

**Project title:** Integrated Pest Management Scholarships  
(three)

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**Report:** 2014/15 Scholarships

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**Location of project:** Harper Adams University

**Industry Representative:** n/a

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# AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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## **Introduction**

This project was initiated to provide industry relevant crop protection training in the UK. There is a serious lack of training in the UK for specialists in integrated crop pest and disease management (including weed scientists). The scholarship bursary scheme complements that already in existence for the MSc in Entomology based here at Harper Adams funded by the Royal Entomological Society. Crop protection issues in horticulture are rarely covered at undergraduate level in the UK and when they are, never to any great depth. The UK lacks suitably qualified graduates in this area. Providing funding will stimulate and enable suitably motivated students to acquire specialist post-graduate training in this area.

The continuing production of safe, wholesome food in an environmentally sensitive manner is a major political issue for national governments and internationally within global commodity markets. A report produced by the UK Cabinet Office in 2008 (Food Matters: Towards a Strategy for the 21st Century) predicts that the global population will rise to 9Bn by 2050 rising from a current estimate of nearly 6.8Bn. This increase in population size will substantially increase the demand for food. The global estimates vary in magnitude, but it is thought approximately 25% of crops are lost to pests and diseases, such as insects, fungi and other plant pathogens (FAO Crop Prospects and Food Situation 2009).

The Integrated Crop Pest and Disease Management course offers students training in techniques to facilitate crop food production. The course covers a broad range of topics in applied entomology, plant pathology and nematology and all students receive training in fundamental skills which will enable them to enter either a pest/disease management work environment or a research career in applied entomology, plant pathology or pest management. There is, however, considerable flexibility within the course thus enabling each student to focus on specialist subjects consistent with their interests and future career intentions such as horticulture and related disciplines.

## **Applicants**

Applications for the MSc have been low for some years, hence the request for funding from AHDB Horticulture. Applicants for 2013-14 were up by one on the previous year and for 2014 we saw a further increase to seven, again numbers were small but all of high quality. Applications for 2015-16 were only slightly up from the previous year, but were all excellent, including one who came through the undergraduate summer placement at Harper Adams University.

The three Scholars for 2014-2015 were:

Samuel Deane who came to us with a 2(i) in Agriculture from UCD and achieved a Pass. His interests in pest management were kindled by his agronomy module. He is now working as an agronomist for Premium Crops Ltd.

Christopher Lambert came to us from the University of Aberystwyth with a 2(i) in Marine & Freshwater Biology. He became interested in pest management whilst working part-time in a local garden centre. He passed the MSc with Distinction. He is currently seeking a PhD position having taken time off to travel in India.

Aidan Thomas came directly to us from Swansea University with a First Class degree in Zoology. He became interested in entomology and integrated pest management during his final year when he did a project with Professor Tariq Butt. He also passed the MSc with Distinction and in addition, was awarded the BCPC Prize for the best research project. He is now doing a BBSCR/CASE PhD at Harper Adams University under the supervision of Professor Simon Leather investigating ways in which to improve biological control in organic vegetable production. The CASE contribution is coordinated by AHDB Horticulture.

## **Project summaries**

### **Samuel Deane – Distribution and abundance of slugs and their beetle predators in relation to cultivation**

Farmers in temperate climates such as the U.K. believe minimum tillage practices can lead to an increase in crop damage due to slugs. This study investigated the effect of cultivation on slug abundance and diversity. Conventional, organic and minimum tillage fields were sampled using pitfall traps. Predatory carabid beetles numbers were higher in those fields with minimum tillage and this correlated with fewer numbers of slugs. It thus appears likely that by creating a stable environment for generalist predators such as carabid beetles, retaining crop residues which slugs feed upon, by monitoring slug thresholds in vulnerable crops and applying molluscicidal treatments when needed, that slug numbers can be kept to manageable populations

### **Christopher Lambert - Chronotoxicity of several insecticides to the peach-potato aphid, *Myzus persicae***

Many insects possess rhythms which govern biological functions over a twenty-four hour period. These functions can be physiological, behavioural or biochemical in nature. Chronotoxicity has been demonstrated in numerous species of insect, but the taxon that has had this phenomenon studied in the most depth is *Drosophila*. As the primary model organism in determining circadian rhythms, *Drosophila melanogaster* was found to possess significantly variable susceptibility time periods when exposed to a variety of pesticides. At the time of writing, no substantial research into chronotoxicology of aphids has been found. This is unusual because circadian biology is very well studied in certain members of Aphididae. With the importance of many aphids as a pest species and the apparent lack of research on the subject, species of aphids were selected as the study organisms for this project. Greater tolerance of a pesticide at certain times of day could be related to the same mechanisms that drive resistances to certain pesticides. If the time of day is a factor in the effectiveness of a pesticide, it follows that research into chronotoxicity has the potential to alter current pesticide application practices by targeting their use at the optimum time of day. Applying a pesticide at the more effective time period would mean a reduction in cost to farmers and other users, reduced impact on non-target and beneficial organisms, less run off/drift, and fewer residues on foods. This study focused on the following questions: 1) Does the susceptibility of aphids to pesticides vary throughout a twenty-four hour period? 2) Does the peak susceptible time vary between species? and 3) Does the susceptible time vary between classes of pesticide with different modes of action? This project found that there were indeed differences in host susceptibility, dependent upon the time of day that the aphids were exposed to pesticide. This suggests that chronotoxicity has the potential to alter host resistance, and that current pesticide application practices should be more targeted in their use to ensure they are applied at the optimum time of day

### **Aidan Thomas - Compatibility of *Dalotia coriaria* with entomopathogenic fungi for the control of *Otiorhynchus sulcatus* in strawberry crops**

This project evaluated the ability of the predatory rove beetle *Dalotia coriaria* to control *Otiorhynchus sulcatus* in the presence of an entomopathogen, *Metarhizium brunneum* (*anisopliae*) in laboratory and semi-field studies. Bioassays examined the ability of *D. coriaria* to predate *O. sulcatus* eggs and larvae as well as reporting the functional response to increasing density of the latter. Semi-field trials demonstrated the impact of *M. brunneum* (as Met52) on the reproductive ability of *D. coriaria*. A second semi-field trial examined the

level of control of *O. sulcatus* provided by *D. coriaria* on its own and in combination with Met52. *Dalotia coriaria* can consume *O. sulcatus* eggs but the level of consumption is low. Adult and larvae *D. coriaria* both increased their consumption of larvae in response to increasing prey density. No significant impact on the breeding level of *D. coriaria* was observed in the presence of Met52. Trials indicated that *D. coriaria* was able to control *O. sulcatus* to similar levels as Met52 and in combination control was significantly higher. The study confirms the potential for *D. coriaria* to act as a biological control of *O. sulcatus* in strawberry plants in combination with Met52.

## **Conclusions**

The scheme is definitely having an impact in that we receive more enquiries about the course. Take-up is still relatively low, despite the bursaries and we feel that this is in part, due to the fact that many new graduates are feeling financially insecure and that the bursaries are limited in number. We are stressing to potential applicants that, due to the demand for IPM graduates, the excellent employment prospects mean that the course is likely to be a good investment, even for non-bursary holders.

We also found that the number of projects available from the horticultural industry that were feasible as MSc projects was lower than expected. We plan to start talking to potential industry project suppliers earlier this year but would also welcome suggestions from AHDB Horticulture.