PEST AND DISEASE INFORMATION BULLETIN

BIOLOGY & MANAGEMENT OF NUT ROT OF CHESTNUT

Chestnut Rot is a significant problem facing the Australian chestnut industry. Symptoms manifest as brown lesions on the kernel of the chestnut. The disease is often not visible externally, providing a challenge for growers and consumers alike.

A fungus named *Gnomoniopsis smithogilvyi* sp. nov. was identified living on decaying chestnut burrs and branches, was isolated from diseased chestnut kernels, and was isolated as an endophyte from asymptomatic chestnut flowers, leaves and stems.

Orchard sanitation is key to Chestnut Rot management. Targeting infected burrs by removal or placing a thick layer of organic mulch over top to block ascospores are options. Growing a range of varieties is recommended to spread out the flowering times of the chestnut trees and reduce the risk of floral infection.

The findings of this study show the key to reducing the incidence of Chestnut Rot is through improved orchard hygiene. Perithecia and ascospores of the Chestnut Rot organism were found growing as a saprophyte on decaying burrs on the orchard floor. Ascospores were determined as the primary source of inoculum in the infection of chestnut flowers, leaves and stems in December. Targeting the perithecia and ascospores on burrs is therefore critical for controlling the disease.

Recommendations for targeting infected burrs include:

Removal of burrs from the orchard floor
Removing and disposing of the primary source of inoculum will reduce the infection of chestnut flowers during the flowering period.

Mulching over top of burrs
Placement of a thick organic compost layer over top of the burrs to provide a physical barrier to ascospores. Organic mulches have also been found to contain antagonistic microbes that reduce the activity of pathogens such as *Phytophthora cinnamomi* Rands (You and Sivasithamparam 1995). This method has been particularly successful with *Persea americana* Mill. (Avocado) (You and Sivasithamparam 1995). Perithecia and asccospores are microscopic, and can exist on very small fragments of decaying burrs and branches. Therefore the layer of mulch would have to be thick enough and evenly spread enough over top of burrs to have a significant effect on blocking ascospore movement.

Watering burrs during non-conducive periods
Watering dead burrs on the orchard floor during non-infective periods may be an option for growers to reduce ascospore frequency during the flowering period. Research by Mondal et al. (2003) with *M. citri* found that ascospore release can be advanced by irrigating frequently during dry, non-infective conditions stimulating ascospore release when environmental conditions are unfavourable for infection.

Biological control
Biological controls and antagonistic fungi such as *Trichoderma* and *Gliocladium virens* Mill. Giddens and Foster have been found to reduce the activity of chestnut diseases such as *Cryphonectria parasitica* (Chestnut Blight) (Arisan-Atac et al. 1995) and *Phytophthora* Root Rot (Chambers and Scott 1995). *Trichoderma* based products are available in Australia including 'Tri-D25' which is a mix of *Trichoderma koningii* Oudem. and Trichoderma harzianum Rifai. (Zadco 2011). There is future scope to test the effectiveness of these control agents on *G. smithogilvyi*.

Variety selection
The results of this study show the selection of one variety over another is not the key to solving Chestnut Rot, even though variety selection has been previously advised (Rinaudo et al. 2009). The important commercial varieties (Decoppi Marone, Purton's Pride, Red Spanish) sampled in the 2008 and 2009 orchard and market surveys were all affected by Chestnut Rot. A more effective method is to plant a diversity of varieties that flower during different periods. This staggers the receptivity period of chestnut flowers and reduces the probability of an epidemic. If only one variety is grown, or varieties that flower at the same time, there is potential for the pathogen to infect all trees if the environmental conditions are conducive, for example, heavy rainfall during the critical period of flowering. This strategy spreads the risk of infection to achieve an overall reduction, rather than eliminating the risk completely.

Fungicides
The use of fungicides on perithecia and ascospores is not recommended for several reasons. The environmental impact of fungicides on the microflora of the soil could potentially make the conditions more favourable to pathogens by reducing the presence and action of antagonistic and beneficial micro-organisms (Jenkins 2005; Schreiner and Bethlenfalvay 2005). Fungicides also place the pathogen under high selective pressure, with surviving offspring possessing fungicide resistance genes quickly being selected and passing the genes on to their offspring (Dekker 1986; Ma and Michailides 2005). The presence of the teleomorph indicates the potential for sexual recombination, a higher genetic diversity and hence a greater probability of resistance genes occurring in Chestnut Rot fungus populations.

The use of these recommendations will hopefully reduce incidence to the target of <10%.

FIGURES

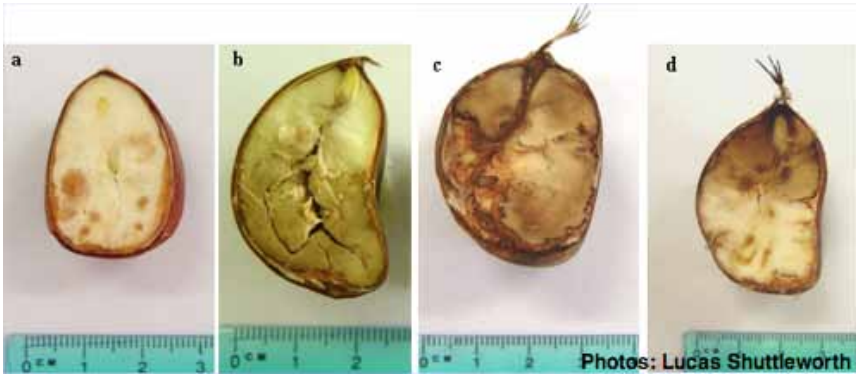

Fig. 1 Chestnut Rot symptoms. a=light brown spotting, b, c=medium brown rot, d=medium and dark brown rot.

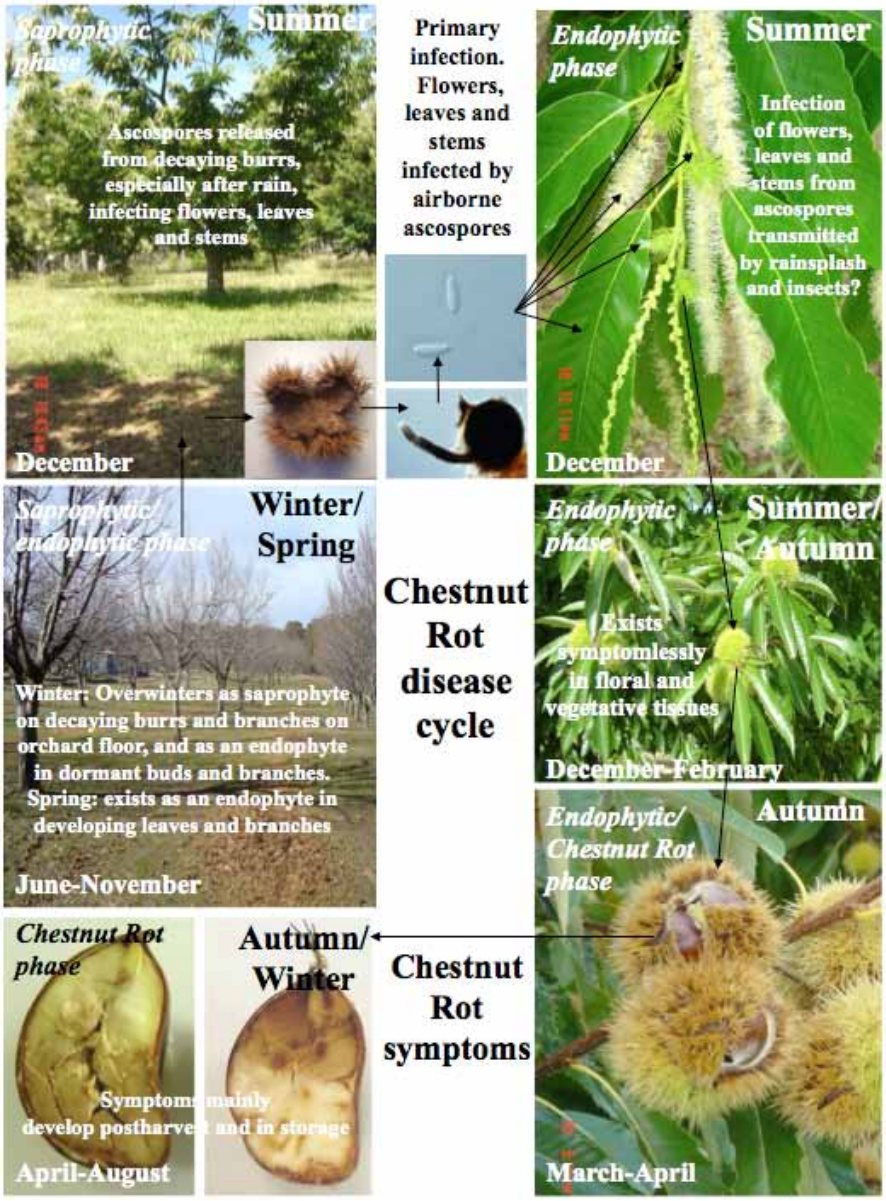

Fig. 2 The disease cycle of Chestnut Rot in *Castanea* sp. in South-Eastern Australia (Washington et al. 1999, Ogilvy 1998, Smith and Ogilvy 2008).

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