

Simulated Herbivory May Underestimate the Effects of Natural Herbivory: A Case Study with Dyer's Woad

E. Gerber¹, L. Edelmann² and H. L. Hinz¹

¹CABI Europe – Switzerland, Delémont, Switzerland e.gerber@cabi.org

²University of Neuchâtel, Faculty of Sciences, Neuchâtel, Switzerland

Abstract

Weed biological control critics and advocates alike have expressed a strong desire for improved predictive ability in the selection of effective agents. Consequently, studies on plant response to herbivory have become increasingly important in risk assessments. The first objective of our study was to assess the response of Dyer's woad (*Isatis tinctoria* L.) to damage by a root-crown mining weevil (*Ceutorhynchus rusticus* Gyllenhal.) currently investigated as a biological control agent for North America. Manipulating phytophagous insects can be logistically challenging and simulated herbivory is frequently advocated as a technique for replacing natural herbivory. However, mechanical damage does not always produce the same response as herbivore feeding, in particular when trying to mimic internal feeding organisms. A second objective was therefore to evaluate whether artificial herbivory can reproduce *C. rusticus* attack on dyer's woad. In addition, both natural and simulated herbivory were combined with two levels of plant competition from the North American grass *Festuca idahoensis* Elmer. Dyer's woad reacted to both types of herbivory by an increased production of secondary shoots. These shoots were however thinner and shorter and both biomass and seed production were reduced compared to control plants. Simulated herbivory caused similar effects as natural herbivory, but the magnitude of impact was lower compared to natural herbivory. *F. idahoensis* only had a weak effect on Dyer's woad, while Dyer's woad reduced biomass of *F. idahoensis*. Weevil attack on Dyer's woad increased the biomass of *F. idahoensis*, while simulated herbivory had no effect on grass biomass. In conclusion, the results of our study confirm 1) the potential of *C. rusticus* as an effective biological control agent for Dyer's woad and 2) revealed that simulated herbivory was able to mimic effects of natural herbivory, but that it underestimated the magnitude of effect in our study system.