Biological control of Californian thistle
(*Cirsium arvense*) with *Puccinia punctiformis*

Caitlin Henderson, recipient of the Dan Watkins Scholarship in Weed Science 2016/2017, is an MSc student at Lincoln University. *Cirsium arvense*, commonly known as Californian thistle, is a problematic weed in New Zealand and around the world. In agricultural systems, Californian thistle competes with plants causing a decrease in yield, which reduces animal feed availability. This subsequently affects livestock health and production. Californian thistle is a highly invasive weed due to its creeping root system. If the roots are fragmented, this promotes more spread as the root fragments release additional buds from dormancy. This effect can also make the weed difficult to control.

There are various methods to control this weed, including chemical (the most commonly utilised), cultural, physical and biological control. There are several biological control agents that aid in the control of Californian thistle including the Californian thistle gall fly (*Uraphora cardui*), green thistle beetle (*Cassida rubiginosa*), white soft rot (*Sclerotinia sclerotiorum*) and the rust fungus *Puccinia punctiformis*. *Puccinia punctiformis* shows potential for being a biological control agent for a number of reasons. This includes its presence in New Zealand, its host specificity and its ability to systemically infect thistles, which will cause damage to the roots and reduce the ability of thistles to grow the next season.

The main objectives of this research are to determine if there are any genetic differences between rust samples from different locations and to measure the susceptibility of different genotypes of Californian thistle to the rust fungus. To achieve these objectives, a survey of Californian thistle populations around New Zealand will be conducted to determine the percentage of rust-infected shoots within different populations and in different areas. Samples will be collected at these different sites and subsequently processed using molecular tools. The molecular work will determine if there are any genetic differences among rust isolates. A glasshouse experiment will be conducted using one rust isolate on different genotypes of Californian thistle to determine the virulence of the rust.

Recent studies of *P. punctiformis* have allowed the lifecycle to be better understood, but the reasoning behind its lack of self-perpetuation is unknown. There is still little known about the genetic diversity of the rust, whereas the plant is considered to be highly genetically diverse and it is unknown whether this diversity contributes to the virulence of the pathogen.