

PhD Project Advertisement

Project title: *Decoding Heat Tolerance At Flowering: Using Multi-omics Approaches to Unlock Crop Resilience*

Project No: FBS25-81-Lloyd-ac

Lead supervisor: Dr Andrew Lloyd, IBERS, Aberystwyth University

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Co-supervisors:

Professor Fady Mohareb, Centre for Soil, Agrifood and Biosciences, Cranfield

Professor Luis Mur, Department of Life Sciences, Aberystwyth University

Dr Smita Kurup, Rothamsted Research, Rothamsted Research

Project description: Global warming is creating significant challenges for agriculture, with rising temperatures threatening crop yields worldwide. In Europe, including the UK, the frequency of extremely hot days is predicted to increase dramatically in the coming decades, jeopardizing key crops such as cereals and oilseeds. This project focuses on uncovering how plants maintain fertility during heat stress at flowering—a critical stage for seed production—and applying this knowledge to develop heat-resilient crops.

Our recent work in the model plant *Arabidopsis thaliana* has identified key genetic and biochemical pathways linked to heat stress resilience during flowering. This project will build on these findings, using genome-wide association studies (GWAS), RNA sequencing (RNAseq), and advanced metabolomic profiling to uncover the molecular mechanisms that enable plants to maintain seed production under heat stress. We will validate these resilience traits in *Arabidopsis* under controlled conditions and apply the insights to *Brassica napus* (oilseed rape), screening a diverse germplasm collection available through Rothamsted Research, to identify candidate lines for the breeding of heat-tolerant crops. By linking genetic variation, molecular responses, and key traits, this project has the potential to deliver impactful advances in crop improvement.

This PhD provides an excellent opportunity to develop expertise in cutting-edge research methods. You will gain hands-on experience in GWAS to identify genetic markers of heat tolerance, RNAseq to analyze gene activity during stress, and metabolomics to profile biochemical changes associated with resilience. Additionally, you will work with a diverse *Brassica napus* germplasm collection, performing controlled-environment experiments to assess fertility and yield under heat-stress conditions. These interdisciplinary approaches will prepare you for a career at the forefront of plant science and crop improvement.

Training opportunities: This project provides multidisciplinary training in molecular plant genetics, association mapping (GWAS), metabolomics, and bioinformatics, preparing you for a research career in academia or industry. You will gain hands-on experience in advanced molecular techniques, including CRISPR gene editing, at Aberystwyth University and bioinformatics analysis during placements at Cranfield University. A three-month placement at Rothamsted Research will provide specialized training in *Brassica napus* development and crop science. The research focuses on a previously unstudied gene family linked to heat-stress resilience, offering opportunities to generate novel fundamental biological insights and translate them into crop improvement. You will benefit from expert supervision, access to cutting-edge facilities, and funding to present your work at national and international conferences. Postgraduate courses and placements will further develop a wide range of transferable skills, ensuring you are well-equipped for a future in plant science or related disciplines.

Project supervision style: The student will meet with the lead supervisor, Dr. Andrew Lloyd, for 1:1 meetings on a fortnightly basis to review progress, address challenges, and planning. These meetings will ensure continuous, focused guidance and support throughout the project. In addition, the student will participate in a) weekly lab meetings, which serve as a forum for informal discussions, troubleshooting, and collaborative feedback and b) fortnightly IBERS research group meetings, providing an opportunity to deliver formal research presentations, fostering critical discussion and enhancing presentation skills. The student will meet monthly with wider members of the supervisory team to ensure comprehensive support and oversight. Feedback will be provided within two weeks of submission of drafts or research outputs to ensure timely progress.

Student profile: We encourage applications from candidates with backgrounds in plant biology, genetics, biochemistry, agriculture, or related fields. While prior experience with molecular or data analysis techniques is helpful, full training will be provided. Most importantly, we are looking for individuals with curiosity and a commitment to addressing the global challenge of food security in a changing climate.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2024/25 this is £19,237 (£21,237 at Brunel University) and it will increase slightly each year at rate set by UKRI.

Equity Diversity and Inclusion:

The FoodBioSystems DTP is committed to equity, 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](#) and include:

- Offering reasonable adjustments at interview for shortlisted candidates who have disclosed a disability or specific learning difference.
- [Guaranteed interview](#) and [applicant mentoring](#) schemes for applicants, with UK home fees status, from eligible under-represented ethnic groups.

These are opt-in processes.

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.

The closing date is 3 February 2025 (10.00 GMT). Please visit the [FoodBioSystems website](#) to access the [2025 cohort applicant guidance document](#); and for up to-date information on how to apply, eligibility, studentship rates, and part time registration.