05 Promotion of understory native legumes - a possible method of control of *P. cinnamomi* in the Northern Jarrah forest of W.A.

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Jarrah dieback, a disease caused by an introduced soil-borne fungus *Phytophthora cinnamomi* (Rands), is widely distributed throughout the Jarrah (*E. marginata* Sm) forest of South Western Western Australia. The widespread nature of the disease in a forest which has a low value per hectare means that it is impractical to attempt control by intensive cultural practices such as fungicidal applications. Prescription burning is the only practical management tool available which can be used to bring about broadscale changes in the forest environment. In particular, high intensity wild fire has been observed to promote a dense understory of native legume species in areas in which the understory was previously proteaceous.

The soil physical environment on upland freely drained sites is less favourable for *P. cinnamomi* sporulation under dense legume stands when compared to non-legume areas. The dense canopy and litter layer of the legume understory depresses soil temperatures in spring during the period when, under open forest, there is a coincidence of favourable soil moisture and temperature conditions. During summer and early autumn rainfall is intercepted by the legume canopy and litter layer preventing rewetting when soil temperatures are high enough to permit sporulation. In autumn or early winter rewetting of the soil results in the depression of soil

temperature below the critical level for sporulation and this condition persists until spring.

A change to a legume understory reduces the quantity of highly susceptible roots in the soil. Proteaceous species which are predominant in non-legume areas are highly susceptible to *P. cinnamomi*. For example, *P. cinnamomi* can completely invade the root system of native *Banksia grandis* Willd. which commonly occurs as dense thickets in non-legume areas. In pot trial studies in which fungal population levels were high and soil environmental conditions optimum, *P. cinnamomi* was found to invade larger suberized roots of *B. aquifolium* Benth., *A. myrtifolia* Willd., *M. dilitata* R.Br. and *A. strigosa* Link. seedlings but the fungus has not been recovered from any part of the root systems of *A. pulchella* R.Br. and *A. extensa* Lindl. seedlings. Mortality of *B. grandis* is rapid following inoculation. In pot trials 20% of inoculated *B. aquifolium* seedlings died but the fungus did not cause mortality in any of the remaining legume species tested.

Mortality and *P. cinnamomi* invasion of the roots of Jarrah seedlings when planted in pots with *A. pulchella*, *B. aquifolium* and *A. strigosa* were significantly less than those planted in pots containing *B. grandis*. *P. cinnamomi* population levels in pots containing legume species were markedly reduced over a period of 4-8 months whereas the population levels in *B. grandis* pots remained consistently high.

Sporulation of the fungus was inhibited when mycelium was suspended in soil extracts obtained from pots in which *A. pulchella* were growing. 45.8% of the bacterial isolates extracted from *A. pulchella* pots were antagonistic to *P. cinnamomi*, whereas only 18.5% of isolates from a *B. grandis* soil were antagonistic. Preliminary evidence suggests that *Rhizobium* spp contribute to the resistance of the legumes.

Native legume species may further improve forest health by contributing nitrogen to the ecosystem.

Low intensity prescription burning causes mortality of legume species and favours proteaceous species in the shrub and understory layer. High intensity prescription burning in forest areas where there is a store of legume seed in the soil results in regeneration of dense legume stands. It is, therefore, possible that legume stands could be promoted on a broadscale basis in the forest by modification of the existing prescription burning programme.

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