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THE INFECTION OF PERIDERM BY ZOOSPORES OF P.CINNAMOMI: A HISTOLOGICAL DETECTIVE STORY.

THE INFECTION OF PERIDERM BY ZOOSPORES OF ***PHYTOPHTHORA CINNAMOMI***: A HISTOLOGICAL DETECTIVE STORY.

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Background and Objectives

In woody plants the periderm provides a formidable barrier to mechanical damage, and only a few fungal pathogens have been shown to directly penetrate suberised and/or lignified phellem cells. Recent research has shown that when the non-wounded periderm of *Eucalyptus marginata* (jarrah) seedlings are exposed to motile zoospores of *P. cinnamomi*, infection occurs [1] and may result in seedling death [2]. The current histological study was undertaken to determine how zoospores of *P. cinnamomi* circumvent the periderm.

Materials and Methods

Jarrah seedlings between 6 and 18 months old were inoculated with an axenic suspension of motile zoospores using the method described in [1]. Seedlings were harvested up to 48 hours after inoculation, and were prepared for light (LM), fluorescence (FM), transmission electron (TEM) and scanning electron microscopy (SEM) using standard techniques.

Results and Conclusions

SEM examination of inoculated tissue revealed that zoospores were attracted to jarrah tissue at sites of bud emergence such as leaf axils and on the lignotuber. The attraction of the pathogen was characterised by concentrated numbers of zoospores bound at these sites, all with germ-tubes orientated directly toward the plant. In contrast, zoospores bound randomly and with no particular orientation to periderm, and green stem (tissue with epidermis and cuticle). Zoospores appeared to get trapped in the rough topography of the periderm. Zoospores did not show any attraction to stomata or lenticels.

LM and FM examinations revealed that *P. cinnamomi* invaded and colonised jarrah stems at the sites where zoospores were attracted. In a 48 hour period, the pathogen penetrated, extensively colonised and macerated the thin-walled meristematic tissue of the emerging buds, and moved into the connecting vascular tissue. The susceptibility of the buds to infection was dependent on the stage of emergence at the time of inoculation. Although zoospores showed no attraction to stomata, FM revealed that zoospores will penetrate through stomata, if binding occurs in close proximity.

Germ-tubes from randomly bound zoospores were occasionally observed to grow between the thin-walled suberised phellem cells. Although, hyphae were never observed to directly penetrate suberised phellem cells, hyphae were occasionally observed within the cells. The direct penetration of the thick-walled lignified cells by hyphae was observed in TEM.

In conclusion, this study presents new evidence about the mechanisms employed by *P. cinnamomi* to circumvent the periderm. It has been demonstrated: that the buds in the lower stem and lignotuber are the 'Achilles heel' of jarrah seedlings; that *P. cinnamomi* can directly penetrate the lignified phellem cells; and that the pathogen will grow between suberised phellem cells

References

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2. O'Gara E, McComb JA, Colquhoun IJ, Williams MR, Hardy GEStJ, 1997. Proceedings Australasian Plant Pathology 11th Biennial Conference, pp 26.