

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement 2017

Project Brief

Applications close at Noon, Friday, 2 June 2017

Lead Supervisors:	Dr Herman Wijnen Dr Haruko Okamoto
Email:	H.Wijnen@soton.ac.uk
University/Research Organisation:	University of Southampton
Department:	Biological Sciences
Project Title:	Role of the diamondback moth circadian clock in its impact on brassica plants.

Total Student Support Costs: £	£ 2,500 (£200 for 10 weeks plus £500 research and training support grant)
<i>Based on a minimum of £200/week full time for a minimum of 8 weeks and maximum of 10 weeks and a £500 Research and Training Support Grant.</i>	

Proposed Start Date: Monday, 26 June 2017	Proposed End Date: Friday, 1 September 2017
<i>Projects should run over the summer vacation and we recommend that projects will have terminated by 15 September 2017.</i>	

Brief Summary – please provide a brief summary (291/300 words) of the project.

The ultimate aim of this project is to provide insight in targets for management of the brassica crop pest *Plutella xylostella* (diamondback moth, DBM)¹ by identifying relevant patterns of gene regulation in insect and host. Physiological activities of insects (e.g. feeding and oviposition) and plants (e.g. synthesis of attractants and defensive metabolites i.e. glucosinolates) are both regulated by environmentally-entrained circadian rhythms. It has been shown that insect herbivory on crucifer plants depends on clock-controlled production of glucosinolates in the plant². It is likely that the impact of DBM on Brassica depends on clock-controlled rhythms in insect resistance as well as plant defense. However, the former has not been studied. The primary goal of this project is to investigate how the DBM circadian clock contributes to activity, herbivory, and the expression of resistance genes.

The student will undertake this research in the general laboratories in Biological Sciences at UoS and will be supervised by Drs Herman Wijnen and Haruko Okamoto. Biological Sciences have a state of the art insectary, controlled plant growth facilities and glass houses suitable to conduct this research. The student will be given necessary H&S induction. Both HW and HO will guide him/her to conduct day-to-day research to work in these key areas as well as the guidance in performing sustainable research. The student will be working closely with HW laboratory and join weekly lab meetings in which s/he will be presenting experimental results. This multidisciplinary project offers training opportunities in behavioural, molecular, and genetic experiments in insects and plants as well as data analysis techniques and oral and written presentation and communication skills. There are no IP concerns.

References

[1] Furlong et al (2013) *Annu. Rev. Entmol.* 58, 517-41., [2] Goodspeed et al (2013) *Curr Biol* 23, 1235-414.

Please give an indicative timescale for the student's work over the length of the project: (141/150 words).

Prior to start date

Referral at occupational health

Experimental DBM larva will be grown on Chinese cabbage under constant light, light/dark, or dark/light cycles for 2 weeks prior to experimental feeding.

Weeks 1 - 3

Laboratory inductions

Sowing seeds and planting

Identify clock genes and putative resistance genes by bioinformatics analyses of published data sets and DBM genome database (<http://iae.fafu.edu.cn/DBM/>)

Design qPCR primers

Weeks 4 - 10

DBM larvae raised under the different conditions will be paired with light/dark-raised Chinese cabbage plants under constant light and examined for:

- 1) Weight gain over time – weeks 4 - 7
- 2) Activity/feeding patterns (time lapse recordings) – weeks 4 - 7
- 3) Transcript levels across the day for clock and resistance genes by qPCR – weeks 5 - 8
- 4) Quantitative and statistical analyses of experiments (1-3) and production of summary report – weeks 8 - 10

Proposed procedure for appointing students, including selection criteria:

The student undertaking this project should have a significant academic excellence firstly by his A-level scores in natural science and Biology subjects demonstrating that he has the knowledge he requires to work on this project and to conform to the UoS laboratory H&S protocols. Students with an interest in environmental biology that are studying degree programmes in quantitative subjects including math, physics, statistics, computing and engineering will be considered for this position. In particular a call will go out among current students of the 'mathematics with biology' programme. Further, students aspiring to pursue postgraduate research in quantitative and qualitative biology will be prioritized for this opportunity.