

Supplementary Material

Defence responses of native and invasive plants to the native generalist vine parasite *Cassytha pubescens* – anatomical and functional studies

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Host range and preference

Survey sites

To determine the host range and host preferences of *Cassytha pubescens*, surveys were conducted in Mark Oliphant and Scott Creek Conservation Parks. Mark Oliphant Conservation Park (MOCP) is a 178 ha park located 14 km southeast of Adelaide, South Australia in the Mount Lofty Ranges, South Australia. Scott Creek Conservation Park (SCCP) is 758 ha located 30 km southeast of Adelaide. The area has a Mediterranean-type climate, with hot dry summers (average temperature January 26.8°C) and cool wet winters (average temperature July 12.9°C). The average annual rainfall ranges from 700 to 1100 mm.

Both sites have vegetation representative of the Mount Lofty Ranges: open sclerophyll woodlands dominated by an overstorey of *Eucalyptus obliqua*. *E. fasciculosa* is also found in MOCP and SCCP and *E. cosmophylla* in SCCP. In both parks the understorey is dominated by *Acacia pycnantha*, *A. myrtifolia*, *Leptospermum myrsinoides*, *Banksia marginata* and *Hakea rostrata*. Both parks have the invasive species *Cytisus scoparius* and *Ulex europaeus*. *Cassytha pubescens* is also present in both parks and utilises both invasive and native species as hosts.

Survey method

Surveys consisting of five line-transects, 50 m long each, were established within each of the parks. Transects were randomly distributed within areas known to contain *C. pubescens*. In SCCP the area did not contain large populations of either *C. scoparius* or *U. europaeus*, but they were abundant in MOCP. Where a plant touched the transect line it was identified, its height measured and its health assessed. Plants were placed within height classes of 50 cm. Plants larger than 250 cm were grouped together. Plant health was categorised as either dead (no live biomass present), poor (less than 50% live biomass), fair (50% to 90% live biomass) and good (more than 90% live biomass). The presence or absence of *C. pubescens* was recorded for each plant. Where *C. pubescens* was found on a plant, and haustoria firmly attached were observed on the target shrub, its health and density were assessed. *Cassytha pubescens* health was assessed using the same categories for host health. *Cassytha pubescens* density was categorised as low, medium, high and very high, defined as less than 25%, 25% to 50%, 50% to 75% and 75% to 100% of the host biomass covered with *C. pubescens*, respectively.

Results

Across both sites 1302 plants were identified, of these 228 were infected with *C. pubescens*. In MOCP and SCCP, 756 and 518 hosts were found respectively; of these individuals 133 and 95 were infected with *C. pubescens*. Forty-seven species were found across both sites, 26 in MOCP and 37 in SCCP. *Cassyltha pubescens* was present on 15 species in MOCP and 26 in SCCP. *Cytisus scoparius* and *L. myrsinoides* were the most abundance species at 17% and 8.7% of the total number of plants sampled, however *C. scoparius* was only found within MOCP. The most abundant species in MOCP were *C. scoparius* and *Pultenaea daphnoides* representing 30% and 14% of the plants surveyed. In SCCP the most abundant species were *L. myrsinoides* and *Xanthorrhoea semiplana* at 20% and 9% respectively. Of the 47 species surveyed, 33 were infected with *C. pubescens*, indicating a broad host range. The five most commonly infected taxa were *Acacia spp.*, *Cytisus scoparius*, *Daviesia spp.*, *Hakea spp.*, *Hibbertia spp.*, *Leptospermum myrsinoides* and *Pultenaea spp.* Of these *Cytisus scoparius* and *Daviesia spp.* were only present in MOCP and *Hibbertia spp.* Only in SCCP (Table S1). *Cassyltha pubescens* does not appear to use any host species surveyed in proportion to availability. When growing on *L. myrsinoides* and *C. scoparius* the relative proportion of *C. pubescens* is far greater than the relative abundance of either host. *Cytisus scoparius* represents 17.57% of the species surveyed, however 38.15% of the *C. pubescens* surveyed utilises this species as a host. Likewise *L. myrsinoides* has a relative abundance of 8.74% yet 14.91% of the *C. pubescens* was found on this host. In contrast, the next most abundant host species, *Pultenaea daphnoides* had a relative abundance of 10.71% with 7.46% of *C. pubescens* (Fig. S1).

Table S1. Species found at Mark Oliphant Conservation Park (MOCP) and Scott Creek Conservation Park (SCCP), their abundances and the proportion of those species infected with *C. pubescens*

Species	Species abundance ^A	Percentage with <i>C. pubescens</i>	Species abundance	Percentage with <i>C. pubescens</i>
	MOCP		SCCP	
<i>Acacia myrtifolia</i>	44	13.64	2	21.43
<i>Acacia notabilis</i>			4	0.00
<i>Acacia paradoxa</i>	1	0.00		
<i>Acacia pycnantha</i>	2	0.00	14	7.14
<i>Acacia retinoides</i>			1	0.00
<i>Acacia verticillata</i>			1	0.00
<i>Acrotriche fasciculiflora</i>	62	3.23	2	0.00
<i>Acrotriche patula</i>			3	33.33
<i>Acrotriche serrulata</i>			1	0.00
<i>Allocasuarina muelleriana</i>			10	20.00
<i>Allocasuarina verticillata</i>			4	0.00
<i>Asclepias rotundifolia</i>	1	0.00	1	0.00
<i>Banksia marginata</i>	37	5.41	2	0.00
<i>Brachyloma ericoides</i>			20	25.00
<i>Calytrix tetragonia</i>	1	0.00	29	20.69
<i>Chenopod sp</i>				
<i>Clematis microphylla</i>	2	0.00		
<i>Cytisus scoparius</i>	229	37.99		
<i>Daviesia brevifolia</i>	4	25.00	2	0.00
<i>Daviesia leptophylla</i>	31	12.90		
<i>Dillwynia hispida</i>			1	0.00
<i>Dillwynia sericea</i>			3	66.67
<i>Dillwynia sp</i>	2	0.00		
<i>Eucalyptus cosmophylla</i>			18	22.22
<i>Eucalyptus fasciculosa</i>			18	5.56
<i>Eucalyptus obliqua</i>	33	3.03	14	7.14
<i>Genista monspessulana</i>	20	15.00		
<i>Hakea carinata</i>	22	4.55	6	33.33
<i>Hakea rostrata</i>	7	28.57	14	14.29
<i>Hibbertia aspera</i>	2	0.00	46	15.22
<i>Hibbertia exuciates</i>			11	9.09
<i>Hibbertia riparia</i>	22	0.00	43	20.93
<i>Isopogon ceratophyllus</i>			6	0.00
<i>Ixodia achillaeoides</i>			1	100.00
<i>Lepidosperma semiteres</i>			1	100.00
<i>Leptospermum myrsinoides</i>	6	16.67	108	30.56
<i>Pinus radiata</i>	1	0.00		
<i>Platylobium obtusangulum</i>	1	0.00	32	3.13
<i>Pteridium aquilinum</i>	90	1.11		
<i>Pultenaea acerosa</i>			1	100.00
<i>Pultenaea daphnoides</i>	109	14.68	24	4.17
<i>Pultenaea involucrata</i>			18	16.67
<i>Rubus fruticosus</i>	12	41.67		
<i>Species C</i>	5	0.00		
<i>Spyridium phyllicoides</i>			3	33.33
<i>Xanthorrhoea semiplana</i>	10	10.00	47	4.26

^ANumber of individuals surveyed for that species.

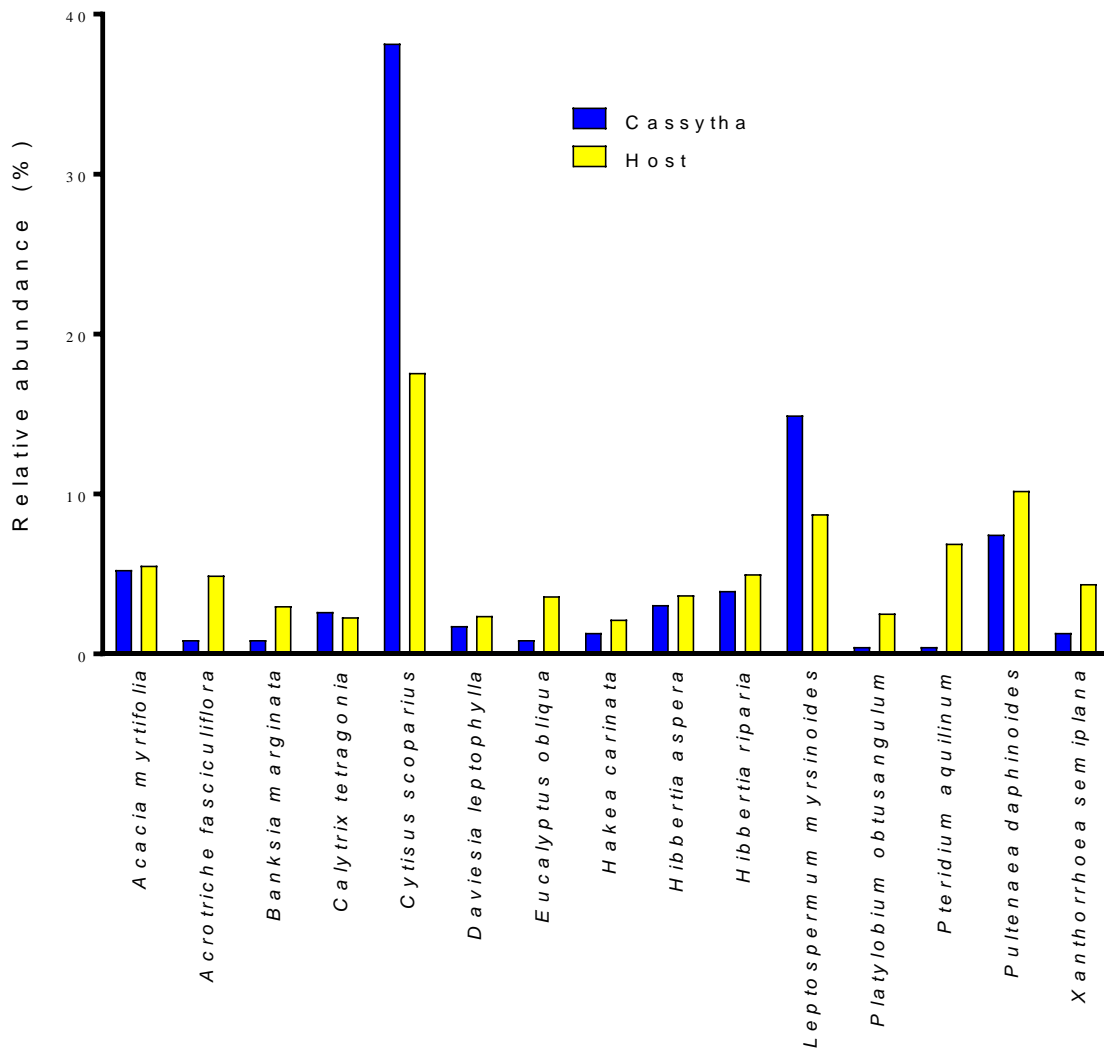


Fig. S1. Relative abundance of host species (%) and relative abundance of *Cassytha pubescens* on each species (%) for the most abundant species found in both Mark Oliphant Conservation Park and Scott Creek Conservation Park. Inequality between the blue and yellow bars indicates hosts that are infected by *C. pubescens* contrary to their availability as hosts.