

PhD Project Advertisement

Project title: Harnessing cell permeable peptides to enhance crop development and biochemistry

Project No: FBS2024-061-JonesH-ar

Lead supervisor: Huw Jones, DLS, Aberystwyth University

Email: hdj2@aber.ac.uk

Co-supervisors:

Luke Bell, University of Reading

Dylan Phillips, Aberystwyth University

Project description:

This research project will explore novel ways to alter the nutritional and other aspects of food crops. It will build on existing work done by the supervisors doi.org/10.1038/s41598-020-70532-x using 'cell-permeable-peptides' (CPPs) to deliver chemical cargoes through the cell wall and plasma membranes into cellular compartments. We will focus on a CPP called Cupid and we have in-kind support for training and synthesis of materials (worth over £10,000) from the company that developed this peptide.

There are two specific aims for this project.

1.To modify the nutritionally valuable, glucosinolate pathway in Brassica plants using Cupid to deliver transcription factor proteins known to modulate the glucosinolate pathway. This would represent a novel, non-genetically-modified approach to alter plant cell secondary metabolites.

2.To adapt the cargo-carrying capacity of Cupid to allow it to transport nucleic acids as well as proteins into cells. This would be a novel use of CPPs and could overcome the current recalcitrance of many plant species to conventional genetic transformation systems. This is timely due to the changes by many regulatory authorities (including UK and maybe EU) to remove some forms of genome editing from existing GMO regulations.

There are many challenges to food production systems and nutritional qualities. These include climate change and the more frequent occurrence of extreme weather events, a drive towards more sustainable agricultural and a growing global population. Some of these challenges could be overcome by growing more resilient crops that possess better nutrient profiles for human and animal diets. This project uses cutting-edge molecular and cellular biology to make targeted biochemical and/or genetic changes to plant cells with the aim of improving nutritional qualities while also enhancing agricultural resilience and sustainability.

Training opportunities:

This project offers multidisciplinary training in cell biology, molecular biology, biochemical analysis, and protein modelling equipping the student with skills that can be utilised in a range of scientific disciplines either at a university or in industry. The student will receive advanced training in biochemical analysis from the University of Reading, and molecular plant genetics at Aberystwyth University. In addition, training in advanced protein synthesis will be supplied by Cupid Peptide Co. Ltd. The student will also undertake several post-graduate courses at Aberystwyth during the programme, helping develop a wide set of transferrable skills.

The student will have the opportunity to showcase their research to the scientific community at the annual Monogram meeting, and funding allocated for them to attend an international conference, such as the Global Conference on Plant Science and Molecular Biology. The student will be also encouraged to develop their teaching skills by aiding in the supervision of undergraduate students working in the lab and to undertake the Teaching for Postgraduates at Aberystwyth University (TPAU) programme.

Student profile:

Applicants need to have a keen interest and ideally some experience in molecular and cellular biology. They need an ability to conduct carefully-controlled experiments and record detailed outcomes.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2023/24 this is £18,622 and it will increase slightly each year at rate set by UKRI.

Equality Diversity and Inclusion:

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher(DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the [FoodBioSystems DTP website](#).

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.

References:

Fenton, D., Phillips, D., Maddison, A. et al. Cupid, a cell permeable peptide derived from amoeba, capable of delivering GFP into a diverse range of species. *Sci Rep* 10, 13725 (2020). <https://doi.org/10.1038/s41598-020-70532-x>

For up to date information on funding eligibility, studentship rates and part time registration, please visit the [FoodBioSystems website](#).