi* was being dispersed with soil moved during road building and logging operations.

We have initiated a program to investigate the role of heavy vehicles, road pavements and gravel/shale pits (used to provide surface materials for pavement construction) in the dispersal of *P. megasperma* inoculum throughout the conservation estate of Western Australia.

Historically *P. megasperma* has not been frequently isolated from soil samples collected from areas of the south-west of Western Australia forested with karri and jarrah. We assessed 8 heavy vehicle samples, 154 pavement samples and 193 gravel/shale pit samples from the southern karri forest region for the presence of *P. megasperma*, and other species of *Phytophthora*. The results of this survey are presented in Table 1.

Table 1 Percent recovery of *P. cinnamomi*, *P. megasperma,* and other species of *Phytophthora,* from gravel samples collected off heavy vehicles and from pavement surfaces and gravel/shale pits in an area of karri forest in the south-west of Western Australia.

Sample Source	**No. Samples Tested**	**% Samples +ve for**		
		P. cinnamomi	***P.megasperma***	***Phytophthora* sp.**
Heavy Vehicles	8	0	0	25
Pavement Surfaces	154	5.2	0	44.8
Gravel/Shale Pits	193	7.2	0	10.4
Totals	**355**	**6.2**	**0**	**25.6**

P. megasperma was not retrieved from any of the 355 samples tested. In contrast with this, *P. cinnamomi* was recovered from 6.2% of the samples. Species of *Phytophthora* other than *P. cinnamomi* and *P. megasperma* were recovered from 25.6% of samples. While these results support Podger's assertion that *P. cinnamomi* inoculum is being dispersed with soil moved during road construction, as well as the inoculum of other *Phytophthora* species, we have not provided evidence to support the notion that inoculum of *P. megasperma* is being dispersed in the same manner. This may reflect a low incidence of *P. megasperma* in the study area. **This area of research is ongoing.** In the next quarter we intend to collect samples from pavement surfaces in the northern and south-eastern sand plains in order to determine their *P. megasperma* status.

It is generally accepted that high soil moisture levels are important in the development of disease caused by *P. cinnamomi* as dieback frequently occurred near and spread rapidly from culverts and drains along roadways. Further, Podger (1968, 1972) observed that while disease caused by *P. cinnamomi* was formed in almost the entire range of topographic situations in the south-west of Western Australia, it was more frequent along drainage lines and in broad valleys than on upper surfaces and ridges. Shearer and Tippett (1989) confirmed Podger's observation reporting that the dendritic pattern of areas affected by *P. cinnamomi* illustrate the interaction of the fungus with the streams in shallow valleys draining upland areas.

We have initiated a program to investigate the role of streams and "water points" (water bodies accessed during pavement construction and fire fighting) in the dispersal of *P. megasperma*. The results of a survey of 5 water points in the southern karri forest and 7 in the northern jarrah forest are presented in Table 2.

Table 2 Percent of water points in the northern jarrah and southern karri forests from which *P. cinnamomi*, *P. megasperma*, and other species of *Phytophthora,* was recovered.

Sample Source	**No. Water Points Tested**	**% Samples +ve for**		
		P. cinnamomi	***P. megasperma***	***Phytophthora* sp.**
Karri Forest	5	0	TBD[1]	100
Northern Jarrah Forest	7	14.3	TBD	57.1

1 TBD = To be determined.

Circa 200 isolates of *Phytophthora,* other than *P. cinnamomi*, have been recovered from the 10 water points found to be infested with *Phytophthora.* The identities of these isolates will be determined in the next quarter. **This area of research is ongoing**. In the next quarter we intend to survey for *P. megasperma* in streams/water points in the northern and south-eastern sand plain regions.

3. TO COMPARE THE RELATIVE PATHOGENICITIES OF TAXA WITHIN THE *P. MEGASPERMA* COMPLEX, AND OTHER FIELD OCCURRING PHYTOPHTHORAS

We have established a field experiment which aims to compare the relative pathogenicities of five molecular species of *Phytophthora* recovered from the southern karri forest with that of *P. cinnamomi.* While *P. megasperma* is not being assessed in this study, it is planned to include this species in several repeat experiments elsewhere. **This area of research is ongoing**. In samples retrieved from the northern sand plain, five molecular species of *P. megasperma* have been identified by isoenzyme analysis. The materials required to test the relative pathogenicities of

these Phytophthoras with that of *P. cinnamomi* under field conditions in the northern sand plain have been prepared. The experiment will be established when weather is suitable.

ACKNOWLEDGMENTS

We wish to thank Frank Podger for his advice on research matters which is seen as vital to the ongoing success of this project.

REFERENCES

Podger, F.D. (1968). Aetiology of jarrah dieback, a disease of dry sclerophyll *Eucalyptus marginata* Sm. forests in Western Australia. M.Sc. Thesis. Univ. Melbourne. 292 p.

Podger, F.D. (1972). *Phytophthora cinnamomi,* a cause of lethal disease in indigenous plant communities in Western Australia. *Phytopathology*. **62**:972-981.

Shearer, B.L. and J.T. Tippett. (1989). Jarrah dieback: The dynamics and management of *Phytophthora cinnamomi* in the jarrah (*Eucalyptus marginata*) forest of south-western Australia. Department of Conservation and Land Management *Res. Bull.* No. 3.

CONTROL OF *PHYTOPHTHORA* AND *DIPLODINA* CANKER IN WESTERN AUSTRALIA

PROGRESS REPORT TO THE ENDANGERED SPECIES UNIT, AUSTRALIAN NATURE CONSERVATION AGENCY

OCTOBER 1996

Department of Conservation and Land Management
Locked Bag 104, Bentley Delivery Centre, WA 6983