

FoodBioSystems DTP - PhD Project Advertisement

Project title:

FBS2021-45-Thompson: Genome-wide association studies of raspberry germplasm to investigate postharvest quality traits

Lead supervisor:

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Co-supervisors:

Prof. Monique Raats - University of Surrey (UoS)

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Project description:

The appearance, flavour, scent, and texture of berry fruits provide consumers a highly valued sensory experience. Their high levels of antioxidants, vitamins, minerals, and fibre have led to these fruits being considered as “superfoods” where increased consumption is believed to be a means to improve general health and wellbeing. Worldwide raspberry production has doubled during the last 15 years, with the UK becoming one of the top 10 producers - this has led to increased activity and competition to breed new high quality, high yielding cultivars. However, despite a relatively small genome, the molecular genetics of raspberry is understudied compared to strawberry.

Edward Vinson (EV) is a well-established UK company, breeding, propagating, and growing soft fruits for major UK supermarkets. Over the last 30 years, their breeding program released very popular varieties that are now grown worldwide. EV intends to invest further in genetic research and molecular breeding for traits related



to fruit quality and shelf-life, making use of their large raspberry germplasm collection to breed best-selling raspberry cultivars that meet consumer’s preferences.

The aim of the project is to perform a genome-wide association study (GWAS) on the existing raspberry germplasm of EV, to investigate the genetic basis of nutrition and shelf-life, and to ultimately make raspberry consumption more attractive to consumers.

Firstly, we will study the key traits attracting consumers to purchase raspberries in store. Consumer preferences are vitally important to the sale of raspberries, not least because they are subject to rapid change during postharvest transport and storage leading to high levels of loss and waste when they fail to meet consumer expectations. EV will grow 400 raspberry lines on their breeding sites and you will perform genotype-by-sequencing (GBS) and phenotyping for key raspberry traits, including physical and biochemical characteristics

focusing on EV and consumer/supply chain interests. Physical time-sensitive measurements (e.g. fruit firmness) will be performed on the EV breeding site alongside EV staff, and you will complete biochemical analyses at CU in a well-equipped post-harvest technology lab where chemical composition of fruits can be analysed for antioxidants, soluble solids, and organic acids. You will use GWAS analysis, to discover QTL and candidate genes for key traits, and this information will be built into marker assisted selection within the EV breeding program.

Training opportunities:

The project offers training on broad scientific subjects: lab work, fieldwork and bioinformatic data analysis. You will also be trained how to study consumer behaviour and process the resulted data with the help of UoS. You will be trained in fruit sampling and analyses at the EV breeding sites in Kent, which will be done in several placements of a total duration of at least 3-months. This gives an opportunity to become familiar with the EV's bespoke digital and physical phenotyping platforms. You will be trained to carry out biochemical analysis in the post-harvest laboratory of CU e.g. using advanced high-throughput LC-MS and HPLC. The CU Bioinformatic group will train the student in how to prepare and analyse sequence data for GBS analysis using existing pipelines developed for tomato and raspberry projects. You will then be trained in GWAS where the bioinformatics department is currently working with human datasets. You will create their own training plan, which might include attending relevant courses from MSc CU courses on "Food Systems and Management" and "Applied Bioinformatics". The student will be supported to dissemination their results at international conferences (e.g. Rosaceae Genomics Conference).

Student profile:

BSc degree related to biological sciences with knowledge of biochemistry, molecular biology, genetics and statistics, and an interest in plant breeding. General practical experience in a biochemical or genetic laboratory environment would be an advantage. The student should have an aptitude for data analysis and computer programming, although full training will be given.

Funding particulars:

Edward Vinson is a co-sponsor of the project, offering their genetic material and financial support for the planned research.

The project is part of the FoodBioSystems BBSRC Doctoral Training Partnership (DTP), it will be funded subject to a competition to identify the strongest applicants.

The studentship is open to UK and international students (including EU countries) however due to funding rules, no more than 30% of the projects can be allocated to international students.

The funding will include a tax free stipend (minimum £15, 285 per year), support for tuition fees at the standard UK rate (currently £4,407 per year) and a contribution towards research costs. **Please note** that the host universities have not yet confirmed the level of fees charged to international students funded by the DTP. Fee levels may vary across the institutions. This information will be shared on the FoodBioSystems DTP website as soon as it becomes available.

To apply

Please go to [FoodBioSystems DTP website](#) for information on how to apply for this studentship. The closing date for applications will be 8 February 2021.