Host-pathogen interaction of *Phaeomoniella chlamydospora*, causal organism of Petri disease, in grapevine tissue

Eve Cottral[1,2,5], Gunta Jaudzems[3], Ian Pascoe[1,2], Jacqueline Edwards[1],[2] and Peter. A. Taylor[4]

[1]*Co-operative Research Centre for Viticulture, PO Box 154, Glen Osmond, SA, 5064 , Australia*
[2]*Institute for Horticultural Development, Department of Primary Industries, Private Bag 15, Ferntree Gully Delivery Centre, Vic, 3156, Australia*
[3]*School of Biological Sciences, Building 18, Monash University, Clayton, Vic, 3800, Australia*
[4]*Crop Protection Approvals, Ltd, Level 1, 5, Everage Street, Moonee Ponds,Vic, 3039, Australia*
[5]*Institute of Land and Food Resources, The University of Melbourne,Vic, 3010, Australia*

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Introduction

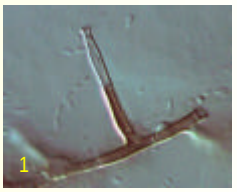
Petri disease (black goo decline) is a grapevine trunk disease caused by the fungus *Phaeomoniella chlamydospora* (Pch) (Figure 1). It is characterised by dark streaks in the vascular tissue (Figure 2) and causes reduction in yield, threatening the sustainability of the viticulture industry. To investigate the infection path of Pch, this study, using tissue-cultured grapevine plants, was undertaken to further the histopathology research reported by Pascoe and Cottral (2000).

Method

Tissue-cultured grapevines were inoculated with Pch and harvested 3 weeks after inoculation. Stem tissue was embedded in resin & examined using light and transmission electron microscopy (TEM).

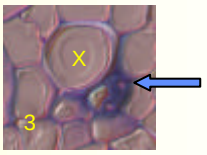
Observations

- Hyphae initially grew between the paratracheal cells and then penetrated these cells before infecting the vessel lumen
- Reaction zones surrounded the intercellular and intracellular hyphae (Figure 3 and short arrows in Figure 4)
- Under the TEM these reaction zones (Z1,Z2, Z3 in Figure 5) varied in electron density
- These reaction zones stained positive for phenolic compounds with Toluidine Blue
- Plugging of vessel lumens with tyloses and phenolic compounds occurred both with and without hyphae present

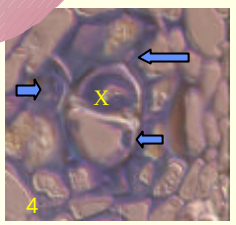


Pch in sap (x1000)

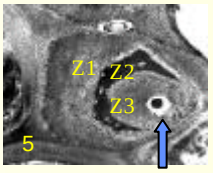
Cross section: grapevine with black goo symptoms



Intracellular hyphae (arrow) surrounded by reaction zones (near a xylem vessel, X) (x1000)



Infected xylem vessel (X) with intracellular hyphae (short arrows) and intercellular hyphae (long arrow) and reaction zones (x1000)



TEM image of one infected cell with intracellular hypha (arrowed) surrounded by multi-layered reaction zone (x8200)

Concluding remarks

Pch hyphae grow between paratracheal cells and then penetrate the paratracheal cell wall causing tylosis production and deposition of phenolic compounds in the surrounding cells. These results are consistent with those reported by Pascoe and Cottral (2000) and Lorena *et al* (2001) who found that Pch hyphae grow intracellularly in paratracheal cells before penetrating the vessel pit membranes to enter the xylem lumen, and that phenolic deposition can occur ahead of the advancing fungus. In addition, this study revealed that several groups of phenolic compounds, varying in electron density, surround the hyphae as it infects the plant tissue.

References

Lorena,T., Calamassi,R., Mori,B., Mugnai,L., and Surico,G. (2001). *Phaeomoniella chlamydospora*-grapevine interaction: histochemical reactions to fungal infection. *Phytopathologia Mediterranea*. **40**. Supplement, S400-S406.

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