

# Pathogenicity of *Phytophthora multivora* to *Eucalyptus gomphocephala* and *E. marginata*

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## INTRODUCTION

Since the early 1990s there has been a significant decline of *E. gomphocephala*, and more recently *E. marginata*, in the tuart forest in tuart woodland in Yalgorup National Park SW Western Australia, although no satisfactory aetiology has been established to explain the decline. Characteristics of the canopy dieback and decline distribution are reminiscent of other forest declines known to involve *Phytophthora* soil pathogens and indicate that a *Phytophthora* species may be involved in the decline. In 2007 isolates of *Phytophthora multivora*, recently described by (1), were recovered from rhizosphere soil of declining or dead trees of *Eucalyptus gomphocephala* and *E. marginata*. For *E. gomphocephala* and *E. marginata*, the pathogenicity of *P. multivora* was tested: *ex situ* on seedlings using a soil infestation method; and *in situ* on stems using an under bark infestation method.

## MATERIALS AND METHODS

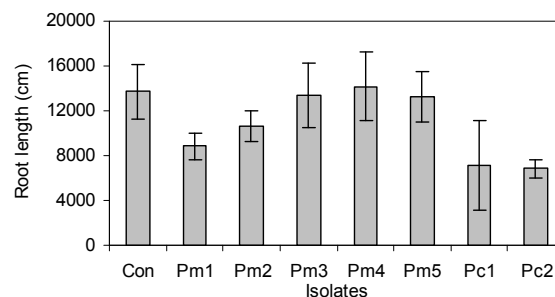
*Ex situ* soil inoculation trial: The roots of *E. gomphocephala* seedlings, grown in neutral coarse river sand, were infested with a vegetable juice—vermiculite medium colonised with five isolates of *P. multivora* isolated across the Yalgorup decline and two isolates of *P. cinnamomi*; while the roots of *E. marginata* seedlings were infested with one isolate of *P. multivora* as described (2). After one year the roots of infested seedlings were scanned and the lengths of roots of different diameters were calculated using the WINRHIZO Pro V 2007d software (Reagent Instruments, Québec, Canada). Isolates were recovered from the roots of all infested seedlings.

*In situ* under bark inoculation trial: The stems of less than 1.5 m tall *E. gomphocephala* saplings, naturally growing on site in Yalgorup National Park, were under bark inoculated with five isolates of *P. multivora*; while saplings of *E. marginata* were inoculated with one isolate of *P. multivora* as described (3). After nine weeks saplings were harvested and lesion lengths calculated.

## RESULTS

*Ex situ* soil inoculation trial: Preliminary results from the *ex situ* soil infestation trial indicate that *E. gomphocephala* seedlings treated with *P. multivora* isolate Pm1 and Pm2 and *P. cinnamomi* isolates Pc1 and Pc2, had significantly less roots between 0–2 mm in diameter compared to the control (Figure 1). *Eucalyptus gomphocephala* seedlings infested with *P. multivora* isolates Pm3, Pm4 and Pm5 did not have significantly less roots compared to the control across any size class. *Eucalyptus marginata* seedlings infested with *P. multivora* isolate Pm1, did not have significantly less roots compared to the control across any size class.

*In situ* under bark inoculation trial: Saplings of *E. gomphocephala* and *E. marginata* inoculated with all *P. multivora* isolates had significantly longer lesions compared to the control. When harvested the average lesion length on *P. multivora* inoculated *E. gomphocephala* and *E. marginata* seedlings was 13.6 mm and 90.5 mm respectively.



**Figure 1.** Length of live roots (mean ± SE) of *E. gomphocephala* seedlings for roots 0–2 mm in diameters Con, control; Pm 1–5, *P. multivora* isolates 1–5; Pc 1–2 *P. cinnamomi* isolates.

## DISCUSSION

The significant reduction in root diameter in *E. gomphocephala* seedlings after infestation with isolates Pm1 and Pm1 indicates that *P. multivora* is a pathogen of *E. gomphocephala* under glasshouse conditions and may be a significant soil pathogen to *E. gomphocephala* in the field. The variation in pathogenicity of *P. multivora* isolates used in the soil infestation trial suggests that there is variation in the pathogenicity of *P. multivora* isolates within the field.

The significant lesion lengths measured in *E. gomphocephala* and *E. marginata* sapling inoculated with *P. multivora* isolates confirms that *P. multivora* is a pathogen to both host species under conditions where *P. multivora* can colonise the vascular tissue in the field. The lesion lengths indicate that *P. multivora* can be especially *E. marginata* saplings.

The variation in pathogenicity observed between isolates and species in both soil infestation and under bark inoculation trials suggests that *P. multivora* can be significantly aggressive to both *E. gomphocephala* and *E. marginata*; although further research is needed to understand the population dynamics of the pathogen and its impact within the tuart decline in Yalgorup National Park.

## REFERENCES

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2. Jung T, Blaschke H, Neumann P (1996) Isolation, identification and Pathogenicity of *Phytophthora* species from declining oak stands. *European Journal of Forest Pathology* **26**, 253–272.
3. Shearer BL, Michaelsen BJ, Somerford PJ (1988) Effects of isolate and time of inoculation invasion of secondary phloem of *Eucalyptus* spp. and *Banksia grandis* by *Phytophthora* spp. *Plant Disease* **72**, 121–126.