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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Contents

Abstract ......................................................................................................................................... 2
Acknowledgements ........................................................................................................ 3
List of figures ................................................................................................................................. 9
List of tables ................................................................................................................................. 10
Author declaration ....................................................................................................................... 11

Chapter 1: Ecological mechanisms maintaining natural variation in secondary metabolites ...... 12
Mechanisms for the maintenance of secondary metabolite diversity ........................................ 13
Evidence for the role of herbivores ............................................................................................... 14
Study species ................................................................................................................................. 16
Glucosinolate structure and the genetic control of biosynthesis ................................................ 22
Importance of field studies .......................................................................................................... 24
Thesis aims .................................................................................................................................... 26
References ..................................................................................................................................... 27

Chapter 2: Glucosinolate polymorphism in wild cabbage (Brassica oleracea) influences the structure of herbivore communities .................................................................................. 35
Erika Newton, James Bullock, Dave Hodgson.
Published in Oecologia

Abstract ......................................................................................................................................... 36
Introduction .................................................................................................................................... 37
Materials and methods ................................................................................................................ 41
Field sites ....................................................................................................................................... 41
Surveying plants and herbivores ................................................................................................... 41
Genetics of glucosinolates in Brassicaceae .................................................................................. 42
Glucosinolate extraction and preparation for HPLC ..................................................................... 45
Chapter 3: Inter-annual responses of herbivores to glucosinolate polymorphisms in wild cabbage (*Brassica oleracea*)

Erika Newton, James Bullock, Dave Hodgson

Abstract

Introduction

Materials and methods

Statistical analysis

Intra-population responses of herbivores to glucosinolates

Inter-populations responses of herbivores to glucosinolate frequencies
Chapter 4: Bottom-up vs. top-down effects of glucosinolate variation on aphid colony dynamics in wild cabbage populations

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Abstract

Introduction

Study system

Materials and methods

Field sites

Glucosinolate extraction and analysis

Experimental design

Statistical analysis

Results

Effect of plant phenotype on aphids

Responses of natural enemies

Discussion

Differential effects of glucosinolates on aphid colony dynamics
Chapter 6: Does herbivore attack have a differential effect on the fitness of glucosinolate phenotypes? .........................................................161

Erika Newton, James Bullock, Dave Hodgson

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>161</td>
</tr>
<tr>
<td>Introduction</td>
<td>162</td>
</tr>
<tr>
<td>Materials and methods</td>
<td>163</td>
</tr>
<tr>
<td>Effects of herbivores and glucosinolates on seed set</td>
<td>164</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>164</td>
</tr>
<tr>
<td>Results</td>
<td>165</td>
</tr>
<tr>
<td>Effects of herbivores and glucosinolates on seed set</td>
<td>165</td>
</tr>
<tr>
<td>Discussion</td>
<td>173</td>
</tr>
<tr>
<td>Glucosinolates and plant fitness</td>
<td>173</td>
</tr>
<tr>
<td>Effects of herbivores on the fitness of different phenotypes</td>
<td>173</td>
</tr>
<tr>
<td>Effect of environment and phenotype but no evidence for G-by-E</td>
<td>174</td>
</tr>
<tr>
<td>Detecting costs in natural populations</td>
<td>175</td>
</tr>
<tr>
<td>Conclusions</td>
<td>176</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>177</td>
</tr>
<tr>
<td>References</td>
<td>177</td>
</tr>
</tbody>
</table>

**Chapter 7: Discussion** ........................................................................................................180

Wider implications of results and future work 185

References 187
List of Figures

Chapter 1:
Figure 1.1. General locations of field sites in south west England 18
Figure 1.2. Locations of Dorset field sites 19
Figure 1.3. Locations of Devon field sites 20
Figure 1.4. Locations of Cornwall field sites 21
Figure 1.5. Diagram of aliphatic glucosinolate loci 23

Chapter 2:
Figure 2.1. Diagram of aliphatic genetics 44
Figure 2.2. Frequencies of aliphatic glucosinolate phenotypes 50
Figure 2.3. Intra-population responses of herbivore species to sinigrin 56
Figure 2.4. Herbivore responses to glucosinolates at the inter-population scale. 59

Chapter 3:
Figure 3.1 Responses of herbivore species to glucosinolates 82
Figure 3.2. Mean probability of snail infestation 83
Figure 3.3. Herbivore responses to sinigrin at the inter-population scale 86

Chapter 4:
Figure 4.1. Mean counts of unwinged aphids 111
Figure 4.2. Mean proportions of winged aphid 112
Figure 4.3. Mean proportions of Diaeretiella rapae-parasitised aphids 114
Figure 4.4. Mean counts of unwinged aphids on plants in each treatment 115
Chapter 5:

Figure 5.1. The effect of genotype and environment on plant fitness 137
Figure 5.2. Mean seed set produced by plants in each treatment 145
Figure 5.3. The effect of the cumulative number of aphids on plant seed set 147
Figure 5.4. The relationship between basal stem diameter and seed set 148

Chapter 6:

Figure 6.1. Mean seed set of plants differing in aliphatic glucosinolate profile 166
Figure 6.2. The correlation between plant basal stem diameter and seed set 167
Figure 6.3. Effect of B. brassicae, phenotype and population on seed set 169
Figure 6.4. Effect of progoitrin on seed production, results from B. brassicae 170
Figure 6.5. Effect of snails, phenotype and population on seed set in 2008 171
Figure 6.6. Effect of progoitrin on seed production, results from snail analysis 172

List of Tables

Chapter 2:

Table 2.1. Significance of all fixed factors 51
Table 2.2. Variance components for each ecological scale 54

Chapter 3:

Table 3.1. Significance of all fixed factors 87
Author’s declaration

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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.