

Above- and below-ground herbivore interactions: what do they mean for weed biocontrol outcome?

Ronny Groenteman ^{*1}, Dave Kelly ², Simon Fowler ¹, Graeme Bourdôt ³

¹ Landcare Research, PO box 40, Lincoln, 7640, NZ

² School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140, NZ

³ AgResearch Limited, Private Bag 4749, Christchurch, 8140, NZ

The effects of below-ground herbivory on plant population dynamics and on plant communities are becoming increasingly recognised in recent years. For a long time root feeders were hardly used in classical weed biocontrol because they are difficult to work with, yet they have similar-to-better establishment rates than above-ground herbivores and more of them appear to contribute to target weed suppression than above-ground herbivores. Root feeders used in biocontrol are usually used in combination with above-ground biocontrol agents. It is therefore important to tease apart the effects of the above- and below-ground interactions and their effect on the biocontrol outcome. We studied paired above- and below-ground interactions between the three biocontrol agents introduced to New Zealand for the biocontrol of nodding thistle, *Carduus nutans*. We used cages in a garden experiment to quantify the effects of individual and paired agent species. We then manipulated the results in a matrix model to investigate the potential effect on the growth rate of the target weed population. We conclude that competitive above-ground interactions between the two seed predator agents limit the potentially more effective of the two, and that there was evidence that the crown-root feeder negatively affect the above-ground gall-forming agent. Population models indicated that no combination of the three agents was sufficient to bring nodding thistle populations in New Zealand to decline.

