Plant-herbivore interactions in natural *Brassica oleracea* communities

Submitted by:

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Erika L. Newton

Abstract

Co-evolutionary interactions between plants and herbivores are suggested to be the driving force behind the high diversity observed in plant secondary metabolites. These compounds play an important role in herbivore resistance mechanisms in many plant species. An individual plant can produce and store a number of structurally different secondary compounds. Variation in plant chemical profiles is commonly observed within and between natural populations across a wide range of taxa, yet the ecological importance of this variation is still a major question in the area of plant-herbivore interactions.

In this thesis I use wild cabbage (*Brassica oleracea* var. oleracea) plants in twelve naturally established populations to investigate plant-herbivore interactions mediated by structural variation in aliphatic glucosinolates, a class of secondary metabolites produced by the *Brassicaceae*.

Overall, the results showed that several herbivore species respond to the genetically determined variation in glucosinolate profile, indicating that the structure of the local herbivore community can be influenced by variation in plant defence chemistry. In addition, the direction of herbivore responses to different plant chemical phenotypes differed between species. A finer scale study which focused on the interactions between an herbivore and aliphatic glucosinolate variation supported the general trend observed in the large scale study. Glucosinolate profile was also found to have an impact on plant seed set.

The findings show that glucosinolate profiles may be under selection in these natural plant populations and provide some support for the role of herbivores in the maintenance of secondary metabolite diversity.

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Author's declaration

Statement of contribution to co-authored papers:

I carried out all data collection for each of the chapters, including herbivore surveys, seed collection and HPLC analysis of glucosinolates. I carried out all statistical analysis under the guidance of Dave Hodgson and James Bullock and I followed a methodology developed by Dave Hodgson for the spatial inter-population statistical analysis (Chapters 2 and 3). I initially drafted all sections of the chapters and amended later drafts following the advice of D. J. Hodgson, J. M. Bullock and, for Chapters 2 and 4, several anonymous journal reviewers.