

# *Cassytha pubescens:*

## Germination biology and interactions with native and introduced hosts

Hong Tai (Steven), Tsang  
B.Sc. Hons (University of Adelaide)

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School of Earth & Environmental Science  
University of Adelaide, Australia

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## Abstract

The native hemiparasitic vine *Cassytha pubescens* infects and often kills the invasive weeds *Cytisus scoparius* and *Ulex europaeus* in the Mount Lofty Ranges, South Australia. This leads to the consideration of whether this parasite is a suitable biological control agent for these weeds. The aims of this study were to investigate germination characteristics of the parasite, the direct effects of the parasite on both invasive and native hosts, and the indirect effects of the parasite on interactions between native and invasive hosts.

Seed dormancy and germination of *C. pubescens* were examined. Imbibition tests revealed that the seeds are enclosed in a water impermeable seed coat, which produces physical dormancy. Germination experiments showed that heat and scarification broke the physical dormancy, but the germination rate of heated seeds was over three times higher than that of scarified seeds. Thus this parasite may have evolved to share similar fire-related germination cues as some of its native hosts.

The direct impact of *C. pubescens* on growth of *Acacia myrtifolia* (a native legume) and *Cytisus scoparius* (an invasive legume) was investigated in a pot experiment. None of the parasites on infected *A. myrtifolia* survived, so none of the *A. myrtifolia* was successfully infected with the parasite. In contrast, *C. pubescens* successfully infected *C. scoparius*. Host biomass accumulation was reduced by 21%, relative to uninfected plants. Photosystem II efficiencies were reduced but only on the infected branches. The total nitrogen content of infected plants plus parasite was the same as that of uninfected plants, and there was no impact of infection on nodulation by *Rhizobium*. Thus, it is likely that the removal of nitrogen by the parasite, reduces the supply to the host, and this limits the biomass accumulation of *C. scoparius*.

The differences in resistance to the parasite by native and invasive hosts were studied. A pot experiment was conducted using  $^{32}\text{P}$  to examine the uptake of nutrients by the parasite from either *C. scoparius* or *A. myrtifolia*. In this experiment, *C. pubescens*

was able to successfully attach to *A. myrtifolia* hosts. The parasite absorbed no  $^{32}\text{P}$  when attached to the native host, but did take up  $^{32}\text{P}$  from the invasive host. This suggests *A. myrtifolia* resists the formation of functional haustoria by the parasite, while the invasive host does not. It is likely that this resistance of the native host to the native parasite may have evolved through long-term coexistence, whereas the invasive host has had only a short-term association with the parasite.

To investigate if the differences in host resistance to *C. pubescens* lead to changes in competitive outcomes between hosts, plants of the invasive weed *Ulex europaeus* were grown together with either *A. myrtifolia*, or a native non-legume, *Leptospermum myrsinoides*, and either with or without *C. pubescens*. There was no effect on either biomass accumulation of hosts or on the intensity of competition between hosts. However, as these are perennial species, it is possible that the experiment was too short to detect any effects. Long-term experiments and field monitoring may be required to resolve these competitive interactions.

These results provide an important insight into the germination ecology of *C. pubescens*, and the nature of its impact on both native and invasive hosts. Unlike the morphologically similar holoparasites of the genus *Cuscuta*, *C. pubescens* does not seem to act as a carbon sink, thus had little effect on symbiotic nitrogen fixation. This suggests a different carbon-nitrogen economy model from the one proposed for the morphologically similar holoparasites, *Cuscuta* spp. The study also detected differences in resistance of hosts to the parasite; however, this appeared to have no effect on host competition in a short-term pot experiment.

## Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Hong Tai (Steven), Tsang

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