

PhD Project Advertisement

Project title: *Novel breeding strategies for elite raspberry cultivar selection*

Project No: FBS25-03-KeveiZ-ca

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Co-supervisors:

Professor Gancho Slavov, Institute of Biological, Environmental and Rural Sciences (IBERS), Aberystwyth University

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Project description: Raspberries are clonally propagated and grown for the high-value fresh market in the UK, and around the world, providing many nutritional benefits and pleasure to consumers. Demand is increasing and plant breeders constantly strive to introduce superior varieties to capture greater market share and to provide advantages to growers and benefits to consumers. Traditional breeding methods involve cross-pollination between elite outbreeding varieties, and then selection of the best progeny clones using direct observation, and by simple measurements of yield and quality. This can be a slow and expensive process, requiring great skill by the breeder.

Recently the raspberry genome has become available, and low-cost genotyping methods for defining thousands of genetic differences between thousands of clones are available. This allows the “Genomic Selection (GS)” approach to be used where genotype and plant trait data are combined to create GS models. The GS models are designed to predict which seedlings will develop into the best performing crop plants based on genotype data alone – this can save costs in land and labour and accelerate the rate of crop improvement over the breeding generations.

Cranfield University has a close collaboration with a global soft-fruit breeding company and has already created pipelines for genetic analysis such as Quantitative Trait Locus analysis, and Genome Wide Association Studies, using raspberry genome assemblies developed in-house; Aberystwyth University has experience in GS in a range of crops.

In this project you will work with supervisors at Cranfield and Aberystwyth in collaboration with the breeding company to identify the best GS strategies for raspberry. You will perform data analysis on existing trait (phenotype) and genotype data, collect new data from active breeding populations, build GS models for commercially interesting traits, and test the models against alternative breeding populations. You will compare different strategies, create GS models of practical use to breeders, and generate new knowledge about genetic diversity in raspberry.



Training opportunities: You will be based mainly at Cranfield University where you will be trained in plant genetics, postharvest science, bioinformatics and modelling via our MSc taught modules in these topics and through personal tutoring. You will learn molecular biology laboratory techniques and obtain hands-on experience in fundamental plant genetics and functional genomic approaches. Training will also be provided in sensor technology for non-destructive fruit

traits phenotyping. Aberystwyth University will provide training in integrating quantitative genomics into breeding/conservation programmes, methods to analyse multi-omic and phenomic data, and the role of Artificial Intelligence methods in plant breeding. For trait phenotyping and harvesting plant material, you will spend several weeks at the raspberry breeders' site in Kent, England, during the harvesting seasons, and will experience at first hand a commercial soft-fruit breeding operation.

Project supervision plan: Beside informal discussions, the student will meet weekly with ZK (primary supervisor) to discuss the project progress and receive feedback. Depending on the project stage, MA and AT will also participate in these weekly meetings when their expertise is required. Likewise, we will have a monthly online catch up meeting with all supervisors (ZK/MA/AT/GTS) included to monitor the overall progress and to consider the training needs of the student. ZK, MA and AT have a weekly group meeting with research students presenting their project progress, the student will also participate explaining the latest results. In the laboratory, technical supervision will be undertaken by the supervisors, experienced laboratory technician will provide help to use special tools, kits. The student's progress will be evaluated as the CU's standard practice, monthly meetings-minutes will be recorded, with feedback, and submitted to CANVAS. Annual progression reviews will be held with independent experienced staff.

Student profile: You will have an aptitude for analysis of large data sets. Basic skills in molecular biology, genetics and bioinformatics would be highly advantageous.

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 an 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.

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