

Transnational Access Report

1. General Information

Project Acronym (ID):	HEFT
Project Title	Latex secondary metabolites as determinants of root-herbivore foraging in nature: Evaluation of a new tag-and-trace system
Installation used	MicroCT, University of Nottingham
Name of Group Leader	Prof. Matthias Erb
Name of organization	University of Bern

2. Duration of access

Begin of the project	End of the project
02.11.2015	13.11.2015

3. Project summary (max. 250 words)

Root-feeding arthropods are among the most harmful agricultural pests. However, due to the lack of suitable monitoring systems, little is known about their foraging behavior in the soil. Using a native plant-herbivore system, the latex-producing common dandelion (*Taraxacum officinale* agg.) and its predominant root feeding enemy, the grubs of the common cockchafer (*Melolontha melolontha*), we are in the process of developing a new field-compatible tag-and-trace system to profile *M. melolontha* behavior below ground. As a source of rubber and other secondary metabolites, *Taraxacum* species are a promising future crop. *M. melolontha* on the other hand is an important grassland pest in central Europe which causes significant yield losses in pastures and orchards. Its preferred host is the common dandelion. Understanding the foraging patterns of *M. melolontha* in the soil may help to optimize current monitoring and control strategies, for instance by providing information about optimal sampling and treatment time points and depths. To monitor *M. melolontha* behavior under realistic soil conditions, we tag the grubs with copper rings around the body and record the position of the larvae in the soil in space and time using a commercial hand-held metal detector.

We used X-ray MicroCT as an orthogonal approach to evaluate the impact of the metal tag on larval mobility by profiling the movement and feeding patterns of tagged and non-tagged *M. melolontha* and thereby validate the tag-and-trace system for future applications in the field.

6. Main achievements (max. 250 words)

To monitor *M. melolontha* behavior under realistic soil conditions, we are under the development of a tag-and-trace system which involves tagging of the grubs with a copper ring around the larval body. We used MicroCT to profile feeding and mobility patterns of untagged and tagged grubs in the root system of *T. officinale* to investigate potential behaviour influencing effects of the tagging. Using statistical comparison of foraging and moving parameters, we found no differences in amount and type of consumed root material for tagged and non-tagged *M. melolontha*. However, tagged grubs moved more slowly than non-tagged grubs. From this experiment, we conclude that the tag-and-trace system is useful for small-scale experiments, but may underestimate larval movement in large soil volumes. The visualization of *M. melolontha* foraging patterns in the root system of *T. officinale* using MicroCT gave us valuable information about the behavior of root herbivores, as it allowed for detailed three-dimensional observations of feeding decisions *in vivo*. Furthermore, the experiment was essential for the development and evaluation of the tag-and-trace system for further applications. The method will promote understanding the biology of an important, but often overlooked group of herbivores in natural and agricultural systems in the future.

7. Publications related to the access granted, acknowledging the support by EC.

In preparation.