RESEARCH

DOES PRICKLY MOSES SUPPRESS PHYTOPHTHORA DIEBACK?

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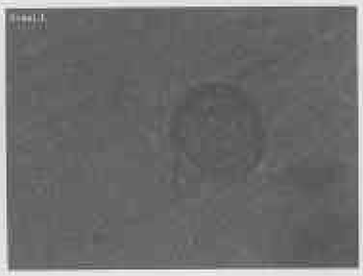
The native legume, Prickly Moses, *Acacia pulchella*, is an important feature in the Western Australian landscape. It not only creates a dazzling brightness during autumn-winter periods but also is resistant to *Phytophthora cinnamomi* (*Pc*) attacks. This soil-borne pathogen attacks plant roots, causing symptoms originally called 'Jarrah Dieback', and is a major threat to the survival of many WA plants. *Pc* has a complex lifestyle, in the soil and the root, involving several different types of spores (Fig 1). It also has different strains, the widely found one being the A2 type.

Prickly Moses is a common component of many forest woodland and heathland ecosystems and is known to be a variable species with several varieties and informal variants. Several studies found that it reduces the sporangial production of *Pc* and the idea of using it as a biological control tool has been around for a while. However, the benefit of this method has not been explored effectively. To develop effective control methods, it is important to understand the interactions between the control agent and the different life forms of the pathogen. My study encompassed several aspects of the suppression of *Pc* by Prickly Moses and included three commonly found varieties of this species and several isolates of the common A2 strain of the fungus.

The study highlighted many aspects of the suppression. It was established that the soil inoculum of the common A2 type 1 strain of *Pc* varied between the varieties of *A. pulchella* and the suppression was more evident when the plants were mature or entered the reproductive stage. However, the suppressive effect was not observed in sandy soils. The suppression was also due at least in part to the root exudates. The root exudates collected from the aseptically grown *A. pulchella* plants immobilized the main infective agent of *Pc*, the motile zoospores, caused mycelial damage and cytoplasmic collapse of the chlamydospores. In other words, it definitely inhibited fungal growth and survival.



The major breakthrough of this study was the discovery of selfed oospores (usually formed by a sexual process involving the two compatible strains of *Pc*, A1 and A2) within root tissues in the soils under *A. pulchella* plants. This was a chance observation, made in the initial stages of the study. As the study progressed, confirmation was established of the ability of *Pc* to produce viable oospores. The stimulation for this process was available in several jarrah forest soils with and without Prickly Moses. Among other possible mechanisms, soil chemical properties, moisture levels and temperature proved to have a significant role in producing these oospores of the A2 type of *Pc*. The thick-walled oospores are the persistent form of the pathogen's life cycle and known to last for a long time.

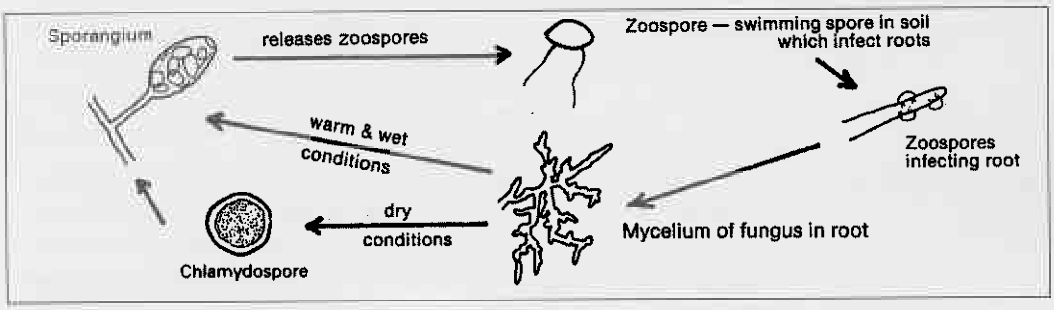


Fig 1: Life cycle of Phytophthora cinnamomi *in Western Australia*

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Phytophthora

In summary, my study identified the direct effects of *A. pulchella* on *Pc* and posed a number of questions. Which of the two functions of the plant on the pathogen plays a more significant role - the suppression of the infective stages or the stimulation of the dormant phase? Are the advantages of this natural suppressive mechanism under Prickly Moses to depress the asexual and pathogenic stages of *Pc* compromised by its ability to induce oospore formation? The most important fact is that they both keep the pathogen in check. The balance therefore, should be in favour of destruction of the pathogen and reduction of mycelium, zoospores and chlamydospores with oospores playing a lesser role in this environment. However, it is very important to investigate the germinability of the oospores produced, and ascertain their infectivity.

Hence, Prickly Moses has direct and indirect effects on *Pc*. The indirect effects include the encouragement of an antagonistic soil microflora, or promoting a soil physical environment that is unfavourable for sporangial production of *Pc* as observed in other studies. By suppressing the pathogen, Prickly Moses plants provide a healthy soil environment for the adjacent susceptible species. These aspects should be considered in attempting to produce faster and more effective control.

The observation of *Pc's* ability to produce selfed oospores in several jarrah forest soils also raises a number of important questions with regards to the life cycle and management of the pathogen in forestry and natural ecosystems, given the potential of these thick-walled spores to lay dormant for a long time. *Pc* is clearly a versatile soil borne pathogen that survives under hostile conditions encountered in its natural environment. Without detailed knowledge of its biology, it is difficult to formulate effective control measures.

In conclusion, this study was conducted amidst several constraints, with funding being the biggest! Despite the difficulties it was rewarding to accomplish the task and the findings of this study will hopefully move the 20th century concept of utilising Prickly Moses as a biological control tool, forward into the new millennium.

Meanwhile, concerned landholders on gravelly soils could consider planting lots of Prickly Moses!

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